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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, 40 divisions, and 176 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 dressing: crushing and grinding, concentration or mineral preparation
2. Process metallurgy
 - a. Pyrometallurgy: metallurgical processes that involve the use of heat
 - i. Gas-solid reactions; *e.g.*, roasting
 - ii. Distillation: processes for refining metals by condensing metal vapours

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.

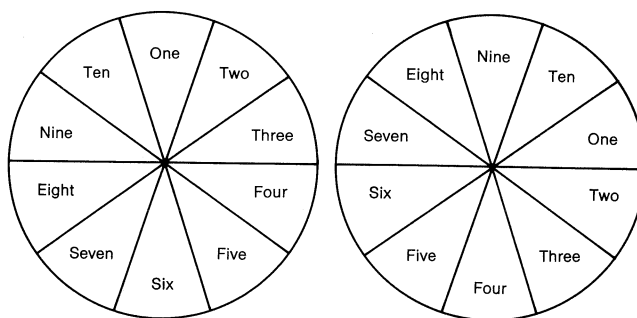
The second point is that the Outline of Knowledge is conceived as a circle of learning. To say that the contents of an *en-cyclo-pædia* form a circle of learning is more than a literal transliteration from Greek to English. In Greek or English, reference to the circle introduces a powerful metaphor, 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.

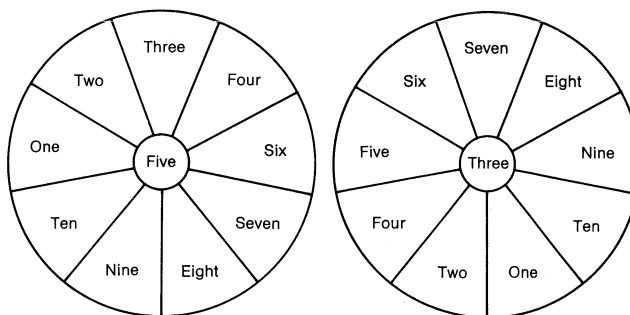
For a synopsis of the subject matter covered in each of the 10 parts of the outline, the reader is referred to the Table of Contents set forth on pages 9–15 of this volume. The titles of the individual parts are given in the following list:

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

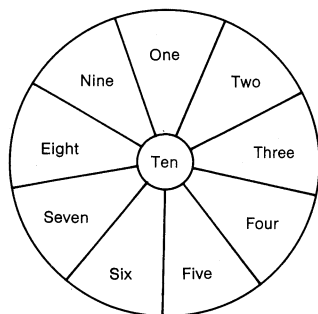
The pair of diagrams below shows the 10 parts as segments of a circle. Part One is placed at the top of the diagram to the left, and Part Nine is at the top of the diagram to the right, to illustrate the effect achieved by rotating the circle.



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 681 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 encyclopædia, 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 encyclopædias, 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

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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.

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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.

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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 Principles and Concepts
Physical Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

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

Biographies

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INDEX: See entries under all of the terms above

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- 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
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 8. Applications of radioactivity
[see 723.G.8.]
 9. Measurement and characterization of radioactivity
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- D. The neutron as a component of the nucleus and in nuclear reactions
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 2. Sources of neutrons
 3. Manipulation and control of neutrons
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 - b. The types of nuclear reactions classified according to the nuclear processes involved or according to their products
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 3. Theories and models of nuclear reactions
- F. The splitting of atomic nuclei by nuclear fission
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 - c. The energy released in fission
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 - 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

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 - 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 basic 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
 Atoms: Their Structure, Properties, and Component Particles
 Physical Principles and Concepts
 Physical Sciences, The
 Radiation
 Subatomic Particles

MICROPAEDIA: Selected entries of reference information

General subjects

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

Biographies

See Section 10/32 of Part Ten

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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 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: rutherfordium (or kurchatovium), hahnium (or nielsbohrium), element 106, element 107
- 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 214.F. and 222.B. and C.]
 - c. In the atmosphere
[see also 214.G. and 221.A.1.c.]
 - 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>	cerium	nobelium	cesium
actinide	einsteinium	plutonium	francium
actinium	fermium	protactinium	lithium
americium	lawrencium	thorium	potassium
berkelium	mendelevium	uranium	rubidium
californium	neptunium	<i>alkali metals:</i>	sodium
		alkali metal	

<i>alkaline-earth metals:</i>	<i>nitrogen group:</i>	samarium	manganese
alkaline-earth	antimony	scandium	molybdenum
metal	arsenic	terbium	nickel
barium	bismuth	thulium	niobium
beryllium	nitrogen	ytterbium	osmium
calcium	nitrogen group	yttrium	palladium
magnesium	element	<i>synthetic elements,</i>	platinum
radium	phosphorus	<i>including the</i>	rhenium
strontium	<i>noble gases:</i>	<i>transuranium</i>	rhodium
<i>boron group:</i>	argon	<i>elements:</i>	ruthenium
aluminum	helium	americium	silver
boron	krypton	berkelium	tantalum
boron group	neon	californium	technetium
element	noble gas	curium	titanium
gallium	radon	einsteinium	transition element
indium	xenon	element 106	tungsten
thallium	<i>oxygen group:</i>	element 107	vanadium
<i>carbon group:</i>	oxygen	fermium	zirconium
carbon	oxygen group	hahnium	<i>zinc group:</i>
carbon group	element	lawrencium	cadmium
element	polonium	mendelevium	mercury
germanium	selenium	neptunium	zinc
lead	sulfur	nobelium	zinc group
silicon	tellurium	plutonium	element
tin	<i>rare-earth elements:</i>	promethium	<i>other:</i>
<i>halogen elements:</i>	cerium	rutherfordium	allotropy
astatine	dysprosium	technetium	Aufbau principle
bromine	erbium	transuranium	chemical element
chlorine	europium	element	chemical symbol
fluorine	gadolinium	<i>transition elements:</i>	group
halogen	holmium	chromium	lanthanide
iodine	lanthanum	cobalt	contraction
<i>hydrogen and its</i>	lutetium	copper	metal
<i>isotopes:</i>	neodymium	gold	metalloid
deuterium	praseodymium	hafnium	nonmetal
hydrogen	promethium	iridium	nucleosynthesis
tritium	rare-earth metal	iron	periodic law

Biographies

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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 bond: shell theory, ion pairs
 - ii. The nature of covalent and coordinate bond: 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

Molecules: Their Structure, Properties, and Forms

Physical Principles and Concepts

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	pyrazine
<i>aldehydes and</i>	serotonin	number	pyrazole
<i>ketones:</i>	transaminase	ligand	pyridine
acetone	<i>carbides:</i>	ligand field theory	pyrimidine
aldehyde	carbide	metal carbonyl	pyrrole
benzaldehyde	silicon carbide	<i>dyes and pigments:</i>	quinoline
ethyl acetoacetate	tungsten carbide	alizarin	thiazine
formaldehyde	<i>carbohydrates:</i>	anthraquinone	thiazole
ketone	carbohydrate	anthraquinone dye	thiophene
<i>alkaloids:</i>	cellulose	auxochrome	<i>hydrocarbons:</i>
alkaloid	disaccharide	azo dye	acetylene
atropine	glucose	carmine	benzene
caffeine	glycoside	chlorophyll	biphenyl
cocaine	monosaccharide	chromophore	butadiene
codeine	pectin	cochineal	butane
curare	polysaccharide	cyanine dye	butene
ephedrine	sugar	dye	ethane
heroin	<i>carboxylic acids:</i>	flavonoid	ethylene
ibogaine	acetic acid	indigo	hydrocarbon
mescaline	benzoic acid	lake	methane
morphine	butyric acid	melanin	naphthalene
nicotine	carboxylic acid	porphyrin	olefin
piperine	citric acid	Prussian blue	paraffin
quinidine	fatty acid	quercitron bark	hydrocarbon
quinine	formic acid	triphenylmethanedyne	propane
scopolamine		ultramarine	styrene
theophylline			

- 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
deoxyribonucleic
acid
guanine
nuclease
nucleic acid
nucleoside
nucleotide
ribonucleic acid
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
turpentine oil
wax
whale oil
organic halogen compounds:
acid halide
aldrin
benzene
hexachloride
carbon
tetrachloride
chloral
chloral hydrate
chlordane
chlorobenzene
chloroform
chlorotrifluoro-
ethylene
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:
carborane
ferrocene
Grignard reagent
metal carbonyl
tetraethyllead
peroxy compounds:
hydrogen peroxide
peroxide
peroxy acid
petroleum, gasoline, oil, and coal:
gasoline
kerosine
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
polychlorotri-
fluoroethylene

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

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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 C.6., 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 Principles and Concepts

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
amphoterism	<i>catalysis of reactions:</i>	electrical double layer	<i>kinetics and mechanism:</i>
Brønsted–Lowry theory	acid–base catalysis	electrochemical reaction	activation energy
buffer	catalysis	electrochemistry	Arrhenius equation
hydrogen ion	catalyst	electrolysis	chain reaction
hydroxide	catalyst poison	electrolytic cell	
	Ziegler–Natta catalyst		

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

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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: Gibbs equation for entropy change, the Gibbs–Dalton rule 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, 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. Acoustical 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 Principles and Concepts
 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	

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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
Physical Principles and Concepts

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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. 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

C. 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
- D. 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.]
- E. 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
- F. 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, The Concept of
 Mechanics: Energy, Forces, and Their Effects
 Physical Principles and Concepts

MICROPAEDIA: Selected entries of reference information

General subjects

<i>deformation and elasticity:</i>	yield point	kinetics	statics
bulk modulus	Young's modulus	mass	velocity
<i>deformation and flow</i>	<i>elementary classical mechanics:</i>	mechanics	<i>energy:</i>
elasticity	acceleration	momentum	energy
Hooke's law	collision	motion	kinetic energy
plasticity	d'Alembert's principle	motion, equation of	mechanical energy
shear modulus	dynamics	Newton's law of gravitation	potential energy
slip	force	Newton's laws of motion	power
strain	gravity, centre of inertia	particle	work
stress	kinematics	position vector	<i>fluid mechanics:</i>
tensile strength			Archimedes' principle

austausch	Magnus effect	precession	ballistics
coefficient	Pascal's principle	reduced mass	celestial mechanics
Bernoulli's	Reynolds number	torque	density
theorem	terminal velocity	uniform circular	equilibrium
boundary layer	Torricelli's	motion	equivalence
capillarity	theorem	<i>vibrations:</i>	principle
cavitation	turbulent flow	damping	escape velocity
convergence and	viscosity	pendulum	Kepler's laws of
divergence	<i>rotary motion:</i>	periodic motion	planetary motion
eddy	angular	reduced mass	pressure
fluid	momentum	resonance	reference frame
fluid mechanics	angular velocity	simple harmonic	specific gravity
Froude number	centrifugal force	motion	statistical
hydraulics	Coriolis force	vibration	mechanics
laminar flow	couple	<i>others:</i>	
Mach number	inertia, moment of	action	

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Section 127. Electricity and Magnetism**A. The static electrical charge****1. General phenomena of static electricity**

- The basic laws of electrostatics that relate the interaction of charged bodies at rest
- The electrostatic field
- The electric dipole
- Electrostatic energy and force
- Electricity in the atmosphere
[see also 212.C., 221.A.4., and 223.B.2.]

2. Electrostatics of dielectrics and capacitors: polarization**3. Electrostatic potential**

- High-voltage phenomena
- Electrical 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**

- General phenomena of moving electrical charges: definitions of electrical quantities and their units
- Electromotive force
- Behaviour of direct currents in electrical 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

- The motion of charged particles in an electric field
- The mechanisms of the conduction of electricity: in a vacuum, in gases, in liquids and solids, in metals and semiconductors
- Thermoelectric effects: phenomena in which electrical energy is transformed into thermal energy or vice versa
- 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.e.]
- 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 electrical 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
 Physical Principles and Concepts

MICROPAEDIA: Selected entries of reference information

General subjects

<i>stationary electric charges and related phenomena:</i>	dielectric constant	electric field	electrostatic induction
capacitance	electret	electric polarization	Stark effect
Coulomb force	electric charge	electric potential	<i>electric currents and related phenomena:</i>
dielectric	electric dipole	electric susceptibility	alternating current
	displacement		

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

Biography

Maxwell, James Clerk
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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. General properties of electromagnetic waves
 2. Waves of the electromagnetic spectrum and their properties
 - a. Electric current waves
 - b. Radio waves
 - c. Microwaves
 - d. Infrared waves
 - e. Visible light
[see C., below]
 - f. Ultraviolet waves
 - g. X-rays
[see 111.D.]
 - h. Gamma radiation
 3. Sources of incoherent electromagnetic waves
 - a. Sources of radio waves: oscillators, antennas
 - b. Sources of microwaves: klystrons, travelling wave tubes
 - c. Sources of infrared, visible, and ultraviolet waves
 - i. Black-body radiation
 - ii. Luminescence, fluorescence, phosphorescence
 - iii. The passage of electrical current through a resisting medium
 - d. Sources of X-rays: X-ray tubes, nuclear and astronomical sources
 - e. Sources of gamma rays: nuclear sources, Mössbauer radiation
 4. Sources of coherent electromagnetic waves: lasers and masers
[see 725.B.5.g. and 735.G.3.]
 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
[see 624.B.1.]
 - 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
Electromagnetic Radiation
Light
Optics, Principles of
Sound

MICROPAEDIA: Selected entries of reference information

General subjects

<i>behaviour and</i>	Doppler effect	line broadening	Snell's law
<i>properties of waves:</i>	double refraction	longitudinal wave	standing wave
absorption	Faraday effect	moiré pattern	total internal
amplitude	Fermat's principle	Newton's rings	reflection
beat	frequency	phase	transverse wave
Brewster's law	Huygens' principle	Rayleigh scattering	wave front
diffraction	interference	reflection	wave motion
dispersion	interference fringe	refraction	wave number

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

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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.

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- 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 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 also 126.A.]
 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 unsolved three-body problem
 4. The general n -body problem
- 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–Fitzgerald
big-bang model	carbon cycle	gravitation	contraction
cosmology	nucleosynthesis	gravitational radius	relativistic mass
cosmos	proton–proton	Newton’s law of	relativity
expanding universe	reaction	gravitation	time dilation
Hubble’s constant	<i>extraterrestrial life</i> :	weight	<i>other</i> :
Mach’s principle	Green Bank	weightlessness	cosmic ray
Olbers’ paradox	equation	<i>relativity</i> :	ephemeris
quasar	Ozma, Project	Einstein’s mass–	Scorpius X-1
steady-state	<i>gravitation</i> :	energy relation	supernova
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	experiment	principle	

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

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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 also 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.4.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.6.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 6.a.ii., 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.F.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	Pallas	Copernican system	heliopause
Muslim calendar	Ra-Shalom	eclipse	limb darkening
perpetual calendar	Trojan planets	ecliptic	photosphere
Roman republican calendar	<i>Moon:</i>	equinox	solar cycle
solar calendar	Cassini's laws	equinoxes,	solar energy
Tibetan calendar	Copernicus	precession of the	solar flare
week	libration	heliocentric system	solar nebula
year	Linné	nutaton	solar
<i>comets:</i>	Mare Orientale	occultation	prominence
Arend-Roland,	Moon	orbit	solar radiation
Comet	Tycho	orbital velocity	solar wind
comet	<i>Neptune:</i>	parallax	Sun
Encke's comet	Neptune	phase	sunspot
Halley's comet	Nereid	Ptolemaic system	<i>Uranus:</i>
<i>Jupiter:</i>	Triton	retrograde motion	Ariel
Amalthea	<i>objects of</i>	solstice	Miranda
Callisto	<i>extraterrestrial</i>	synodic period	Oberon
Europa	<i>origin:</i>	tidal friction	Titania
Ganymede	achondrite	tide	Umbriel
Great Red Spot	ataxite	Tychonic system	Uranus
Io	carbonaceous	zodiac	<i>Venus:</i>
Jupiter	chondrite	<i>Pluto:</i>	Venus
<i>Mars:</i>	chondrite	Charon	<i>other:</i>
Chryse Planitia	chondrule	Pluto	albedo
Deimos	Hraschina	<i>Saturn:</i>	Bode's law
Mars	meteorite	Dione	celestial mechanics
Olympus Mons	meteor	Enceladus	Forbush effect
Phobos	meteorite shower	Iapetus	gegenschein
Syrtis Major	meteorite	Mimas	interplanetary
Tharsis	meteoritics	Phoebe	medium
Utopia Planitia	meteoroid	Rhea	mare
<i>Mercury:</i>	Orgueil meteorite	Saturn	planet
Caloris	tektite	Titan	Planet X
Mercury	Tunguska event	Tethys	planetesimal
<i>minor planets:</i>	<i>planetary motion:</i>	<i>Sun:</i>	quadrature
asteroid	aberration,	chromosphere	rille
Eros	constant of	corona	satellite
Icarus	anomaly	facula	solar system
	conjunction	flash spectrum	

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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 EarthEarth, The: Its Properties, Composition, and Structure
Solar System, The**MICROPAEDIA:** Selected entries of reference informationGeneral subjects

atmosphere	Earth tide	latitude and	sea level
biosphere	equator	longitude	seafloor spreading
continent	geoid	North Pole	South Pole
continental drift	hydrosphere	ocean	tide
Coriolis force	isostasy	orbit	
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.4.]
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. Geological aspects of heat flow: convection currents in 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.C. and F.]
 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
[see also 241.G.]
- F. Physical properties of Earth materials
1. Volumetric properties: rock density and porosity
 2. Mechanical properties
[see also 126.C., D., and F.]
 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

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 may be 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.C. 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 [see also 133.A.4.d., 212.E., and 214.A.5.]

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
[see also 214.A.5.]
 - b. The composition and mineralogy of meteorites that may correspond to rocks forming the Earth's interior
[see also 133.A.4.d.]
 - 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 external morphology of minerals
2. The physical properties of minerals: hardness; cleavage; specific gravity; magnetic, electrical, optical, and thermal properties
3. Classification of minerals in terms of crystal structure and chemical composition
 [see also 122.F.]

a. The principal nonsilicate minerals

- i. Native elements
- ii. Sulfides, including arsenides and antimonides
 [see also 4.c., below]
- iii. Sulfosalts
- iv. Oxides and hydroxides
- v. Halides
- vi. Carbonates
- vii. Nitrates and iodates
- viii. Borates
- ix. Sulfates
- x. Chromates
- xi. Phosphates, including vanadates and arsenates
- xii. Tungstates and molybdates

b. The silicate minerals

- i. Silicate structure and composition: the basic structural units, the silica tetrahedra and octahedra
- ii. Isolated or double tetrahedral group silicates
- iii. Chain silicates
- iv. Sheet silicates
- v. 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, tremolite
- 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 zeolites; *e.g.*, natrolite, heulandite
 - b. The occurrence of mineral associations
 - i. In igneous and metamorphic rocks
 - ii. In ore deposits
 - iii. In sedimentary rocks and precipitates
 - iv. In the Moon, planets, and meteorites
 - c. Ore deposits: concentrations of metals and metalliferous minerals
[see also 724.C.3.]
 - d. Minerals of gem quality
 - 5. Geochemical equilibria
- B. Rocks and other constituents of the Earth's crust
- 1. Igneous rocks
 - a. Properties of igneous rocks
 - 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
 - b. Classification systems: clastic, nonclastic
 - c. Sedimentary structures
 - d. Sedimentary environments: marine, nonmarine
 - e. Distribution of sedimentary rocks through time
 - f. Principal types of sedimentary rocks
 - i. Conglomerates, tillites, and other heterogeneous clastic rocks
 - ii. Quartzose sandstones and arkoses
 - iii. Graywackes
 - iv. Shales
 - v. Loess
 - vi. Limestones and dolomites
 - vii. Evaporites
[see also 724.B.1.b.]
 - viii. Siliceous rocks
 - ix. Phosphorites
 - x. Coals
[see D.1., below]
 - 3. Metamorphic rocks
 - a. Properties of metamorphic rocks
 - b. Classification of metamorphic rocks

- c. Formation 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. Mineral fuels
 - a. Coals
[see also 724.B.1.b. and C.2.]
 - a. Petroleum
[see also 122.G.1.a. and 724.B.2. and C.1.]
 - a. Tar sands and oil shales
[see also 122.G.1.a. and 724.B.2. and C.1.]
 - d. Natural gas
[see also 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.1.c.]
 - 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>	magnesite	analcime	nepheline
borate mineral	nahcolite	anorthite	orthoclase
borax	rhodochrosite	aventurine	peristerite
ulexite	<i>feldspar and</i>	celsian	perthite
<i>carbonate minerals:</i>	<i>feldspathoid</i>	feldspar	plagioclase
aragonite	<i>minerals:</i>	feldspathoid	sanidine
bastnaesite	adularia	labradorite	scapolite
calcite	albite	microcline	sodalite
carbonate mineral	alkali feldspar	micropegmatite	wairakite

halide minerals:

calomel
cerargyrite
fluorite
halide mineral
halite

igneous rocks and formations:

amygdule
andesite
anorthosite
aplite
basalt
basanite
batholith
dacite
diabase
dike
diorite
dunite
felsic rock
gabbro
granite
granodiorite
greisen
igneous rock
ijolite
Kimberlite
laccolith
lamprophyre
latite
leucitite
limburgite
magma
monzonite
myrmekite
nephelinesyenite
nephelinite
obsidian
pegmatite
peridotite
perlite
phonolite
picrite
pitchstone
pumice
pyroxenite
rhyolite
roof pendant
sill
spilite
syenite
tachylyte
teschenite
thermalite
tinguaite
trachyte
tuff
volcanic glass
xenolith

metamorphic rocks and their formation:

amphibolite facies

anatexis
cataclastite
charnockite
eclogite
epidote-amphibolite facies
glaucophane schist facies
gneiss
granitization
granulite facies
greenschist facies
hornfels facies
induration
marble
metamorphic rock
metamorphism
metatexis
migmatite
phyllite
sanidinite facies
schist
skarn
slate
zeolitic facies

mineral fuels and deposits:

anthracite
asphalt
asphaltite
bitumen
bituminous coal
brown coal
cannel coal
coal
crude oil
gas reservoir
Gilsonite
lignite
maceral
natural gas
oil shale
ozokerite
peat
petroleum
petroleum trap
pitch lake
pyrobitumen
shale oil
subbituminous coal
tar sand
wet gas

molybdate and tungstate minerals:

molybdate
and tungstate minerals
scheelite
wolframite
wulfenite

native elements:

diamond
electrum

graphite
industrial
diamond
native element
oxide and hydroxide minerals:

anatase
bauxite
boehmite
cassiterite
chromite
chrysoberyl
columbite
corundum
cuprite
emery
gibbsite
goethite
gossan
hematite
ilmenite
limonite
magnetite
oxide mineral
pitchblende
psilomelane
pyrochlore
pyrolusite
ruby
ruby spinel
rutile
sapphire
spinel
thorianite
uraninite

phosphate minerals:

amblygonite
apatite
arsenate mineral
carnotite
descloizite
erythrite
fluorapatite
lazulite
mimetite
phosphate mineral
pyromorphite
scorodite
triphylite
turquoise
vanadate mineral
variscite

sedimentary rocks and their formation:

arkose
armoured mud ball
black shale
breccia
cementation
conglomerate
diagenesis
diatomaceous earth
dolomite

evaporite
flysch
geode
gravel
graywacke
h lleflinta
limestone
lithification
loess
lutite
marl
molasse
nodule
  lite
phosphorite
porcellanite
quartzite
sand
sandstone
sedimentary facies
sedimentary rock
shale
siliceous rock
silt
siltstone
stratification
stylolite
subgraywacke
tillite
tripoli

silica minerals:

agate
amethyst
aventurine
carnelian
chalcedony
chert and flint
chrysotile
citrine
coesite
cristobalite
fulgurite
jasper
lechatelierite
moss agate
onyx
opal
phillipsite
quartz
rock crystal
rose quartz
sard and sardonyx
sepiolite
serpentine
silica
silica mineral
smoky quartz
tridymite

silicate minerals:

actinolite
aegirine
almandine
amphibole

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

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 structure, composition, and physical properties of the atmosphere

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

1. Regions of the atmosphere

a. The lower atmosphere: the troposphere, the stratosphere, the mesosphere

b. The upper atmosphere: the thermosphere and the exosphere

c. The composition of the atmosphere: the gross composition and regional variations

i. Water cycle

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

ii. Carbon budget

iii. Nitrogen budget

iv. Sulfur budget

2. The homosphere

- a. The effects of ultraviolet radiation: photodissociation of molecules
 - b. The role of the ozone layer: the absorption of ultraviolet radiation of wavelengths harmful to plant and animal life and the heating of the stratosphere and mesosphere
 - c. Mechanisms of air mixing: molecular and turbulent diffusion
- 3. The heterosphere
 - a. Oxygen dissociation in the lower thermosphere
 - b. Effects of vertical transport: the distribution of atmospheric constituents
 - c. Variations in atmospheric densities
 - d. The escape of helium and hydrogen from the upper atmosphere
 - e. Ionization mechanisms
[see also 4.b., below]
- 4. The ionosphere
[see also 127.B.2.]
 - a. The gross features of the ionosphere
 - b. Formation and characteristics of the ionosphere
 - c. Ionospheric variations and disturbances of atmospheric origin
 - d. Ionospheric variations and disturbances of solar origin: auroras and magnetic storms
[see also 133.B. and 212.B.]
 - e. The effects of the ionosphere on radio waves
[see also 735.I.5.]
- 5. The exosphere
 - a. Effects of low particle density on the properties of the exosphere
 - b. Determination of the critical zone, the layer above which the number of particle collisions is negligible
 - c. Particle trajectories in the exosphere
 - d. The Van Allen radiation belts
[see also 133.B. and 212.B.]
- B. The large-scale motions of the atmosphere
[see also 223, 232.A.5., and 723.G.5.]
 - 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 also 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>	Hadley cell	aureole	<i>other:</i>
<i>and disturbances:</i>	hurricane	aurora	air
anticyclone	jet stream	halo	air mass
atmospheric	monsoon	<i>regions and zones of</i>	atmosphere
circulation	polar anticyclone	<i>the atmosphere:</i>	atmospheric
atmospheric	Rossby wave	D region	pressure
turbulence	Siberian	E region	greenhouse effect
cyclone	anticyclone	exosphere	lapse rate
cyclostrophic	thunderstorm	F region	magnetic storm
wind	tricellular theory	ionosphere	solar wind
doldrums	tropical cyclone	magnetosphere	temperature
eddy	updraft and	mesosphere	inversion
extratropical	downdraft	ozonosphere	whistler
cyclone	wind	protonosphere	
Ferrel cell	<i>atmospheric optical</i>	stratosphere	
geostrophic motion	<i>phenomena:</i>	thermosphere	
gradient wind	airglow	troposphere	
Greenland	atmospheric	Van Allen	
anticyclone	corona	radiation belt	

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 241.C.]**C. The physical and chemical properties of freshwater**
[see also 214.A.5.]

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 D.1.e.]
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 interaction: heat, water vapour, and carbon dioxide

F. Waves in the hydrosphere

[see also 126.E., 128.A., and 232]

1. Surface waves: simple waves, ocean waves, tsunamis
2. Internal waves
3. Tides
[see 133.E.6.c.]

G. 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.]
5. The influence of ocean currents on weather and climate
[see also 223.D.1.d.]

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
 Hydrosphere, The
 Ice and Ice Formations
 Lakes
 Oceans
 Rivers

MICROPAEDIA: Selected entries of reference information

General subjects*freshwater resources:*

aquifer
 groundwater
 ice
 lake
 reservoir
 river

spring

water resource
 well

ice masses:

firn
 glacier

ice formation

ice shelf
 iceberg
 pack ice
 permafrost
 polynya

motions of the sea:

density current
 ocean current
 rip current
 seiche
 tide

tsunami	halocline	lagoon	hydrologic cycle
undertow	thermocline	ocean	hydrosphere
wave	<i>saltwater bodies:</i>	<i>other:</i>	sea level
whirlpool	bay	air-sea interface	water mass
<i>ocean zones:</i>	estuary	bore	
bottom water	gulf	fetch	

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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.c. and 723.G.5.]
 - a. Humidity indices: absolute, specific, and relative humidity; dew-point temperature
 - b. Climatic aspects of atmospheric humidity
[see D.1.e., below]
 - c. Effects of atmospheric humidity on the life and health of humans and other life forms
[see D.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
[see also 723.G.5.]
 - 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 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
[see 221.B.5.b.]
- C. Weather forecasting
 1. Synoptic weather data: the collection and correlation of meteorological observations

2. Short-range weather prediction
3. Long-range weather prediction

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. and 723.G.5.]
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. Causes: variations in the tilt of the Earth's axis and orbital motion, and changes in solar radiation and atmospheric transparency

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</i>	humidity	bora	Greenland
<i>and precipitation:</i>	precipitation	breeze	anticyclone
aerosol	rain	Buys Ballot's law	gregale
cloud	rime	convergence and	haboob
condensation	snow	divergence	Hadley cell
nucleus	<i>atmospheric pressure</i>	cyclone	harmattan
dew	<i>and wind:</i>	cyclostrophic wind	horse latitude
fog	anticyclone	etesian wind	jet stream
frost	atmospheric	foehn	katabatic wind
hail	circulation	geostrophic motion	khamsein
hoarfrost	atmospheric	gradient wind	lee wave
	pressure		

levanter	microclimate	weather bureau	tornado
lightning	pluvial regime	weather forecasting	tropical cyclone
mistral	season	weather map	<i>weather lore:</i>
monsoon	snow line	weather station	Groundhog Day
polar anticyclone	spring	windchill	Saint Swithin's
Siberian	summer	World Weather	Day
anticyclone	timberline	Watch	weather lore
subtropical high	urban climate	<i>weather disturbances</i>	<i>other:</i>
surge	winter	<i>and related</i>	almanac
tricellular theory	<i>meteorological</i>	<i>phenomena:</i>	atmospheric
updraft and	<i>measurement and</i>	atmospheric	electricity
downdraft	<i>weather forecasting:</i>	turbulence	El Niño
wind	Beaufort scale	blizzard	front
<i>climate and climatic</i>	hygrometry	extratropical	greenhouse effect
<i>variation:</i>	isentropic chart	cyclone	smog
autumn	isobar	hurricane	sunshine
climate	isotherm	lightning	urban dust
drought	psychrometric	storm	weather
Indian summer	chart	thunder	weather
Köppen climatic	temperature–	thunderstorm	modification
classification	humidity index		

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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: mid-ocean ridges, continental margins, abyssal depressions
[see also 723.G.3. and 735.J.2.]
 - 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.]
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
[see also 241.G.]

- C. The continental shelf and slope
 - 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: mid-ocean ridges, trenches, fracture zones, seamounts and guyots, abyssal hills and plains, sediments of the ocean floor
[see G., below, and 241.G.]
 - c. Basin boundaries: the continental slope, the continental rise
[see C., above]
 - 2. The origin of ocean basins
- E. Coral islands, coral reefs, and atolls
[see also 354.B.]
- 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 also 212.G. and 214.B.4.]
- G. Oceanic ridges
[see also 241.G.]
 - 1. Classification of ridges
 - a. The mid-oceanic ridge system
 - b. Other ridges: lateral, linear, and boundary ridges; microcontinents
 - 2. Origin and growth of ridges
 - a. General geophysical properties
 - b. Mid-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
[see also A.3., above]

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>	submarine canyon	<i>landforms and surface features:</i>	beach
continental shelf	submarine fan	alluvial fan	canyon
continental slope	submarine slump	basin	cave

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

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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]
 - 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 351]

a. Effects of plants and organisms on rock weathering and soil formation

[see A.1., above]

b. Effects of vegetation type and density on sediment yield

[see A.4.h., 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.4.d.]

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 geological 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.F.]

c. Lakes in arid regions

[see C.5.c., below]

d. Glacial lakes

[see C.6.e. 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.g., 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.D.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 354.A.1.c.]
 - 10. The subterranean environment: caves and cave systems
[see also 354.A.1.d.]
- 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>	cirque	sandbar	ultisol
alluvial fan	drumlin	sea cave	vertisol
arroyo	esker	wave-cut	<i>volcanic structures and related</i>
bajada	estuary	platform	<i>phenomena:</i>
delta	fjord	<i>physiographic effects of eolian processes:</i>	cinder cone
desert pavement	glacial valley	barchan	fumarole
drainage basin	ice cave	desert varnish	geyser
floodplain	kettle	playa	hot spring
fluvial process	moraine	saline flat	lava cave
inselberg	moulin	sand dune	mud volcano
meander	outwash	seif	volcanic dome
oxbow lake	roche	<i>soil formation and</i>	volcano
river	moutonnée	<i>major soil types:</i>	<i>other:</i>
river terrace	till	alfisol	astrobleme
valley	<i>gravitational processes on</i>	aridisol	meteorite crater
waterfall	<i>hillslopes:</i>	chernozem	morphogenetic region
<i>effects of weathering:</i>	avalanche	clay	peneplain
calcrete	creep	entisol	permafrost
cave	landslide	histosol	pingo
duricrust	mass movement	humus	polder
exfoliation	mudflow	inceptisol	residual landform
ferricrete	rock glacier	kaolisol	thermokarst
pediment	<i>marine features</i>	laterite	
pepino hill	<i>produced by wave</i>	mollisol	
sinkhole	<i>action:</i>	oxisol	
weathering	beach	podsol	
<i>glacial features and landforms:</i>	beach cusp	podsollic soil	
chatter mark	chenier	soil	
	lagoon	spodosol	

Biographies

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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 geological record; and the eras and periods of geological time.

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

242. The Interpretation of the Geological Record 86

243. The Eras and Periods of Geological 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

[see also 133.A.7.]

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 133.A.7. and 221.A.]

1. The relation of the development of the Earth's atmosphere to the origin of the solar system, the development of other planetary atmospheres

2. The original atmosphere of the Earth

3. Development of the present terrestrial atmosphere

[see also 112.C. and 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.D.2.c.]

C. The origin and evolution of the hydrosphere

1. The early oceans

2. The chemical view of the modern oceans

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2. The tectonic mountain belts

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3. The geosynclinal hypothesis of mountain building

4. The development of mountain systems

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3. Hess' seafloor spreading model
4. Plate tectonics as a unifying theory
 - a. 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 hydrosphere:</i>	<i>landmasses and ocean basins:</i>	plate tectonics	orogeny
atmosphere	continental drift	seafloor spreading	sedimentation
Earth	Gondwanaland	hypothesis	subsidence
hydrosphere	Laurasia	<i>evolution of the Earth's crust:</i>	uplift
ocean	Pangaea	epeirogeny	volcanism
		erosion	weathering

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 - 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
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 - 2. Radiometric dating
[see also 723.G.8.]
 - a. Radioactivity and radioactive decay
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 - 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 geological processes as absolute chronometers
- 4. Applications of absolute dating
 - a. The absolute geological 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 geological record
- F. The reconstruction of the geological history of the Earth based on the global correlation of the accumulated evidence from the geological record
[see 241 and 243]

Suggested reading in the *Encyclopædia Britannica*:

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

Earth, The: Its Properties, Composition, and Structure

Geochronology: The Interpretation and Dating of the Geological Record

MICROPAEDIA: Selected entries of reference information

General subjects

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

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2. The Quaternary Period
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 - a. The Pleistocene Epoch
[see also 232.A.7. and C.6.]
 - b. The Holocene, or Recent, Epoch
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Suggested reading in the *Encyclopædia Britannica*:**MACROPAEDIA:** Major articles dealing with the eras and periods of geological time

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

MICROPAEDIA: Selected entries of reference informationGeneral subjects

<i>Cenozoic Era:</i>	Helvetian Stage	Nebraskan Glacial Stage	Villafranchian Stage
Aftonian	Holocene Epoch		
Interglacial Stage	Holstein	Neogene period	Waal Interglacial Stage
Allerød	Interglacial Stage	Neolithic period	
Ancylus Stage	Hypsithermal	Oligocene Epoch	Weichsel Glacial Stage
Aquitania Stage	Climatic Interval	Paleocene Epoch	
Auversian Stage	ice age	Paleogene period	Wisconsin Glacial Stage
Bartonian Stage	Illinoian Glacial Stage	Paleolithic period	
Blancan Stage	Ipswichian	Pleistocene Epoch	Würm Glacial Stage
Blytt-Sernander system	Interglacial Stage	Pliocene Epoch	Yarmouth Interglacial Stage
Boreal Climatic Interval	Iron Age	Pontian Stage	
Bracheux Sands	Irvingtonian Stage	Quaternary period	<i>Lower Paleozoic Era:</i>
Bronze Age	Kamasian Pluvial Stage	Rancholabrean Stage	Arenig Series
Calabrian Stage	Kanjeran Pluvial Stage	Riss Glacial Stage	Ashgill Series
Cenozoic Era		Riss-Würm Interglacial Stage	Cambrian period
Chattian Stage	Kansan Glacial Stage	Rupelian Stage	Canadian Series
Cromerian	Lattorfian Stage	Saale Glacial Stage	Caradoc Series
Interglacial Stage	Laurentide Ice Sheet	Salpausselkä ridges	Cayugan Series
Eemian Interglacial Stage	London Clay	Sangamon	Champlainian Series
Elsterian Glacial Stage	Ludian Stage	Interglacial Stage	Chazy Stage
	Luisian Stage	Sannoisian Stage	Cincinnati Arch
Eocene Epoch	Lutetian Stage	Sarmatian Stage	Cincinnatian Series
Florissant Formation	Mauer	Scandinavian Ice Sheet	Dalradian Series
Gamblian Pluvial Stage	Mesolithic period	Siwalik Series	Holmia Series
	Mindel Glacial Stage	Stampian Stage	Idamean Stage
Gipping Glacial Stage	Mindel-Riss Interglacial Stage	Sub-Atlantic Climatic Interval	Lipalian interval
	Miocene Epoch	Sub-Boreal Climatic Interval	Llandelo Series
Great Drought	Montian Stage	Tertiary period	Llandovery Series
Günz Glacial Stage		Tortonian Stage	Llanvirn Series
Günz-Mindel Interglacial Stage		Trinil Faunal Zone	Ludlow Series

Medinan Series	Niobrara	Longmyndian	Ecca Series
Nashville Dome	Limestone	Onverwacht Series	Eifelian Stage
Niagaran Series	Pierre Shale	Phanerozoic Eon	Famennian Stage
Oeland Series	Purbeck Beds	Precambrian time	Finger Lakes Stage
Ordovician period	Raukumara Series	Proterozoic	Frasnian Stage
Paleozoic Era	Rhaetian Stage	Seine Series	Guadalupian Stage
Paradoxides Series	Solnhofen	Sturtian Series	Helderbergian
Queenston Delta	Limestone	Swaziland System	Stage
Silurian period	Stormberg Series	Timiskaming	Karoo System
Soussien Stage	Taitai Series	Series	Kungurian Stage
Tremadoc Series	Triassic period	Torridonian Series	Leonardian Stage
Trempealeauan	Turonian Stage	Transvaal System	Meramecian Series
Stage	Valanginian Stage	Ventersdorp	Mississippian
Wenlock Series	Wealden Series	System	period
Williston Basin	<i>Precambrian Era:</i>	Witwatersrand	Missourian Series
<i>Mesozoic Era:</i>	Animikie Series	System	Monongahela
Albian Stage	Belt Series	<i>Upper Paleozoic Era:</i>	Series
Anisian Stage	Bitter Springs	Alberta Basin	Morrowan Series
Aptian Stage	microfossils	Avonian Stage	Namurian Series
Barremian Stage	Bruce Series	Beaufort Series	Ochoan Stage
Berriasian Stage	Cobalt Series	Carboniferous	Old Red Sandstone
Clarence Series	Coutchiching	period	Osagian Series
Coniacian Stage	Series	Catskill Delta	Pennsylvanian
Cretaceous period	Fig Tree Series	Cazenovian Stage	period
Great Oolite Series	Grand Canyon	Chemungian Stage	Permian Basin
Gulf Series	Series	Chesterian Series	Permian period
Hauterivian Stage	Grenville Series	Coal Measures	Pottsville Series
Hell Creek	Gunflint	Conemaugh Series	Salado Formation
Formation	microfossils	Deerparkian Stage	Siegenian Stage
Jurassic period	Huronian System	Desmoinesian	Springeran Series
Karnian Stage	Katangan Complex	Series	Stephanian Series
Lance Formation	Keewatin Series	Devonian period	Tioughnioga Stage
Maestrichtian	Keweenawan	Devonian Series	Virgilian Series
Stage	System	Downtonian Stage	Westphalian Series
Mata Series	Lewisian Complex	Dunkard Group	Wolfcampian Stage
Mesozoic Era			

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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.

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 - II. The Molecular Basis of Vital Processes 112
 - III. The Structures and Functions of Organisms 117
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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.

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Section 311. Characteristics of Living Things

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 - 2. Mechanism and vitalism: the adequacy of physics and chemistry for the explanation of living phenomena
 - 3. The successive and emergent levels of biotic organization: the molecular, cellular, organismic, individual, and population levels
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 - 1. The common occurrence of nucleic acids and metabolic and genetic regulators in all living things
 - 2. Metabolism
 - 3. Homeostasis
 - 4. Reproduction and development

5. Variation among organisms
6. Sensory and behavioral reactions to external stimuli
- C. The search for life beyond the Earth
 1. The notion of extraterrestrial life and its chemistry
 2. The significance of the search for life beyond the Earth
 3. Exobiological survey of the solar system: its physical environments and biological prospects

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the characteristics of living things
Life

MICROPAEDIA: Selected entries of reference information

General subjects

cell	life
evolution	life cycle
homeostasis	metabolism

Biographies

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 2. Steps in the production of chemical precursors of life
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 - b. Production of simple organic molecules
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 - b. Early stages of phylogeny: chemical evolution of early living systems, the probable main lines of descent
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 - c. Major trends in the phylogeny of plants: algal predecessors, land plants, seed plants
 - d. Major trends in the phylogeny of animals: origin of multicellular animals, changes in the body plan of the lower metazoans, theories of linear descent from lower to higher forms and of descent along two principal lines
 - e. Life as the product of a historical process
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2. The evidence for evolution
3. The synthetic theory of evolution

C. The process of evolution

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- b. Aspects of the process of natural selection: coloration, mimicry, polymorphism
- c. Implications of natural selection: the coefficient of selective advantage, imperfect or excessive adaptation, and extinction

2. Heritable variation: the raw material of evolution

a. Mutation: sudden changes in genes

- i. The nature of mutation
- ii. Types of mutation
- iii. Significance of mutation

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3. Theories about the rate of evolution: slow evolution and "punctuated" evolution

D. The establishment of species and the process of speciation

1. The distinctiveness of species
2. The criterion of reproductive isolation
3. The properties of species
4. The evolution of species: allopatric speciation, sympatric speciation, stasipatric speciation
5. 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	Lamarckism	polymorphism
aggressive mimicry	concealing	mimicry	selection
analogy	coloration	mosaic evolution	speciation
auxochrome	Darwinism	Müllerian mimicry	species
biopoiesis	dialectic	mutation	spontaneous
carotene	eobiont	Origin of Species	generation
chromophore	evolution	orthogenesis	
clone	homology	phylogeny	

Biographies

See Section 10/34 of Part Ten

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Section 313. The Classification of Living Things

- A. Systematic classification of organisms in a hierarchical arrangement
 - 1. The objectives of biological classification: identification and the making of natural groups
 - 2. History of biological classification: from Aristotle to Linnaeus and Darwin
 - 3. The process of establishing taxonomic relationships
 - 4. Current systems of classification
- B. The viruses
- C. The monerans: the procaryotes
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 - 2. Bacteria and allies
- D. The protists: the simpler eucaryotes
 - 1. Algae
 - 2. Slime molds
 - 3. True fungi
 - 4. Algal-fungal partnerships: lichens
 - 5. Protozoans
- E. Bryophytes, or the nonvascular plants
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 - 2. Mosses
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 - 2. Club mosses, or lycopsids
 - 3. Horsetails, or sphenopsids
 - 4. True ferns
 - 5. Gymnosperms, or the nonflowering seed plants
 - a. Early gymnosperms
 - b. Conifers
 - 6. Angiosperms, or the flowering plants
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 - b. Monocotyledonous plants
- G. The invertebrates: animals without backbones
 - 1. The lower invertebrates
 - a. Mesozoans
 - b. Sponges
 - c. Coelenterates
 - d. Ctenophores
 - e. Flatworms
 - f. Ribbonworms
 - g. Spiny-headed worms
 - h. Aschelminths
 - i. Entoprocts
 - 2. The lophophorates
 - a. Moss animals, or ectoprocts

- b. Phoronid worms
- c. Lamp shells, or brachiopods
- 3. The schizocoelomates
 - a. Mollusks
 - b. Peanutworms
 - c. Annelids
 - d. Spoonworms
 - e. Oncopods
 - f. Arthropods
[see H., below]

H. Arthropods

- 1. Trilobites
- 2. Arachnids
- 3. Crustaceans
- 4. Myriapods
- 5. Insects, or hexapods

I. The enterocoelomates

- 1. Echinoderms
- 2. Chordates
 - a. Tunicates
 - b. Cephalochordates
 - c. Vertebrates
[see J., below]

J. Vertebrates

- 1. Fishes
- 2. Amphibians
- 3. Reptiles
- 4. Birds
- 5. Mammals

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the classification of living things

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

MICROPAEDIA: Selected entries of reference information

General subjects

<i>amphibians:</i>	Cacops	frog	Leptodactylidae
amphibian	caecilian	green frog	midwife toad
amphiuma	clawed frog	hellbender	mud puppy
arrow-poison frog	Diadectes	Ichthyostega	Myobatrachidae
axolotl	Eryops	Labyrinthodontia	narrow-mouthed
bullfrog	fire-bellied toad	leopard frog	toad

newt
salamander
Seymouria
siren
spadefoot toad
Surinam toad
tadpole
toad
tree frog

*angiosperms—beech
order:*

beech
black oak
bur oak
chestnut
chestnut oak
chinquapin
English oak
live oak
oak
pin oak
red oak
tanbark oak
white oak
willow oak

*angiosperms—
bellflower order:*

balloonflower
bellflower
Campanulales
harebell
Lobeliaceae
rampion
tuftbell

*angiosperms—birch
order:*

alder
Balanopales
Betulaceae
birch
filbert
gray birch
hop-hornbeam
hornbeam
paper birch
river birch
sweet birch
white birch
yellow birch

*angiosperms—
buttercup order:*

anemone
baneberry
barberry
Berberidaceae
bugbane
buttercup
Christmas rose
Clematis
columbine
globeflower
hellebore
Hepatica

larkspur
mayapple
meadow rue
monkshood
Oregon grape
Ranunculaceae
Ranunculales

*angiosperms—cactus
order:*

barrel cactus
cactus
chin cactus
cholla
Christmas cactus
Easter cactus
fishhook cactus
hedgehog cactus
leaf cactus
living-rock cactus
Mammillaria
melon cactus
night-blooming
cereus
old-man cactus
Opuntia
organ-pipe cactus
peyote
pincushion cactus
prickly pear
Rhipsalis
saguaro
Schlumbergera
sea-urchin cactus

*angiosperms—caper
order:*

Brassicaceae
broccoli
Brussels sprouts
cabbage
candytuft
Capparales
cauliflower
charlock
Chinese cabbage
collard
cress
kale
Kerguelen cabbage
kohlrabi
marsh cress
mustard
peppergrass
radish
rape
rock cress
rocket
spiderflower
stock
toothwort
turnip
wallflower
whitlow grass

*angiosperms—
composite order:*

artichoke
Asteraceae
basket-flower
boneset
chamomile
Chrysanthemum
cineraria
coneflower
dandelion
endive
fleabane
goldenrod
groundsel
guayule
Jerusalem
artichoke
lettuce
marigold
pussy-toes
safflower
sunflower
thistle
zinnia

*angiosperms—
dogwood order:*

angelica
anise
Apiaceae
Araliaceae
carrot
Cornales
cow parsnip
dogwood
fatsia
ivy
parsnip
poison hemlock
schefflera
tupelo

*angiosperms—ebony
and primrose orders:*

Bumelia
Diospyros
Ebenales
ebony
persimmon
pimpernel
primrose
Primulales
sapodilla
storax

*angiosperms—
euphorbia order:*

boxwood
Buxaceae
cassava
castor-oil plant
copperleaf
croton
crown of thorns

Euphorbiaceae
Euphorbiales
Jatropha
jojoba
manchineel
mercury
Omphalea
Phyllanthus
poinsettia
redbird cactus
sandbox tree
spurge
tung tree

*angiosperms—figwort
order:*

Acanthaceae
belladonna
Bignoniaceae
bladderwort
broomrape
eggplant
figwort
foxglove
Gesneriaceae
henbane
Indian paint brush
jacaranda
mullein
nightshade
petunia
potato
sausage tree
Scrophulariales
Solanaceae
toadflax
tobacco
tomato
witchweed

*angiosperms—
gentian order:*

Apocynaceae
Asclepiadaceae
bedstraw
buckbean
carrion flower
coffee
Gentianaceae
Gentianales
Indian hemp
Loganiaceae
madder
oleander
partridgeberry
periwinkle
Rubiaceae

*angiosperms—
geranium order:*

Barbados cherry
flax
Geraniales
geranium
Impatiens
lignum vitae

nasturtium	bilberry	onion	spearmint
Oxalis	blueberry	phormium	teak
shamrock	Clethra	pickerelweed	Verbenaceae
wood sorrel	cranberry	Sansevieria	<i>angiosperms—myrtle</i>
<i>angiosperms—ginger</i>	crowberry	Smilax	<i>order:</i>
<i>order:</i>	Ericales	ti	allspice
abaca	Gaultheria	tulip	cannonball tree
arrowroot	heath	water hyacinth	Cuphea
banana	heather	yam	Epilobium
bird-of-paradise	huckleberry	<i>angiosperms—</i>	Eucalyptus
flower	Indian pipe	<i>magnolia order:</i>	Eugenia
Cannaceae	Kalmia	Annonaceae	feijoa
ginger	Labrador	champac	fireweed
ginger lily	tea	cherimoya	Fuchsia
Marantaceae	leatherleaf	lancewood	guava
Musaceae	Lyonia	magnolia	jaboticaba
plantain	Pieris	Magnoliaceae	Leptospermum
prayer plant	pipsissewa	Magnoliales	loosestrife
Strelitziaceae	rhododendron	Myristicaceae	mangrove
Zingiberaceae	Vaccinium	pawpaw	mare's-tail
Zingiberales	wintergreen	tulip tree	Myrtales
<i>angiosperms—grass</i>	<i>angiosperms—laurel</i>	Winteraceae	myrtle
<i>order:</i>	<i>order:</i>	ylang-ylang	Onagraceae
agrostology	avocado	<i>angiosperms—</i>	paperbark tree
Arundinaria	California laurel	<i>mallow order:</i>	pomegranate
bamboo	greenheart	Abutilon	water chestnut
barley	lambkill	balsa	<i>angiosperms—nettle</i>
beach grass	Laurales	baobab	<i>order:</i>
bent grass	laurel	Bombacaceae	Cannabis
bluegrass	sassafras	cacao	elm
bluestem	sweet shrub	cotton	Ficus
bromegrass	<i>angiosperms—lily</i>	durian	fig
cordgrass	<i>and iris orders:</i>	Hibiscus	hackberry
corn	Agavaceae	jute	hemp
crabgrass	Alliaceae	kapok	India rubber plant
esparto	Amaryllidaceae	kenaf	jackfruit
fescue	Asparagus	linden	Moraceae
foxtail	asphodel	mallow	mulberry
grass	bear grass	Malvaceae	Osage orange
love grass	blue-eyed	Malvales	Pilea
millet	grass	okra	ramie
muhly	cantala	roselle	Ulmaceae
needlegrass	chive	sisal	Urticaceae
oat grass	Colchicum	Sterculiaceae	Urticales
oats	Crocus	Tiliaceae	<i>angiosperms—orchid</i>
panicum	Dioscoreaceae	urena	<i>order:</i>
Paspalum	Dracaena	<i>angiosperms—mint</i>	bucket orchid
Pennisetum	elephant's-foot	<i>order:</i>	Dendrobium
Poaceae	Erythronium	balm	Epidendrum
quack grass	fritillary	Coleus	greenhood
reed	garlic	dittany	helleborine
Restionales	Gladiolus	dragonhead	jewel orchid
rice	henequen	glory-bower	ladies' tresses
rye	Iridales	Lamiaceae	lady's slipper
ryegrass	Iris	Lamiales	Odontoglossum
sorghum	leek	Lantana	Oncidium
sugarcane	Liliaceae	lavender	Ophrys
wheat	Liliales	lemon verbena	orchid
wild rice	mariposa lily	Mentha	Orchis
<i>angiosperms—heath</i>	Mauritius	peppermint	Pogonia
<i>order:</i>	hemp	rosemary	twayblade
Arbutus	Narcissus	Salvia	Vanda
azalea			

vanilla
angiosperms—palm
and related orders:

Anthurium
 Arales
 Arisaema
 Arum
 babassu palm
 calla
 coco de mer
 coconut palm
 Cyclanthales
 date palm
 dumb cane
 oil palm
 palm
 Pandanales
 Philodendron
 skunk cabbage
 Typhales

angiosperms—pea
order:

Acacia
 Albizia
 bean
 bluebonnet
 broom
 chick-pea
 Clianthus
 clover
 cowpea
 crown vetch
 Fabales
 honey locust
 indigo
 laburnum
 lentil
 locoweed
 locust
 logwood
 lupine
 mesquite
 Mimosa
 narra
 pagoda tree
 palo verde
 pea
 peanut
 redbud
 rosewood
 senna
 sensitive plant
 smoke tree
 soybean
 sunn
 vetch
 Wisteria

angiosperms—pepper
and birthwort

orders:
 birthwort
 Peperomia
 Piperaceae

Piperales
 wild ginger
angiosperms—phlox

order:
 alkanet
 bindweed
 borage
 Boraginaceae
 bugloss
 Convolvulaceae
 dodder
 forget-me-not
 Hydrophyllaceae
 Ipomoea
 Lennoaceae
 Loasaceae
 Mertensia
 Phlox
 Polemoniales
 Rivea
 sweet potato
 waterleaf

angiosperms—
pineapple and
related orders:

Aechmea
 Bromeliaceae
 Commelinales
 Cryptanthus
 Cyperales
 Dyckia
 Eriocaulales
 Juncals
 papyrus
 pineapple
 Puya
 Spanish moss
 spiderwort
 Tillandsia
 umbrella plant
 Zebrina

angiosperms—pink
order:

Amaranthaceae
 baby's breath
 beet
 Bougainvillea
 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
 attar of roses
 blackberry
 boysenberry
 cherry
 chokecherry
 cinquefoil
 cotoneaster
 crab apple
 firethorn
 hawthorn
 loganberry
 loquat
 medlar
 nectarine
 peach
 pear
 plum
 quince
 raspberry
 Rosales
 rose
 spirea
 strawberry
 sweetbrier

angiosperms—rue
order:

Anacardiaceae
 bel fruit
 burning bush
 Burseraceae
 cashew
 citron
 grapefruit
 kumquat
 lemon
 lime
 mahogany

mango
 Meliaceae
 myrrh
 orange
 pili nut
 Pistacia
 poison ivy
 Rhus
 Rutaceae
 Rutales
 shaddock
 Simaroubaceae
 sumac
 tree of heaven

angiosperms—
sandalwood order:

Australian
 Christmas tree
 Balanophoraceae
 bastard toadflax
 dwarf mistletoe
 Loranthaceae
 mistletoe
 sandalwood
 Santalaceae
 Santalales
 Viscaceae

angiosperms—
saxifrage order:

Astilbe
 currant
 Echeveria
 gooseberry
 houseleek
 hydrangea
 Kalanchoe
 Pittosporaceae
 Ribes
 Saxifragaceae
 Saxifragales
 saxifrage
 stonecrop

angiosperms—
soapberry order:

Aceraceae
 akee
 box elder
 buckeye
 guarana
 horse chestnut
 litchi
 maple
 red maple
 Sapindales
 silver maple
 sugar maple

angiosperms—
staff-tree, buckthorn,
olive orders:

alder buckthorn
 ash
 bittersweet

buckthorn	gourd	carnivorous plant	tarantula
Ceanothus	melon	cobra plant	tick
Celastraceae	pansy	Connarales	trap-door spider
Celastrales	papaya	Daphne	whip scorpion
Euonymus	Passiflorales	Diapensiales	wolf spider
Forsythia	passion-flower	dicotyledon	<i>arthropods—</i>
holly	pumpkin	Dilleniales	<i>crustaceans:</i>
jasmine	rock rose	everlasting	amphipod
jujube	squash	Glossopteris	barnacle
lilac	sun rose	hardwood	blue crab
Oleaceae	Violales	Hippuridales	branchiopod
olive	violet	Illicales	brine shrimp
privet	watermelon	Leitneriales	clam shrimp
Rhamnales	<i>angiosperms—walnut</i>	lotus	copepod
tea olive	<i>order:</i>	macadamia	crab
Vitaceae	butternut	monocotyledon	crayfish
<i>angiosperms—</i>	hickory	Nelumbonales	crustacean
<i>amarisk order:</i>	Juglandales	Nepenthes	crustacean louse
boojum tree	pecan	Nepenthes	decapod
ocotillo	walnut	Paeoniales	Dungeness crab
Tamaricales	<i>angiosperms—water</i>	peony	fiddler crab
tamarisk	<i>lily order:</i>	pitcher plant	fish louse
<i>angiosperms—tea</i>	fanwort	Plumbaginales	gammarid
<i>order:</i>	hornwort	Podostemales	ghost crab
Camellia	Nymphaeales	Polygalales	gribble
Clusiaceae	Rafflesiales	Polygonales	hermit crab
Dipterocarpaceae	water lily	poplar	hooded shrimp
Elatinaceae	water shield	Proteales	horseshoe shrimp
franklinia	<i>angiosperms—</i>	Rafflesiales	isopod
Gordonia	<i>water-plantain and</i>	rhubarb	krill
mammee apple	<i>related orders:</i>	Salicales	land crab
mangosteen	Alismales	Sarraceniales	lobster
Ochnaceae	arrowhead	sundew	malacostracan
Saint-John's-wort	Elodea	taro	mantis shrimp
stewartia	Hydrocharitales	Theligonales	mantle
Theaceae	Najadales	Thymelaeales	mussel shrimp
Theales	pondweed	Triuridales	mustache shrimp
<i>angiosperms—teasel</i>	water plantain	Venus's-flytrap	opossum shrimp
<i>order:</i>	<i>angiosperms—</i>	wild flower	pea crab
bush honeysuckle	<i>witch-hazel and</i>	willow	pill bug
Caprifoliaceae	<i>related orders:</i>	<i>arthropods—</i>	robber crab
Dipsacaceae	Casuarinales	<i>arachnids:</i>	sand flea
Dipsacales	Didymelales	arachnid	scampi
elder	Eucommiales	black widow	shellfish
feverwort	Eupteleales	brown spider	shrimp
honeysuckle	Fothergilla	chigger	skeleton shrimp
scabious	Hamamelidaceae	crab spider	sow bug
snowberry	Hamamelidales	false scorpion	spider crab
teasel	katsura tree	funnel weaver	tadpole shrimp
Valerianaceae	Myricales	funnel-web spider	tanaid
Viburnum	plane tree	garden spider	water flea
<i>angiosperms—violet</i>	sweet gum	giant water	whale louse
<i>and related orders:</i>	Trochodendrales	scorpion	<i>arthropods—</i>
Begonia	winter hazel	harvestman	<i>other:</i>
Begoniales	witch hazel	jumping spider	arthropod
bottle gourd	<i>angiosperms—other:</i>	mite	centipede
bryony	aspen	nursery-web spider	eurypterid
cucumber	barbeya	red spider	horseshoe crab
Cucurbitales	buckwheat	scorpion	insect
Datisceae	buffalo berry	silk spider	millipede
dishcloth gourd	Calycerales	spider	myriapod
Flacourtiaceae		sunspider	Paradoxides

pauropod	screamer	ruff	cuculiform
sea spider	sheldgoose	sandpiper	eagle owl
symphylian	shelduck	seedsnipe	fish owl
trilobite	shoveler	sheathbill	ground cuckoo
<i>bacteria and allies:</i>	snow goose	skimmer	hawk owl
actinomycete	steamer duck	skua	horned owl
Bacillus	stiffail	snipe	owl
bacteria	swan	stilt	roadrunner
biochemical	teal	surfbird	screech owl
oxygen	whistling duck	tattler	short-eared owl
demand	white-fronted	tern	turaco
blue-green algae	goose	thickknee	wood owl
Clostridium	wigeon	turnstone	<i>birds—extinct:</i>
denitrifying	wood duck	willet	Aepyornis
bacteria	<i>birds—</i>	woodcock	Archaeopteryx
episome	<i>caprimulgiform and</i>	yellowlegs	Diatryma
eubacteria	<i>apodiform orders:</i>	<i>birds—columbiform</i>	Hesperornis
gram stain	apodiform	<i>and psittaciform</i>	Ichthyornis
Haemophilus	caprimulgiform	<i>orders:</i>	<i>birds—falconiform</i>
Lactobacillus	chuck-will's-widow	bristlehead	<i>order:</i>
Micrococcus	crested swift	cockatoo	accipiter
mycoplasma	frogmouth	columbiform	bald eagle
Pasteurella	hummingbird	conure	bateleur
pneumococcus	nighthawk	dodo	bird of prey
pseudomonad	nightjar	domestic pigeon	buzzard
rickettsia	oilbird	lovebird	caracara
Salmonella	owlet frogmouth	macaw	condor
sheathed bacteria	poorwill	parakeet	eagle
Spirillum	potoo	parrot	falcon
spirochete	swift	passenger pigeon	falconiform
Staphylococcus	swiftlet	pigeon	golden eagle
Streptococcus	whippoorwill	psittaciform	goshawk
Streptomyces	<i>birds—charadriiform</i>	sandgrouse	gyrfalcon
sulfur bacteria	<i>order:</i>	turtledove	harrier
Vibrio	auk	wood pigeon	hawk
<i>birds—anseriform</i>	auklet	<i>birds—coraciiform</i>	hobby
<i>order:</i>	avocet	<i>and piciform orders:</i>	kestrel
Anatidae	charadriiform	barbet	kite
anseriform	courser	coraciiform	lammergeier
black duck	curlew	flicker	merlin
bufflehead	dotterel	honey guide	osprey
Canada goose	dowitcher	hornbill	peregrine falcon
canvasback	godwit	ivory-billed	secretary bird
dabbling duck	great auk	woodpecker	sparrowhawk
diving duck	greenshank	jacamar	turkey vulture
duck	guillemot	kingfisher	vulture
eider	gull	kookaburra	<i>birds—galliform and</i>
gadwall	jacana	motmot	<i>gruiform orders:</i>
goldeneye	jaeger	piciform	bustard
goose	killdeer	piculet	button quail
magpie goose	knot	puffbird	coot
mallard	lapwing	roller	crake
merganser	murre	sapsucker	crane
néné	murrelet	toucan	curassow
perching duck	oystercatcher	woodpecker	finfoot
pintail	painted snipe	<i>birds—cuculiform</i>	galliform
pochard	phalarope	<i>and owl orders:</i>	gallinule
redhead	plover	ani	grouse
ring-necked duck	pratincole	barn owl	gruiform
scaup	puffin	coucal	guinea fowl
scoter	redshank	cuckoo	hoatzin

jungle fowl	Galápagos finch	scrub-bird	gannet
limpkin	gnatcatcher	seed-eater	grebe
megapode	goldfinch	sharpbill	hammerhead
mesite	grackle	shrike	heron
partridge	Grallinidae	shrike-vireo	ibis
peacock	grass finch	silky flycatcher	kiwi
pheasant	grosbeak	song-babbler	loon
ptarmigan	ground thrush	songbird	moa
quail	Hawaiian	sparrow	ornithology
rail	honeycreeper	starling	ostrich
seriema	helmet-shrike	Sturnidae	pelecaniform
trumpeter	Hirundinidae	sunbird	pelican
turkey	honeycreeper	swallow	penguin
whooping crane	honeyeater	Sylviidae	petrel
<i>birds—passeriform</i>	house sparrow	tailorbird	plumage
<i>order:</i>	hypocory	tanager	prion
accentor	Icteridae	tapaculo	procellariiform
Aegithalidae	Irenidae	thickhead	rhea
antbird	jay	thrush	shearwater
becard	kingbird	tit	shoebill
bell-magpie	kinglet	tit-babbler	snakebird
bellbird	kiskadee	tityra	spoonbill
bird-of-paradise	lark	towhee	stork
bishop	laughing thrush	treecreeper	storm petrel
blackbird	Leiostrix	Turdidae	syrinx
Bombycillidae	lyrebird	tyrannulet	tinamou
bowerbird	magpie	tyrant flycatcher	trogon
broadbill	magpie-robin	umbrellabird	tropic bird
buffalo weaver	manakin	vanga-shrike	<i>bryophytes:</i>
bulbul	mannikin	vireo	Bryophyta
bunting	martin	wagtail	bug-on-a-stick
butcherbird	meadowlark	warbler	carpet moss
Callaeidae	Mimidae	wattle-eye	cord moss
Campephagidae	mockingbird	waxbill	cushion moss
canary	monarch	waxwing	granite moss
Carduelidae	Muscicapidae	weaver	hair-cap moss
catbird	mynah	white-eye	horned liverwort
Certhiidae	Nectariniidae	whydah	leafy liverwort
chat	nightingale	woodcreeper	liverwort
chat-thrush	nightingale thrush	woodswallow	luminous moss
chough	nuthatch	woodwarbler	Marchantia
cisticola	oriole	wren	moss
cock-of-the-rock	oropendola	Xenicidae	peat moss
cordon bleu	ovenbird	<i>birds—others:</i>	screw moss
Corvidae	Panuridae	albatross	tree moss
Cotingidae	Paridae	aviary	wind-blown moss
creeper	Parulidae	aviculture	<i>classification:</i>
crow	passeriform	bird	classification
cuckoo-shrike	pewee	bittern	nomenclature
currawong	Philepittidae	booby	taximetrics
Dendrocolaptidae	phoebe	cassowary	taxon
dipper	pipit	casuariiform	taxonomy
drongo	pitta	ciconiiform	<i>enterocoelomates:</i>
Emberizidae	Ploceidae	coly	acornworm
Estrildidae	prinia	Colymbiformes	amphioxus
fairy bluebird	quelea	cormorant	arrowworm
false sunbird	raven	diving petrel	beardworm
fantail	redstart	egret	bêche-de-mer
flowerpecker	Remizidae	emu	blastoid
flycatcher	robin	flamingo	brittle star
forktail	rockfowl	frigate bird	cake urchin
Furnariidae	rosefinch	fulmar	carpoid

chordate	guitarfish	Bothriolepis	sailfish
crinoid	hammerhead shark	Cephalaspis	scad
crown-of-thorns	mackerel shark	hagfish	scat
starfish	mako shark	lamprey	sea bass
cystoid	monkfish	ostracoderm	sheepshead
echinoderm	ray	Palaeospondylus	Siamese fighting
echinoid	saw shark	placoderm	fish
graptolite	sawfish	spiny shark	sleeper
heart urchin	shark	swim bladder	slipmouth
hemichordate	skate	<i>fishes—perciform</i>	snapper
protochordate	stingray	<i>order:</i>	snook
pterobranch	thresher shark	angelfish	soapfish
sand dollar	tiger shark	archer fish	tigerfish
sea cucumber	white shark	barracuda	spearfish
sea lily	<i>fishes—cypriniform</i>	bass	spiny eel
sea squirt	<i>and siluriform</i>	bigeye	stargazer
sea urchin	<i>orders:</i>	black bass	sunfish
shellfish	barb	blenny	surfperch
starfish	bitterling	bluegill	surgeonfish
tunicate	bullhead	bonito	swordfish
<i>fishes—atheriniform</i>	carp	butterfish	threadfin
<i>and related orders:</i>	catfish	butterfly fish	tilefish
atheriniform	characin	carangid	tripletail
dealfish	chub	cichlid	tuna
dory	corydoras	crappie	weakfish
flying fish	dace	damsel fish	weever
grunion	electric catfish	darter	wolfish
killifish	electric eel	discus fish	wrasse
lantern-eye fish	goldfish	dragonet	<i>fishes—</i>
live-bearer	hatchetfish	drum	<i>pleuronectiform</i>
molly	knifefish	fingerfish	<i>and tetraodontiform</i>
oarfish	labeo	glassfish	<i>orders:</i>
silversides	loach	goatfish	boxfish
<i>fishes—</i>	madtom	goby	dab
<i>batrachoidiform and</i>	minnow	gourami	filefish
<i>related orders:</i>	ostariophysan	grouper	flatfish
anglerfish	pencil fish	grunt	flounder
batfish	piranha	hind	halibut
brotula	roach	hogfish	mola
cave fish	sucker	jack	plaice
clingfish	tench	jewfish	porcupine fish
cod	tetra	labyrinth fish	puffer
frogfish	tigerfish	mackerel	sole
goosefish	wels	marlin	tetraodontiform
grenadier	zebra fish	mojarra	triggerfish
hake	<i>fishes—</i>	moonfish	turbot
paracanthopterygian	<i>gasterosteiform</i>	mudskipper	<i>fishes—salmoniform</i>
pearlfish	<i>order:</i>	mullet	<i>order:</i>
pollock	cornetfish	Nile perch	Atlantic salmon
toadfish	gasterosteiform	parrot fish	bristlemouth
whiting	pipefish	perch	brook trout
<i>fishes—</i>	sea horse	perciform	brown trout
<i>cartilaginous:</i>	shrimpfish	pikeperch	capelin
basking shark	stickleback	pomfret	char
blue shark	swamp eel	pompano	coho
carcharhinid	trumpet fish	porgy	hatchetfish
chimaera	<i>fishes—jawless fish</i>	prickleback	king salmon
chondrichthian	<i>and placoderms:</i>	rabbitfish	lake trout
Cladoselache	Agnatha	ragfish	mudminnow
devil ray	antiarch	remora	pike
dogfish	Arctolepis	runner	rainbow trout
electric ray	arthrodire		salmon

salmoniform	<i>gymnosperms:</i>	branch and twig	flesh fly
sandfish	alerce	borer	fly
scaleless dragonfish	American	carion beetle	fruit fly
smelt	arborvitae	casebearing beetle	fungus gnat
spookfish	Araucaria	chafer	gall midge
trout	arborvitae	checkered beetle	Hessian fly
viperfish	bald cypress	click beetle	horse fly
whitefish	big tree	coleopteran	housefly
<i>fishes—scorpaeniform</i>	California nutmeg	Colorado potato	hover fly
<i>and related orders:</i>	cedar	beetle	leaf miner
dragonfish	conifer	cucumber beetle	louse fly
flathead	Cordaitales	darkling beetle	midge
flying gurnard	Cupressaceae	dermestid beetle	mosquito
greenling	cycad	dung beetle	robber fly
lion-fish	Cycadeoidales	elm bark beetle	tachinid fly
lumpsucker	Cycas	firefly	tsetse fly
poacher	cypress	flat bark beetle	vinegar fly
redfish	cypress pine	flea beetle	warble fly
scorpaeniform	dawn redwood	flower chafer	<i>insects—</i>
scorpion fish	Douglas fir	glowworm	<i>hymenopteran order:</i>
sculpin	eastern red cedar	ground beetle	ant
sea robin	English yew	Japanese beetle	Apocrita
snailfish	Ephedra	June beetle	bee
stonefish	false cypress	ladybird beetle	braconid
zebra fish	fir	leaf-rolling weevil	bumblebee
<i>fishes—others:</i>	giant arborvitae	long-horned beetle	chalcid
alewife	ginkgo	metallic	cuckoo wasp
anchovy	Gnetaceae	wood-boring	fig wasp
bichir	Greek fir	beetle	gall wasp
bony fish	hemlock	net-winged beetle	honey ant
bowfin	incense cedar	plum curculio	honeybee
Cheirolepis	Japanese cedar	potato beetle	horntail
chondrostean	Japanese torreyia	predaceous	hymenopteran
clupeiform	Japanese yew	diving beetle	ichneumon
coelacanth	juniper	primitive weevil	leaf-cutter bee
crossopterygian	larch	rhinoceros beetle	sand wasp
deep-sea fish	Lebachia	rove beetle	sawfly
Dipterus	Pinaceae	seed beetle	spider wasp
eel	pine	shining leaf chafer	Symphyta
elopiform	Podocarpaceae	soldier beetle	thread-waisted
Eusthenopteron	redwood	spider beetle	wasp
fish	seed fern	stag beetle	velvet ant
gar	Sequoia	strepsipteran	wasp
gulper	spruce	tiger beetle	wood wasp
herring	stinking yew	tortoise beetle	<i>insects—lepidopteran</i>
holostean	Taxaceae	tumbling flower	<i>order:</i>
ladyfish	Taxodiaceae	beetle	bagworm moth
lungfish	Torreya	unicorn beetle	blue butterfly
menhaden	umbrella pine	water scavenger	bollworm
moray	Welwitschiaceae	beetle	brush-footed
mormyrid	yellowwood	weevil	butterfly
notopterid	yew	whirligig beetle	butterfly
osteoglossomorph	<i>insects—coleopteran</i>	<i>insects—fly order:</i>	carpenter moth
paddlefish	<i>order:</i>	anthomyiid fly	casebearer
Rhipidistia	alfalfa weevil	bee fly	clearwing moth
sardine	bark beetle	biting midge	copper butterfly
shad	beetle	black fly	diamondback
sturgeon	bess beetle	blow fly	moth
tarpon	billbug	bot fly	flour moth
teleost	blister beetle	crane fly	forester moth
wolf herring	boll weevil	dipteran	gelechiid moth

geometrid moth	dipluran	water scorpion	siliceous sponge
gossamer-winged butterfly	dobsonfly	water strider	spiny-headed worm
gypsy moth	dragonfly	webspinner	sponge
hairstreak	earwig	whitefly	tapeworm
harvester	ephemeropteran	<i>lophophorates:</i>	threadworm
hawk moth	flea	Atrypa	trichina
lappet	flower bug	horseshoe worm	Venus's flower basket
leaf roller moth	froghopper	lamp shell	worm
lepidopteran	giant water bug	lingulid	zoanthid
measuring worm	grape phylloxera	moss animal	<i>mammals—</i>
milkweed butterfly	grasshopper	Tetractinella	<i>artiodactyl order:</i>
monarch butterfly	harlequin	<i>lower invertebrates:</i>	alpaca
morpho	cabbage bug	archaeocyathid	antelope
moth	heteropteran	Ascaris	aoudad
olethreutid moth	homopteran	aschelminth	artiodactyl
owlet moth	human louse	Aurelia	aurochs
painted lady	jumping plant louse	bread-crumbs	babirusa
parnassian butterfly	katydid	sponge	bighorn
peppered moth	lace bug	Cassiopea	bison
pyralid moth	lacewing	Chrysaora	boar
regal moth	leaf insect	clionid	bongo
saturniid moth	leafhopper	cnidarian	bontebok
silkworm moth	locust	coral	bovid
skipper	long-horned grasshopper	ctenophore	brocket
slug caterpillar	louse	eelworm	buffalo
moth	lygaeid bug	entoproct	bush pig
sulfur butterfly	mantid	eye worm	camel
swallowtail butterfly	mantispid	filarial worm	cattle
tent caterpillar	marsh treader	flatworm	chamois
moth	mayfly	fluke	chevrotain
tiger moth	meadow grasshopper	freshwater jellyfish	deer
tineid moth	mealybug	gastrotrich	dibatag
tussock moth	mole cricket	Gonionemus	duiker
white butterfly	neuropteran	guinea worm	eland
yucca moth	odonate	hookworm	fallow deer
zebra swallowtail butterfly	orthopteran	horny sponge	gaur
<i>insects—others:</i>	plant bug	Hydra	gazelle
alderfly	proturan	Hydractinia	gerenuk
ambush bug	psocid	jellyfish	giraffe
antlion	pygmy grasshopper	Leucosolenia	gnu
aphid	red bug	Liriope	goat
apterygote	San Jose scale	lungworm	guanaco
assassin bug	scale insect	medusa	hartebeest
back swimmer	scorpionfly	mesozoan	hippopotamus
bedbug	shield-backed grasshopper	millepore	ibex
bristletail	short-horned grasshopper	nematocyst	impala
bug	smaller water strider	nematode	Kobus
burrower bug	snakefly	Obelia	kudu
caddisfly	springtail	pinworm	llama
chewing louse	stinkbug	planarian	moose
chinch bug	stonefly	polyp	mountain goat
cicada	sucking louse	Portuguese man-of-war	mule deer
cockroach	termite	priapulid	muntjac
cone-headed grasshopper	thrips	ribbonworm	musk deer
coreid bug	treehopper	rotifer	musk-ox
cottony-cushion scale	walkingstick	Rugosa	nyala
cricket	water boatman	sea anemone	okapi
		sea fan	oryx
		sea gooseberry	peccary
		sea pen	Père David's deer
		sea walnut	pig

pronghorn	crabeater seal	tiger	woolly rhinoceros
red deer	dhole	viverrid	<i>mammals—</i>
reedbuck	dingo	walrus	<i>insectivore and</i>
reindeer	dog	weasel	<i>edentate orders:</i>
roe deer	elephant seal	Weddell seal	anteater
ruminant	fennec	wildcat	armadillo
saiga	ferret	wolf	edentate
sheep	fisher	wolverine	elephant shrew
sika	flat-headed cat	<i>mammals—cetacean</i>	golden mole
springbok	fossa	<i>order:</i>	hedgehog
tahr	fox	ambergris	insectivore
vicuña	fur seal	baleen whale	mole
wapiti	genet	beaked whale	otter shrew
warthog	golden cat	beluga	short-tailed shrew
water buffalo	gray fox	blue whale	shrew
white-tailed deer	grison	bottlenose whale	sloth
yak	grizzly bear	dolphin	solenodon
<i>mammals—bat</i>	harbour seal	fin whale	tenrec
<i>order:</i>	harp seal	gray whale	<i>mammals—</i>
bat	hooded seal	humpback whale	<i>monotremes and</i>
brown bat	hyena	killer whale	<i>marsupials:</i>
bulldog bat	jackal	narwhal	bandicoot
disk bat	jaguar	pilot whale	cuscus
false vampire bat	jaguarundi	porpoise	echidna
free-tailed bat	kinkajou	right whale	glider
Hipposideridae	leopard	sei whale	kangaroo
horseshoe bat	leopard cat	sperm whale	koala
Jamaican fruit bat	linsang	whale	marsupial
New Zealand	lion	<i>mammals—extinct:</i>	marsupial mole
short-tailed bat	lynx	Baluchitherium	marsupial mouse
Phyllostomatidae	margay	Barylambda	monotreme
Pteropodidae	marten	Brontotherium	native cat
sheath-tailed bat	mink	Camelops	numbat
vampire bat	mongoose	cave bear	opossum
Vespertilionidae	monk seal	Chalicotherium	phalanger
<i>mammals—carnivore</i>	mustelid	Condylarthra	platypus
<i>order:</i>	ocelot	Coryphodon	rat kangaroo
aardwolf	olingo	Creodonta	rat opossum
African	otter	dawn horse	Tasmanian devil
hunting dog	ounce	Dinohyus	Tasmanian wolf
Arctic fox	Pallas's cat	Dryopithecus	wallaby
Asiatic black bear	panda	Elasmotherium	wombat
badger	polar bear	Glyptodon	<i>mammals—</i>
bat-eared fox	polecat	Irish elk	<i>perissodactyl</i>
bear	procyonid	Litopterna	<i>order:</i>
bearded seal	puma	mammoth	ass
binturong	raccoon	mastodon	donkey
black bear	raccoon dog	Merychippus	Equidae
bobcat	ratel	Miacis	horse
brown bear	sable	Moeritherium	mule
bush dog	sea lion	Moropus	perissodactyl
cacomistle	seal	multituberculata	Przewalski's horse
Caffre cat	serval	Mylodon	rhinoceros
canine	skunk	Notoungulata	tapir
caracal	sloth bear	Oreopithecus	zebra
carnivore	South	Phenacodus	<i>mammals—primate</i>
cat	American fox	sabre-toothed cat	<i>order:</i>
cheetah	spectacled bear	Thylacosmilus	ape
civet	stoat	titanotheres	avahi
clouded leopard	sun bear	Toxodon	aye-aye
coati	suricate	Triconodon	baboon
coyote	tayra	Uintatherium	capuchin monkey

Celebes black ape	gundi	Fucus	Gymnodinium
chimpanzee	hamster	green algae	gymnostome
colobus	harvest mouse	Irish moss	haplosporidian
diana monkey	hutia	kelp	helioflagellate
drill	jerboa	laver	heliozoan
durukuli	jumping mouse	Nostoc	heterochlorid
galago	kangaroo rat	Oedogonium	heterotrich
gelada	lemming	phytoplankton	Holomastigotoides
gibbon	maned rat	Pleurococcus	hymenostome
gorilla	marmot	red algae	hypermastigote
guenon	mole rat	Sargassum	hypotrich
hamadryas	mouse	sea lettuce	Leishmania
howling monkey	muskrat	seaweed	microsporidian
indri	nutria	Spirogyra	myxosporidian
langur	paca	stonewort	Nosema
lemur	pocket mouse	Ulothrix	odontostome
loris	porcupine	Vaucheria	oligotrich
macaque	pouched rat	water bloom	opalinid
mandrill	prairie dog	water net	Paramecium
mangabey	rat	<i>protists—fungi:</i>	peritrich
marmoset	rice rat	Agaricales	Plasmodium
monkey	rock rat	Amanita	proteomyxid
orangutan	rodent	Ascomycetes	protomonad
patas monkey	sewellel	Basidiomycetes	protozoan
potto	spiny rat	Boletaceae	pseudopodium
primate	springhare	cup fungus	radiolarian
proboscis monkey	squirrel	Deuteromycetes	rhizomastigote
rhesus monkey	tuco-tuco	fungus	Sarcocystis
saki	viscacha	Lycoperdales	sarcodine
siamang	vole	mushroom	sporozoan
sifaka	water rat	mycorrhiza	suctorian
spider monkey	white-footed	Oomycetes	testacean
squirrel monkey	mouse	Polyporales	tintinnid
tarsier	wood rat	stinkhorn	trichocyst
titi	woodchuck	truffle	trichomonad
tree shrew	<i>mammals—others:</i>	water mold	trichostome
uakari	aardvark	yeast	Trypanosoma
woolly monkey	colugo	Zygomycetes	volvocid
woolly spider	dugong	<i>protists—</i>	Volvox
monkey	elephant	<i>protozoans:</i>	Vorticella
<i>mammals—rodent</i>	hare	actinomyxidian	<i>protists—others:</i>
<i>order:</i>	hyrax	amoeba	beard lichen
agouti	lagomorph	astome	Iceland moss
bamboo rat	mammal	Balantidium	lichen
bandicoot rat	manatee	Ceratium	manna
beaver	pangolin	Chlamydomonas	Myxomycetes
cane rat	pika	chloromonad	oak moss
capybara	proboscidean	chrysomonad	Parmelia
cavy	rabbit	ciliate	Plasmodio-
chinchilla	sea cow	cilium	phoromycetes
chipmunk	sirenian	cnidosporidian	protist
cloud rat	ungulate	coccolith	slime mold
cotton rat	<i>protists—algae:</i>	cryptomonad	<i>reptiles—</i>
dormouse	Acetabularia	dinoflagellate	<i>crocodylians:</i>
field mouse	agar	Entamoeba	alligator
flying squirrel	algae	entodiniomorph	caiman
gerbil	algology	Euglena	crocodile
gopher	brown algae	flagellate	gavial
grasshopper	Chlorella	flagellum	<i>reptiles—extinct:</i>
mouse	desmid	foraminiferan	Allosaurus
ground squirrel	diatom	fusulinid	Anatosaurus
guinea pig	dulse	gregarine	Ankylosaurus

Apatosaurus	black snake	<i>schizocoelomates</i> —	squid
Bradysaurus	blind snake	<i>annelids:</i>	top shell
Camptosaurus	boa	annelid	triton shell
Clidastes	boomslang	earthworm	tusk shell
Cynognathus	brown snake	fanworm	whelk
Dicynodon	bull snake	feather-duster	worm shell
Dimetrodon	bushmaster	worm	<i>schizocoelomates</i> —
Dimorphodon	Cerastes	fireworm	<i>others:</i>
dinosaur	coachwhip	leech	oncopod
Diplodocus	cobra	lugworm	onychophoran
Edaphosaurus	colubrid	oligochaete	peanutworm
Euparkeria	copperhead	palolo worm	pentastomid
Gorgosaurus	coral snake	peacock worm	spoonworm
ichthyosaur	egg-eating snake	polychaete	tardigrade
Iguanodon	elapid	rag worm	trochophore
Limnoscelis	fer-de-lance	sea mouse	<i>tracheophytes:</i>
Mesosaurus	flying snake	<i>schizocoelomates</i> —	Adiantaceae
mosasaur	garter snake	<i>mollusks:</i>	angiosperm
Moschops	green snake	ammonoid	Aspleniaceae
Nothosaurus	hognose snake	ark shell	bracken
Ornitholestes	indigo snake	belemnoid	cliffbrake
Oviraptor	king snake	bivalve	club moss
Pachycephalo-	krait	bubble shell	fern
saurus	mamba	cephalopod	gymnosperm
Pentaceratops	mangrove snake	chiton	horsetail
phytosaur	moccasin	clam	Lepidodendron
Plateosaurus	python	cockle	Lycopsidea
Plesiosaurus	racer	conch	Marattiaceae
Podokesaurus	rat snake	cone shell	Ophioglossaceae
Protoceratops	rattlesnake	coquina clam	Osmundaceae
Psittacosaurus	sea snake	cowrie	Pleuromeia
Pteranodon	shieldtail snake	cuttlefish	Polypodiaceae
pterodactyl	sidewinder	ear shell	prefern
pterosaur	snake	gaper clam	Psilopsida
Rhamphorhyn-	taipan	gastropod	quillwort
chus	tree snake	geoduck	Rhynie plants
sauropterygian	vine snake	jingle shell	Salviniales
Stegosaurus	viper	land snail	Schizaeaceae
Struthiomimus	wart snake	mantle	Sphenopsida
therapsid	water snake	mollusk	spike moss
Triceratops	<i>reptiles—turtles:</i>	monoplacophoran	staghorn fern
Tritylodon	Blanding's turtle	murex	tracheophyte
Tyrannosaurus	box turtle	mussel	whisk fern
<i>reptiles—lizards:</i>	Emydidae	nautilus	<i>viruses:</i>
anole	mud turtle	nudibranch	adenovirus
Calotes	musk turtle	octopus	arbovirus
chameleon	painted turtle	olive shell	cytomegalovirus
gecko	pond turtle	opisthobranch	lysogeny
Gila monster	sea turtle	oyster	myxovirus
glass snake	side-necked turtle	periwinkle	picornavirus
horned toad	snake-necked	piddock	plant virus
iguana	turtle	prosobranch	polyoma virus
Komodo dragon	snapping turtle	pteropod	poxvirus
lizard	softshell turtle	pulmonate	virion
monitor lizard	terrapi	razor clam	virology
racerunner	tortoise	scallop	virus
skink	turtle	seashell	
<i>reptiles—snakes:</i>	wood turtle	shellfish	
adder	<i>reptiles—others:</i>	shipworm	
anaconda	reptile	slug	
Aniliidae	tuatara		

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.

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322. Metabolism: Bioenergetics and Biosynthesis 115

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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
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- D. Ethyl alcohol, alcohol consumption
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- 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
- 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
 Cells: Their Structures and Functions
 Chemical Compounds
 Drugs and Drug Action
 Poisons and Poisoning

MICROPAEDIA: Selected entries of reference information

General subjects

<i>biocides:</i>	Toxaphene	<i>drugs affecting the</i>	<i>drugs—analgesics:</i>
Agent Orange	<i>biotoxins:</i>	<i>autonomic nervous</i>	acetaminophen
aldrin	lambkill	<i>system:</i>	acetanilide
biological control	mycotoxin	adrenergic drug	acetylsalicylic acid
chemosterilant	poison	anticholinesterase	analgesic
chloral	toxin	atropins	antipyrine
chlordane	venom	beta blocker	salicylic acid
DDT	<i>carbohydrates:</i>	cholinergic drug	<i>drugs—anesthetics:</i>
dichlorobenzene	carbohydrate	ganglion blocking	anesthetic
dimethoate	cellulose	agent	chloroform
fumigant	disaccharide	neuromuscular	cocaine
fungicide	glucose	blocking agent	curare
herbicide	glycoside	<i>drugs affecting the</i>	cyclopropane
insecticide	monosaccharide	<i>cardiovascular</i>	procaine
Malathion	pectin	<i>system:</i>	hydrochloride
parathion	polysaccharide	digitalis	
phorate	sugar	heparin	
rodenticide		nitroglycerin	

- drugs—antibiotics:*
 allopurinol
 ampicillin
 antibiotic
 cephalosporin
 erythromycin
 penicillin
 streptomycin
 tetracycline
- drugs—antiseptics:*
 Dakin's solution
 iodoform
 melachite green
 merbromin
 silver nitrate
- drugs—chemotherapeutic:*
 allopurinol
 anthelmintic
 catechu
 chloroquine
 diethylcarbamazine
 citrate
 diethylstilbestrol
 isoniazid
 pamaquine
 Prontosil
 quinacrine
 quinine
 sulfa drug
 sulfadiazine
 sulfanilamide
 sulfonamide
 tryparsamide
- drugs—hallucinogens:*
 bufotenine
 Cannabis
 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
 meproamate
 reserpine
 tranquilizer
- drugs—other drugs and drug action:*
 adjuvant
 antacid
 antagonism
 antihistamine
 antimicrobial agent
 astringent
 cytotoxic drug
 diuretic
 drug
 ephedrine
 laxative
 phenol coefficient
 promethazine
 quinidine
 scopolamine
 synergism
 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
 hormone
 insulin
 luteinizing
 hormone (LH)
 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
 deoxyribonucleic
 acid
 guanine
 nucleic acid
 nucleoside
 nucleotide
 ribonucleic acid
 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
 lipoic acid
 nicotinic acid
 pantothenic acid
 para-aminobenzoic
 acid
 vitamin
 vitamin A
 vitamin B complex
 vitamin B₁
 vitamin B₂
 vitamin B₆
 vitamin B₁₂
 vitamin C
 vitamin D
 vitamin E
 vitamin K
- other:*
 adenosine
 triphosphate
 denaturation
 histamine
 piperine
 sapogenin
 secretion

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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

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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	

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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 Musculatory 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
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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 312.A.3.]
- 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
 - 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	fission	multicellular
chromosome	gamete	organism
cytology	in vitro	nucleus
cytoplasm	fertilization	ploidy
cytoplasmic	meiosis	protoplasm
streaming	mitosis	receptor
fertilization		recombination

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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

Organs and Organ Systems, Plant and Animal
Tissues and Fluids

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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
Tissues and Fluids

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	thermoreception
<i>nervous systems:</i>	vagus nerve	canal	touch reception
adrenergic nerve	<i>sensory reception—</i>	sound reception	<i>other:</i>
fibre	<i>photoreception:</i>	tympanic	acclimatization
autonomic nervous	cone	membrane	biological rhythm
system	eye	vestibulocochlear	diapause
brain	eyespot	nerve	hibernation
cerebral fissure	macula lutea	<i>sensory reception—</i>	homeostasis
cerebrospinal fluid	photoreception	<i>other:</i>	tropism
cranial nerve	rhodopsin	chemoreception	

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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 musculatory system
[see 421.H.6. and 7.]

Suggested reading in the *Encyclopædia Britannica*:

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

Integumentary Systems
Muscles and Muscle Systems
Supportive and Connective Tissues
Tissues and Fluids

MICROPAEDIA: Selected entries of reference information

General subjects

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

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

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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
Tissues and Fluids

MICROPAEDIA: Selected entries of reference information

General subjects

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

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

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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.1.]
- 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 ¹
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	

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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 man, 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
 Tissue Culture

MICROPAEDIA: Selected entries of reference information

General subjects

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

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

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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	

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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]

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

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

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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.E., F., and G.]
 - 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.D.]
 - b. Radiation
 - c. Illumination

- d. Water and soil characteristics, salts
[see 222]
- e. Wave action: wind and water
[see 222.F. and 223.B.]
- f. Fire as a limiting factor
- 4. The conditioning of the abiotic environment by living organisms
- 5. The effect of micro-environments 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 articles dealing with the basic features of the biosphere

Biosphere, The
Ecosystems

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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原因 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
Ecosystems

MICROPAEDIA: Selected entries of reference information

General subjects

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

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

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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 Megagaeon 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 Notogaeon realm: Australia, New Guinea, New Zealand, tropical Pacific islands
3. The Neogaeon 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, The	Rivers
Ecosystems	Soil Organisms
Lakes	Trees
Oceans	

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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
 4. The cultivation of animals: animal breeding and raising
 5. Major uses of animals

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

Suggested reading in the *Encyclopædia Britannica*:

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

Biosphere, The	Gardening and Horticulture
Conservation of Natural Resources	Horses and Horsemanship
Ecosystems	Pets
Farming and Agricultural Technology	

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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 Judaeen 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 re sewn 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. Estimates of the antiquity of mankind and of the chronology of hominid evolution
- C. 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)
 - 2. Distinguishing characteristics of the Hominidae
 - a. Morphological characteristics
 - b. Inferred behavioral characteristics
 - c. Contrasting adaptations of Hominidae and Pongidae
- D. The fossil record of the Hominidae

1. The discovery and recognition of the hominid fossil record
2. Classification of the Hominidae
 - a. *Ramapithecus*
 - b. *Australopithecus*
 - c. *Homo erectus*
 - d. *Homo sapiens*
 - i. Fossil remains from Europe and Africa: Vértesszöllös man, Swanscombe man, Steinheim man, Fontéchevade man, Omo man
 - ii. The Neanderthal peoples of Europe
 - iii. Populations of sub-Saharan Africa
 - iv. Populations of Asia
 - v. Cro-Magnon man

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

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 412. Human Heredity: the Races of Mankind**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 races

1. Aspects of racial diversity
2. Hallmarks of race
 - a. Old hallmarks; *e.g.*, colour, hair form, body measurements, features such as eyes and nose
 - b. New hallmarks; *e.g.*, blood traits, amino acids, enzymes
3. Modern measures of race: blood groups and genetic evidence
4. A geographic taxonomy of the living races: Caucasoids; Congoids and Capoids; Australoids and Oceanic peoples; peoples of East Asia; peoples of the Indian subcontinent; peoples of the Western Hemisphere—North, Central, and South American Indians
5. Present distribution of human populations

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>	microrace	Central American	Neo-Hawaiian
assortative mating	phenylthiocarbamide	Indian local races	local race
character	tasting	East African local	North American
consanguinity	race	race	Indian local races
dominance	<i>race—races of man:</i>	Forest Negro local	northeast
eugenics	African Pygmy	race	European local
founder principle	local race	Indic geographic	race
genetic drift	Alpine local race	race	northern
heterospecific	American	Mediterranean	Mongoloid local
mating	Coloured local	local race	race
pedigree	race	Melanesian	northwest
recessiveness	American Indian	geographic race	European local
<i>race—aspects of</i>	geographic race	Micronesian	race
<i>racial diversity:</i>	Aryan	geographic race	Polynesian
anthropometry	Australoid	Mongoloid	geographic race
beta-aminoisobutyric	geographic race	geographic race	South American
acid excretion	Capoid local race	Negrito local race	Indian local races
geographic race	Caucasoid	Negroid geographic	Southeast Asian
local race	geographic race	race	local race

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
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 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

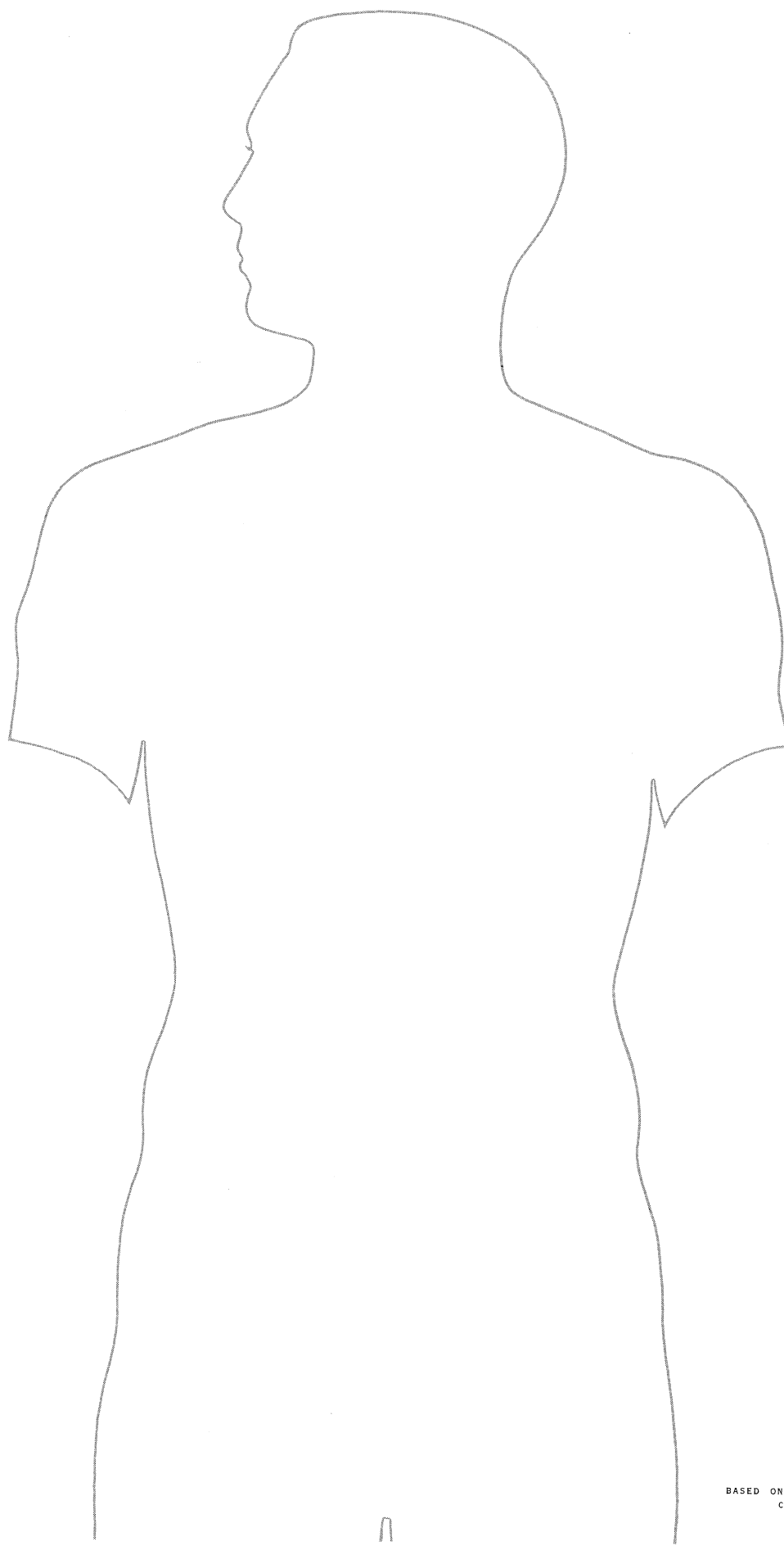
PLATE

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.

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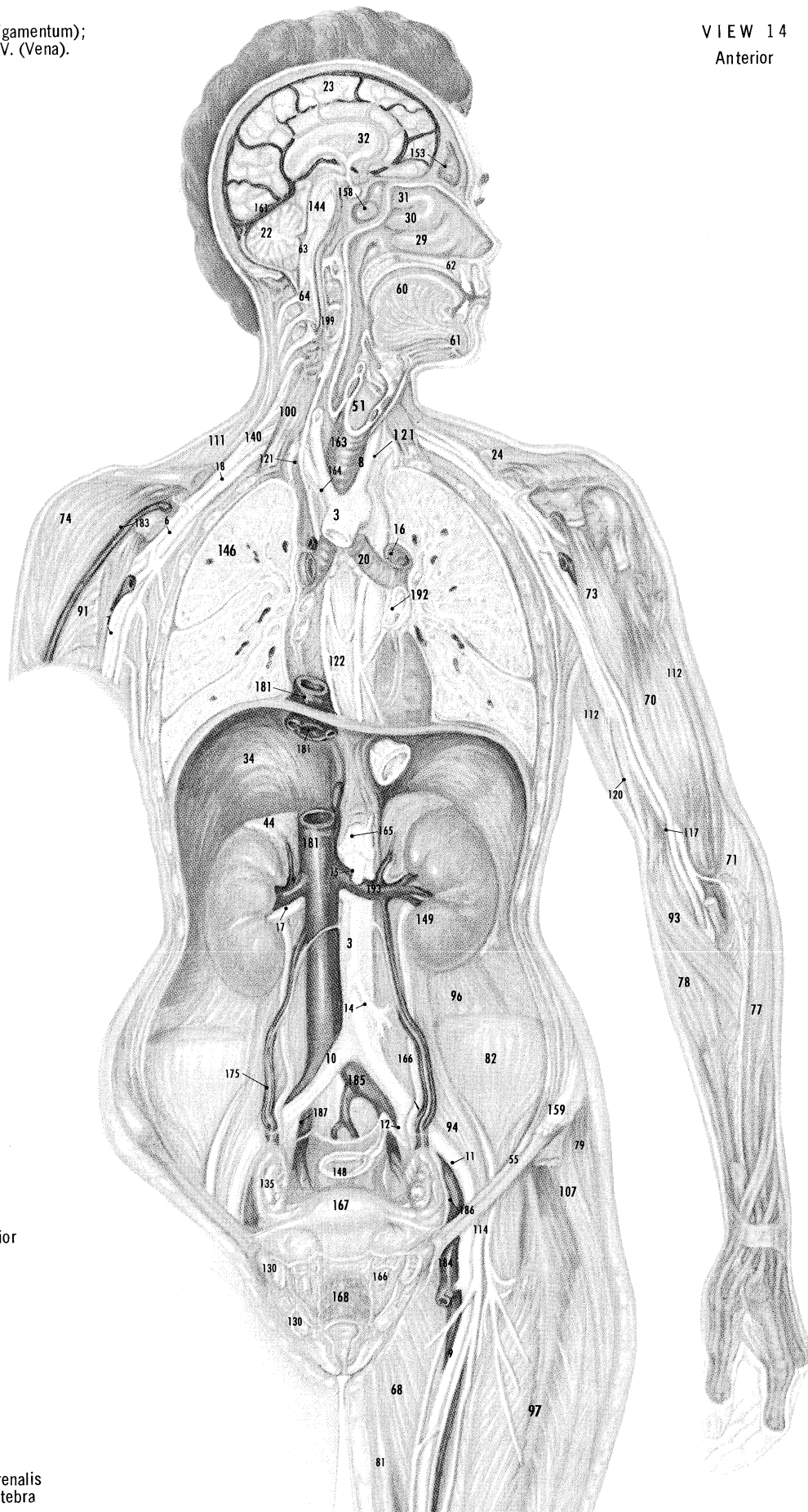


Abbreviations: A. (Arteria); L. (Ligamentum);
M. (Musculus); N. (Nervus); and V. (Vena).

KEY TO VIEW 14

3. Aorta
6. A. axillaris
7. A. brachialis
8. A. carotis communis
9. A. femoralis
10. A. iliaca communis
11. A. iliaca externa
12. A. iliaca interna
14. A. mesenterica inferior
15. A. mesenterica superior
16. A. pulmonalis
17. A. renalis
18. A. subclavia
20. Bronchus principalis
22. Cerebellum
23. Cerebrum
24. Clavicula
29. Concha nasalis inferior
30. Concha nasalis media
31. Concha nasalis superior
32. Corpus callosum
34. Diaphragma
44. Glandula suprarenalis
51. Larynx
55. L. inguinale
60. Lingua (tongue)
61. Mandibula
62. Maxilla
63. Medulla oblongata
64. Medulla spinalis
68. M. adductor longus
70. M. brachialis
71. M. brachioradialis
73. M. coracobrachialis
74. M. deltoideus
77. M. extensor carpi radialis longus
78. M. flexor carpi radialis
79. M. gluteus medius
81. M. gracilis
82. M. iliacus
91. M. pectoralis major
93. M. pronator teres
94. M. psoas major
96. M. quadratus lumborum
97. M. quadriceps femoris (rectus)
100. M. scalenus anterior
107. M. tensor fasciae latae
111. M. trapezius
112. M. triceps brachii
114. N. femoralis
117. N. medianus
120. N. ulnaris
121. N. vagus
122. Oesophagus (esophagus)
130. Os pubis
135. Ovarium (ovary)
140. Plexus brachialis
144. Pons
146. Pulmo (lung)
148. Rectum
149. Ren (kidney)
153. Sinus frontalis
158. Sinus sphenoidalis
159. Spina iliaca anterior superior
161. Tentorium cerebelli
163. Trachea
164. Truncus brachiocephalicus
165. Truncus coeliacus
166. Ureter
167. Uterus
168. Vagina
175. Vasa ovarica
181. V. cava inferior
183. V. cephalica
184. V. femoralis
185. V. iliaca communis
186. V. iliaca externa
187. V. iliaca interna
193. V. renalis
192. V. pulmonalis
199. Vertebra

VIEW 14 Anterior



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

MICROPAEDIA: Selected entries of reference information

General subjects

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

urine	adductor muscle	external auditory canal	uterus
<i>integument and its derivatives:</i>	biceps muscle	inner ear	vagina
dermis	extensor muscle	sound reception	vulva
epidermis	flexor muscle	tympenic membrane	<i>reproductive system—male:</i>
hair	gluteus muscle	vestibulocochlear nerve	bulbourethral gland
mammary gland	iliocostalis muscle	<i>nervous system—eye and vision:</i>	ductus deferens
nail	latissimus dorsi	aqueous humour	ejaculation
perspiration	levator muscle	cone	epididyme
sebaceous gland	muscle	eye	erection
sweat gland	pectoralis muscle	eyelid	penis
<i>lymphatic system:</i>	sphincter muscle	focusing	prostate gland
adenoids	<i>nervous system—autonomic:</i>	iris	scrotum
lymph	adrenergic nerve fibre	lens	semen
lymph node	autonomic nervous system	macula lutea	seminal vesicle
lymph nodule	cranial nerve	optic nerve	sperm
lymphoid tissue	facial nerve	retina	spermatic cord
Peyer's patch	ganglion	rhodopsin	spermatogenesis
spleen	spinal nerve	rod	testis
thymus	vagus nerve	tear duct and gland	<i>reproductive system—other:</i>
tonsil	<i>nervous system—central:</i>	<i>nervous system—other:</i>	artificial insemination
<i>mouth, teeth, and gums:</i>	brain	nervous system	orgasm
canine tooth	cerebellum	neuron	placenta
cementum	cerebral cortex	neurotransmitter	sexual intercourse
dentine	cerebral fissure	proprioception	umbilical cord
enamel	cerebrospinal fluid	smell	<i>respiratory system:</i>
gum	cerebrum	taste	diaphragm
incisor	hypothalamus	<i>reproductive system—female:</i>	larynx
molar	laterality	clitoris	lung
mouth	medulla oblongata	fallopian tube	nose
palate	meninges	menopause	pulmonary
periodontal membrane	pons	menstruation	alveolus
permanent tooth	spinal cord	oogenesis	respiration
premolar	<i>nervous system—ear and hearing:</i>	ovary	trachea
primary tooth	auricle	ovulation	<i>other:</i>
saliva	bone conduction	ovum	bursa
salivary gland	ear	puerperium	human body
tongue	eustachean tube	uterine cervix	mucus
tooth			reticuloendothelial system
<i>muscles:</i>			
abdominal muscle			
abductor 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 311 and 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
[see 421.A.3., B., and C.]
 - 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—birth:</i>	<i>life cycle—other:</i>	
bath	natural childbirth	adolescence	immunity
furo	parturition	aging	inflammation
sauna	presentation	death	interferon
spa	<i>life cycle—prenatal:</i>	middle age	interleukin
Turkish bath	embryo	old age	phagocytosis
<i>exercise:</i>	fertilization	<i>protective</i>	<i>other:</i>
aerobics	fetus	<i>mechanisms of the</i>	dieting
exercise	implantation	<i>body:</i>	health
jogging	in vitro	antibody	immunization
physical	fertilization	antigen	nutrition
education	pregnancy	coagulation	preventive
		homeostasis	medicine
			sleep
			vegetarianism

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
[see 10/35.B.1.b.]
 - 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
 - l. Psychological therapy
[see 436.D.]

- 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
[see 10/35.B.2.g.]
 11. Allergenic diseases and anaphylactic shock
- E. The symptoms, diagnosis, and treatment of diseases affecting any organ or tissue of the body: tumours, 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. Female sex-oriented process under endocrine control: menstrual disorders, abnormal changes in pregnancy
[see 10/35.B.1.c.]

- g. The pancreas
- h. Other endocrine glands: pineal gland, thymus
- 6. The reproductive system
 - a. Genetic and congenital abnormalities
 - b. Functional genital disorders
 - c. Infections
 - d. Structural changes of unknown causes: tumours and injuries
 - e. Diseases of the mammary glands
- 7. The excretory system
[see 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 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
[see 10/35.B.1.e.]
 - g. Disorders of the ear and hearing
[see 10/35.B.1.e.]
 - 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
Burns	Digestive Systems	Systems	Respiratory
Cancer	Disease	Metabolism	Systems
Childhood	Endocrine Systems	Muscles and	Sensory Reception
Diseases and	Excretion and	Muscle Systems	Supportive and
Disorders	Excretory	Nerves and	Connective
Circulation and	Systems	Nervous Systems	Tissues
Circulatory	Immunity	Nutrition	Transplants, Organ
Systems	Infectious Diseases	Poisons and	and Tissue
Diagnosis and		Poisoning	
Therapeutics			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>diagnosis—laboratory tests:</i>	stethoscope	sarcoma	polyp
amniocentesis	<i>disorders—allergic and immunological:</i>	thyroid tumour	pyothorax
basal metabolic rate	acquired immune deficiency syndrome	tumour	sinus squeeze
blood analysis	allergy	<i>disorders—cardiovascular:</i>	<i>disorders—congenital and hereditary</i>
blood count	anaphylaxis	air embolism	<i>metabolic diseases:</i>
Bromsulphalein test	angioedema	aneurysm	acatalasia
cardiac catheterization	asthma	angioma	alkaptonuria
electrocardiography	autoallergic disease	aorta, coarctation of the	Andersen's disease
electroencephalography	autoantibody	aortic insufficiency	cystathioninuria
electromyography	autoimmunity	aortic stenosis	cystic fibrosis
endoscopy	drug allergy	arteriosclerosis	cystinosis
enzyme analysis	hay fever	arteriovenous fistula	cystinuria
glucose tolerance test	hypersensitivity	arteritis	de Toni-Franconi syndrome
inulin clearance	reagin	atrial fibrillation	Fabry's disease
kidney function test	serum sickness	bradycardia	Forbes' disease
liver function test	<i>disorders—blood diseases:</i>	cardiac arrhythmia	galactosemia
Papanicolaou's stain	agranulocytosis	coronary heart disease	Gaucher's disease
protein-bound iodine test	anemia	embolism	glucose-6-phosphate dehydrogenase deficiency
Rubin's test	aplastic anemia	endocarditis	glycogen storage disease
serological test	erythroblastosis fetalis	heart block	gout
skin test	folic-acid-deficiency anemia	heart failure	Hartnup disease
thyroid function test	hemoglobinopathy	heart malformation	Hers' disease
tuberculin test	hemophilia	hypertension	homocystinuria
urinalysis	hereditary spherocytosis	hypotension	Hunter's syndrome
<i>diagnosis—radiography and ultrasound:</i>	iron-deficiency anemia	infarction	Hurler's syndrome
angiocardiology	leukemia	milk leg	iminoglycinuria
angiography	leukocytosis	mitral insufficiency	lipid storage disease
brain scanning	leukopenia	mitral stenosis	maple-syrup urine disease
cholecystography	methemoglobinemia	myocardial infarction	Maroteaux-Lamy syndrome
contrast medium	pernicious anemia	patent ductus arteriosus	McArdle's disease
diagnostic imaging	polycythemia	pericarditis	metachromatic leukodystrophy
echocardiography	purpura	pulmonary heart disease	methemoglobinemia
echoencephalography	septicemia	pulmonary stenosis	Niemann-Pick disease
myelography	sickle-cell anemia	Raynaud's disease	phenylketonuria
phonocardiography	thalassemia	rheumatic fever	Pompe's disease
radiology	thrombocytopenia	shock	porphyria
tomography	uremia	stroke syndrome	Sanfilippo's syndrome
urography	<i>disorders—cancers:</i>	syncope	Scheie's syndrome
<i>diagnosis—other:</i>	breast cancer	thrombophlebitis	Tay-Sachs disease
autopsy	cancer	varicose vein	tyrosinemia
diagnosis	carcinogen	ventricular fibrillation	von Gierke's disease
gynecological examination	carcinoma	ventricular septal defect	Wilson's disease
knee-jerk reflex	Ewing's tumour of bone	Wegener's granulomatosis	<i>disorders—other congenital and hereditary:</i>
lumbar puncture	Hodgkin's disease	<i>disorders—cavity and membrane:</i>	achondroplasia
multiphasic health screening	Kaposi's sarcoma	mediastinitis	acrocephalosyndactyly
sphygmomanometer	laryngeal cancer	peritonitis	agenesis
	leukemia	pleurisy	
	multiple myeloma	pneumothorax	
	nephroblastoma		
	osteosarcoma		
	renal carcinoma		

albinism	urogenital	thyroiditis	colitis
Albright's	malformation	<i>disorders—excretory</i>	constipation
syndrome	vittiligo	<i>system:</i>	diarrhea
angioma	von Willebrand's	Bright's disease	dysentery
atresia and stenosis	disease	cystitis	enteritis
cerebral palsy	<i>disorders—connective</i>	enuresis	fasciolopsiasis
chromosomal	<i>tissue:</i>	hematuria	gastritis
disorder	amyloidosis	kidney failure	gastroenteritis
cleft palate	Dupuytren's	kidney stone	hookworm disease
cleidocranial	contracture	nephroblastoma	ileitis
dysostosis	herniated disk	nephrosclerosis	indigestion
congenital disorder	lupus	nephrotic	intestinal
craniosynostosis	erythematosus	syndrome	diverticulum
cretinism	tendinitis	pyelonephritis	intestinal
cryptorchidism	<i>disorders—ear and</i>	renal carcinoma	obstruction
cutis laxa	<i>hearing:</i>	renal cyst	intestinal squeeze
D1-trisomy	deafness	renal	intussusception
digit malformation	ear squeeze	osteodystrophy	myiasis
Down's syndrome	earwax impaction	uremia	nausea
Dupuytren's	labyrinthitis	urethritis	pancreatitis
contracture	Menière's disease	urinary tract	peptic ulcer
dwarfism	otitis media	obstruction	proctitis
dysplasia	presbycusis	<i>disorders—eye and</i>	salmonellosis
E-trisomy	stirrup fixation	<i>vision:</i>	trichinosis
erythroblastosis	<i>disorders—endocrine:</i>	amblyopia	trichomoniasis
fetalis	acromegaly	astigmatism	vomiting
harelip	Addison's disease	blepharitis	<i>disorders—hepatic</i>
heart	adrenogenital	blindness	<i>and biliary:</i>
malformation	syndrome	cataract	cholecystitis
hemophilia	Albright's	colour blindness	cirrhosis
hereditary	syndrome	conjunctivitis	clonorchiasis
spherocytosis	chromophobe	detached retina	fatty liver
hermaphroditism	adenoma	double vision	gallstone
intussusception	cretinism	exophthalmos	hepatitis
Klinefelter's	cryptorchidism	glaucoma	jaundice
syndrome	Cushing's	hyperopia	<i>disorders—infectious</i>
mandibulofacial	syndrome	iris	<i>diseases caused</i>
dysostosis	diabetes insipidus	keratitis	<i>by bacteria</i>
Marfan's syndrome	diabetes mellitus	lens dislocation	<i>and related</i>
microcephaly	dwarfism	myopia	<i>organisms:</i>
Morquio's	endemic goitre	night blindness	anthrax
syndrome	Fröhlich's	nystagmus	bacteremia
muscular	syndrome	ophthalmoplegia	bartonellosis
dystrophy	gigantism	optic atrophy	bejel
neural tube defect	granulomatous	optic neuritis	boutonneuse fever
neurofibromatosis	thyroiditis	presbyopia	brucellosis
osteochondroma	Graves' disease	ptosis	chancroid
osteogenesis	Hashimoto's	retinitis	chlamydia
imperfecta	disease	pigmentosa	cholera
patent ductus	hyperglycemia	retrolental	diphtheria
arteriosus	hyperparathyroidism	fibroplasia	dysentery
pectus excavatum	hypoglycemia	scleritis	glanders
peromelia	hypothyroidism	strabismus	gonorrhea
pseudohermaphroditism	myxedema	sty	granuloma
respiratory distress	parathyroid	trachoma	inguinale
syndrome	adenoma	uveitis	impetigo
Rett syndrome	pheochromocytoma	visual-field defect	Legionnaires'
Siamese twin	Plummer's disease	<i>disorders—</i>	<i>disease</i>
sickle cell anemia	Riedel thyroiditis	<i>gastrointestinal:</i>	leprosy
teratology	Sheehan's	appendicitis	leptospirosis
thalassemia	syndrome	cestodiasis	listeriosis
Turner's syndrome	Stein-Leventhal	cholera	Lyme disease
	syndrome	coccidiosis	lymphogranuloma
	thyroid tumour	colic	venereum

mastitis	schistosomiasis	dermatomyositis	anorexia nervosa
meliodosis	sleeping sickness	lumbago	beriberi
osteomyelitis	toxoplasmosis	muscle tumour	bulimia
paresis	trichinosis	muscular	calcium deficiency
plague	trichomoniasis	dystrophy	celiac disease
psittacosis	<i>disorders—infectious</i>	myasthenia gravis	chlorine deficiency
puerperal fever	<i>diseases caused by</i>	myositis	cobalt deficiency
pyelonephritis	<i>various agents:</i>	myotonia	copper deficiency
Q fever	conjunctivitis	tetanus	fluorine deficiency
rat-bite fever	endocarditis	tetany	iodine deficiency
rheumatic fever	infection	trichinosis	kwashiorkor
Rocky Mountain	meningitis	<i>disorders—nervous</i>	magnesium
spotted fever	otitis media	<i>system:</i>	deficiency
salmonellosis	pharyngitis	Alzheimer's disease	malnutrition
scarlet fever	pneumonia	amyotrophic	manganese
scrub typhus	scrub typhus	lateral	deficiency
septicemia	septic arthritis	sclerosis	obesity
streptobacillary	sexually	analgesia	osteomalacia
fever	transmitted	aphasia	pellagra
sty	disease	apraxia	phosphorus
syphilis	splenitis	ataxia	deficiency
tetanus	tonsillitis	cerebral palsy	rickets
toxic shock	zoonosis	chorea	scurvy
syndrome	<i>disorders—infectious</i>	coma	tropical sprue
trachoma	<i>diseases caused by</i>	convulsion	vitamin A
trench fever	<i>viruses:</i>	dementia	deficiency
tuberculosis	acquired immune	dyslexia	vitamin A excess
tyluremia	deficiency	encephalitis	vitamin B2
typhoid	syndrome	epilepsy	deficiency
typhus	adenovirus	focal seizure	vitamin B12
whooping cough	infection	grand mal	deficiency
yaws	chicken pox	herpes zoster	vitamin D excess
<i>disorders—infectious</i>	Colorado tick fever	hydrocephalus	vitamin E
<i>diseases caused by</i>	common cold	hyperactivity	deficiency
<i>fungi:</i>	dengue	kernicterus	vitamin K
actinomycosis	encephalitis	kuru	deficiency
aspergillosis	herpes simplex	listeriosis	<i>disorders—oral:</i>
blastomycosis	herpes zoster	meningitis	canker sore
candidiasis	infectious	microcephaly	caries
cryptococcosis	mononucleosis	multiple sclerosis	gingivitis
histoplasmosis	influenza	neural tube defect	glossitis
Madura foot	kuru	neuralgia	periodontitis
mycosis	measles	neuritis	thrush
nocardiosis	mumps	paralysis	tooth squeeze
ringworm	pappataci fever	paresis	<i>disorders—poisoning:</i>
sporotrichosis	poliomyelitis	Parkinson's disease	antimony
thrush	pox disease	petit mal	poisoning
<i>disorders—infectious</i>	rabies	Pick's disease	arsenic poisoning
<i>diseases caused by</i>	Rift Valley fever	poliomyelitis	botulism
<i>parasites:</i>	roseola infantum	psychomotor	cadmium
ascariasis	rubella	seizure	poisoning
cestodiasis	smallpox	rabies	cyanide poisoning
Chagas' disease	wart	Rett syndrome	fish poisoning
clonorchiasis	yellow fever	sciatica	food poisoning
coccidiosis	<i>disorders—lymphatic</i>	senile brain disease	lead poisoning
dysentery	<i>system:</i>	sleeping sickness	medicinal
echinococcosis	Hodgkin's disease	syringomyelia	poisoning
fasciolopsiasis	lymphedema	tic	mercury poisoning
filariasis	lymphogranuloma	Tourette's	mushroom
hookworm	venereum	syndrome	poisoning
kala-azar	sporotrichosis	vertigo	poison
malaria	tonsillitis	<i>disorders—nutritional</i>	
paragonimiasis	<i>disorders—muscle:</i>	<i>diseases:</i>	
	cramp	anorexia	

- shellfish poisoning
venom
disorders—pregnancy related:
abortion
ectopic pregnancy
hydatidiform mole
miscarriage
placenta accreta
placenta praevia
placentae abruptio
placental infarction
preeclampsia and eclampsia
premature birth
disorders—pressure injuries and other disorders caused by physical agents:
acceleration stress
acoustic trauma
air embolism
altitude sickness
barotrauma
bends
blast injury
burn
crush injury
deceleration injury
decompression sickness
ear squeeze
ebullism
electrical shock
frostbite
heatstroke
hypothermia
intestinal squeeze
mediastinal emphysema
motion sickness
nitrogen narcosis
radiation injury
rotational stress
sinus squeeze
snakebite
spatial disorientation
subcutaneous emphysema
sunburn
taravana syndrome
temperature stress
thoracic squeeze
tooth 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
pseudohermaphroditism
puerperal fever
Stein–Leventhal syndrome
uterine bleeding
vaginitis
vesiculitis
vulvitis
disorders—respiratory system:
adenovirus infection
alveolar proteinosis
anthracosis
asbestosis
atelectasis
berylliosis
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:
acquired immune deficiency syndrome
chancere
chancroid
chlamydia
gonorrhea
granuloma inguinale
herpes simplex
lymphogranuloma venereum
proctitis
syphilis
disorders—skeletal:
achondroplasia
acromegaly
bone lesion
callus
cervical spondylosis
cleidocranial dysostosis
craniosynostosis
dislocation
dysplasia
dwarfism
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
insect bite and sting
itching
keratosis
mole
nevus
pemphigus
pinta
pseudoxanthoma elasticum
psoriasis
ringworm
scleroderma
seborrheic dermatitis
vitiligo
wart
disorders—other:
asthenia
atrophy
childhood diseases and disorders
cyst
dehydration
disease
diverticulum
edema
empyema
fever
gangrene
hamartoma
headache
hernia
hiccup
hypophosphatemia
potassium deficiency
progeria
Reye's Syndrome
sarcoidosis
Sjögren's syndrome
sodium deficiency
splenitis
splenomegaly
sudden infant death syndrome
tumour

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

Biographies

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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.]
- 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	birth control
International Fund for Agricultural Development	dentistry	euthanasia	contraception
Medicare	epidemiology	Hippocratic oath	flying doctor service
National Health Service	hematology	medical jurisprudence	health maintenance organization
World Food Programme	industrial medicine	<i>preventive medicine:</i>	hospice
World Health Organization	midwifery	immunization	planned parenthood
<i>health-care fields:</i>	nursing	preventive medicine	Rospital
aerospace medicine	optometry	quarantine	medical association
	osteopathy	<i>other:</i>	public health
	paramedical personnel	American Medical Association	social security
	pharmacy		
	plastic surgery		
	psychiatry		
	surgery		

Biographies

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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 articles dealing with human nature and experience: general considerations

Behaviour, The Development of Human
Psychology

MICROPAEDIA: Selected entries of reference information

General subjects

adjustment	creativity	insight	psychological
adolescence	emotion	instinct	development
attitude	etiquette	intelligence	reflex
behaviour genetics	habit	memory	sibling rivalry
child development	human behaviour	middle age	thanatology
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- 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
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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

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 - c. Perceptual constancy: the tendency of objects to appear stable in size, shape, brightness, or colour despite changing conditions of stimulation
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 - 3. Interrelations among the senses
 - 4. Social and interpersonal aspects of space perception: territorial behaviour, reason in perception, and nativistic and empiricistic considerations
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- 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
Psychology

MICROPAEDIA: Selected entries of reference information

General subjects

<i>parapsychological</i>	consciousness	synesthesia	sensation
<i>phenomena:</i>	delirium	time perception	sense
extrasensory	eidetic image	<i>sensation:</i>	smell
perception	hallucination	chemoreception	sound reception
parapsychological	illusion	flavour	thermoreception
phenomenon	movement	mechanoreception	<i>other:</i>
precognition	perception	pain	attention
telepathy	pain	photoreception	circadian rhythm
<i>perception:</i>	perception	proprioception	stress
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 3. Hypnosis and related states of altered consciousness
 4. Fatigue
 5. Transient states caused by altered body chemistry

Suggested reading in the *Encyclopædia Britannica*:

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

Emotion and Motivation, Human
Psychology

Sex and Sexuality
Sleep and Dreams

MICROPAEDIA: Selected entries of reference information

General subjects

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

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	

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- 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
 Psychology
 Thought and Thought Processes

MICROPAEDIA: Selected entries of reference information

General subjects

amnesia	conditioning	memory	recognition
association	discrimination	mnemonic	social learning
attitude	generalization	perceptual learning	suggestion
brainwashing	imitation	persuasion	thought
cognition	insight	psychomotor	training, transfer of
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2. Psychoanalytic theories of personality: the importance of id, ego, superego, life and death instincts, and the collective unconscious
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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
Psychology

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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 herds-men-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 Meso-America
 - 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. Among the Khoisan peoples: Hottentots and Bushmen
- 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	Iran
American Indians	Mediterranean Sea
Arctic, The	North Africa
Asia	Pacific Islands
Australia	Sudan
Central Africa	Turkey and Ancient Anatolia
Culture, The Concept and Components of	Union of Soviet Socialist Republics
East Indies, The	West Indies
Eastern Africa	Western Africa
Europe	

MICROPAEDIA: Selected entries of reference information

General subjects

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

- | | | | |
|-------------------------|------------------------|-------------------|---------------------------|
| Mossi | Bhīl | Batak | Hungarian |
| Ngbandi | Bhutia | Bisaya | Lapp |
| Nilot | Brahui | Buginese | Mari |
| Nuba | Chakma | Cebuano | Mordvin |
| Nuer | Chenchu | Cham | Slav |
| Sara | Chin | Dayak | Szekler |
| Senufo | Dafla | Dusun | Tatar |
| Serer | Durrānī | Ifugao | Vlach |
| Songhai | Ghilzay | Igorot | See also |
| Tuareg | Gond | Ilocano | Section 514 |
| Tukulor | Gurung | Jakun | <i>Middle America and</i> |
| Wolof | Ḥazāra | Javanese | <i>northern Andes:</i> |
| Zerma | Ho | Kachin | Achagua |
| <i>Arctic:</i> | Jāt | Karen | Amuzgo |
| Aleut | Kadar | Kayan | Arawak |
| Chukchi | Khāsi | Kenyah | Bribri |
| Dolgan | Khond | Kubu | Cakchiquel |
| Eskimo | Koch | Lampong | Caquetío |
| Even | Koli | Madurese | Cayapa |
| Evenk | Korku | Magindanao | Cenú |
| Gilyak | Kota | Malay | Chatino |
| Kamchadal | Kuki | Manggarai | Chinantec |
| Ket | Kurumba | Maranao | Chocho |
| Komi | Lepchā | Miao | Chocó |
| Koryak | Limbu | Minahasan | Chol |
| Lapp | Magar | Minangkabau | Chontal |
| Nenets | Magh | Mon | Chortí |
| Ostyak and Vogul | Mina | Montagnard | Ciboney |
| Yakut | Mishmi | Moro | Colorado |
| Yukaghir | Mizo | Muong | Cuicatec |
| <i>Asia—Central and</i> | Munda peoples | Murut | Cumanagoto |
| <i>East:</i> | Nāga | Ngada | Cuna |
| Ainu | Newar | Palaung | Goajiro |
| Ami | Nūristāni | Pangasinan | Guaymí |
| Buryat | Pahārī | Rejang | Huastec |
| Chahar | Pashtun | Samal | Huichol and Cora |
| Chuang | Rai | Sasak | Ixcatec |
| Daghur | Sansi | Semang | Jicaque |
| Hani | Santāl | Senoi | Kekchí |
| Hui | Savara | Shan | Lacandon |
| Kalmyk | Sinhalese | Sikanese | Lenca |
| Kazakh | Tamang | Solorese | Maya |
| Khalkha | Tamil | Sundanese | Mazatec |
| Kirgiz | Tharu | Tagalog | Miskito |
| Oyrat | Toda | Tai | Mixe-Zoquean |
| Pai | Vedda | Tasaday | Mixtec |
| Puyi | <i>Asia—South</i> | Tau Sug | Nahua |
| Sanka | <i>Siberian:</i> | Tenggerese | Otomí |
| Tadzhik | Buryat | Tetum | Paéz |
| Tibetan peoples | Khakass | Toradja | Palenque |
| Tung | Nenets | Wa | Patángoro |
| Turkic peoples | Ostyak and Vogul | <i>Europe:</i> | Pijao |
| Turkmen | Oyrat | Balt | Pocomam |
| Tuvinian | Soyot | Bashkir | Popoloca |
| Uighur | Tofalar | Basque | Puruhá |
| Uzbek | Tuvinian | Bulgarian | Quiché |
| Yao | Uighur | Caucasian peoples | Sumo |
| Yi | Yakut | Chuvash | Taino |
| <i>Asia—South:</i> | <i>Asia—Southeast:</i> | Circassian | Tairona |
| Afrīdī | Achinese | Finnic peoples | Tarasco |
| Andamanese | Arakanese | Fleming and | Tepehuan |
| Baḍaga | Atoni | Walloon | Tojolabal |
| Baluchi | Balinese | Gypsy | Totonac |

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

Ge
Guaraní
Jívaro
Kawaíb

Maxakali
Mundurukú
Mura
Nambicuara

Shavante
Sherente
Shipibo
Tucuna

Tupian
Tupinambá
Witoto
Yanoamö

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 Urbanization
Social Differentiation

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
Kulturkreis
Mesolithic period
modernization
Neolithic period
nomadism
Paleolithic period

peasantry
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
[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, below]
 - 6. Recreation, sports and games

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
 Social Differentiation
 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	
band	family	lineage	
blood brotherhood	gens	matriarchy	

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

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 G.]
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
- 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. The classification of language
 2. Languages spoken in Europe and areas of European colonization
 - a. Indo-European languages
 - i. Indo-Iranian languages
[see H.3.a.i., below]
 - ii. Celtic languages
 - iii. Italic languages
[see H.6.c., below]
 - iv. Romance languages
 - v. Greek language
 - vi. Baltic languages
 - vii. Slavic languages
 - viii. Germanic languages
 - ix. English language
 - x. Albanian language
 - xi. Armenian language
 - xii. Tocharian language
[see H.6.e., below]
 - b. Non-Indo-European languages
 - i. Uralic languages
 - ii. Basque language
 3. Languages of Asia and Oceania
 - a. Languages of Asia
 - i. Indo-Iranian languages

- ii. Dravidian languages
 - iii. Austro-Asiatic languages
 - iv. Sino-Tibetan languages
 - v. Tai languages
 - vi. Japanese language
 - vii. Korean language
 - viii. Altaic languages
 - ix. Uralic languages
[see H.2.b.i., above]
 - x. Paleosiberian languages
 - xi. Caucasian languages
- b. Languages of Oceania
 - i. Austronesian languages
 - ii. Australian Aboriginal languages
 - iii. Papuan languages
- 4. Languages of Africa and the Middle East
 - a. African languages
 - i. Niger-Congo languages
 - ii. Chari-Nile and Nilo-Saharan languages
 - iii. Khoisan languages
 - b. Hamito-Semitic languages
 - i. Semitic languages
 - ii. Egyptian language
 - iii. Berber languages
 - iv. Cushitic languages
 - v. Chadic languages
- 5. Indian languages of the Americas
 - a. Eskimo-Aleut languages
 - b. North American Indian languages
 - c. Mexican and Central American Indian languages
 - d. South American and Caribbean Indian languages
- 6. Extinct languages of the world
 - a. Anatolian languages
 - b. Etruscan language
 - c. Italic (non-Romance) languages
 - d. Sumerian language
 - e. Tocharian language
 - f. Sources of other ancient languages: ancient epigraphic remains
- 7. Constructed languages
 - a. Special international or universal languages, including Esperanto and Interlingua; Basic English
 - b. Machine languages: 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

<i>alphabets and other</i>	Mayan	punctuation	Ural-Altaic
<i>writing systems:</i>	hieroglyphic	slang	languages
alphabet	writing	speculative	Uzbek language
Arabic alphabet	Myazedi	grammar	<i>languages—</i>
Aramaic alphabet	inscription	surname	<i>Austro-Asiatic:</i>
Armenian alphabet	Nabataean	syntax	Austro-Asiatic
Brāhmī	alphabet	tense	languages
Braille	North Semitic	voice	Khmer language
Canaanite	alphabet	<i>languages—African:</i>	Mon-Khmer
inscriptions	ogham writing	African languages	languages
Chinese writing	Pahlavi alphabet	Bantu languages	Munda languages
system	Palmyrenian	Central Sudanic	Nicobarese
cuneiform writing	alphabet	languages	languages
Cypriot syllabary	Phoenician	Eastern Sudanic	Vietnamese
Cyrillic alphabet	alphabet	languages	language
demotic script	pictography	Khoikhoi	<i>languages—</i>
Devanāgarī	Pitman shorthand	language	<i>Austronesian:</i>
Eggjum Stone	Rosetta Stone	Khoisan language	Austronesian
Ethiopic alphabet	runic alphabet	Kwa languages	languages
Etruscan alphabet	Sarada script	Meroitic language	Cebuano
Glagolitic alphabet	shorthand	Niger-Congo	Javanese language
Gothic alphabet	Sinaitic	languages	Malay language
Grantha alphabet	inscriptions	Nilotic languages	Melanesian
Greek alphabet	South Semitic	Nubian languages	languages
Gregg shorthand	alphabet	San languages	Micronesian
Gupta script	Speedwriting	Swahili language	languages
Gurmukhi	stenotypy	West Atlantic	Oceanic languages
alphabet	syllabary	languages	Polynesian
Hankul	Syriac alphabet	Xhosa language	languages
Hebrew alphabet	Ugaritic alphabet	Zulu language	Tagalog language
hieroglyph	writing	<i>languages—Altaic:</i>	<i>languages—</i>
Hittite hieroglyphic	<i>grammar, syntax,</i>	Altaic languages	<i>Caucasian:</i>
writing	<i>and vocabulary:</i>	Chuvash language	Avar-Ando-Dido
Iguvine Tables	abbreviation	Kazakh language	languages
Indic writing	agglutination	Kirgiz language	Caucasian
systems	auxiliary	Mongol language	languages
kana	gender	Mongolian	Georgian language
Kensington Stone	grammar	languages	Kartvelian
Kharoṣṭī	honorific	Tatar language	languages
Kök Turki	mood	Turkic languages	Laz language
alphabet	morpheme	Turkish language	Mingrelian
Latin alphabet	name	Turkmen language	language
Linear B	patronymic	Uighur language	Nakh languages

- languages—
Dravidian:
 Dravidian languages
 Kannada language
 Malayalam language
 Tamil language
 Telugu language
 languages—
Hamito-Semitic:
 Akkadian language
 Amharic language
 Arabic language
 Aramaic language
 Berber languages
 Chadic languages
 Coptic language
 Cushitic languages
 Eblaite language
 Egyptian language
 Ge'ez language
 Hamito-Semitic languages
 Hausa language
 Hebrew language
 Phoenician language
 Semitic languages
 South Arabic language
 Syriac 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
 Faeroese language
 Frisian language
 German language
 Germanic languages
 Gothic language
 Icelandic language
 Middle English language
 Netherlandic language
 Norwegian language
 Old English language
 Old Norse language
 Old Saxon language
 Scandinavian languages
 Swedish language
 Swiss German language
 Yiddish
 languages—*Indo-European (Greek):*
 Demotic Greek language
 Greek language
 Katharevusa Greek language
 Koine
 languages—*Indo-European (Indo-Iranian):*
 Apabhramsa language
 Assamese language
 Avestan language
 Baluchi language
 Bengali language
 Bihari languages
 Burushaski language
 Dardic languages
 Gujarati language
 Hindi language
 Hindustani language
 Indian languages
 Indo-Aryan languages
 Indo-Iranian languages
 Iranian languages
 Kashmiri language
 Marathi language
 Oriya language
 Ossetic language
 Pahari languages
 Pahlavi language
 Pāli language
 Parthian language
 Pashto language
 Persian language
 Prākṛit languages
 Punjabi 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 language
 Ladino language
 Latin language
 Mozarabic language
 Occitan language
 Oscan language
 Osco-Umbrian language
 Portuguese language
 Rhaetian dialects
 Romance languages
 Romanian language
 Sabellic dialects
 Sardinian language
 Spanish language
 Umbrian language
 Vulgar Latin
 languages—*Indo-European (Slavic):*
 Belorussian 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
 Luwian language
 Lydian language
 Raetian language
 Tocharian language
 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-Manguean languages
 Quiché language
 Uto-Aztecan languages
 Yucatec language

- languages—North American Indian:*
 Algonkian languages
 American Indian languages
 Cherokee language
 Hokan languages
 Hopi language
 Macro-Algonkian 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 languages
 Min languages
 Pinyin
 romanization
- languages—Sino-Tibetan:*
 languages
 Tibetan language
 Wade-Giles romanization
 Wu language
- languages—South American Indian:*
 American Indian languages
 Arawakan languages
 Quechuan languages
 Tupí-Guaraní languages
- languages—Tai:*
 Shan language
 Tai language
 Thai language
- languages—unaffiliated (extinct):*
 Elamite language
 Etruscan language
 Hattic language
 Hurrian language
 Sumerian language
- languages—unaffiliated (living):*
 Andamanese language
 Australian Aboriginal languages
 Basque language
 Eskimo-Aleut languages
 Japanese language
 Korean language
 Paleosiberian languages
 Papuan languages
- languages—Uralic:*
 Estonian language
 Finnish language
 Finno-Ugric languages
 Hungarian language
 Karelian language
 Lapp language
 Mari language
 Mordvin language
 Permic languages
 Ural-Altaic languages
 Uralic languages
- linguistics:*
 anthropological linguistics
 comparative linguistics
 computational linguistics
 dialect
 dialectology
 diglossia
 ethnolinguistics
 etymology
 general semantics
 generative grammar
 glossematics
 glottochronology
 Grimm's law
 historical linguistics
 immediate constituent analysis
 koine language
 linguistics
 morphology
 Neogrammarian
 neurolinguistics
 Prague school
- psycholinguistics
 semantics
 semiotics
 sociolinguistics
 structuralism
 stylistics
 synchronic linguistics
 transformational grammar
 Verner's law
- phonetics:*
 accent
 allophone
 articulation
 click
 consonant
 inflection
 International Phonetic Alphabet
 intonation
 nasal
 palatalization
 phoneme
 phonetics
 phonology
 rounding
 stop
 suprasegmental
 tone
 velarization
 voice
 vowel
- other:*
 communication
 cryptology
 humour
 name
 semaphore
 sign language
 symbol
 speech
- Biographies**
 Carey, William
 Grimm, Jacob
 Ludwig Carl and Wilhelm Carl
 Jakobson, Roman
 Jespersen, Otto
 Kimhi, David
 Levita, Elijah
 Lomonosov, Mikhail Vasilyevich
 Rask, Rasmus
 Saussure, Ferdinand de
 Schleicher, August
 Ulfilas

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 187

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 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
 Crime and Punishment
 Propaganda
 Public Opinion
 Social Sciences, The
 Social Structure and Change
 Work and Employment

MICROPAEDIA: Selected entries of reference information

General subjects

<i>punishment and rehabilitation:</i>	Irish system	<i>social change:</i>	<i>social norms and associated</i>
amnesty	mark system	civil disobedience	<i>phenomena:</i>
Auburn system	ostracism	revitalization	assimilation
Baumes Laws	panopticon	movement	collective
Borstal system	parole	sanction	behaviour
commutation	penal colony	satyāgraha	folkway
deportation	Pennsylvania	sit-in	norm
Elmira system	system	social change	public opinion
exile and	prison	social Darwinism	role
banishment	probation	social movement	social structure
indeterminate	recidivism	temperance	
sentence	reformatory	movement	
	workhouse		

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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. The adolescent
2. The aged
3. Women
4. Cultural minorities
[see A.4., above]
5. The poor
6. Criminals and delinquents
7. Sexual deviants
8. Prostitutes
9. Drug and alcohol users
10. Suicidal persons

- 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 Differentiation
Crime and Punishment	Social Sciences, The
Family and Kinship	Social Welfare
Sex and Sexuality	

MICROPAEDIA: Selected entries of reference information

General subjects

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

Biographies

See Section 10/36 of Part Ten

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 Differentiation
Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

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

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See Section 10/36 of Part Ten

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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: levels of 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	Population
Cities	Rural Society and Agriculture, Modern
Climate and Weather	Social Sciences, The
Modernization and Urbanization	

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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
Economic Theory
Government Finance
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 737.C.1.]
 - d. Imperfect knowledge on the part of buyers as to alternative uses of their buying power
[see 532.B.2.]
3. The role of the public sector in the distribution of goods and services: government budgets
[see 534.B.1. and 535.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
Government Finance
International Trade
Markets
Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

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

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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 inferior 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
[see also 724]
 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
 - g. The market for long-term funds: savings institutions, the stock and bond market, 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 structure of business corporations
- 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	Economic Growth	International Trade	Rural Society
Banks and	and Planning	Marketing and	and Agriculture,
Banking	Economic Theory	Merchandising	Modern
Business	Government	Markets	Social Sciences, The
Organization	Finance	Money	Work and
Coins and Coinage	Insurance	Public Enterprises	Employment

MICROPAEDIA: Selected entries of reference information

General subjects

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

- risk
 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
 holding company
 industrial
 espionage
 inventory
 limited liability
 mercantile agency
 merger
 monopoly
 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
 Eurodollar
 fractional reserve system
 franc
 gold-exchange standard
 gold standard
 Gresham's law
 lira
 mark
 money
 money supply
 parity
 peso
 pound sterling
 ruble
 rupee
 quantity theory of money
 seigniorage
 silver standard
 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
 Krupp von Bohlen und Halbach, Gustav
 McCormick, Cyrus Hall
 Penney, J.C.
 Pew, J. Howard and Joseph N.
 Rockefeller, John D.
 Schwab, Charles M.
 Mellon, Andrew W.
 Morgan, John Pierpont
 Rothschild family
 Sage, Russell
 Yerkes, Charles Tyson
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

Biographies

advertising and public relations:
 Benton, William
 Bernays, Edward I.
 Bernbach, William
 Byoir, Carl
 Lasker, Albert
finance:
 Baring family
 Belmont family
 Fugger family

Squibb, E.R.	Hill, Joe	Woodcock, George	See also Section 10/36 of Part Ten
Thyssen family	Hoffa, James R.	<i>merchandising:</i>	
<i>labour:</i>	Meany, George	Marcus, Stanley	
Chavez, César	Reuther, Walter	Sears, R.W.	
Debs, Eugene V.	Stephens, Uriah	Ward,	
Feather, Victor	Smith	Montgomery	

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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: the Lorenz diagram, the Gini and Pareto coefficients
 - 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 corporation 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	Public Enterprises
Government Finance	Social Sciences, The
International Trade	Social Welfare
Land Reform and Tenure	Taxation

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	worker's	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	

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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

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

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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
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See Section 10/36 of Part Ten

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

Biographies

Bakunin, Mikhail Aleksandrovich	Herzen, Aleksandr	Mao Zedong	Tocqueville,
Bebel, August	Jefferson, Thomas	Marx, Karl	Alexis de
Bentley, Arthur F.	Kropotkin, Peter	Plekhanov, Georgy	Trotsky, Leon
Bernstein, Eduard	Laski, Harold J.	Valentinovich	Webb, Sidney and
Blanc, Louis	Lasswell, Harold D.	Proudhon,	Beatrice
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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 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
Political Systems
Public Administration
Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>administrative units:</i>	dictatorship	<i>municipal</i>	<i>titles and offices:</i>
borough	federalism	<i>government:</i>	chancellor
canton	government	alderman	count
city	military	burgomaster	duke
city-state	government	city manager	emperor
commonwealth	monarchy	mayor	grand duke
commune	oligarchy	pao chia	king
county	two-party system	town meeting	landgrave
municipality	<i>legislative bodies:</i>	<i>public administration:</i>	lord
state	Commons,	administrative law	prime minister
shire	House of	bureaucracy	prince
township	Congress of the	cabinet	tsar
<i>courts and judiciary:</i>	United States	civil service	<i>other:</i>
See Section 552	Diet	commission	assembly
<i>governmental forms</i>	Knesset	ombudsman	local option
<i>and systems:</i>	Lords, House of	public	states' rights
absolutism	Parliament	administration	tenure
aristocracy	Representatives,	regulatory agency	
bicameral system	House of	spoils system	
democracy	Senate		

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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.A. and 544.E.]
 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
 Crime and Punishment
 Police
 Political Parties and Interest Groups
 Political Systems
 Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>censorship:</i>	<i>electoral process:</i>	<i>law enforcement:</i>	<i>sheriff</i>
banning	absentee voting	capital punishment	<i>legislative procedure:</i>
censor	Australian Ballot	constable	cloture
censorship	election	criminal	filibuster
obscenity	electoral college	investigation	legislative
pornography	plebiscite	Federal Bureau of	investigative
<i>electoral</i>	plurality system	Investigation	powers
<i>constituencies:</i>	political	Interpol	parliamentary
constituency	convention	KGB	procedure
gerrymandering	political party	police	<i>other:</i>
legislative	primary election	posse comitatus	revolution
apportionment	referendum and	punishment	sabotage
pocket borough	initiative	ranger	terrorism
proportional	suffrage	Royal Canadian	
representation		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
- B. International treaties and agreements
[see also 533.F.3.]
- C. Foreign policy and diplomacy
- 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
 - 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.]

Suggested reading in the *Encyclopædia Britannica*:

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

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

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aggression and warfare:</i>	terrorism	international organization	National Security Agency
aggression	total war	legate	Ultra
amphibious warfare	visit and search war	mediation	<i>military organization and personnel:</i>
annexation	<i>diplomacy and international agreements:</i>	neutralism	admiral
belligerency	alliance	power, balance of treaty	aide-de-camp
blitzkrieg	ambassador	United Nations	air force
blockade	armistice	<i>intelligence gathering:</i>	armed force
civil defense	arms control	BND	army
conquest	collective security	Central Intelligence Agency	battalion
convoy	consul	counterespionage	brevet
economic warfare	executive agreement	espionage	captain
embargo	foreign service	intelligence	cavalry
infiltration	geopolitics	KGB	centurion
mobilization	international agreement	MI-5	chasseur
sabotage		MI-6	coast guard
safe-conduct		Mossad	
ship-of-the-line warfare			

commandant	mercenary	just war	sovereignty
company	military police	logistics	territorial waters
division	militia	military science	<i>other:</i>
dragoon	navy	sea power	American Legion
frogman	phalanx	strategy	concentration
general	platoon	tactics	camp
general staff	privateer	<i>sovereignty:</i>	conscientious
grenadier	quartermaster	colonialism	objector
guerrilla	ranger	dominion	conscription
hussar	regiment	exterritoriality	fifth column
infantry	streletsy	home rule	impressment
legion	<i>military science:</i>	imperialism	martial law
lieutenant	air power	influence,	military, naval,
marine	deterrence	sphere of	and air academies
marshal		protectorate	

Biographies*diplomats and
statesmen:*

Adenauer, Konrad
Ben-Gurion, David
Bismarck,
Otto von
Bunche, Ralph
Chamberlain,
Neville
Chou En-lai
Churchill, Winston
Clemenceau,
Georges
Curzon, George
Nathaniel
Curzon,
Marquesse
Disraeli, Benjamin
Dulles, John
Foster
Eisenhower,
Dwight D.
Gandhi, Mohandas
Karamchand
Gaulle, Charles de

Gladstone,
William Ewart
Goebbels, Joseph
Gromyko, Andrey
Andreyevich
Hammar skjöld,
Dag
Hitler, Adolf
Ho Chi Minh
Kennedy, John F.
Khrushchev,
Nikita S.
Kissinger,
Henry A.
Lie, Trygve
Marshall,
George C.
Metternich,
Klemens,
Fürst von
Mussolini, Benito
Nasser, Gamal
Abdel
Nehru, Jawaharlal

Roosevelt,
Franklin D.
Stalin, Joseph
Stevenson,
Adlai E.
Sun Yat-sen
Thant, U
Weizmann, Chaim
Wilson, Woodrow
*intelligence agents
and officers:*
Baker, Lafayette
Curry
Bancroft, Edward
Boyd, Belle
Burgess, Guy; and
Maclean, Donald
Donovan,
William J.
Hiss, Alger
Mata Hari
Redl, Alfred
Schulmeister, Karl
Van Deman,
Ralph H.

Winterbotham,
Fredrick William
Yardley, Herbert
Osborne
military theorists:
Clausewitz,
Carl von
Douhet, Giulio
Jomini, Henri,
baron de
Liddell Hart, Sir
Basil
Mahan, Alfred
Thayer
Montalembert,
Marc-René,
marquis de
Montecuccoli,
Raimonde
Scharnhorst,
Gerhard Johann
David von
Vauban, Sébastien
le Prestre de

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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; the profession and 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, principles and institutions:</i>	decretal	Chambre des Comptes	peine forte et dure
aedile	dispensation	Chambre des Enquêtes	right, petition of
archon	ecclesiastical court	Chambre des Requêtes	seisin
Basilica	excommunication	Clarendon, Assize of	serjeanty
censor	False Decretals	court baron	socage
civitas	Gratian's Decretum	Court Leet	tallage
clientship	Hadith	curia regis	usury
comitia	Halakha	fehmic court	wardship and marriage
concubinage	Mishna	High Commission, Court of	wergild
cuneiform law	penitential book	High Court of Admiralty	<i>modern legal codes and systems:</i>
decemviri	Shari'ah	law merchant	adat
delator	Talmud	legal glossator	Chinese law
delict	Torah	manorial court	German Civil Code
dharmashastra	<i>legal practitioners:</i>	Parlement	Indian law
dicastery	advocate	piepoudre court	Israeli law
Egyptian law	assessor	prerogative court	Japanese Civil Code
emphyteusis and superficies	attorney general	prévôt	Japanese law
Greek law	barrister	Privy Council	Napoleonic Code
Hammurabi, Code of	lawyer	Reichskammergericht	Prussian Civil Code
hypothec	notary	Requests, Court of	Roman-Dutch law
interdict	solicitor	Star Chamber, Court of	Scottish law
jus gentium	<i>medieval European law—codes and systems:</i>	<i>medieval European law—principles:</i>	Soviet law
jus Latii	Anglo-Saxon law	blood money	Swiss Civil Code
Justinian, Code of	Brehon law	clergy, benefit of	<i>other:</i>
manus	capitulary	composition	assize
nomos	Germanic law	compurgation	bar association
Pandects	Jerusalem, Assizes of	copyhold	civil law
patria potestas	Sachsenspiegel	demesne	common law
proscription	Salic Law	entail	custom
Roman law	Salic Law of Succession	feudal land tenure	disbarment
Roman legal procedure	Scandinavian law	feudalism	duel
stipulatio	Welsh law	fief	equity
talion	Westminster, Statutes of	frankpledge	feud
Twelve Tables, Law of the	<i>medieval European law—institutions and officers:</i>	freehold	law
<i>ecclesiastical law:</i>	audiencia	heriot	law code
canon law	Augmentations, Court of	homage and fealty	movable and immovable
Codex Juris Canonici		liege	natural law
Corpus Juris Canonici			sumptuary law

Biographies

Austin, John	Brougham and Vaux, Henry	Cardozo, Benjamin Nathan	Darrow, Clarence
Blackstone, Sir William	Peter Brougham, 1st Baron	Cockburn, Sir Alexander James	Draco
Brandeis, Louis	Burger, Warren E.	Edmund	Erskine, Thomas
Brennan, William J., Jr.		Coke, Sir Edward	Erskine, 1st Baron

Field, Stephen J(ohnson)	Holmes, Oliver Wendell, Jr.	Matthews, Stanley Miller, Samuel	Story, Joseph Taney, Roger
Fortas, Abe	Jackson, Robert H.	Freeman	Brooke
Frankfurter, Felix	Johnson, William	Pufendorf, Samuel,	Waite, Morrison
Grotius, Hugo	Mansfield (of Caen	Freiherr von	Remick
Hale, Sir Matthew	Wood), William	Savigny, Friedrich	Warren, Earl
Hand, Learned	Murray, 1st	Karl von	White, Edward
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Marshall	Marshall, John	Stone, Harlan Fiske	

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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

MICROPAEDIA: Selected entries of reference information

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bailiff	assault and battery	acquittal	limitation,
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lord chancellor	fraud	search and seizure	Hague Convention
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 - b. Laws concerning children: legitimacy, adoption, and guardianship; parental obligations and rights
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- b. Jurisdiction or venue in private international law: the source and nature of the conflict of laws, foreign judgments and choice of law
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 - 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
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average	escrow	marriage law	remainder
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cessio bonorum	joinder and	separation	servitude
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B. The learning process and the teaching art

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2. Pedagogy: the art and science of teaching

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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

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b. Elementary and secondary education

c. Higher education: colleges, universities, and professional schools

d. Special education: education of exceptional children

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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

Education, Higher

Education, Social and Economic Aspects of

Education, Special

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

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public school	land-grant college	education	Winnetka Plan
realschule	madrasah	computer-assisted	<i>vocational education:</i>
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 - e. Sectarian systems: national and regional sectarian systems, sectarian education as an alternative system to public education

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 - c. Ancient Hebrew education
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 - 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
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 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
 Education, Systems of
 Religious Education
 Teaching

MICROPAEDIA: Selected entries of reference information

General subjects

<i>educational systems:</i>	progressive	Dalton Plan	Quincy Plan
coeducation	education	hornbook	Winnetka Plan
correspondence	<i>history of education:</i>	land-grant college	<i>other:</i>
education	American	lyceum movement	academy
educational system	Missionary	mechanics'	Nobel Prize
liberal arts	Association	institute	Pugwash
minority education	cathedral school	nation	Conference
monitorial system	charity school	normal school	
parochial education	chautauqua	philanthropinum	
	movement		

Biographies

Adler, Mortimer J.	Cygnaeus, Uno	Hopkins, Johns	Richards, Ellen
Alcuin	Dewey, John	Hutchins,	Swallow
Bagley, William	Eaton, John	Robert M.	Sadler, Sir Michael
Chandler	Froebel, Friedrich	Lancaster, Joseph	Ernest
Basedow, Johann	Griswold, Alfred	Mann, Horace	Stowe, Calvin E.
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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 inane. 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 articles dealing with the theory and classification of the arts

Arts, Classification of the
Arts, Style in the
Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

art	folk art	mimesis	race, milieu, and
fine art	inspiration	popular art	moment

INDEX: See entries under all of the terms above

Section 612. Experience and Criticism of Works of Art; the Nonaesthetic Contexts 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.E.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

Art Conservation and Restoration
 Arts, Criticism of the
 Arts, Practice and Profession of the
 Libraries
 Museums

MICROPAEDIA: Selected entries of reference information

General subjects

Actors Studio, The	Degenerate Art	Public Works of	Treasury Section
antique	forgery	Art Project	of Painting and
Armory Show	library	Royal Academy of	Sculpture
art conservation	little magazine	Dramatic Art	Universal
art criticism	MacDowell Colony	Salon	Copyright
art history	maniera	Salon des	Convention
Beaux-Arts,	Mbari Mbayo Club	Indépendants	WPA Federal Art
École des	museum	Stanislavsky	Project
Berne Convention	PEN, International	method	World Intellectual
censorship	propagandistic art	Treasury Relief Art	Property
copyright		Project	Organization

Biographies

Baumgarten,
Alexander
Gottlieb
Cotton, Sir Robert
Bruce, 1st
Baronet

Fenollosa,
Ernest F.
Fry, Roger
Read, Sir Herbert
Rossetti, William

Ruskin, John
Santayana, George
Thou, Jacques-
Auguste de

Vasari, Giorgio
Winckelmann,
Johann

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 Near 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 the Far East: 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	East Asian Arts	Islāmic Arts	South Asian Arts
American Indians	Egyptian Arts and Architecture, Ancient	Oceanic Arts	Southeast Asian Arts
Central Asian Arts	Folk Arts	Popular Arts	
		Prehistoric Peoples and Cultures	

MICROPAEDIA: Selected entries of reference information

<i>arts in particular cultures:</i>	Baroque period	Impressionism	Régence style
African arts	Bohemian school	Jacobean age	Regency style
Central Asian arts	Byzantine art	Louis XIII style	Renaissance art
East Asian arts	Carolingian art	Louis XIV style	Rococo style
Egyptian art	Classicism and Neoclassicism	Louis XV style	Romanesque art
Islāmic arts	Constructivism	Louis XVI style	Romanticism
Oceanic arts	Cubism	Mannerism	Stijl, de
Paleolithic Period	Dada	minimalism	Stuart style
South Asian arts	Early Christian art	modern art	Surrealism
Southeast Asian arts	Early Netherlandish art	Mozarabic art	Symbolist movement
<i>historical periods, styles, schools, and movements:</i>	Empire style	naïve art	Visigothic art
Aestheticism	Expressionism	Naturalism	
Anglo-Saxon art	formalism	Novembergruppe	
Art Deco	Futurism	Op art	
Art Nouveau	Georgian style	Ottonian art	
	Gothic art	Pop art	
	Henry IV style	Queen Anne style	
		Realism	

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 237
- 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 content 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 poetry 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
 - e. The short story and its antecedents; *e.g.*, the tale, the sketch
 - 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 613]
- D. The history of literature
- 1. Literature of Western peoples
 - 2. Literatures of non-Western peoples
[see 613]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with literature

General subjects

African Arts	Dutch Literature	Latin-American Literature	Russian Literature
American Indians	English Literature	Literature	Scandinavian Literature
American Literature	French Literature	Latin Literature	South Asian Arts
Australia and New Zealand, Literatures of	German Literature	Literature, The Art of	Southeast Asian Arts
Belgian Literature	Greek Literature	Literature, The History of	Spanish Literature
Canadian Literature	Hebrew Literature	Western	Yiddish Literature
Celtic Literature	Homer's Epics, The	Oceanic Arts	Yugoslav Literature
Central Asian Arts	Hungarian Literature	Polish Literature	
Chinese Literature	Islamic Arts	Popular Arts	
Czechoslovak Literature	Italian Literature	Portuguese Literature	
	Japanese Literature	Rhetoric	
	Korean 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 comedy
catharsis	dramatic literature	comedy of	slapstick
chronicle play	fabula Atellana	manners,	sofie
climax	fabula palliata	comedy of	tragedy
cloak and sword drama	farce	melodrama	tragicomedy
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larmoyante	Hocktide play	Old Comedy	Wakefield plays
	hubris	prologue and epilogue	

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Raven cycle
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trickster tale
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affective fallacy
Cambridge critics
Chicago critic
Formalism
Freudian criticism
literary criticism
mimesis
New Criticism
New Humanism
organic unity
race, milieu, and moment
sublime
literary devices:
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Klephtic ballad
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macaronic
- muwashshah
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Pindaric ode
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Sturm und Drang
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- popular literature:*
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- prose forms:*
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 I novel
 Indianista novel
 Künstlerroman
 literary sketch
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- maqāmah
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 nonfiction novel
 novel
 novella
 picaresque novel
 problem novel
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 sentimental novel
 short story
 tradición
- romances:*
 Alexander
 romance
 Arthurian legend
 Hellenistic
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- sagas and related*
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- satire:*
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- themes and types:*
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 moderns
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 Beatrice
 Bluebeard
 courtly love
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 Isengrim
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 Bluestocking
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 chapbook
 character writer
 children's
 literature
 classical literature
 conceptismo
 costumbrismo
 culteranismo
 dolce stil nuovo
 emblem book
 fellow traveller
 frontier humour
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 Hindi literature
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 Utopian literature
 Weltschmerz
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 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
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American writers:

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 Sandburg, Carl
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 Lawson, Henry
 McAuley, James
 Phillip
 Paterson, A.B.
 Richardson, Henry
 Handel
 Stewart, Douglas
 White, Patrick

*British and Irish
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 Akenside, Mark
 Arden, John
 Auden, W.H.
 Austen, Jane
 Beaumont, Francis
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 Belloc, Hilaire
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 Blake, William
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 Browne, Sir
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 Elizabeth Barrett
 Browning, Robert
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 Burns, Robert
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 Byron, George
 Gordon Byron,
 6th Baron
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 Defoe, Daniel
 Dickens, Charles
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 Douglas, Gawin
 Dowson, Ernest
 Dryden, John
 Dunbar, William
 Durrell, Lawrence
 Edgeworth, Maria
 Eliot, George
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 Evelyn, John
 Farquhar, George
 Fielding, Henry
 Fletcher, John
 Forster, E.M.
 Foxe, John
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- Marlowe,
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 Pinter, Harold
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 Ramsay, Allan
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 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
 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
 Mori Ōgai
 Mishima Yukio
 Murasaki Shikibu
 Natsume Sōseki
 Ōe Kenzaburō
 Ou-yang Hsiu
 Shiga Naoya
 Tu Fu
 Wang An-shih
 Zeami Motokiyo
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, vicomte 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-Holstein,
 Anne-Louise-
 Germaine
 Necker,
 baronne 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, Shmuel
Yosef
Berdichevsky,
Micah Joseph
Bialik, Hayyim
Nahman
Hisdai 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
Muhammad
- 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 Alighieri
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, José
Basílio da
García Márquez,
Gabriel
Gonçalves Dias,
Antônio
Gonzaga, Thomaz
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, José
López y Fuentes,
Gregorio
Lugones, Leopoldo
Lynch, Benito
Machado de Assis,
Joaquim Maria
Mallea, Eduardo
Mármol, José
Martí, José Julián
Matto de Turner,
Clorinda
Mera, Juan León
Mistral, Gabriela
Neruda, Pablo
Nervo, Amado
Olmedo, José
Joaquín
Onetti, Juan
Carlos
Palma, Ricardo
Paz, Octavio
Quiroga, Horacio
Ramos, Graciliano
Reyes, Alfonso
Riviera, José
Eustacio
Roa Bastos,
Augusto
Sabato, Ernesto
Sarmiento,
Domingo
Faustino
Silva, José
Asunción
Storni, Alfonsina
- Torres Bodet,
Jaime
Vallejo, César
Vargas Llosa,
Mario
Vega, Garcilaso de
la: el Inca
Veríssimo, Enrico
Lopes
Zorrilla de San
Martín, Juan
*Middle Eastern
writers:*
Cevdet Paşa,
Ahmed
Edib Adıvar,
Halide
Ferdowsi
Gökalp, Ziya
Hâfez
Hakim, Tawfiq al-
İbn Battūṭah
İbn Hızam
Jāhiz, al-
Jamalzadeh,
Mohammad Ali
Kemal, Namık
Ma'arri, al-
Mutanabbi, al-
Omar Khayyam
Sa'di
Taha Hussein
New Zealand writers:
Baxter, James K.
Mansfield,
Katherine
Sargeson, Frank
Sinclair, Keith
Portuguese writers:
Camões, Luís de
Castelo Branco,
Camilo
Deus, João de
Eça de Queirós,
José Maria de
Herculano
de Carvalho
e Araújo,
Alexandre
Quental, Antero
Tarquínio de
Sá de Miranda,
Francisco de
Vicente, Gil
Vieira, António
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:
Akhmatova, 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
Ilf, Ilya; and
Petrov, Yevgeny
Ivanov, Vsevolod
Vyacheslavovich
Jirásek, Alois
Katayev, Valentin
Khomyakov,
Aleksy
Stepanovich
Krléza, Miroslav
Kundera, Milan
- Lermontov,
Mikhail
Lomonosov,
Mikhail
Vasilyevich
Mandelstam, Osip
Emilyevich
Mayakovsky,
Vladimir
Vladimirovich
Modrzewski,
Andrzej
Pasternak, Boris
Pilnyak, Boris
Potocki, Waclaw
Pushkin,
Aleksandr
Rozanov, Vasily
Vasilyevich
Saltykov, Mikhail
Yevgrafovich,
Graf
Seifert, Jaroslav
Sienkiewicz,
Henryle
Sinyavsky, Andrey
Donatovich
Slowacki, Juliusz
Solzhenitsyn,
Aleksandr
Tikhonov, Nikolay
Semyonovich
Tolstoy, Leo
Tsvetayeva,
Marina Ivanovna
Turgenev, Ivan
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
Blasco Ibáñez,
Vicente
Buero Vallejo,
Antonio

Calderón de la Barca, Pedro	Rueda, Lope	Fuller, Margaret	Schlegel, August
Cervantes	Ruiz, Juan	Gottsched, Johann	Wilhelm von
Saavedra, Miguel de	Sender, Ramón	Christoph	Schlegel,
Echegaray y Eizaguirre, José	José	Henley, William	Friedrich von
Encina, Juan del	Tamayo y Baus, Manuel	Ernest	Stephen, Sir Leslie
Espronceda y Delgado, José de	Tirso de Molina	Howells, William	Wilson, Edmund
García Lorca, Federico	Torres Naharro, Bartolomé de	Dean	<i>Yiddish writers:</i>
Góngora y Argote, Luis de	Unamuno, Miguel de	Lamb, Charles	Ansky, S.
Herrera, Fernando de	Valera y Alcalá	Leavis, F.R.	Asch, Sholem
Jiménez, Juan Ramón	Galiano, Juan	Lessing, Gotthold	Goldfaden,
León, Luis de Palacio Valdés, Armando	Valle-Inclán, Ramón María del	Ephraim	Abraham
Pardo Bazán, Emilia	Vega, Garcilaso de la	Lowell, James	Mendele Moykher
Pérez Galdós, Benito	Vega, Lope de	Russell	Sforim
Quevedo y Villegas, Francisco	Zorrilla y Moral, José	Menéndez Pidal, Ramón	Peretz, Isaac Leib
Gómez de Rojas, Fernando de	<i>theorists and critics:</i>	Menéndez y Pelayo, Marcelino	Singer, Isaac
	Arnold, Matthew	Merezhkovsky, Dmitry	Bashevis
	Barbey d'Aureville, Jules-Amédée	Sergeyevich	<i>other:</i>
	Boileau, Nicolas	Mochnecki, Maurycy	Conscience,
	Brandes, Georg	Ortega y Gasset, José	Hendrik
	Breton, André	Papini, Giovanni	Ghelderode,
	Burke, Kenneth	Pater, Walter	Michel de
	Empson, Sir William	Roy, Camille	Kazantzákis,
	Frye, Northrop	Rymer, Thomas	Níkos
		Sainte-Beuve, Charles-Augustin	Koraïs,
		Saintsbury, George	Adamantios
			Verhaeren, Émile
			Vondel, Joost van den

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.1.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
[see 611.B.3.]
- 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
[see 613]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the theatre

African Arts	Oceanic Arts	Theatre, The Art of the	Theatrical Production
American Indians	Popular Arts	Theatre, The History of	
Central Asian Arts	South Asian Arts	Western	
Circus	Southeast Asian Arts		
East Asian Arts			
Folk Arts			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>dramatic conventions and techniques:</i>	chorus	Stanislavsky method	biomechanics
agon	courtyard theatre	stock company	Cruelty, Theatre of
alienation effect	directing	summer theatre	environmental theatre
lazzo	hanamichi	theatre	Fact, Theatre of
soliloquy	open stage	theatre-in-the-round	little theatre
<i>elements of theatrical production:</i>	proscenium	<i>movements and tendencies:</i>	Living Newspaper
acting	régisseur	Absurd, Theatre of the	Open Theatre
actor-manager system	repertory theatre		theatricalism
	skene		

<i>popular dramatic entertainment:</i>	multiple setting	bunraku	wayang
burlesque show	pageant wagon	ching-hsi	Yiddish drama
cabaret	perspective scenery	Comédie-Française	<i>other:</i>
carnival	scene shifting	Comédie-Italienne	benefit
circus	sound effects	commedia dell'arte	performance
conjuring	spotlight	commedia erudita	children's
Fasching	stage design	drame bourgeois	company
ice show	stage machinery	droll	choragus
masque	trap	epic theatre	civic theatre
mime and	<i>stock characters:</i>	farce	claque
pantomime	Brighella	Fastnachtsspiel	clown
minstrel show	Capitano	interlude	East Asian arts
music hall and	Columbine	Jesuit drama	Enfants san Souci
variety	Dottore	Kabuki theatre	Englische
pageant	Guignol	Karagög	Komödianten
revue	Harlequin	liturgical drama	improvisation
shell game	Kasperle	ludi scaenici	Islāmic arts
son et lumière	Miles Gloriosus	melodrama	juggler
vaudeville	Pantaloon	miracle play	Misrule, Lord of
Wild West show	Pedrolino	morality play	Oceanic arts
<i>staging and stage design:</i>	Punch	mumming play	peep show
cyclorama	Scaramouche	mystery play	South Asian arts
deus ex machina	soubrette	Nō theatre	Southeast Asian
ekkyklema	zanni	ombres chinoises	arts
limelight	<i>types of theatrical production:</i>	Passion play	toy theatre
Linnebach lantern	afterpiece	sacra	ventriloquism
mansion	auto sacramental	rappresentazione	
	black theatre	Satyr play	

Biographies

<i>actors and actresses:</i>	Lenya, Lotte	Craig, Edward	Richardson, Tony
Ashcroft, Dame	Lunt, Alfred; and	Gordon	Shubert brothers
Peggy	Fontanne, Lynn	Guthrie,	<i>other:</i>
Barrymore, Lionel	Mathews, Charles	Tyrone	Barnum, P.T.
Bernhardt, Sarah	Murdoch, James	Littlewood,	Henslowe, Philip
Booth, Edwin	Edward	Joan	Lupino family
Cooper, Dame	Nakamura	Popov, Alexey	Macready, William
Gladys	Utaemon	Dmitriyevich	Charles
Duse, Eleonora	Neuber, Caroline	Reinhardt, Max	
Gwyn, Nell	Olivier, Laurence	Stanislavsky,	
Irving, Sir Henry	Paxinou, Katina	Konstantin	
Kean, Edmund	Siddons, Sarah	Zavadsky, Yury	
Kemble, John	Taylor, Laurette	Alexandrovich	
Philip	Terry, Ellen	<i>producers:</i>	
Kendal, Dame	Worth, Irene	Belasco, David	
Margaret; and	<i>directors:</i>	Meyerhold,	
William Hunter	Barraut,	Vsevolod	
Kortner, Fritz	Jean-Louis	Yemilyevich	
	Burian, Emil		

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 make-up, 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	horror film	New Wave	underground film
auteur theory	Metro-Goldwyn-Mayer, Inc.	newsreel	Warner Bros.
cinéma vérité	montage	reel	Pictures, Inc.
CinemaScope	motion picture	script	
documentary film	musical film	Technicolor	
dubbing		3-D	

Biographies

<i>actors and actresses:</i>	Muni, Paul	Eisenstein, Sergey	Sennett, Mack
Astaire, Fred	Newman, Paul	Fellini, Federico	Sternberg,
Bergman, Ingrid	Olivier, Laurence	Ford, John	Josef von
Bogart, Humphrey	Pickford, Mary	Godard, Jean-Luc	Stroheim,
Brando, Marlon	Stewart, James	Griffith, D.W.	Erich von
Chaplin, Charlie	Sydow, Max von	Hawks, Howard	Truffaut, François
Crawford, Joan	Tracy, Spencer	Hitchcock, Sir	Vertov, Dziga
Davis, Bette	Wayne, John	Alfred	<i>producers:</i>
Garbo, Greta	Welles, Orson	Huston, John	Disney, Walt
Gish, Lillian	<i>directors:</i>	Kurosawa Akira	Goldwyn, Samuel
Grant, Cary	Antonioni,	Lubitsch, Ernst	Korda, Sir
Guinness, Sir Alec	Michelangelo	Malle, Louis	Alexander
Hepburn,	Bergman, Ingmar	Ousmane,	Mayer, Louis B.
Katharine	Buñuel, Luis	Sembène	Selznick, David O.
Huston, Walter	Capra, Frank	Pabst, G.W.	<i>other:</i>
Lloyd, Harold	Cavalcanti, Alberto	Pagnol, Marcel	Lumière, Auguste
March, Fredric	Clair, René	Paul	and Louis
Mastroianni,	deMille, Cecil B.	Ray, Satyajit	Muybridge,
Marcello	Dreyer, Carl	Renoir, Jean	Eadweard
Mifune Toshiro	Theodor	Rossellini, Roberto	Westmore family
Monroe, Marilyn			

Section 624. Music**A. The art of music**

1. Diverse conceptions of music as an art
2. Problems of musical meaning
3. Problems of musical interpretation
4. The relation of music to other human activities
5. Writings about music

B. The sources of musical sound

1. The physical aspects of musical sound: tone, movement, pitch, timbre
[see 128.E.6.]
2. The human voice: techniques, styles, and historical developments of the art of singing in Western and non-Western cultures
[see also 421.C.1. and 3.]
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. Electroponic 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. Pulse and metre
 - b. Rhythm
 - c. Tempo
3. Timbre
4. Harmony
5. Counterpoint
6. Texture: monophonic, homophonic, heterophonic, polyphonic
7. Orchestration and instrumentation
8. Musical forms and variations

D. Musical notation**E. Forms of musical composition**

1. Instrumental forms
 - a. Sonata
 - b. Symphony

- c. Chamber music: music for small ensemble; *e.g.*, duet, trio, quartet, quintet
- d. Concerto
- e. Variation forms; *e.g.*, chaconne, passacaglia, variation set
- f. Fugue
- g. Forms for electrophonic instruments: *e.g.*, tape music, computer music
- 2. Vocal forms
 - a. Solo vocal forms
 - i. Liturgical chant
 - ii. Secular song; *e.g.*, chanson, canzone
 - iii. "Art song"; *e.g.*, lied, concert aria
 - b. Choral forms
 - i. Sacred choral forms; *e.g.*, mass, motet, anthem, cantata, oratorio
 - ii. Secular choral forms; *e.g.*, secular cantata, symphonic choral music
 - iii. Occasional choral music: choral forms composed to commemorate an occasion of state; *e.g.*, a royal marriage
 - c. Vocal forms for solo or choral performance
 - i. Madrigal
 - ii. Lied, chanson, glee
- F. Musical performance
- G. Music for the theatre
[see 622.A.8.]
 - 1. General considerations about theatrical music; *e.g.*, its nature and elements, its role as distinct from the role of concert music, its relation to other elements of theatre
 - 2. Types of theatrical music
 - a. Opera
 - b. Music for theatrical dance; *e.g.*, ballet, modern dance
[see 625]
 - c. Music theatre; *e.g.*, musical comedy, operetta, zarzuela, Nō theatre
[see 622.B.1.]
 - d. Incidental and background music; *e.g.*, for the theatre, for motion pictures and television
- H. Jazz
 - 1. 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
 - 2. Development of jazz styles
- I. Primitive, folk, and popular music
[see 613]
- J. Recording and reproduction of music
 - 1. Types of music reproduction: mechanical, acoustical, electrical
[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
- K. The history of music
 - 1. Western music
 - 2. The music of non-Western peoples
[see 613]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with music

African Arts	Folk Arts	Musical Forms and	South Asian Arts
American Indians	Mozart	Genres	Southeast Asian
Bach	Music, The Art of	Musical	Arts
Beethoven	Music, The	Instruments	
Central Asian Arts	History of	Oceanic Arts	
East Asian Arts	Western	Popular Arts	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aerophones—brass</i>	saxophone	lute	arrangement
<i>instruments:</i>	shakuhachi	mandolin	cadenza
alphorn	shawm	mandora	canon
bugle	sheng	p'i-p'a	cantus firmus
cornet	whistle	rabāb	coda
euphonium	<i>chordophones—harp</i>	rebec	counterpoint
French horn	<i>family:</i>	samisen	fauxbourdon
horn	Aeolian harp	san-hsien	fugue
ophicleide	angular harp	sāraṅgī	ground bass
saxhorn	arched harp	sitar	hocket
serpent	bridge	tar	instrumentation
trombone	frame harp	theorbo	leitmotiv
trumpet	harp	'umd	melody
tuba	Irish harp	viol	musical variation
<i>aerophones—</i>	konghou	viola	ornamentation
<i>keyboard</i>	musical bow	violin	ostinato
<i>instruments:</i>	pedal harp	yüeh-ch'in	paraphrase
accordion	<i>chordophones—</i>	<i>chordophones—lyre</i>	parody
barrel organ	<i>keyboard</i>	<i>family:</i>	period
concertina	<i>instruments:</i>	crwth	ritornello
harmonium	clavichord	kinnor	<i>elements of pitch:</i>
organ	clavicytherium	kithara	church mode
positive organ	dulce melos	lyre	combination tone
regal	harpsichord	pluriarc	comma
<i>aerophones—</i>	piano	<i>chordophones—zither</i>	consonance and
<i>woodwind</i>	player piano	<i>family:</i>	dissonance
<i>instruments:</i>	spinet	Autoharp	diatonic
aulos	square piano	ch'in	ēchos
bagpipe	upright piano	cimbalom	equal temperament
basset horn	virginal	dulcimer	gamut
bassoon	<i>chordophones—lute</i>	koto	harmonia
clarinet	<i>and fiddle families:</i>	monochord	hexachord
curtal	balalaika	psaltery	meantone
English horn	banjo	trumpet marine	temperament
fife	cello	vina	microtonal music
flageolet	chitarrone	wagon	mode
flute	cittern	yang-ch'in	musica ficta
harmonica	double bass	zither	octave species
heckelphone	erh-hu	<i>electrophones:</i>	overtone
hichiriki	fiddle	electronic carillon	pentatonic scale
hornpipe	gittern	electronic organ	pitch
musette	guitar	music synthesizer	scale
oboe	gusla	ondes martenot	solmization
ocarina	hu-ch'in	theremin	tessitura
panpipe	hurdy-gurdy	trautonium	tetrachord
pipe and	kamanjā	<i>elements of</i>	timbre
tabar	koboz	<i>composition:</i>	tone
recorder	lira	accompaniment	tonos

- tune family
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 whole-tone scale
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 quintet
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 quartet
 responsorial singing
 trio
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 barcarole
 berceuse
 binary form
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 cantilena
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 carol
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 clausula
 conductus
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 fugal tune
 lai
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 nocturne
 quodlibet
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 serenade
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 Jew's harp
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 Chicago style
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 Dixieland
 free jazz
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 New Orleans style
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 minnesinger
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 troubadour
 trouvère
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membranophones:
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 dundún pressure
 drum
- friction drum
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 timpani
 tsuzumi
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 Ars Nova
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 conservatory
 ethnomusicology
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 musicology
 program music
 Roman de Fauvel
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 solfeggio
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 concertato style
 empfindsamer Stil
 Franco-Netherlandish school
 Gebrauchsmusik
 gymel
 Mannheim school
 Notre-Dame school
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 homophony
 monophony
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 Carnatic music
 Chinese music
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 dastgah
 gagaku
 gamelan
 Hindustani music
 Indian music
 Japanese music
 Korean music
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 nagauta
 raga
 tāla
 taqsim

Turkish music	beat	Coptic chant	lied
Vedic chant	eurhythmics	Ethiopian chant	madrigal
<i>notation:</i>	iqā'āt	Gallican chant	madrigal comedy
accidental	isorhythm	Gregorian chant	mélodie
clef	metre	hymn	musique mesurée
mensural notation	polyrhythm	kontakion	nigun
musical notation	rhythm	liturgical music	rondeau
neume	rhythmic mode	mass	serenata
note	rubato	Mi-Sinai tune	song
score	syncopation	motet	villancico
shape-note hymnal	<i>theatre music:</i>	Mozarabic chant	villanella
staff	ballad opera	Old Roman chant	villota
tablature	cabaletta	oratorio	virelai
time signature	Camerata	Passion music	yodel
<i>performance</i>	cavatina	plainchant	<i>vocal registers:</i>
<i>technique:</i>	drinking song	psalm tone	alto
bel canto	incidental music	psalmody	baritone
improvisation	intermezzo	requiem mass	bass
musical expression	libretto	responsory	castrato
singing	music drama	Russian chant	countertenor
<i>popular forms:</i>	musical comedy	Sarum chant	falsetto
bluegrass	Nigerian theatre	sequence	soprano
blues	opera	Syrian chant	tenor
boogie-woogie	opera buffa	Te Deum	<i>other:</i>
bossa nova	opéra-comique	Laudamus	bull-roarer
calypso	opera seria	troparion	cantor
country and	operetta	trope	change ringing
western	Singspiel	<i>vocal forms—secular:</i>	computer music
gospel music	verismo	air de cour	conducting
highlife	zarzuela	ayre	Greek music
kivela	<i>vocal forms—sacred:</i>	ballade	metronome
ragtime	Ambrosian chant	balletto	music
reggae	Anglican chant	cantiga	musical
rhythm and blues	anthem	cantillation	composition
rock	antiphon	canzonetta	national anthem
shanty	Armenian chant	carnival song	
spiritual	Byzantine chant	catch	
<i>rhythmic elements:</i>	canonical hours	chanson	
accent	cantata	frottola	
aksak	canticle	glee	
	chorale	goliard songs	

Biographies

composers—Ars Nova

period:

Adam de la Halle
Landini, Francesco
Machaut,
Guillaume de
Sachs, Hans

composers—Baroque:

Bach, Johann
Sebastian
Buxtehude,
Dietrich
Corelli, Arcangelo
Couperin, François
Couperin, Louis
Dittersdorf, Karl
Ditters von
Frescobaldi,
Girolamo
Handel, George
Frideric

Purcell, Henry

Rameau,
Jean-Philipp
Scarlatti,
Domenico
Schein, Johann
Hermann
Schütz, Heinrich
Telemann, Georg
Philipp
Vivaldi, Antonio

composers—Classical period:

Arne, Thomas
Bach, Carl Philipp
Emanuel
Beethoven,
Ludwig van
Boccherini, Luigi
Boyce, William
Cherubini, Luigi

Clementi, Muzio
Gluck, Christoph
Haydn, Joseph
Mozart, Wolfgang
Amadeus
Pleyel, Ignace
Joseph

composers—modern:

Barber, Samuel
Bartók, Béla
Berg, Alban
Bernstein, Leonard
Boulez, Pierre
Cage, John
Carter, Elliott, Jr.
Copland, Aaron
Cowell, Henry
Debussy, Claude
Hindemith, Paul
Honegger, Arthur
Ives, Charles

Janáček, Leoš
Krenek, Ernst
Messiaen, Olivier
Milhaud, Darius
Penderecki,
Krzysztof
Poulenc, Francis
Prokofiev, Sergey
Ravel, Maurice
Roussel, Albert
Satie, Erik
Schoenberg,
Arnold
Scriabin,
Aleksandr
Shostakovich,
Dmitry
Stockhausen,
Karlheinz
Strauss, Richard
Stravinsky, Igor

- Villa-Lobos, Heitor
Webern,
Anton von
Weill, Kurt
Xenakis, Iannis
- composers—opera:*
Bellini, Vincenzo
Bizet, Georges
Britten, Benjamin,
Baron Britten of
Aldeburgh
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
Lerner, Alan Jay
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
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
Rubinstein, Anton
Grigoryevich
Saint-Saëns,
Camille
Schubert, Franz
Schumann, Robert
Sibelius, Jean
Smetana, Bedřich
Tchaikovsky, Peter
Ilich
Vaughan Williams,
Ralph
Weber, Carl
Maria von
Wolf, Hugo
- conductors:*
Ansermet, Ernest
Beecham, Sir
Thomas
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 George
Stokowski,
Leopold
Szell, George
Thomas, Theodore
Toscanini, Arturo
Walter, Bruno
Weingartner, Felix
- instrument makers:*
Amati family
Bohn, Theodor
Cavaille-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
Seeger, Pete
Sinatra, Frank
Smith, Bessie
- musicians—ragtime,*
jazz, swing, bebop:
Armstrong, Louis
Basie, Count
Coltrane, John
Davis, Miles
Dorsey, Jimmy
and Tommy
Ellington, Duke
Gillespie, Dizzy
Goodman, Benny
Hines, Earl
Holiday, Billie
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 Jan
Rubinstein, Anton
Grigoryevich
Schnabel, Artur
- singers—baritones*
and basses:
Chaliapin, Fyodor
Ivanovich
Fischer, Johann
Ignaz Ludwig
Fischer-Dieskau,
Dietrich

Lablache, Luigi	Horne, Marilyn	Schumann, Elisabeth	Pears, Sir Peter
Maurel, Victor	Malibran, Maria	Sills, Beverly	Raaff, Anton
Pinza, Ezio	Viardot, Michelle	Sutherland, Dame	Reszke, Jean de
Fortunato	Ferdinande	Joan	Rubini, Giovanni
Robeson, Paul	<i>singers—sopranos:</i>	<i>singers—tenors:</i>	Battista
Warren, Leonard	Callas, Maria	Björling, Jussi	Slezak, Leo
<i>singers—contraltos:</i>	Destinn, Emma	Caruso, Enrico	Tucker, Richard
Alboni, Marietta	Farrar, Geraldine	Domingo, Plácido	<i>violinists:</i>
Anderson, Marian	Flagstad, Kirsten	Duprez,	Auer, Leopold
Butt, Dame Clara	Galli-Curci,	Gilbert-Louis	Elman, Mischa
Ellen	Amelita	García, Manuel del	Heifetz, Jascha
Ferrier, Kathleen	Garden, Mary	Popolo	Joachim, Joseph
Homer, Louise	Grisi, Giulia	García, Manuel	Menuhin, Sir
Schumann-Heink,	Lehmann, Lotte	Patricio	Yehudi
Ernestine	Lind, Jenny	Rodriguez	Oistrakh, David
<i>singers—</i>	Melba, Dame	Gigli, Beniamino	Fyodorovich
<i>mezzo-sopranos:</i>	Nellie	McCormack, John	Paganini, Niccolò
Artot, Désirée	Nilsson, Marta	Mario, Giovanni	Perlman, Itzhak
Baker, Dame Janet	Birgit	Matteo	Ysaÿe, Eugène
Abbott	Pons, Lily	Nourrit, Adolphe	
Berganza, Teresa	Ponselle, Rosa	Pavarotti, Luciano	
Gerhardt, Elena	Price, Leontyne		

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.A.8. 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.*, with 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

[see 613]

E. The history of dance

1. The dance of Western peoples
2. The dance of non-Western peoples
[see 613]

Suggested reading in the *Encyclopædia Britannica*:**MACROPAEDIA:** Major articles dealing with dance

African Arts	East Asian Arts
American Indians	Folk Arts
Central Asian Arts	Oceanic Arts
Dance, The Art of	Popular Arts
Dance, The	South Asian Arts
History of	Southeast Asian
Western	Arts

MICROPAEDIA: Selected entries of reference information**General subjects**

<i>ballet:</i>	hora	<i>Indian classical</i>	mambo
assemblé	hornpipe	<i>dance:</i>	minuet
ballet	huayño	bhārata-nāṭya	passacaglia
Ballet comique de	hula	garabā	passepied
la reine	jarabe	kathak	pavane
ballet movement	jig	kathākali	quadrille
ballet position	jota	Manipuri	rumba
battement	juba	orissi	samba
brisé	kolo	<i>popular dance:</i>	tango
classical ballet	ländler	allemande	twist
entrechat	maypole dance	basse danse	volta, la
fouetté en tournant	mazurka	bergamasca	waltz
International Ballet	Morris dance	branle	<i>other:</i>
Competitions	polka	cakewalk	bugaku
pirouette	polska	chaconne	choreography
<i>folk dance:</i>	reel	Charleston	dance
bourrée	rigaudon	contredanse	dance notation
capoeira	sarabande	courante	eurythmics
carole	seguidilla	estampie	Labanotation
clog dance	square dance	fox-trot	modern dance
conchero	sword dance	galliard	tap dance
country dance	syrtos	gavotte	
fandango	Virginia reel	gigue	
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Biographies

Balanchine,	Diaghilev, Sergey	Humphrey, Doris	Petit, Roland
George	Dolin, Anton	Jooss, Kurt	Rambert, Dame
Baryshnikov,	Duncan, Isadora	Laban, Rudolf	Marie
Mikhail	Fokine, Michel	Lifar, Serge	Saint Denis, Ruth
Bournonville,	Fonteyn, Dame	Massine, Léonide	Tamiris, Helen
August	Margot	Nijinsky, Vaslav	Taylor, Paul
Cunningham,	Graham, Martha	Nikolais, Alwin	Weidman, Charles
Merce	Helpmann, Sir	Nureyev, Rudolf	
deMille, Agnes	Robert	Pavlova, Anna	

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 613]
 - 7. The history of architecture
 - a. Western architecture
 - b. The architecture of non-Western peoples
[see 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	Egyptian Arts and Architecture, Ancient
American Indians	Folk Arts
Architecture, The Art of	Garden and Landscape Design
Architecture, The History of Western	Oceanic Arts
Central Asian Arts	South Asian Arts
East Asian Arts	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	Lady chapel	bay window	porte-cochère
coffer	lantern of the dead	beam	portico
diaper	lych-gate	belvedere	quoin
finial	minaret	bema	retaining wall
fluting and reeding	mosque	bond	roof
fret	narthex	bracket	rose window
frieze	nave	brise-soleil	rotunda
gingerbread	obelisk	buttress	salomónica
hoodmold	pagoda	canopy	setback
ornament	presbytery	cantilever	spandrel
pinnacle	pulpit	capital	spire
pulvinated frieze	rood screen	carrel	squinch
reticulated work	sacristy	caryatid	staircase
rinceau	sedilia	casement window	term
running-dog	śikhara	chigai-dana	thermal window
pattern	slype	chimneypiece	tracery
rustication	stave church	clerestory	truss
scrollwork	stūpa	colonnade	tympanum
stalactite work	temple	column	vault
strapwork	torii	console	wall
stringcourse	transept	corbel	window
stuccowork	triforium	corbel table	<i>architecture—</i>
swag	ziggurat	cornerstone	<i>styles, schools, and</i>
<i>architecture—</i>	<i>architecture—</i>	cupola	<i>movements:</i>
<i>recreational:</i>	<i>residential:</i>	culp	African arts
amphitheatre	apartment house	dome	Akbar period
auditorium	bungalow	door	architecture
furo	chalet	dormer	Art Deco
Islāmic bath	château	entablature	Art Nouveau
odeum	cliff dwelling	exedra	Baroque period
stadium	desert palace	fenestration	Bauhaus
thermae	domus	footing	Burgundian
Turkish bath	hogan	foyer	Romanesque style
<i>architecture—</i>	igloo	framed building	Byzantine art
<i>religious:</i>	inn	gable	Carolingian arts
abbey	insula	gallery	Carpenter Gothic
aisle	lodge	gargoyle	Central Asian arts
ambo	log cabin	geodesic dome	Chicago School
ambulatory	longhouse	hip roof	Churrigueresque
apse	manor house	hypocaust	chusimp'o style
baldachin	palace	intercolumniation	Cistercian style
baptistery	pueblo	lantern	Classicism and
basilica	ranch house	loft	Neoclassicism
campanile	residential	loggia	Composite order
chancel	architecture	louver	Constructivism
chantry	saltbox	lunette	Corinthian order
chapel	tent	megaron	Doric order
chapter house	tepee	moucharaby	Early Christian art
chevet	villa	newel	Egyptian Art
choir	yurt	oriel	Empire style
choragic	<i>architecture—</i>	Palladian window	Federal style
monument	<i>structural elements</i>	patio	Functionalism
church	<i>and building details:</i>	pedestal	Futurism
cloister	alcove	pediment	Gothic art
confessional	anta	pendant	Gothic Revival
crypt	arcade	pendentive	Greek Revival
gopura	arch	penthouse	Henry IV style
hagioscope	atlas	piano nobile	International Style
hall church	atrium	pilaster	Ionic order
iconostasis	balcony	podium	Isabelline
jinja	balustrade	porch	Islāmic arts
			Kara-yo

Karnatic temple
architecture
Manueline
Mozarabic art
New Brutalism
Norman style
North Indian
temple
architecture
Oceanic arts
order
Palladianism
Picturesque style
Plateresque
prairie school
rocaille
Rococo style
Romanesque art
Second Empire
style
Shāh Jahān period
architecture
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Shingle style
shoin-zukuri
South Asian arts

South Indian
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architecture
Southeast
Asian arts
Steamboat Gothic
Stijl, de
superposed order
tap'o style
Tenjiku
Tudor style
türbe
Turkish Rococo
style
Tuscan order
architecture—
other:
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belfry
caravansary
cenotaph
cha-shitsu
columbarium
cortile
court
crannog
entasis

folly
Gujarāt woodwork
hôtel-Dieu
hypostyle hall
kiosk
kiva
mausoleum
megalith
module
orientation
quadrangle
skyscraper
stela
tholos
tower
triumphal arch
landscape design:
allée
arbor
broderie
cascade
conservatory
espalier
fountain
gazebo
green theatre
greenhouse

grotto
jardin anglais
labyrinth
landscape
architecture
nymphaeum
orangery
park
parterre
pavilion
pergola
playground
topiary
urban design:
acropolis
bastide
boulevard
Cité Industrielle
civic centre
forum
garden city
green belt
new town
piazza
promenade
urban planning

Biographies

architects:

Aalto, Alvar
Adam, Robert
Adler, Dankmar
Alberti, Leon
Battista
Behrens, Peter
Bernini, Gian
Lorenzo
Blondel,
Jacques-François
Borromini,
Francesco
Boullée,
Étienne-Louis
Bramante, Donato
Breuer, Marcel
Brunelleschi,
Filippo
Bulfinch, Charles
Butterfield,
William
Cerceau, du,
family
Chambers, Sir
William
Churriguera family
Corbusier, Le
Delorme, Philibert
Fischer von Erlach,
Johann Bernhard

Fuller, R.
Buckminster
Garnier, Charles
Gaudí, Antoni
Gropius, Walter
Guarini, Guarino
Hoffman, Josef
Hunt, Richard
Morris
Jenney, William
LeBaron
Johnson, Philip C.
Jones, Inigo
Kahn, Albert
Kahn, Louis I.
Kent, William
Klint, Kaare
Latrobe, Benjamin
Ledoux,
Claude-Nicolas
Loos, Adolf
Lutyens, Sir Edwin
Mansart, François
Mansart, Jules
Hardouin-
Meigs,
Montgomery C.
Mendelsohn, Erich
Michelozzo
Mies van der
Rohe, Ludwig
Nervi, Pier Luigi

Neutra, Richard
Joseph
Niemeyer, Oscar
Olbrich, Josef
Palladio, Andrea
Pei, I.M.
Phidias
Pietro da Cortona
Pugin, Augustus
Welby
Northmore
Richardson, Henry
Hobson
Root, John
Wellborn
Rudolph, Paul
Saarinen, Eero
Sangallo family
Sansovino, Jacopo
Schinkel, Karl
Friedrich
Serlio, Sebastiano
Sinan
Soufflot,
Jacques-Germain
Stone, Edward
Durell
Street, George
Edmund
Strickland,
William
Sullivan, Louis
Tange Kenzō

Upjohn, Richard
Vanbrugh, Sir
John
Venturi, Robert
Vignola,
Giacomo da
Viollet-le-Duc,
Eugène-
Emmanuel
Wagner, Otto
Walter, Thomas
White, Stanford
Wren, Sir
Christopher
Wright, Frank
Lloyd
urban planners:
Brown, Lancelot
Burnham,
Daniel H.
Fry, E. Maxwell
and Jane Drew
Le Nôtre, André
L'Enfant,
Pierre-Charles
Loudon, John
Claudius
Nash, John
Olmsted,
Frederick Law
Repton, Humphry
Soleri, Paolo

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 626.A.5.b.]
 - d. Masks
4. Primitive and folk sculpture
[see 613]

C. The history of sculpture

1. Western sculpture
2. The sculpture of non-Western peoples
[see 613]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with sculpture

Masks
Sculpture, The Art of
Sculpture, The History of Western

MICROPAEDIA: Selected entries of reference information

General subjects

<i>styles:</i>	Futurism	Rococo style	<i>types:</i>
Amarāvati sculpture	Gandhāra art	Romanesque art	Airport art
Baroque art	Jōgan style	Sānchi sculpture	bieri
beak style	korwar style	South Indian	bird stone
Bhārhut sculpture	Kushān art	bronze	colossus
Classicism and Neoclassicism	malanggan style	Sukhothai style	cylinder seal
Cubism	Mannerism	Tami style	Daedalic sculpture
Eastern Indian	Massim style	Tempyō style	death mask
bronze	Mathurā art	Tori style	environmental
Fujiwara style	Northern Wei sculpture	U Thong style	sculpture
	Renaissance	Western Indian	figurehead
		bronze	gigaku mask

gisant	mobile	<i>other:</i>	Oceanic arts
kachina	relief	African arts	sculpture
kinetic sculpture	segoni-kun	armature	South Asian arts
kore	stabile	Central Asian arts	Southeastern
kouros	Tanagra figurine	contrapposto	Asian arts
mbulu-ngulu	telum figure	Gothic art	
minimalism	terra-cotta	lost-wax process	
moai figure	uli figure	modeling	
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 of 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
 - ii. Nonrepresentational painting
 - c. Kinds of painting determined by the maker or by the audience: primitive and folk painting
[see 613]
- 6. The history of painting
 - a. Western painting
 - b. The paintings of non-Western peoples
[see 613]
- 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.]
- 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
[for technological aspects, 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, holography, astronomical photography, aerial photography, radiography

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
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
cartoon
chalk drawing
charcoal drawing
chiaroscuro
comic strip
crayon
drapery
drawing
écorché figure
foreshortening
isometric drawing
line-and-wash
drawing
metal point
pastel
pen drawing
pencil drawing
perspective
sanguine
scratchboard
sgraffito
silhouette
sketch
squaring
wash drawing*painting:*aerial perspective
anamorphosis
bark painting
casein painting
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Fotoform
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monotype
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Anhwei
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Six Masters of
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Mālwa painting
Mewār painting
Mughal painting
Pahari painting
Rājasthānī
painting
South Asian arts
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Tabriz school*styles of painting—**Japanese:*chinsō
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Shijō school
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Tosa school
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Yamato-e*styles of painting—**Western:*Abstract
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Bambocciati
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Düsseldorf school
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Fontainebleau,
school of
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Futurism
genre painting
Geometric style
Ghent-Bruges
school
Hiberno-Saxon
style
Hudson River
school
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Intimism
Italianate painters
Jack of Diamonds
Japanism
London group
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Macchiaioli
Metaphysical
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Neue	Pskov school	trompe l'oeil	Sogdian art
Künstlervereinigung	Purism	Utrecht school	Southeastern
Neue Sachlichkeit	Rayonism	vanitas	Asian arts
New York school	Romanticism	veduta	wondjina style
Norwich school	singerie	Venetian school	<i>other:</i>
Novgorod school	Social Realism	Vingt, Les	collage
Op art	still-life painting	Vladimir-Suzdal	design
Orphism	Stroganov school	school	diorama
Peredvizhniki	Suprematism	Winchester school	folk art
plein air painting	Surrealism	Worpswede school	limner
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Postimpressionism	Synchromism	African arts	popular art
Pre-Raphaelite	Synthetism	Amarna style	Poussinist
Brotherhood	Tachism	Central Asian arts	Rubenist

Biographies

illustrators:

Beardsley, Aubrey
Beerbohm,
Sir Max
Crane, Walter
Daumier, Honoré
Gibson, Charles
Dana
Leech, John
Nast, Thomas
Pyle, Howard
Rockwell, Norman
Thurber, James

painters—British:

Burne-Jones, Sir
Edward Coley
Constable, John
Gainsborough,
Thomas
Hogarth, William
Lawrence, Sir
Thomas
Lewis, Wyndham
Millais, Sir John
Everett, 1st
Baronet
Palmer, Samuel
Reynolds, Sir
Joshua
Rossetti, Dante
Gabriel
Stubbs, George
Turner, J.M.W.
Wilson, Richard

painters—Dutch:

Bosch,
Hiëronymus
Bouts, Dirck
Cuyp, Aelbert
Jacobsz
Gogh, Vincent van
Hals, Frans
Mondrian, Piet

Rembrandt
Harmenszoon
van Rijn
Ruisdael,
Jacob van
Scorel, Jan van
Steen, Jan
Terborch, Gerard
Vermeer, Jan

painters—East Asian:

Hasegawa, Tōhaku
Hiroshige
Hokusai
Hsia Kuei
Ma Yüan
Ogata Kōrin
Sesshū
Shiba Kōkan
Tomioka Tessai
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painters—Flemish:

Bruegel, Pieter, the
Elder
Campin, Robert
David, Gerard
Eyck, Jan van
Goes, Hugo
van der
Mabuse, Jan
Massys, Quentin
Memling, Hans
Rubens, Peter Paul
Van Dyck, Sir
Anthony
Weyden, Rogier
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painters—French:

Bonnard, Pierre
Bourdon, Sébastien
Braque, Georges
Cézanne, Paul
Chardin,
Jean-Baptiste-Siméon
Claude Lorrain

Corot, Camille
Courbet, Gustave
David,
Jacques-Louis
Degas, Edgar
Delacroix, Eugène
Duchamp, Marcel
Fouquet, Jean
Fragonard,
Jean-Honoré
Gauguin, Paul
Géricault,
Théodore

Gros,
Antoine-Jean,
Baron
Ingres,
Jean-Auguste-
Dominique
Le Brun, Charles
Léger, Fernand
Manet, Édouard
Matisse, Henri
Monet, Claude
Pissarro, Camille
Poussin, Nicolas
Renoir,
Pierre-Auguste
Rouault, Georges
Rousseau, Henri
Seurat, Georges
Toulouse-Lautrec,
Henri de
Vuillard, Édouard
Watteau, Antoine

painters—German:

Cranach, Lucas,
the Elder
Dürer, Albrecht
Ernst, Max
Grünewald,
Matthias
Holbein, Hans, the
Elder

Holbein, Hans, the
Younger
Kirchner, Ernst
Ludwig
Lochner, Stefan
Marc, Franz
Nolde, Emil
Pacher, Michael

painters—Italian:

Andrea del Sarto
Angelico, Fra
Antonello da
Messina
Bassano, Jacopo
Bellini, Gentile
Bellini, Giovanni
Bellini, Jacopo
Boccioni, Umberto
Botticelli, Sandro
Bramantino
Canaletto
Caravaggio
Carracci family
Castagno,
Andrea del
Cavallini, Pietro
Cimabue
Correggio
Crespi, Giovanni
Battista
Crivelli, Carlo
Duccio di
Buoninsegna
Gaddi, Taddeo
Gentileschi, Orazio
Ghirlandajo,
Domenico
Giorgione
Giotto de Bondone
Giovanni di Paolo
Giulio Romano
Leonardo da Vinci
Lippi, Fra Filippo
Lorenzetti, Pietro

Lotto, Lorenzo	Murillo, Bartolomé	Peale, Charles	Cartier-Bresson,
Mantegna, Andrea	Esteban	Willson	Henri
Martini, Simone	Picasso, Pablo	Pollock, Jackson	Hine, Lewis
Masaccio	Ribera, José de	Rothko, Mark	Wickes
Masolino	Velázquez de	Sargent, John	Nadar
Michelangelo	Cuéllar, Diego	Singer	Ray, Man
Modigliani,	Zurbarán,	Shahn, Ben	Robinson, Henry
Amedeo	Francisco de	Warhol, Andy	Peach
Orcagna, Andrea	<i>painters—United</i>	Whistler, James	Siskind, Aaron
Parmigianino	<i>States:</i>	McNeill	Smith, W. Eugene
Perugino	Allston,	Wood, Grant	Steichen, Edward
Piazzetta,	Washington	Wyeth, Andrew	Stieglitz, Alfred
Giovanni Battista	Beckmann, Max	<i>painters—other:</i>	Strand, Paul
Piero della	Benton, Thomas	Behzad	Weston, Edward
Francesca	Hart	Chagall, Marc	White, Minor
Piero di Cosimo	Bingham, George	Clouet, Jean	<i>printmakers and</i>
Pisanello, Il	Caleb	Kandinsky,	<i>engravers:</i>
Primaticcio,	Cassatt, Mary	Wassily	Bewick, Thomas
Francesco	Cole, Thomas	Klee, Paul	Blake, William
Raphael	Curry, John	Kokoschka, Oskar	Bresdin, Rodolphe
Roberti,	Steuart	Loutherbourg,	Callot, Jacques
Ercole de'	Davis, Stuart	Philip James de	Currier, Nathaniel;
Signorelli, Luca	de Kooning,	Munch, Edvard	and Ives, James
Tiepolo, Giovanni	Willem	Orozco, José	Duvet, Jean
Battista	Eakins, Thomas	Clemente	Klinger, Max
Tintoretto	Frankenthaler,	Rivera, Diego	Kollwitz, Käthe
Titian	Helen	<i>photographers:</i>	Lucas van Leyden
Uccello, Paolo	Gorky, Arshile	Abbott, Berenice	Méryon, Charles
Veronese, Paolo	Homer, Winslow	Adams, Ansel	Raimondi,
Vitale da Bologna	Hopper, Edward	Atget, Eugène	Marcantonio
<i>painters—Spanish:</i>	Hurd, Peter	Bourke-White,	Schongauer,
Dalí, Salvador	Inness, George	Margaret	Martin
Goya, Francisco de	Motherwell,	Brady, Mathew B.	Villon, Jaques
Greco, El	Robert	Brandt, Bill	
Miró, Joan	O'Keeffe, Georgia	Brassaï	

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
 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>	curvilinear style	fan	enamel miniature
barber	Directoire style	farthingale	enamelwork
body modifications	Empire style	glove	Limoges painted
and mutilations	Gates of Paradise	hat	enamel
hairdressing	ghaṭa-pallava	Highland dress	Schwarzlot
mustache	Islāmic arts	hoopskirt	<i>floral and foliage</i>
tattoo	istoriato style	hosiery	<i>decorations:</i>
toupee	Koguryō style	inrō	corsage
wig	Louis XIII style	Kashmir shawl	floral decoration
<i>calligraphy:</i>	Louis XIV style	kimono	garland
black letter	Louis XV style	loincloth	ikebana
bokuseki	Louis XVI style	moccasin	Ikenobō
calligraphy	Mosan school	pajamas	Ko
cancellaresca	Mosul school	p'ao	lei
corsiva	Oceanic arts	paṭolā	moribana
Carolingian	patralata	peplos	nageire
minuscule	Proto-Geometric	petticoat	nosegay
chia-ku-wen	style	Phrygian cap	Ohara
chrysography	Queen Anne style	poke bonnet	rikka
hsiao-chuan	Régence style	redingote	shōka
Insular script	Regency style	ruff	wreath
italic script	rocaille	sandal	zen'ei ikebana
ku-wen	Scythian art	sari	<i>furniture and</i>
Kūfic script	South Asian arts	shawl	<i>accessories:</i>
li-shu	Southeastern	shoe	Act of Parliament
majuscule	Asian arts	skirt	clock
Merovingian script	streamlining	sokutai	armoire
minuscule	Turkish style	stomacher	banjo clock
naskhī script	William and Mary	suit	bath chair
palimpsest	style	surcoat	bed
rubrication	vyāla	sweater	bedspread
ta-chuan	Yi style	swimsuit	bench
ta'liq script	<i>dress and adornment:</i>	tippet	bentwood furniture
testegiatta	aigrette	toga	bonheur du jour
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uncial	bustle	tunic	bureau
<i>decorative art styles</i>	button	turban	cabinet
<i>and motifs:</i>	Chilkat weaving	yashmak	cabriolet leg
African arts	chiton	<i>enameling and</i>	campaign furniture
arabesque	cockade	<i>enamelware:</i>	cane furniture
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Art Nouveau	commode	enamelware	table
Arts and Crafts	corset	Birmingham	cassone
Movement	crinoline	enamelware	cellarette
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Biedermeier style	doublet	champlevé	chest
Central Asian arts	dress	cloisonné	chest of drawers
chinoiserie		en résille	cheval glass

Chippendale	Amelung glass	sconce	sard and sardonyx
coffer	Baccarat glass	toko-no-ma	topaz
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furniture	mosaic glass	carat	lacquerwork
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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-

atism, 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 mankind, 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 mankind, 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

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

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, 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, tunnels, 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: atomic power, automation and the 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	manufacturing research and development	safety engineering security and protection system	service industries technology
Industrial Revolution	safety		

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
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 mankind
 1. Primary energy sources: thermonuclear reaction, nuclear fission, radioactivity
 2. Recurring energy sources: solar energy, natural thermal energy, wind and water energy
 3. Nonrenewable energy sources: coal, gas, petroleum
- B. Devices and techniques for the utilization of energy
 1. Devices for utilizing muscle energy: pulley, lever, block and tackle, treadmill
[see 722.B.2.]
 2. Devices for utilizing wind and water energy: sails and sailboats, windmills, waterwheels, 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 ac and dc
 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 reactors, radioactive isotopes
[see also 112.B.]
- C. Devices for energy conversion
 1. Thermoelectric devices
 2. Thermionic devices
 3. Magnetohydrodynamic and electrogasdynamic devices
 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

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	Industries, Chemical Process
Energy Conversion	Industries, Extraction and Processing
Energy, The Concept of	Refrigeration

MICROPAEDIA: Selected entries of reference information

General subjects

<i>chemical explosives:</i>	<i>electronic devices:</i>	cooling system	solar energy
blasting	amplifier	evaporator	tidal power
blasting cap	antenna	heat exchanger	waterpower
dynamite	antenna array	heat pipe	<i>moving-fluid devices:</i>
explosive	band-pass filter	refrigeration	centrifugal pump
firework	diode	<i>internal-combustion</i>	hydraulic
gunpowder	electric circuit	<i>engines:</i>	transmission
nitrocellulose	electric switch	carburetor	pump
RDX	electron tube	choke	turbine
<i>compression energy</i>	electronics	diesel engine	waterwheel
<i>and its devices:</i>	ferrite	fuel injection	windmill
bellows	grid	gasoline engine	<i>nuclear reactors:</i>
cogeneration	ignitron	ignition system	breeder reactor
compressor	integrated circuit	internal-combustion	fusion reactor
piston and cylinder	klystron	engine	nuclear reactor
pneumatic device	laser	jet engine	<i>rockets:</i>
propellant	magnetron	knocking	Atlas rocket
steam engine	memory tube	ramjet	Delta
<i>electrical devices:</i>	microprocessor	rotary engine	launch vehicle
battery	photoelectric cell	spark plug	rocket
cell	photomultiplier	supercharger	Saturn
electric generator	tube	turbojet	Thor rocket
electric motor	printed circuit	turboprop	V-2 rocket
electrolytic cell	semiconductor	<i>major types of energy:</i>	<i>other:</i>
electromagnet	device	electric power	blowpipe
fuel cell	transistor	energy	magnetohydro-
fuse	<i>heat exchange and</i>	fire	dynamic device
linear motor	<i>related devices:</i>	fossil fuel	perpetual motion
magneto	boiler	geothermal energy	thermionic device
motor generator	cogeneration	hydraulic power	transducer
voltage regulator	condenser	hydroelectric power	

Biographies

Braun, Wernher von
De Forest, Lee
Diesel, Rudolf
Evans, Oliver

Goddard, Robert
Hutchings
Nobel, Alfred
Bernhard

Sperry, Elmer
Ambrose
Stevens, John
Tesla, Nikola

Watt, James
Westinghouse,
George

See also Section 10/37 of Part Ten

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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	flywheel	toggle mechanism
auger	saw	gear	transmission
boring machine	screwdriver	Geneva	washer
drill press	vise	mechanism	<i>simple machines:</i>
grinding machine	wrench	governor	capstan
lathe	<i>machine components:</i>	Harmonic Drive	crank
milling machine	air brake	linkage	inclined plane
planer	air spring	machine	lever
punch press	automatic	mandrel	pulley
reamer	transmission	mechanism	wheel
router	ball bearing	nut	wheel and axle
sander	bearing	pin fastener	<i>other:</i>
sawing machine	belt drive	rack and pinion	block and tackle
shaper	bolt	ratchet	divider
<i>hand tools:</i>	brake	Rolamite	jack
adz	cam	roller bearing	level
ax	clutch	screw	lubrication
brace and bit	differential gear	shaft coupling	pantograph
chisel	eccentric-and-rod	shaft seal	square
drill	mechanism	slider-crank	tool
file	escapement	mechanism	tool and die
hammer	flexible shaft	spring	making
pliers			

Biographies

See Section 10/37 of Part Ten

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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
[see also 212.B.]
 - 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 and electron microscopes
 - b. Telescopes: optical, radio, and airborne telescopes
 - c. Spectroscopes and spectrographs
 - d. Interferometers
 2. Instruments for recording phenomena: cameras
[see 735 G.]
- F. Special instruments and apparatus used in scientific research
 1. General laboratory equipment: filters, mixers, centrifuges
 2. Research reactors
 3. Particle accelerators: betatrons, cyclotrons, linear resonance accelerators, synchrotrons
 4. Mass spectrometers
 5. Chromatographs
 6. Seismographs
[see also 213.B.]
 7. Particle detectors: bubble chambers, scintillation counters
- G. Major systems of measurement and observation
 1. Surveying
[see 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., and G. 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,	Measurement and Observation
Physical and Chemical	Navigation
Calendar	Particle Accelerators
Climate and Weather	Time
Mapping and Surveying	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>astronomical devices:</i>	vernier caliper	<i>instruments and techniques for measuring radiation:</i>	isentropic chart
astrolabe	<i>instruments for measuring force:</i>	actinometer	isobar
astronomical observatory	balance	bolometer	isotherm
Cassegrain reflector	gravimeter	cloud chamber	radiosonde
coronagraph	Roberval balance	coincidence counting	temperature-humidity index
Keplerian telescope	spring balance	densitometer	weather bureau
Mills cross	torsion balance	dosimeter	wind rose
radio interferometer	<i>instruments for measuring electrical and magnetic quantities:</i>	ionization chamber	World Weather Watch
radio telescope	ammeter	photometer	<i>navigational techniques and devices:</i>
Schmidt telescope	bridge	radiometer	celestial navigation
telescope	cathode-ray oscilloscope	scintillation counter	compass
X-ray telescope	electrometer	solid-state detector	consol
<i>calendars:</i>	electroscope	spark chamber	dead reckoning
Aztec calendar	galvanometer	wavemeter	direction finder
Chinese calendar	magnetometer	<i>mapping and surveying:</i>	great circle route
Dionysian period	ohmmeter	aerial photography	inertial guidance system
Egyptian calendar	oscillograph	cartography	loran
French republican calendar	signal generator	contour mapping	loxodrome
Greek calendar	voltmeter	hydrography	navigation
Gregorian calendar	watt-hour meter	isobar	navigation chart
international date line	<i>instruments for measuring motion and fluid flow:</i>	isotherm	portolan chart
Jewish calendar	accelerometer	itinerarium	radio direction finder
Julian calendar	airspeed indicator	map	radio range
leap year	anemometer	metes and bounds	sextant
lunar calendar	gas meter	photogrammetry	shoran
Mayan calendar	speedometer	projection	solar compass
Muslim calendar	tachometer	surveying	<i>particle accelerators:</i>
perpetual calendar	venturi tube	theodolite	betatron
Roman republican calendar	<i>instruments and techniques for measuring properties of liquids:</i>	topographic map	cyclotron
solar calendar	hydrometer	triangulation	particle accelerator
Tibetan calendar	Jolly balance	trilateration	synchrotron
<i>instruments for measuring distance:</i>	pH meter	weather map	<i>pressure measurement:</i>
altimeter	polarimetry	<i>meteorology:</i>	barometer
caliper	viscometer	anemometer	pressure gauge
depth finder		barometer	reversing
gauge		ceilometer	thermometers
range finder		hygrometry	
strain gauge			

<i>radiological dating techniques:</i>	dynamical time	gauss	stone
carbon-14 dating	Ephemeris Time	gill	talent
common-lead dating	longcase clock	gram	ton
fission-track dating	ship's bell	hertz	volt
helium dating	sidereal time	horsepower	watt
ionium-thorium dating	solar time	hour	week
lead-210 dating	standard time	inch	<i>other:</i>
potassium-argon dating	sundial	International System of Units	acoustic
protactinium-231-thorium-230 dating	Universal Time	kelvin	interferometer
radiation-damage dating	watch	kilogram	binocular
rubidium-strontium dating	<i>units and standards of measurement:</i>	league	calorimeter
<i>temperature measurement:</i>	ampere	light-year	control system
pyrometer	apothecaries' weight	litre	dynamometer
thermocouple	astronomical unit	metre	flight recorder
thermometry	avoirdupois weight	metric system	fluidics
<i>timekeeping:</i>	barrel	mile	incubator
astrolabe	British Imperial System	mina	instrumentation
atomic clock	bushel	mole	log
chronometer	calibre	newton	measurement
clepsydra	calorie	ohm	microscope
clock	cord	ounce	optical
Coordinated Universal Time	cubit	parsec	interferometer
daylight saving time	day	pascal	periscope
	finger	phon	photomicrography
	foot	pint	Richter scale
	furlong	pound	seismograph
	gal	quart	servomechanism
		rem	sound-level meter
		second	stroboscope
			telemetry

Biographies

Gilbert, Sir Humphrey	Lawrence, Ernest Orlando
Hakluyt, Richard	Lovell, Sir Bernard
Henry the Navigator	Mercator, Gerardus

See also Section 10/37 of Part Ten

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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

[see also 214.A.4.c.]

 - a. Processes: underground mining, surface mining and quarrying
 - b. Products: coal, salt, stone, metal ores, sulfur, phosphates
 2. Techniques of extracting petroleum and gas

[see also 214.D.]

C. Primary conversion of raw materials

1. Petroleum refining
[see also 214.D.2. and 3.]
2. Coal processing: production of coke, coal tar, light oil, gas, and chemicals
[see also 214.D.1.]
3. Production and processing of metal ores and metals
[see also 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
[see 121.B.12.]
 - 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
 - b. To obtain roundwood, sawn wood, veneer, plywood and laminated constructions, particle board, and fibreboard
 - c. To obtain tobacco and other nonfood products
 - d. To obtain leather and hides
 - e. To obtain furs
 - f. To obtain natural fibres
 - g. To obtain pharmaceuticals
 - 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 and Ceramics

Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>alloys:</i>	ebony	glassblowing	pumice
alloy	fir	Jena glass	quartz
aluminum bronze	greenheart	mirror	shale
amalgam	hardwood	Orrefors glass	soapstone
brass	lancewood	Pitkin glass	spodumene
bronze	logging	Pittsburgh glass	sulfur
calamine brass	mahogany	plate glass	tremolite
cupronickel	narra	Pyrex	<i>mining and</i>
Duralumin	oak	safety glass	<i>quarrying:</i>
electrum	pine	silvering	Frasch process
ferroalloy	rosewood	soda-lime glass	mining
misch metal	seasoning	South Jersey glass	placer mining
pewter	spruce	<i>metals of major</i>	quarry
solder	teak	<i>economic</i>	stopping
stainless steel	wood	<i>importance:</i>	surface mining
steel	<i>forest products—oils</i>	aluminum	<i>oils, fats, and</i>
<i>animal fibres, furs,</i>	<i>and resins:</i>	calcium	<i>waxes—edible:</i>
<i>and hides:</i>	balsam	cast iron	See Section 731
alpaca	copal	chromium	<i>oils, fats, and</i>
camel hair	dammar	cobalt	<i>waxes—inedible:</i>
cashmere	dragon's blood	copper	castor oil
fur	drying oil	gold	Chinese wax
horsehair	gamboge	iron	drying oil
leather	gum	lead	essential oil
llama fibre	lac	magnesium	fat
mohair	mastic	mercury	fish oil
rabbit hair	myrrh	nickel	grease
silk	naval stores	platinum	lanolin
specialty hair fibre	pine oil	potassium	lavender
wool	resin	silver	linseed
<i>ceramics:</i>	rosin	sodium	oil
adobe	tall oil	tin	oil cake
brick	turpentine oil	titanium	oil extraction
cement	wood tar	tungsten	oil palm
firebrick	<i>forest products—</i>	uranium	oil plant
kiln	<i>rubber:</i>	wrought iron	perilla oil
mullite	balata	zinc	pine oil
porcelain	chicle	<i>mineral sources of</i>	sperm oil
enamelling	guttapercha	<i>nonmetals:</i>	spermaceti
Portland cement	latex	asbestos	tall oil
pottery	rubber	barite	turpentine
refractory	<i>forest products—</i>	chrysotile	turpentine oil
tile	<i>other:</i>	feldspar	wax
<i>coal and its</i>	cork	fluorite	whale oil
<i>processing:</i>	lignin	gilsonite	<i>ore processing:</i>
coal	paper pulp	graphite	basic oxygen
coal tar	tannin	gypsum	process
coke	<i>glassmaking:</i>	kaolin	Bessemer process
lignite	Bakewell glass	kimberlite	blast furnace
<i>forest products—</i>	blow molding	limestone	Cowper stove
<i>lumber:</i>	fibreglass	mica	crucible process
balsa	flint glass	phosphorite	cupola furnace

cyanide process	magnetite	<i>pharmaceuticals from</i>	bast fibre
electrometallurgy	pitchblende	<i>plant and animal</i>	bombax cotton
electroplating	pyrite	<i>sources:</i>	cantala
flotation	rutile	alkaloid	coir
hydrometallurgy	scheelite	Apocynaceae	cotton
ingot	sphalerite	belladonna	flax
matte	tetrahedrite	Cinchona	hemp
metallurgy	uraninite	cocaine	henequen
open-hearth	wolframite	codeine	jute
process	<i>petroleum recovery,</i>	Colchicum	kapok
ore dressing	<i>refining, and products:</i>	Ephedra	kenaf
parting	alkylation	foxglove	leaf fibre
patio process	asphalt	heroin	Mauritius hemp
reverberatory	bitumen	insulin	milkweed floss
furnace	cracking	morphine	phormium
smelting	distillation	Strophanthus	ramie
<i>ores of major metals:</i>	drilling machinery	Strychnos	sisal
bauxite	gasoline	vitamin A	sunb
carnallite	kerosine	<i>reclamation and</i>	urena
carnotite	liquefied natural gas	<i>salvage:</i>	<i>other:</i>
cassiterite	liquefied	materials salvage	fibre
chalcocite	petroleum gas	scrap metal	forestry
chalcopyrite	microcrystalline wax	wastewater	kiln
chromite	mineral oil	treatment	natural fibre
cobaltite	naphtha	<i>synthetic gems and</i>	pitch
cuprite	natural gas	<i>crystals:</i>	prospecting
dolomite	oil shale	assembled gem	retting
erythrite	paraffin wax	paste	tanning
galena	petrochemical	synthetic diamond	tar
halite	petroleum	treated gem	
hematite	reforming	Verneuil process	
limestone	salt dome	zone melting	
linnaeite	tar sand	<i>vegetable fibres:</i>	
magnesite	well logging	abaca	

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.5., 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 dressing: crushing and grinding, concentration or mineral preparation
 - 2. Process metallurgy
 - a. Pyrometallurgy: metallurgical processes that involve the use of heat
 - i. Gas-solid reactions; *e.g.*, roasting
 - ii. Distillation: processes for refining metals by condensing metal vapours
 - iii. Ferrous metallurgical processes: techniques for making iron and steel
 - iv. Nonferrous metallurgical processes: techniques for producing copper, lead, zinc, and other metals
 - v. Melting, alloying, casting, and ingot solidification
 - b. Electrometallurgy: metallurgical processes that involve electrochemical reactions
 - i. Electrowinning, electrorefining
 - ii. Electroplating
[see A.6.b., above]
 - c. Hydrometallurgy
 - 3. Metal processing
 - a. Cold and hot working; *e.g.*, forging, rolling, drawing
 - b. Foundry processes; *e.g.*, sand casting, die casting
 - c. Surface treatments; *e.g.*, hot dipping, metal cladding
 - 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: precipitation, allotropic transformation, and decomposition reactions
 - g. Special products; *e.g.*, coins, medals, tokens
 - 4. Physical metallurgy
 - a. Metallography
[see also 125.D.1.]
 - b. Corrosion
 - c. Inspection and testing: mechanical and nondestructive testing
 - 5. 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 articles dealing with the technology of the industrial production processes

Adhesives
Handling, Packaging, and Storage
Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>adhesives, fasteners,</i>	conveyor	powder metallurgy	terneplate
<i>and joining</i>	hose	rolling	tinplate
<i>processes:</i>	industrial truck	sintering	<i>packaging:</i>
adhesive	materials handling	wire	aerosol container
bolt	pipeline	<i>metal treating and</i>	barrel
brazing	stoker	<i>finishing:</i>	bottle
cement	storage	annealing	containerization
joint	<i>metal forming:</i>	anodizing	drum
mortar	anvil	electroless plating	packaging
rivet	die-casting	electroplating	<i>thermal processing:</i>
screw	forging	galvanizing	cryogenics
soldering	founding	plating	dielectric heating
water glass	goldbeating	porcelain	induction heating
welding	grinding machine	enamelling	radio-frequency
<i>materials handling:</i>	investment casting	surface hardening	heating
Archimedes screw	mint	tempering	zone melting

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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.

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 734. Transportation Technology 288
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 736. Military Technology 293
 737. Technology of the Urban Community 295
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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
 - 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 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

Agriculture, The History of	Forestry and Wood Production
Agricultural Sciences	Gardening and Horticulture
Beverage Production	Gastronomy
Farming and Agricultural Technology	Industries, Extraction and Processing
Fishing and Marine Products, Commercial	Public Works
Food Processing	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>beekeeping:</i>	paella	harrow	roe
beekeeping	pasta	hog house	seafood
beeswax	tamale	laying house	sponge
honey	<i>cooking:</i>	millstone	tuna
nectar	baking	plow	whale catcher
royal jelly	boiling	reaper	whaling
<i>beverages:</i>	braising	sakia	<i>food preservation:</i>
absinthe	broiling	scarecrow	dehydration
alcoholic beverage	cookbook	silo	fermentation
aquavit	frying	sprayer	food preservation
beer	leavening agent	thresher	freezing
brandy	pressure cooker	tractor	pasteurization
champagne	sauce	windrower	preservative
coffee	shortening	<i>farming techniques:</i>	refrigeration
cognac	tandoori cookery	chinampa	smoking
distilled liquor	wok	contour farming	<i>horticulture:</i>
gin	<i>egg and dairy</i>	crop rotation	graft
liqueur	<i>products:</i>	drainage	horticulture
maté	butter	dry farming	pruning
proof	butterfat	fertilizer	transplant
pulque	buttermilk	hacienda	<i>livestock and feeds:</i>
rum	candling	hydroponics	cattle
sake	cheese	irrigation	feed
soft drink	churn	Norfolk	goat
tea	cream	four-course	hay
tequila	dairying	system	livestock
vodka	egg	open-field system	pig
whiskey	ice cream	organic farming	sheep
wine	milk	paddy	silage
<i>cereal crops:</i>	yogurt	plantation	<i>meat products:</i>
barley	<i>farm equipment and</i>	ranch	aspic
buckwheat	<i>buildings:</i>	tenant farming	bacon
cereal	barbed wire	terrace cultivation	beef
corn	barn	three-field system	frankfurter
millet	binder	till-less agriculture	game
oats	cellar	<i>fishing and sea</i>	gelatin
popcorn	combine	<i>products:</i>	ham
rice	corn harvester	agar	hamburger
rye	cotton gin	ambergris	lamb
sorghum	cotton harvester	aquaculture	meat
wheat	cream separator	baleen whale	pork
<i>cereal grain products:</i>	crib	bêche-de-mer	sausage
bran	crop duster	caviar	veal
breakfast cereal	cultivator	commercial fishing	venison
couscous	farm machinery	factory ship	<i>oils, fats, and</i>
dumpling	fence	fishery	<i>waxes—edible:</i>
hominy	grain drill	lobster pot	babassu palm
noodle	grain elevator	net	beeswax

butter	oil palm	sugar beet	food processing
butterfat	oil plant	sugarcane	food processor
cocoa butter	perilla oil	<i>tobacco:</i>	forestry
cod-liver oil	sperm oil	chewing tobacco	fowl
cohune oil	spermaceti	cigar	fruit
copra	wax	cigarette	pectin
corn oil	whale oil	pipe	sago
cottonseed	<i>oils, fats, and</i>	smoking	spice and herb
fat	<i>waxes—inedible:</i>	snuff	tapioca
fish oil	See Section 724	tobacco	tree ear
linseed	<i>sugars:</i>	<i>other:</i>	vegetable
margarine	honey	additive	vinegar
oil	maple syrup	arrowroot	
oil cake	molasses	emulsifier	
oil extraction	sugar	food colouring	

Biographies

Burbank, Luther
Carver, George Washington

McCormick, Cyrus Hall

See also Section 10/34 of Part Ten

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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 process 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
 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: the power, gas, telephone, and telegraph 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, Extraction and Processing
Ford, Henry	Industries, Manufacturing
Forestry and Wood Production	Industries, Textile
Industrial Glass and Ceramics	
Industries, Chemical Process	

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 rocket	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	Leblanc process
airship	rocket	motorcycle	man-made fibre
Atlas rocket	Saturn	tire	paper
autogiro	seaplane	tractor	pigment
automatic pilot	STOL airplane	truck	pitch
balloon	supersonic flight	vehicular safety	reactor
biplane	Thor rocket	devices	retort

- 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
- lithopone
- naphthol
- pigment
- quercitron bark
- reactive dye
- sulfur dye
- vat dye
- electronics:*
- See Section 721
- floor coverings:*
- See Section 629 of Part Six
- food service and lodging:*
- cafe
- cafeteria
- fast-food restaurant
- 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
- polychlorotri-fluoroethylene
- 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
- steel
- stainless 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 systems
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 and	William
Carnegie, Andrew	Hughes, Howard	Joseph N., Jr.	Squibb, E.R.
Drake, Edwin	Hunt, H.L.	Rockefeller, John D.	Thyssen family
Laurentine	Kelly, William	Schwab, Charles M.	Yerkes, Charles
			Tyson

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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. Lumber
 - c. Bricks and tiles: other fired clay and ceramics
[see 724.C.5.d.]
 - d. Stone
 - e. Mortar, cement, portland cement, and plaster
[see 724.C.5.b.]
 - f. Metals; *e.g.*, iron, steel, aluminum, copper
[see 724.C.3.]
 - g. Glass
[see 724.C.5.a.]
 - h. Concrete, reinforced concrete, and prestressed concrete
 - i. Composition materials, plastics
4. Testing of building materials
5. Construction machinery
 - a. Transport machinery
 - b. Lifting machinery; *e.g.*, cranes, cables, ropes
6. Construction techniques
 - a. Carpentry
 - b. Masonry construction
 - c. Steel construction
 - d. Concrete construction
7. Building components
 - a. Foundations and footings
 - b. The structural frame
 - c. Floor systems
 - d. Roof systems
 - e. Space-enclosure systems

- f. Finish hardware; *e.g.*, locks, hinges, doorknobs
 - 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. Chimneys and flues
 - 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
 - 7. Stadiums
- 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
 Lighting and Lighting Devices

MICROPAEDIA: Selected entries of reference information

General subjects

<i>bridges:</i>	truss	tile	stove
bridge	wall	wallboard	ventilating
covered bridge	wattle and daub	<i>construction</i>	<i>lighting devices:</i>
military bridge	<i>building foundations:</i>	<i>machinery:</i>	arc lamp
movable bridge	cofferdam	bulldozer	Argand burner
pontoon bridge	pier	crane	candle
suspension	retaining wall	dredge	electric discharge
bridge	settling	drilling machinery	lamp
viaduct	shoring	power shovel	flare
<i>building construction:</i>	soil mechanics	<i>engineering graphics:</i>	flash lamp
beam	<i>building materials:</i>	blueprinting	fluorescent lamp
box frame	aggregate	drafting	incandescent lamp
construction	brick	isometric drawing	kerosine lamp
cantilever	cement	<i>heating, ventilating,</i>	lamp
carpentry	clapboard	<i>and air conditioning</i>	lantern
Chicago School	concrete	<i>systems:</i>	rushlight
drywall	lath	air-conditioning	safety lamp
construction	mortar	chimney	searchlight
framed building	nail	chimneypiece	spotlight
half-timber work	paris, plaster of	electric heater	<i>masonry construction:</i>
hypostyle hall	portland cement	fan	arch
log cabin	pozzolana	fireplace	cyclopean masonry
post-and-lintel	putty	furnace	masonry
system	rammed earth	heat pump	mortar
scaffold	shingle	heating	pointing
skyscraper	shotcrete	hypocaust	

reticulated work	<i>tunnelling:</i>	construction	jetty
rubble masonry	air lock	dam	levee
<i>roof types:</i>	caisson	dock	plumbing
dome	tunnel	drydock	porch
geodesic dome	tunnelling shield	elevator	prefabrication
hip roof	<i>other:</i>	escalator	public-address
roof	acoustics	gate	system
vault	aqueduct	hippodrome	stadium

Biographies

Brunel, Sir Marc Isambard

Eads, James Buchanan

Fuller, R. Buckminster

Nervi, Pier Luigi

Roebing, John Augustus

Roebing, 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>	road at sea, rules
air-cushion	curricule	coach	of the
machine	gig	freight car	rowboat
airframe	hansom cab	locomotive	rudder
airplane	harness	marshalling yard	sail
airport	horse collar	railroad	ship
airship	horsecar	sleeping car	shipyard
autogiro	landau	turbo train	square sail
automatic pilot	one-horse shay	<i>water transport:</i>	steamboat
balloon	phaeton	anchor	tanker
biplane	post chaise	buoy	trawler
blimp	ricksha	canal	tugboat
glider	rockaway	canoe	umiak
helicopter	saddle	castle	<i>other:</i>
instrument landing	sedan	clipper ship	aqueduct
system	stage wagon	fog signal	bicycle
monoplane	stagecoach	gondola	containerization
seaplane	sulky	harbour	elevator
STOL airplane	troika	hydrofoil	escalator
supersonic flight	wagon	jib	litter
Zeppelin	<i>highway transport:</i>	kayak	livery company
<i>animal-powered</i>	automobile	lateen sail	pipeline
<i>transport:</i>	boulevard	lifeboat	Roman road
bridle	bus	lighthouse	system
brougham	electric automobile	lightship	shipping route
buggy	expressway	lock	Silk Road
carriage	motorcycle	longship	tonnage
cart	road	motorboat	traffic control
chaise	tire	ocean liner	transportation
chariot	tractor	paddle wheel	velocipede
coach	truck	raft	
Concord coach		rigging	

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.			

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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 recording and reproducing devices
[see also 128.E.]
 - 1. Mechanical systems: phonographs
 - 2. Magnetic systems: tape recorders
 - 3. Optical systems: motion-picture sound tracks
 - 4. Auxiliary equipment: microphones, amplifiers, speaker systems
 - 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]
3. Holography: laser photography
[see also 128.B.4.]

H. Information processing and systems

1. Elements of information processing
 - a. Recording and storage: image scanning and optical character recognition; mass storage via electromagnetic and electro-optical media (*e.g.*, magnetic tape and disk and optical disk, respectively); microform recording
 - b. Organization and retrieval: indexes and indexing; bibliographic and numeric data bases; computerized catalogs in libraries and library networks
 - c. 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 data base 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; ferrites; other solid-state devices; antennas and waveguides
 - c. Integrated circuits: miniature arrays of interconnected active or passive circuit elements
2. Sensing devices and transducers: piezoelectric devices, microphones and other pickups for sound and vibration, sensors
3. Circuitry

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of information processing and of communications systems

Broadcasting	Libraries
Computer Science	Motion Pictures
Computers	Photography
Cryptology	Postal Systems
Electronics	Printing, Typography, and
Encyclopaedias and	Photoengraving
Dictionaries	Publishing
Information Processing	Telecommunications Systems

MICROPAEDIA: Selected entries of reference information

General subjects

<i>computers:</i>	multiplexing	calculator	special delivery
abacus	Morse Code	cash register	Thurn and Taxis
analogue computer	radio	dictating machine	postal system
artificial	satellite	duplicating	ZIP Code
intelligence	communication	machine	<i>printing and printing</i>
computer	shortwave radio	hectograph	<i>materials:</i>
computer-aided	superheterodyne	photocopying	colour printing
engineering	reception	machine	computerized
computer-assisted	telecommunications	typewriter	typesetting
instruction	system	<i>photography and</i>	embossing
computer program	telegraph	<i>cameras:</i>	engraving
computer	telephone	animation	etching
programming	teleprinter	camera	flatbed press
languages	television	camera lucida	gravure printing
computer science	Telex	camera obscura	incunabula
differential	Telstar	CinemaScope	ink
analyzer	UHF	Cinématographe	intaglio
differentiator	undersea cable	Cinerama	letterpress printing
digital computer	VHF	collotype	Linotype
harmonic analyzer	video tape recorder	dye-transfer	lithography
input/output	videocassette	process	mezzotint
device	recorder	electrophotography	Monotype
integrator	videodisc	enlarger	offset printing
microcomputer	videophone	exposure meter	photocomposition
microprocessor	waveguide	filter	photoengraving
supercomputer	<i>libraries and their</i>	fluorescence	printing
time-sharing	<i>organization:</i>	photography	proofreading
word processing	archives	holography	rotary press
<i>electronic</i>	Bliss Classification	Kinetoscope	typesetting
<i>communication</i>	bookmobile	microform	machine
<i>systems and devices:</i>	Colon	minicam	<i>publishing:</i>
amateur radio	Classification	motion picture	book
broadcasting	Dewey Decimal	negative	codex
cable television	Classification	photography	gazette
citizen's band	library	shutter	journalism
radio	classification	speed	little magazine
Comsat	Library of	Technicolor	news agency
Echo	Congress	viewfinder	newsletter
facsimile	Classification	wet collodion	newspaper
transmission	library science	process	newspaper
Intelsat	Universal Decimal	<i>postal systems:</i>	syndicate
loading	Classification	airmail	pamphlet
minicam	<i>office machines:</i>	Penny Post	publishing
modem	accounting	postal system	
modulation	machine		

royalty	high-fidelity sound	stereophonic sound	information
yellow journalism	system	system	science
<i>sound recording and</i>	loudspeaker	<i>other:</i>	pen
<i>sound devices:</i>	magnetic recording	dictionary	pencil
cassette	microphone	encyclopedia	public-address
digital sound	phonograph	eraser	system
recording	sound recording	information	qalam
flutter and wow	sound track	processing	quill
			stylus

Biographies

Alembert, Jean Le	Ferrié,	Lumière, Auguste	Page, Walter Hines
Rond d'	Gustave-Auguste	and Louis	Pearson, Drew
Armstrong,	Fessenden,	Macmillan, Daniel	Popov, Aleksandr
Edwin H.	Reginald Aubrey	and Alexander	Stepanovich
Beaverbrook, Sir	Girardin, Émile de	Manutius, Aldus,	Pulitzer, Joseph
Maxwell Aitken,	Gollancz, Sir	the Elder	Sarnoff, David
1st Baron	Victor	Marconi,	Siemens,
Bell, Alexander	Greeley, Horace	Guglielmo	Werner von
Graham	Gutenberg,	Morse, Samuel	Siemens, Sir
Benton, William	Johannes	F.B.	William
Burnham, Edward	Haley, Sir William	Murdoch, Rupert	Stone, I.F.
Levy-Lawson, 1st	Harper brothers	Muybridge,	Thomas, Lowell
Baron	Hearst, William	Eadweard	Vincent of
Caxton, William	Randolph	Nelson, William	Beauvais
Cotta family	Josephson,	Rockhill	Wallace, DeWitt
Cowles family	Brian D.	Niépcé, Nicéphore	and Lila Bell
Dana, Charles A.	Knopf, Alfred A.	Northcliffe, Alfred	Acheson
Diderot, Denis	Land, Edwin	Charles William	Webster, Noah
Dimbleby, Richard	Herbert	Harmsworth,	Winchell, Walter
Disney, Walt	Lippmann, Walter	Viscount	Zworykin,
	Luce, Henry R.	Ochs, Adolph	Vladimir Kosma
		Simon	

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Section 736. Military Technology

A. Offensive and defensive delivery and payload systems

1. Development of early weaponry

a. Primitive and ancient weapons and delivery systems

- i. Shock weapons; *e.g.*, clubs, stone axes, swords
- ii. Missile weapons and delivery systems; *e.g.*, spears, javelins, slings, crossbows
- iii. Siege weapons and methods; *e.g.*, catapults
- iv. Weapons and supply carriers; *e.g.*, horses, elephants, camels

b. Gunpowder weapons; *e.g.*, artillery, matchlocks, muskets, rifles, rockets

2. Development of modern weaponry

- a. Modern advances in artillery and gunlike weapons; *e.g.*, recoilless rifles, mortars, breechloaders, explosive shells
- b. Modern advances in military small arms: machine guns, automatic rifles, pistols, submachine guns, and support weapons
- c. Ammunition; *e.g.*, smokeless powder, propellants, high explosives, projectiles, fuses, complete rounds
- d. Mines, grenades, and chemicals
- e. Rockets and missiles
- f. Modern land weapons carriers: tanks, armoured vehicles

- g. Naval ships and craft: naval delivery systems
- h. Aircraft delivery systems
- i. Nuclear warheads and missile systems
- j. Nonballistic weapons: chemical, biological, and psychological warfare

B. Logistics systems, military engineering

C. Purely defensive equipment and systems

- 1. Individual protective gear: body armour, helmets
- 2. Fortifications
 - a. Early fortifications: forts, fortresses, towers, palisades, garrison camps, entrenchments
 - b. Modern fortifications: pillboxes, bunkers, bomb shelters, trenches, coastal batteries
- 3. Warning and detection systems
- 4. Antimissile missiles: deployment techniques and launch systems

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-29	galleon	Luger pistol
atomic bomb	B-52	galley	machine gun
bomb	bomber	ironclad	MAG
grenade	F-4	minesweeper	machine gun
missile	F-16	monitor	matchlock
napalm	F-100	submarine	Mausers rifle
neutron bomb	F-104	U-boat	MG42
nitroglycerin	fighter aircraft	<i>weapons:</i>	musket
nuclear weapon	Harrier	AK-47	pistol
PETN	Hurricane	antiaircraft gun	repeating rifle
shell	Ilyushin IL-76	antitank weapon	revolver
smart bomb	ME-109	Armalite rifle	rifle
thermonuclear bomb	MiG	artillery	sling
torpedo	Mirage	automatic pistol	spear
<i>launch vehicles and rockets:</i>	Mosquito	automatic rifle	Spencer carbine
Atlas rocket	P-38	bayonet	Springfield rifle
cruise missile	P-47	bazooka	Sten gun
Nike missile	P-51	Big Bertha	submachine gun
Polaris missile	Spitfire	bow and arrow	sword
Poseidon missile	Stuka	Bren machine gun	Thompson
rocket	torpedo plane	Browning	submachine gun
Thor rocket	trainer	automatic rifle	Uzi
V-1 missile	TU-16	cannon	submachine gun
V-2 rocket	V-2	carbine	weapon
<i>mechanized ground warfare:</i>	Zero	catapult	<i>other:</i>
armoured vehicle	<i>personal protective equipment:</i>	coastal artillery	Agent Orange
panzer division	armour	crossbow	alcázar
tank	chain mail	dagger	ammunition
<i>military aircraft:</i>	gas mask	field artillery	biological warfare
attack aircraft	helmet	flame thrower	camouflage
AWACS	<i>warships:</i>	flintlock	chemical warfare
B-17	aircraft carrier	Garand rifle	fortification
B-24	battleship	Gatling gun	military bridge
	cruiser	Greek fire	military
	destroyer	gun	engineering
	frigate	lance	
		Lee-Enfield rifle	

naval base
proximity fuze
ram

sapper
shrapnel
snorkel

Strategic Defense
Initiative
strategic weapons
system

tactical weapons
system

Biographies

Braun,
Wernher von
Fermi,
Enrico

Goddard, Robert
Hutchings
Krupp von Bohlen
und Halbach,
Alfried

Krupp von Bohlen
und Halbach,
Gustav
Krupp, Alfred

Oppenheimer, J.
Robert
Teller, Edward

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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
Fire Prevention and Control
Police
Public Works

MICROPAEDIA: Selected entries of reference information

General subjects

*fire prevention and
control:*
fire alarm
fire engine
fire escape

fire extinguisher
fire fighting
fire prevention and
control
fireboat

halon
smoke detector
sprinkler
system

police technology:
criminal
investigation
electronic
eavesdropping

fingerprint	pollution	trolleybus	<i>water-supply systems:</i>
handcuffs	smog	<i>waste disposal:</i>	conduit
lie detector	urban dust	activated-sludge	desalination
<i>pollution control:</i>	<i>urban transport:</i>	system	qanat
acid rain	elevated transit	incinerator	reservoir
electrostatic	line	refuse disposal	water purification
precipitation	monorail	system	water softener
emission-control	streetcar	sedimentation tank	water-supply
system	subway	sewage system	system
muffler	taxicab	sludge	

Biographies

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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 reserves
 - 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 measure the natural phenomena of space; to study the relationship between Sun, Earth, and space; to test instrumentation and communication techniques
 - iii. The use of unmanned spacecraft to probe the Moon and planets

- 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.
- 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: gravitational forces, staging techniques, and 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. Re-entry 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>	Transit
Delta	Zond	<i>satellites:</i>	Vanguard
launch vehicle	<i>ocean and seafloor</i>	Aryabhata	Vela
Saturn	<i>exploration:</i>	Biosatellite	<i>other:</i>
<i>man in space:</i>	bathymetry	Cosmos	Hohmann orbit
Apollo program	bathyscaphe	Discoverer	interplanetary
astronaut	bathysphere	Earth satellite	exploration
Gemini	Challenger	ERTS	National
life-support system	Expedition	Orbiting	Aeronautics
Mercury	diving bell	Astronomical	and Space
Skylab Program	Glomar Challenger	Observatory	Administration
Soyuz	mesoscaphe	Orbiting	prospecting
space shuttle	<i>translunar probes:</i>	Geophysical	seismic survey
space station	Helios	Observatory	sounding rocket
Voskhod	Mariner	Pegasus	space exploration
Vostok	Pioneer	satellite	spacecraft
<i>moon probes:</i>	Venera	observatory	unidentified flying
Apollo program	Viking	Seasat	object
Luna	Voyager	Sputnik	
Moon exploration	Zond	TIROS	

Biographies

Armstrong, Neil
Oberth, Hermann Julius
See also Section 721

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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'an; 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 endued—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 Islāmic 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.

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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

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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. 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
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 10. The doctrine of the Covenant
 11. Miracles
- C. The study and classification of religions
- D. Other systems of belief
1. Myth and mythology
 2. Magic
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 4. Shamanism
 5. Astrology and alchemy
 6. Ancestor worship
 7. Hero worship
 8. Nature worship
- E. 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	Religion, Social Aspects of
Myth and Mythology	Religions, The Study and Classification of
Occultism	Religious and Spiritual Belief, Systems of
Philosophies of the Branches of Knowledge	Theology

MICROPAEDIA: Selected entries of reference information

General subjects

<i>basic concerns and phenomena of religion:</i>	miracle	superstition	fideism
covenant	moral theology	theodicy	High God
creation myth	mysticism	theology	monotheism
creed	myth	theophany	Neo-Paganism
eschatology	paradise	<i>conceptions of the divine or sacred:</i>	pantheism
evil, problem of	prayer	agnosticism	polytheism
faith	prophet	animism	religious
first cause	revelation	anthropomorphism	syncretism
free will	sacrament	atheism	secularism
heaven	sacrifice	Deism	supernaturalism
hell	salvation	deus otiosus	theism
immortality	scripture	dualism	
	sin	extrinsicism	
	soul		

Biographies

Campbell, Joseph	Frazer, Sir James	Malinowski,	Tiele, Cornelius
Durkheim, Émile	George	Bronisław	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

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 - 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.]
 - 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 Education
 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>	martyr	cremation
asceticism	altar	monasticism	embalming
celibacy	church	priesthood	marriage
fasting	high place	prophet	passage rite
feast	mosque	sacred kingship	purification
human sacrifice	synagogue	saint	<i>other:</i>
meditation	<i>religious offices, orders, and</i>	shaman	amen
pilgrimage	<i>personages:</i>	<i>rites of passage and associated practices:</i>	aniconism
prayer	abbot	anointment	confession of faith
sacrament	canonization	Baptism	creed
sacrifice	hagiology	burial	idolatry
tonsure	hermit	circumcision	relic
			scripture

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Division II. The Particular Religions

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The outlines in the nine sections of Division II treat the particular religions of mankind, in different historical eras and world areas.

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 - 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

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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

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with prehistoric religion and primitive religion

Doctrines and Dogmas, Religious
Prehistoric Peoples and Cultures

MICROPAEDIA: Selected entries of reference information

General subjects

amulet	devarāja	moon worship	soul loss
animal worship	Dreaming, the	mother goddess	Stonehenge
animals, master	Earth Mother	phallicism	Sun Dance
of the	fire walking	rain dance	sun worship
animism	headhunting	reindeer sacrifice	taboo
Blessingway rite	hieros gamos	Rice Mother	thunder cult
bull cult	High God	sacred clown	tjurunga
burial mound	mana	sacred pipe	totemism
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 - 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

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2. Early Indo-Iranian religion: nature-polytheism
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3. Religion of the Scythians, Sarmatians, and Alani
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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
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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
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D. Roman religion

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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
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5. Quasi-scientific and magical cults; *e.g.*, numerology, astrology
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- 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 and Asia</i>	gabija	<i>Egyptian pantheon:</i>	Shu
<i>Minor religions:</i>	Kalvis	Amon	Taurt
Hebat	Laima	Anubis	Thoth
Kubaba	lauma	Apepi	<i>Egyptian worship,</i>
Tarhun	Mēness	Apis	<i>practices, and</i>
Teshub	Pērkons	Aton	<i>institutions:</i>
<i>Arabian religion</i>	Saule	Atum	Book of the Dead
<i>(pre-Islāmic):</i>	Zemes mâte	Bast	Canopic jar
hanif	<i>Celtic religion:</i>	Bes	Egyptian religion
Illumquh	Belenus	Buto	Heb-Sed festival
Lāt, al-	Brân	Geb	Hermetic writings
<i>Aztec religion:</i>	Brigit	Hathor	mortuary temple
Chicomecóatl	Celtic religion	Horus	reanimation rite
Coatlicue	Cernunnos	Hu, Sia, and Heh	scarab
Huitzilopochtli	Danu	Isis	<i>Finno-Ugric religion:</i>
nagual	Dôn	Ma'at	haltia
Ometecuhtli	Druid	Mut	Kekri
Quetzalcóatl	Esus	Nekhet	kobdas
Tezcatlipoca	Goibniu	Nu	lud
Tlaloc	Llyr	Nut	maa-alused
Tlazoltéotl	Lugus	Opet	Madderakka
Tonatiuh	Medb	Osiris	Manala
Xipe Totec	Ogmios	Ptah	mudor šuan
Xiuhtecuhtli	Pwyll	Re	noiade
<i>Baltic religion:</i>	Sucellus	Sarapis	
Dievs	Teutates	Sebek	
	Tuatha Dé Danann	Seth	

para	Aglauros	Jason	Trojan horse
Peko	Ajax	Laocoon	Typhon
saivo	Alcmaeon	Laomedon	Uranus
sampo	Amazon	Leto	<i>Greek pantheon:</i>
Tapio	Amphitrite	Leucothea	Aphrodite
tietäjä	Amphitryon	Linus	Apollo
Ukko	Ananke	Lotus-Eater	Ares
väki	Ancaeus	Lycaon	Aristaeus
Ved-ava	Andromache	Marsyas	Artemis
Veraldén-radién	Andromeda	Medea	Asclepius
voršud	Antigone	Medusa	Athena
<i>Germanic mythology:</i>	Antiope	Meleager	Chaos
Aurgelmir	Arethusa	Memnon	Cronus
Balder	Argonaut	Menelaus	Demeter
Fenrir	Ariadne	Midas	Dionysus
Freyja	Arion	Minos	Eros
Germanic	Asclepius	Minotaur	Fury
mythology	Atalanta	Myrmidon	Grace
Heimdall	Athamas	Narcissus	Hades
Hel	Atlas	Neoptolemus	Hebe
Kvasir	Atreus	Niobe	Hecate
Loki	Autolycus	Nisus	Helios
Midgard	Bellerophon	nymph	Hephaestus
Mimir	Briareus	Odysseus	Hera
Norn	Britomartis	Oedipus	Hermes
Odin	Busiris	Orestes	Hestia
Ragnarök	Cadmus	Palamedes	Hippolytus
Skadi	Caeneus	Pandora	Hora
Svafilfari	Calchas	Paris	Hygieia
Thor	Calliope	Pegasus	Muse
Tyr	Cephalus	Peleus	Nemesis
Ull	Cyclops	Pelias	Nereus
Valhalla	Daedalus	Pelops	Nike
Valkyrie	Danaus	Penelope	Pan
Yggdrasil	Daphne	Perseus	Persephone
<i>Gnosticism,</i>	Daphnis	Phaethon	Poseidon
<i>Manichaeism, and</i>	demon	Philoctetes	Priapus
<i>related movements:</i>	Dido	phoenix	Prometheus
aeon	Echo	Pirithous	Rhea
Archon	Endymion	Pleiades	Selene
Cainite	Eos	Polyphemus	Themis
Carpocratian	Erechtheus	Priam	Tyche
Cathari	Erigone	Protesilaus	Zeus
Docetism	Fama	Proteus	<i>Greek worship,</i>
Encratite	Fury	Pyramus and	<i>practices, and</i>
Gnosticism	Galinthias	Thisbe	<i>institutions:</i>
Mandaeanism	Gorgon	Sarpedon	Anthesteria
Manichaeism	Greek mythology	Satyr and Silenus	Bacchanalia
Marcionite	Hector	Scylla and	baetylus
Mazdakism	Hecuba	Charybdis	Carneia
Ophite	Helen	Semele	Daphnephoria
Paulician	Helenus	Seven Against	Delphi
<i>Greek mythology</i>	Heracles	Thebes	Didyma
<i>and legend:</i>	Hesperides	Sibyl	Dodona
Acestes	Hyacinthus	Siren	Eleusinia
Achilles	Hyperborean	Sisyphus	Greek religion
Actaeon	Hypnos	Tantalus	Heraeum
Admetus	Idomeneus	Theseus	herm
Adonis	Ilos	Thetis	lectisternium
aegis	Io	Tiresias	oracle
Agamemnon	Iphigeneia	Titan	Palladium
	Ixion		

Panathenaea	Nabu	Cacus and Caca	<i>Slavic religion:</i>
Pyanopsia	Nergal	Camilla	domovoy
Scirophoria	Ningishzida	Ceres	leshy
Thargelia	Ninhursag	Cupid	mer
Thesmophoria	Ninsun	Diana	Perun
<i>Inca religion:</i>	Ninurta	Dioscuri	rusalka
Chosen Women	Shamash	Faunus	<i>Syrian and</i>
huaca	Sin	Fides	<i>Palestinian</i>
Inti	Tammuz	Fortuna	<i>pantheon:</i>
Pachacamac	<i>Mesopotamian</i>	Fury	Anath
Viracocha	<i>religious literature</i>	Janus	Asherah
<i>Iranian religion</i>	<i>and mythology:</i>	Juno	Astarte
(<i>pre-Islāmic</i>):	Adapa	Jupiter	Atargatis
millet	Enmerkar	Lar	Baal
Mithra	Eridu Genesis	Liber and Libera	Dagon
Mithraism	Etana Epic	Libitina	El
Yima	Gilgamesh	Mars	Kothar
<i>Mayan religion:</i>	Lahmu and	Mercury	Melqart
Ah Kin	Lahamu	Minerva	Resheph
Bacab	Lament for the	Neptune	Shadrafa
Chac	Destruction of Ur	Penates	Tanit
Cizin	Mesopotamian	Picus	Yamm
Dresden Codex	mythology	Psyche	<i>Zoroastrianism:</i>
Itzamná	<i>mystery religions:</i>	Quirinus	Ahriman
Madrid Codex	Andania Mysteries	Salus	Ahura Mazdā
Paris Codex	Attis	Saturn	amesha spenta
Popol Vuh	Cabeiri	Silvanus	Avesta
<i>Mesopotamian</i>	Corybantes	Sol	fravashi
<i>pantheon:</i>	Eleusinian	Venus	Gabar
Adad	Mysteries	Vesta	Gahanbar
Anu	Eumolpus	<i>Roman worship,</i>	Gayōmart
Ashur	galli	<i>practices, and</i>	haoma
Bel	Great Mother of	<i>institutions:</i>	magus
Belit	the Gods	fetial	Nōrūz
Damu	hierophantēs	flamen	Parsi
Dumuzi-Amau-	Iacchus	genius	Rashnu
shumgalana	Jupiter Dolichenus	Haruspices	Saoshyans
Ea	mystery religion	lectisternium	Sraosha
Ereshkigal	Orpheus	Lupercalia	Verethraghna
Ishkur	Taurobolium	Matronalia	Vohu Manah
Ishtar	<i>Roman pantheon:</i>	Parilia	yazata
Lamashtu	Aeneas	pontifex	Zoroastrianism
Marduk	Ascanius	Roman religion	Zurvanism
Meslamtaea	Asclepius	Salii	
Mesopotamian	Bona Dea	supplicatio	
religion		Vestal Virgin	
<u>Biographies</u>			
Akhenaton		Kartēr	
Anquetil-Duperron, A(braham)- H(yacinthe)		Mani	
Basilides		Valentinus	
Imhotep		Zoroaster	

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Section 823. Hinduism and Other Religions of India

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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
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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

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[see also C.4., below]

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 - 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

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 - 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
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 - 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
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 - a. History of Sikhism
 - i. Islāmic and Hindu background (11th–15th century)
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 - 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
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 - 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>	Manasā	sannyasi	Vedānta
<i>caste system:</i>	Manu	Satnāmī sect	Viśiṣṭādvaita
Agarwālā	Matsya	Saura sect	yama
Bania	Meru, Mount	Shaktism	Yoga
bhāiband	Murugaṇ	Smārta sect	<i>Hinduism—ritual</i>
Brahman	naga	Śrīvaiṣṇava	<i>and practice:</i>
Camār	Nandi	Swāmī-Nārāyaṇī	antyeṣṭi
caste	Narasimha	Tantric Hinduism	ārti
Christian caste	Naṭarāja	Teṅkalai	ashram
Dāsa	Paraśurāma	Vaḍakalai	aśvamedha
Devadāsī	Pārvaṭi	vairāgin	darshan
Dom	Prajāpati	Vaiṣṇavism	dikṣā
dvija	Rādhā	Vaiṣṇava-	Dīwālī
gotra	rākṣasa	Sahajiyā	guru
Islāmic caste	Rāma	Vallabhācārya	Holi
jajmānī system	Rāvaṇa	<i>Hinduism—</i>	Janmāṣṭamī
jāti	Saptamātrkā	<i>philosophy and</i>	kīrtana
Kshattriya	Sarasvatī	<i>doctrine:</i>	Kumbh Mela
kul	Sitā	Advaita	liṅga
Mahar	Śiva	ahamkāra	Mahā-śivarātrī
Marāthā	Skanda	ānanda	navaratra
Nambūdiri	Sūrya	anumāna	Om
Nāyar	vāhana	artha	Poṅgal
outcaste	Vāmana	āsana	pradakṣiṇa
pañcāyat	Varāha	āstika	prasāda
pollution and	Varuṇa	atman	pūjā
purification	Vāsudeva	avatar	Rathayātrā
sabhā	Vishnu	Bhedābheda	saṃskāra
Śūdra	yakṣa	cakra	soma
untouchable	Yama	Cārvāka	śrāddha
Vaisya	yuga	cow, sanctity	Śrī-Nāthaji
varṇa	<i>Hinduism—forms,</i>	of the	suttee
<i>Hinduism—deities</i>	<i>sects, movements,</i>	deva	tapas
<i>and mythology:</i>	<i>and orders:</i>	dharma	tilak
Aditi	Ajīvika	Dvaita	tīrtha
Agni	Arya Samaj	Haṭha Yoga	upanayana
Ardhanārīśvara	Bhāgavata	indriya	Vedic sacrifice
Balarāma	bhakti	jñāna	yajña
Brahmā	Brahmo Samaj	karman	<i>Hinduism—</i>
Brahman	Caitanya	kuṇḍalinī	<i>sacred and secular</i>
Caṇḍī	movement	mārga	<i>literature:</i>
churning of the	Dādūpanthī	māyā	Āgama
milky ocean	daśnāmī sannyāsin	Mīmāṃsā	Aranyakas
Dharma-Ṭhaṭkur	Gāṇapatya	nirguṇa	Artha-śāstra
Durgā	Kānpaṭa Yogi	Nyāya	Aṣṭchāp
Gaṇeśa	Kāpālīka and	prakṛti	Bhagavadgītā
Garuḍa	Kālāmukha	pramāṇa	Bhāgavata-Purāṇa
grāmadevatā	Kashmir Śaivism	prāṇa	Brāhmaṇa
Hanumān	Liṅgāyat	prāṇāyāma	dharmashastra
Harihara	Nātha	pratyakṣa	dharmasutra
Indra	Pāñcarātra	puruṣa	Gītagovinda
Jagannātha	Pāśupata	śabda	Gṛhya-sūtra
Kālī	Prarthana Samaj	samadhi	Kalpa-sūtra
Kalkin	Rādhā Soāmi	Sāṃkhya	Mahābhārata
Kāma	Satsang	saṃsāra	maṅgal-kāvya
Krishna	sādhu and swāmī	sat	Manu-smṛti
Kubera	Śaiva-siddhānta	tat tvam asi	Nāyanar
Kūrma	Śaivism	upādhi	
Lakṣmī	sampradāya	Vaisheshika	

Purāṇa	aṣṭamaṅgala	nirjarā	Dasam Granth
Rāmāyaṇa	Bāhubali	Pārśvanātha	gurdwārā
Smṛti	Digambara	Paryuṣaṇa	Gurū
Śrauta-sūtra	dravya	Rṣabhanātha	Harimandir
Śruti	gaccha	Siddha	Khālsā
sūtra	guṇasthāna	Sthānakavāsī	Nāmdhārī
Tantra	Jaina canon	Śvetāmbara	Niraṅkāri
Upanishad	Jaina vrata	syādvāda	Rām Rāiyā
Veda	Jainism	Tīrthaṅkara	Sikhism
<i>Jainism:</i>	jīva	<i>Sikhism:</i>	Singh Sabhā
ahiṃsā	Kālakācāryakathā	Ādi Granth	Udāsī
aḥiṃsā	Kalpa-sūtra	Akāl Takht	<i>other:</i>
Ariṣṭanemi	leśyā	Akālī	Parsi
Biographies			
Aurobindo, Śrī	Keshab	Mīrā Bāi	Rāmānuja
Caitanya	Chunder Sen	Nānak	Ray, Rammohan
Dayananda	Madhva	Ram Singh	Śaṅkara
Sarasvati	Mahāvira	Ramakrishna	Tara Singh
Fateh Singh, Sant	Meher Baba	Ramāna Maharshi	Vivekananda
Gobind Singh			

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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 *dharma*s
 - ii. The emphasis on self-cultivation and self-salvation: the stages leading to *arhat*ship, 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	Samvara	Buddhism	bhikku
Avalokiteśvara	Shih Wang	Pure Land	bodhisattva
Bhaiṣajya-guru	Tārā	Buddhism	cakravartin
brahma-loka	Ti-ts'ang	Reiyū-kai	Dalai Lama
dharma-pāla	Vairocana	Rinzai	lama
Dhyāni-Buddha	Vajrapāṇi	Risshō-Kōsei-kai	mahāsiddha
Five Great Kings	Vajrayoginī	Ritsu	Nechung oracle
Hārītī	yi-dam	Rnying-ma-pa	Panchen Lama
Hevajra	<i>forms, sects, schools, and orders:</i>	Sammatīya	pratyeka-buddha
Kṣitigarbha	Bka'-brgyud-pa	Sarvāstivāda	upāsaka
lokapāla	Dge-lugs-pa	Sautrāntika	<i>philosophy and doctrine:</i>
Lumbinī	eighteen schools	Shingon	Abhidharmakośa
Mahā Māyā	Hinayāna	Sōka-gakkai	abhijñā
mahāpuruṣa	Jōjitsu	Sōtō	akriyāvāda
Maitreya	Kegon	Theravāda	ālaya-vijñāna
Mañjuśrī	Kusha	Tibetan Buddhism	anattā
Māra	Mādhyamika	T'ien-t'ai	arhat
Myō-ō	Mahāsaṅghika	Vajrayāna	ariya-puggala
nāman	Mahāyāna	Yogācāra	
		Zen	

arūpa-loka	Buddhist	Bhadracaryā-	but Sudan
āsrāva	meditation	prañidhāna	caitya
bhava-cakra	dhāraṇī	bhāṇavāra	Gandhāra art
bhūmi	gcod	Bka'-'gyur	Jōgan style
bodhi	gtor-ma	Bstan-'gyur	kapāla
brahma-loka	kōan	Buddhacarita	Kara-yo
brahmacarya	kyūdō	Dhammapada	Mai-chi-shan
brahmavihāra	maṇḍala	Diamond Sūtra	maṇḍala
dharma	mantra	gsung-'bum	Mathurā art
dukkha	mudrā	Guhyasamāja	mudrā
Eightfold Path	nang-mchod	Tantra	Northern Wei
Four Noble Truths	pabbajjā	Heart Sūtra	sculpture
kammatṭhāna	pāramitā	Jātaka	pagoda
karman	pātimokkha	Khuddaka Nikāya	prayer wheel
Kegon	phyi-mchod	Lalitavistara	Sānchi sculpture
Kusha	sādhana	Laṅkāvatāra-sūtra	stūpa
Mādhyaṃika	saṅgha	Lotus Sūtra	Sukhothai style
mahāmudrā	Smon-lam	Mahāvairocana-	Tempyō style
Nirvāṇa	chen-mo	sūtra	Tenjiku
pāramitā	upasampadā	Mahāvastu	thang-ka
prajñāpti	uposatha	Mahāyāna-śrad-	thread cross
Pramāṇa-vārttika	vassa	dhotpāda-śāstra	T'ien-lung Shan
pratītya-samutpāda	vihāra	Milinda-pañha	Tōdai-ji
pratyaya	zazen	Mūlamadhyama-	U Thong style
puñña	<i>sacred and secular</i>	kakārikā	vajra
saddhā	<i>literature:</i>	Prajñāpāramitā	yab-yum
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saṃsāra	Piṭaka	Pure Land Sūtra	<i>other:</i>
saṃvṛti-satya	Abhidhammattha-	Satyasiddhi-śāstra	Abhayagiri
Sarvāstivāda	saṅgha	sūtra	Bon
Satori	Abhidhammāvatāra	Sutta Piṭaka	Buddhist council
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skandha	Abhisamayālaṅ-	Ta-ts'ang Ching	mappō
smṛtyupasthāna	kārāloka	Tipiṭaka	rock edicts
tri-ratna	Amitāyur-dhyāna-sūtra	Vinaya Piṭaka	
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<i>practices and</i>	aṭṭhakathā	<i>iconography, and</i>	
<i>institutions:</i>	Avadāna	<i>ritual objects:</i>	
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Biographies			
Asaṅga	Fa-hsien	Hui-neng	Padmasambhava
Aśoka	Hasegawa Tōhaku	Kūkai	Shinran
Bodhidharma	Hōnen	Nāgārjuna	
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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)
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 - 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

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 - 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

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- 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.I., above]
 - b. Characteristics of primitive Shintō: the role of guardian shrines and shamans
 - c. Shintō literature and mythology: the form and content of the *Koji-ki*, *Nihon-gi*, 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
Confucianism, Confucius and
Japanese Literature
Shintō
Taoism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Chinese deities and mythology:</i>	shen	Shu Ching	tengu
Chang Kuo-lao	Shen Nung	Ssu shu	uji-gami
Ch'ang O	Shou Hsing	Ta hsüeh	Ukemochi no kami
Ch'eng Huang	Shun	Tso chuan	Yama-no-kami
ch'i-lin	Ta Yü	Wu Ching	Yorimitsu
Chih Nü	T'ien	<i>Japanese deities and mythology:</i>	<i>Japanese religious movements:</i>
Chung-li Ch'üan	Ts'ai Shen	Amaterasu	Hito-no-michi
feng-huang	Tsao Chün	Amenouzume	Hōtoku
Fu Hsi	Ts'ao Kuo-chiu	Benten	Kirishitan
Fu Shen	Tsao Shen	Daikoku	Kokugaku
Han Hsiang	T'u-ti	Ebisu	Konkō-kyō
Ho Hsien-ku	Wen Ti	Fukurokuju	Kurozumi-kyō
Hou Chi	Wu hsing	goryō	Neo-Confucianism
Hou I	Yao	Hachiman	Ōmoto
Hou T'u	Yü Ti	hitogami	PL Kyōdan
Hsi Wang Mu	<i>Confucianism—philosophy:</i>	Ho-musubi	Shinbutsu shūgō
Huang Ti	Confucianism	Inari	Tenshō Kōtai
Kuan Ti	hsiao	Izanagi and Izanami	Jingū-kyō
K'uei Hsing	jen	Jimmu	<i>Korean religion:</i>
Lei Kung	li	kami	changsŭng
Li T'ieh-kuai	T'ien Ming	kappa	Ch'ōndogyo
Lu Hsing	<i>Confucianism—sacred literature:</i>	Kusanagi	mudang
Lü Tung-pin	Chou li	Ninigi	P'alkwanhoe
lung	Ch'un-ch'iu	Ōkuninushi	Poch'ōngyo
Men Shen	Chung yung	Sarudahiko	p'ungsuchirisol
Nü Kua	I Ching	Shichi-fuku-jin	Sansin
Pa Hsien	Li chi	Sugawara	<i>Shintō—precept and practice:</i>
P'an Ku	Lun yü	Michizane	harai
p'an-t'ao	Mencius	Sukunahikona	jinja
San Kuan	Shih ching	Susano	
She Chi			

kami	shōzoku	Shrine Shintō	hsin-shu
kamidana	tamaya	Shugen-dō	hsü
Kojiki	torii	State Shintō	Huai-nan-tzu
matsuri	ujigami	Tajong-gyo	Lieh-tzu
musubi	<i>Shintō—sects and</i>	Tangun	p'o
Nihon shoki	<i>schools:</i>	Tenrikyō	p'u
norito	Fukkom Shintō	<i>Taoism:</i>	Tao
Shichi-go-san	Ise Shintō	Chuang-tzu	Tao-te Ching
shinsen	Kyōha Shintō	Dōkyō	te
shinshoku	Ryōbu Shintō	Five Pecks of Rice	tzu-jan
shintai	Sannō Ichijitsu	hsien	wu-wei
shinten	Shintō		
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

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Section 826. Judaism

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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.B.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
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 - 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>	Daniel, Book of	Joel, Book of	Septuagint
'aguna	Dead Sea Scrolls	Jonah, Book of	Solomon, Song of
'avera	Deuteronomy	Joshua, Book of	Ten
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eschatology	Esther, Book of	Kings, books of	Zechariah, Book of
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Hebraic law	Nehemiah,	Malachi, Book of	<i>movements:</i>
Israeli law	books of	Masoretic text	Ashkenazi
messiah	Genesis	Micah, Book of	Bene-Israel
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mitzvah	Book of	Nevi'im	Judaism
mitzwot ma'asiyyot	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

Zionism	Samaritan	bet din	Sabbath
<i>history:</i>	Sambation	bimah	seder
Ammonite	Sanhedrin	cantor	seliḥot
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Covenant	shewbread	David, Star of	shaharith
Asher	Simeon	derasha	Shema
Babylonian Exile	Sinai, Mount	Elijah's cup	shivah
Benjamin	Sodom and	etrog	siddur
Bethel	Gomorraḥ	exegesis	sidra
Boethusian	sofer	gabbai	Simhath Torah
Canaan	Tabernacle	gematria	siyyum
Dan	tanna	genizah	Sukkot
Diaspora	Ten	geṭ	synagogue
Elohim	Commandments	Haṭṭarah	takkanah
ephod	Ten Lost Tribes of	ḥalitza	ṭallit
Ephraim	Israel	Hallel	Tammuz, Fast of
Essene	Therapeutae	hands, laying on of	tashlikh
Gad	Twelve Tribes of	Ḥanukka	ṭerefa
gaon	Israel	Ḥavdala	Three Weeks
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Ḥasidean	Yahweh	hermeneutics	yahrzeit
Haskala	Zealot	ḥol ha-mo'ed	yeshiva
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K'ai-feng Jew	maggid	maḥzor	Mishne Torah
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Kneset ha-Gedola	Sefer ha-temuna	mezuza	Neziqin
Levite	Sefer ha-zohar	middot	Qodashim
ma'amadot	Sefer Yetzira	mikvah	responsa
Manasseh	sefira	minhah	Shulḥan 'arukh
manna	Shabbetaianism	minyan	Talmud
Midianite	tzaddiq	musaf	Thirteen Articles
Mitnagged	<i>rites, practices, and</i>	ne'ila	of Faith
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Musar	'alenu	Passover	tosafot
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Nazirite	'amida	phylactery	Zera'im
Pharisee	anno mundi	pidyon ha-ben	<i>other:</i>
Qumrān	arba' kanfot	piyyut	anti-Semitism
Rechabite	ark	prosbul	Gentile
red heifer	Avinu Malkenu	Purim	I-Thou
Reuben	Bar Mitzvah	rabbi	Jew
Sadducee	berakha	Rosh Hashana	
Biographies			
<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
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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	(Yozel)	Wise, Isaac Mayer
Luria, Isaac ben	Philo Judaeus	Hertz, Joseph	Zuckerman,
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 - 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
 - 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 the 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
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 2. Developments from the fall of Constantinople (1453) to the early 19th century
 3. The Orthodox churches in the 19th century: developments in various areas
 4. The Orthodox Church since World War I
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- 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)

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 - a. Development of the papacy as the chief spiritual and temporal power in the West
 - b. Religious and cultural characteristics of Latin Christianity

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 2. The era of the Reformations and the wars of religion: from Luther's reform to the Peace of Westphalia (16th–17th century)
 - a. Background of the Protestant Reformation in late medieval and Renaissance Catholicism

[see D.1.a., below]

- b. The Protestant Reformation
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 - c. The Catholic Reformation and Counter-Reformation
 - d. The wars of religion
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 - 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
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 - 6. Roman Catholicism today: its current demographic and social aspects
- D. History of Protestantism
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 - a. Its background in European Roman Catholic Christendom
 - b. Luther and the German Reformation
 - c. The Reformation in Switzerland, France, and the Low Countries
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 - d. The English, Scottish, and Irish reformations
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 - 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
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 - h. The wars of religion: church–state relations and the gradual development of the concept of religious liberty during the 16th and 17th centuries
 - 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
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 - 5. Protestantism today: its current demographic and social aspects
- E. Intellectual, spiritual, and imaginative expressions of Christianity
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- 1. Biblical literature: the Old Testament, the New Testament, the Apocrypha
 - 2. Biblical exegesis and hermeneutics
 - 3. Patristic literature
 - 4. Formal, official statements of beliefs and doctrines: creeds, dogmas, confessions of faith
 - 5. Writings of the post-patristic theologians, reformers, and church leaders
 - 6. Writings of the great mystics
 - 7. The relation of philosophy to Christian thought and statement: Christian philosophy

8. Myth and legend: biblical folk and nonbiblical literature, the role of myth 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
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 - b. The role and characteristics of the liturgy: the church as a worshipping community, the church year
 - c. Forms of Christian life: monasticism, the saintly life
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 - a. Major eras, regions, and schools of Christian art
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2. Reformed and Presbyterian churches: Calvinism
3. The Anglican Communion
4. The Free churches
 - a. Baptists
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 - c. Congregationalists
 - d. Methodists
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 - c. Armenian Church
 - d. Coptic Church
 - e. Ethiopian Church
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 - b. Old Catholic churches
3. In Protestantism
 - a. Holiness churches
 - b. Pentecostal churches
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 - i. Adventists
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 - d. Old-line Protestant sects and their derivations
 - i. Mennonites, including Amish and Hutterites
 - ii. The Moravian Church
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 - e. Other independent churches: various Fundamentalist, evangelical, and other sectarian groups
 - f. The Negro churches
4. Special forms tangentially related to traditional Christianity
 - a. New Thought: Unity and other groups
 - b. Christian Science
 - c. Mormonism

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

MICROPAEDIA: Selected entries of reference information

General subjects

<i>belief, doctrine, and dogma:</i>	Ascension	concordat	Holy Spirit
absolution	Assumption	confession	hope
adiaphorism	atonement	consubstantiation	Immaculate
agapē	benefice	deadly sin	Conception
Alpha and Omega	blasphemy	Erastianism	imprimatur
anathema	bull	eschatology	Incarnation
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Friends World Committee for Consultation	Lutheranism	Ephrata Community	Presbyterian Church in Ireland
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	Christian Methodist Episcopal Church	Dutch Reformed Church	United Church of Christ
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	National Primitive Baptist Convention, Inc.	Evangelical Church in Germany, The	
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- d. Doctrines concerning Satan and other intermediate beings, powers, or principles
[see also 811.B.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 Khārijis and Ibāḍis
 - b. Mu'tazilism
 - c. Sunnism
 - d. Shī'ism and its subjects: the Ismā'īlis and other Ismā'īli 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 Sharī'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
ʿādah	istiḥsān	uṣūl al-fiqh	Murji'ah
ahl al-Kitāb	istiṣlāḥ	<i>history:</i>	Qarāmiṭah
Allāh	jihād	Almohads	rāshidūn, ar-
ʿaql	kalām	Almoravids	Salimīyah
ʿāriyah	kasb	Badr, Battle of	<i>myth, legend,</i>
bid'ah	kiswah	Bāṭiniyah	<i>eschatology:</i>
Dahrīyah	Mālikīyah	caliph	Barṣiṣā
diyah	millet	Caliphate	Burāq
fayḍ	mufti	Companions of the	Dajjāl, ad-
ghaybah	Mu'tazilah	Prophet	Dhū al-faqār
Ḥadīth	Qadariyah	Dīn-i Ilāhī	ghūl
Ḥanābilah	qāḍi	Ditch, Battle of the	Hārūt and Mārūt
Ḥanafīyah	qiyas	Hāshimīyah	hātif
ʿiddah	raqāʿ	Hegira	ḥawrāʾ
ijmāʿ	rahbāniyah	Ḥudaybiyah, Pact	Iblis
ijtihād	Shāfi'iyah	of al-	Idris
ikhtilāf	Sharī'ah	Ikhwān aṣ-Ṣafāʾ	ʿifrit
ʿilm al-ḥadīth	shirk	imām	isrāʾ
imām	taqlid	jizyah	Isrāfil
	tashbih	kharāj	ʿIzrāʾil

jahannam	Hegira	zakat	hāl
Jibril	‘id	zāwiyah	ḥaqīqah
jinnī	iḥrām	ziyārah	kashf
Khiḍr, al-	jihād	zuhd	khirqah
maḥdī	jum‘ah	sects, schools,	Malāmatīyah
Mikāl	Ka‘bah	branches:	maqām
mī‘rāj	khitān	‘Alawite	Mawlawīyah
shaitan	khuṭbah	Bohrā	mujāhadah
Sheba, Queen of	mawlid	Deoband school	mushāhadah
Yājūj and Mājūj	minaret	Dönme	Naqshbandīyah
offices and orders:	minbar	Druze	Qādirīyah
caliph	mosque	Ismā‘īliyah	Qalandariyah
imām	muezzin	Ithnā ‘Asharīyah	Rifā‘īyah
marabout	mullah	Khawārij	samā‘
qurrā’	mut‘ah	Mahdist	shaṭṭ
Shādhiliyah	purdah	Māturīdiyah	Shaṭṭārīyah
Qur’ānic literature:	qibla	Mu‘tazilah	Subud
basmalah	rajm	Rāfiḍah	Ṣūfism
fātiḥah	Ramaḍān	Shī‘ite	Suhrawardīyah
fawātiḥ	ṣalāt	Ṣūfism	tariqa
Qur’ān	ṣawm	Sunnite	other:
surah	sayyid	Wahhābiyah	Ahl-e Ḥaqq
ritual, practice,	sharif	Yazidī	American Muslim
observance:	subḥah	Ṣūfism:	Mission
adhān	sunna	Aḥmadiyah	Islām
‘Ashūrā’	tafsīr	Bektāshīyah	Khōjā
Black Stone of	tahajjud	Chishtīyah	Muhammadiyah
Mecca	talbiyah	dervish	M‘zabite
crescent	taqiya	dhikr	sheikh
ghusl	ta‘ziyah	fakir	‘ulamā’
hajj	‘umrah	fana	
<u>Biographies</u>			
leaders and teachers:	Jalāl ad-Dīn	theologians and	Ghazālī, al-
‘Abd Allāh	ar-Rūmī	philosophers:	Ḥasan
Abū Bakr	Jamāl ad-Dīn	‘Abduh,	al-Baṣrī, al-
Ahmad Khan, Sir	al-Afghānī	Muḥammad	Ibn al-‘Arabī
Sayyid	Junayd, Shaykh	Abū Ḥanīfah	Ibn ‘Aqīl
Aḥsā’ī, al-	Mahdī, al-	Aḥmad ibn	Ibn Ḥazm
‘Alī	Muḥammad	Ḥanbal	Ibn Taymīyah
Ghaznavid	Rashīd Riḍā	Ash‘arī, Abū	Muḥāsibī, al-
Dynasty	Sha‘rānī, ash-	al-Ḥasan al-	Sirhindī, Shaykh
Ḥallāj, al-	‘Umar I	Averroës	Aḥmad
Ja‘far ibn	‘Umar II	Avicenna	Suhrawardī, as-
Muḥammad	‘Umar 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.D.3.]
 - 2. Prophecy, divination, astrology
 - 3. Healing cults or practices
 - 4. Pharmacological cults or practices

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with other religions and religious movements in the modern world

Doctrines and Dogmas, Religious
Occultism

MICROPAEDIA: Selected entries of reference information

General subjects

African Greek Orthodox Church	Ghost Dance	Kuga Sorta	Ringatu
Aiyetoro	Handsome Lake cult	Macumba	Rizalist cult
Aladura	Hare Krishna	magic	Rosicrucian
alchemy	Harris movement	Maria Legio	Scientology
anthroposophy	Hauhau	mashriq al-adhkār	spiritual assembly
astrology	healing cult	Moorish Science	Telakhon
Azali	hudūd	Temple of America	theosophy
Bahā'ī faith	I Am movement	Native American Church	Unification Church
Braid movement	Iglesia ni Kristo	Church	'uqqāl
Cao Dai	Indian Shaker Church	New Thought	voodoo
cargo cult	Islam, Nation of	Peace Mission	witchcraft
divination	Kimbanguist	Psychiana	Zionist church
Druze	Church of Zaire	Rastafarian	
Ethiopianism		Ratana Church	
faith healing		Religious Science	

Biographies

Bāb, the	Blavatsky, Helena	Gurdjieff, Georges	Muhammad,
Bhaktivedanta,	Petrovna	Ivanovitch	Elijah
A(bhay)	Divine, Father	Mahesh Yogi,	Smohalla
C(haranaravinda)	Fard, Wallace D.	Maharishi	Steiner, Rudolf
		Moon, Sun Myung	

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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 pythoness 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-Lydia 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 Ardashīr I in the early 3rd century BC, 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 Maʿīn, Sabaʾ, 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	Iran	Palestine
Arabia	Iraq	Prehistoric Peoples
Egypt	Israel	and Cultures
Greco-Roman	Jordan	Syria
Civilization,	Lebanon	Turkey and
Classical	North Africa	Ancient Anatolia

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Anatolia, Crete, and</i>	Harran	Paphlagonia	Ḥimyar
<i>Cyprus:</i>	Hittite	Perga	Kindah
Ahhiyawa	Karatepe	Phocaea	Nabataean
Alaca Hüyük	Kaska	Phrygia	Sabaʾ
Alişar Hüyük	Kizzuwadna	Pisidia	Şāliḥ
Amathus	Knossos	Sakcagöz	Tanūkh
Anatolia	Kultepe	Salamis	Thamūd
Armenia	Luwian	Sardis	<i>Egypt:</i>
Arzawa	Lycaonia	Soli	Abū Jirāb
Aspendus	Lycia	Tarsus	Abū Ruwaysh
Bithynia	Lydia	Troas	Abu Simbel
Boğazköy	Milid	Troy	Amarna, Tell el-
Çatalhöyük	Minoan	Xanthus	Amratian culture
Chalcedon	civilization	Yazılıkaya	Badarian culture
Cilicia	Muşaşir	Zincirli Hüyük	Beni Hasan
Citium	Mysia	<i>Arabia:</i>	Canopus
Gordium	Pamphylia	Arabia Felix	

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|------------------------|-------------------|-----------------------------|--------------------|
| Dahshūr | Babylon | Parni | Carchemish |
| Dayr al-Baḥrī | Babylonia | Parthia | Dibon |
| Dayr al-Madīnah | Birāk, Tall | Pasargadae | Ebla |
| Elephantine | Borsippa | Persepolis | Edom |
| Gerzean culture | Calah | Persis | Far'ah, Tall al- |
| Giza, Pyramids of | Chaldea | Satrap | Fāri'ah, Tall al- |
| Hermopolis Magna | Ctesiphon | Shahr-e Sokhta | Galilee |
| Hierakonpolis | Cunaxa, Battle of | Shuruppak | Gath |
| Hyksos | Dur Sharrukin | Sippar | Gezer |
| Kadesh, Battle of | Elam | Sumer | Ghassulian culture |
| Kahun | Elymais | Susa | Gibeon |
| Karnak | Erech | Teishebaini | Gilead |
| Kawa | Eridu | Ten Thousand | Ḥalaf, Tall |
| Kings, Valley | Eshnunna | Immortals | Ḥasi, Tel |
| of the | Fertile Crescent | Tepe Gawra | Hierapolis |
| Lāhūn, al- | Gaugamela, | Tepe Yahya | Jericho |
| Luxor | Battle of | Toprakkale | Jezreel |
| Ma'ādī, al- | Granicus, Battle | 'Ubayd, Tall al- | Judaea |
| Madīnat Habu | of the | Ur | Judah |
| Maydūm | Guti | Urartu | Kadesh |
| Memphis | Hammurabi, | <i>North Africa:</i> | Kadesh, Battle of |
| Naukratis | Code of | Capsian industry | Karkar |
| nome | Hasanlu | Carthage | Katna |
| Oxyrhynchus | Hassuna | Cyrenaica | Kiriath-sepher |
| Palermo Stone | Hatra | Fezzan | Mari |
| Pelusium | Ḥirah, al- | Gaetulia | Megiddo |
| Per Ramessu | Hurrian | Hadrumetum | Nora |
| pharaoh | Isin | Hippo | Palestine |
| Ramesseum | Jazīrah, al- | Lambessa | Palmyra |
| Sais | Kassite | Leptis | Philistine |
| Ṣaqqārah | Khwarezm | Mauretania | Phoenicia |
| Sarapeum | Kish | Numidia | Samaria |
| Tanis | kudurru | Ptolemais | Ugarit |
| Tasian culture | Lagash | Sabratha | <i>other:</i> |
| Thebes | Larsa | Thugga | Aksum, |
| Turin Papyrus | Lullubi | Tripolitania | Kingdom of |
| <i>Mesopotamia and</i> | Mannai | Utica | Meroe |
| <i>Iran:</i> | Media | Volubilis | Mycenae |
| Adab | Mesene | <i>Palestine and Syria:</i> | Napata |
| Akh lame | Mesopotamia | Ai | Nubia |
| Akkad | Mitanni | 'Ajjul, Tall al- | Ophir |
| Amorite | Nineveh | Alalakh | Pelasgi |
| Anbar | Nippur | Aleppo | Punt |
| Anshan | Nisa | Bashan | Sea People |
| Ashur | Nuzu | Beth Yerah | tell |
| Assyria | Osroëne | Canaan | |
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- Biographies**
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|---------------|--------------------------|-----------------------|------------------|
| <i>Egypt:</i> | Thutmose I | Esarhaddon | Cyrus II |
| Akhenaton | Thutmose III | Hammurabi | Darius II |
| Amenhotep III | Thutmose IV | Merodach-Baladan II | Khosrow I |
| Ankhesenamen | Tutankhamen | Nebuchadrezzar II | Khosrow II |
| Hatshepsut | <i>Israel:</i> | Sargon | Sāsānian dynasty |
| Mentuhotep II | Abraham | Sargon II | Shāpūr II |
| Merneptah | David | Sennacherib | Xerxes I |
| Ramses II | Moses | Tiglath-pileser III | <i>other:</i> |
| Ramses III | Solomon | <i>Persia (Iran):</i> | Suppiluliumas I |
| Ramses IV | <i>Mesopotamia</i> | Achaemenian | Tigranes II the |
| Saite dynasty | (<i>Akkad, Assyria,</i> | dynasty | Great |
| Sesostris I | <i>Babylonia):</i> | Arsacid dynasty | |
| Sesostris III | Ashurbanipal | Artaxerxes II | |
| Snefru | Ashurnarsipal II | Cambyes 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 Halstatt 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 (88–84 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, and Horace; religion; the visual arts
 - e. The empire under Tiberius (AD 14–37), Gaius (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 Sāsānid 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	Greece
Athens	Constantine the Great	Greco-Roman Civilization,	Italy
Augustus	Europe	Classical	Mediterranean Sea
			Rome

MICROPAEDIA: Selected entries of reference information

General subjects

<i>ancient Europe—</i>	Boii	Lucania	Sarmatian
<i>Balkans:</i>	Carnuntum	Mamertini	Scythian
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Getae	Cimbri	Paeligni	Soli
Illyria	Gepidae	Piceni	Steppe, The
Paeonia	Hallstatt	Populonia	<i>Greece—Archaic</i>
Triballi	Heuneburg	Praeneste	<i>period:</i>
<i>ancient Europe—</i>	Lingones	Sabine	Acarnania
<i>Britain:</i>	Marcomanni	Samnite	Achaean
Caledonia	Reinheim	Segesta	Aetolia
Creswell Crags	<i>ancient Europe—</i>	Siculi	agora
Kent's Cavern	<i>Iberia:</i>	Stabiae	amphictyony
Pict	Arevaci	Umbri	Amphipolis
Silures	Celtiberia	Veii	Apamea Cibotus
Skara Brae	Iberian	Veneti	apella
<i>ancient Europe—</i>	Lusitani	Villanovan culture	Archaic period
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Belgae	Ardea	Alani	Bosporus,
Gaul	Ateste	Anazarbus	Kingdom of the
Helvetii	Aurunci	Antioch	boule
La Tène	Boii	Bactria	Calydon
Morini	Caere	Cappadocia	Caulonia
Senones	Este	Caria	Chersonese, Tauric
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Arevaci	Lavinium	Pontus	Corinth

Cumae	Thespiae	fiscus	decemviri
Cyrene	Tiryns	Five Good	decurio
Cyzicus	Trojan War	Emperors	delator
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Dorian	tyrant	Hadrian's Wall	eques
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Eleusis	<i>period:</i>	indiction	gladiator
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prytaneum	Althiburos	censor	tribe
Selinus	Antinoöpolis	civitas	triumph
Sicyon	Antonine Wall	clientship	triumvirate
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strategus	Carrhae, Battle of	comitia	Beaker folk
Tegea	dominus	consul	Lake Dwellings
Thermopylae	emperor	curia	shell mound
Theseum	fasces	Decapolis	Urnfield

Biographies*Greece and**Macedonia:*

Agesilaus II

Alcibiades

Argead dynasty

Cimon

Cleisthenes of

Athens

Demosthenes

Dionysius the Elder

Epaminondas

Lycurgus

Miltiades the

Younger

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Philip II

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Themistocles	Ptolemy IV	Cato, Marcus	Maecenas, Gaius
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<i>Hellenistic states:</i>	Ptolemy V	Cicero, Marcus	Marius, Gaius
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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 the States of Eastern Europe from AD 395 to *c.* 1050 356
922. The Formative Period in Islāmic History, from AD 622 to *c.* 1055 362
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 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
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 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 reign of 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 (610–685)
 - 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)
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 - 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 (Lotharinga): 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)
 - c. 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 Br̃etislav (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
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 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 the states of eastern Europe from AD 395 to c. 1050

Bulgaria	Greco-Roman	Istanbul	Steppe, The
Byzantine Empire,	Civilization,	Italy	History of the
The History	Classical	Kiev	Eurasian
of the	Holy Roman	Poland	Union of Soviet
Charlemagne	Empire, The	Rome	Socialist
Europe	History of the	Spain	Republics
France	Hungary		United Kingdom
Germany	Ireland		Venice

MICROPAEDIA: Selected entries of reference information

General subjects

<i>barbarian invaders</i>	Suebi	logothete	fief
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Ricimer	Irene (d. 803)	(Nicaea)	(Aquitaine)
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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	ḥājib	Mozarab	Ṣaḡālibah
Caliphate	Hāshimīyah	Nahāvand,	Shī'ah
Córdoba	Hegira	Battle of	Ṣiffin, Battle of
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- 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	Germany	Lisbon	Portugal
Antwerp	Habsburg, The	London	Prague
Austria	House of	Low	Rome
Crusades, The	Holy Roman	Countries, The	Spain
Czechoslovakia	Empire, The	Madrid	Sweden
Denmark	History of the	Milan	Switzerland
Europe	Hungary	Naples	United Kingdom
Finland	Iceland	Norway	Venice
Florence	Ireland	Paris	Vienna
France	Italy	Poland	

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	Praguerie	Mudejar	Heneby
Hastings, Battle of	Provence	Navarre	Kalmar Union
Lollard	<i>national affairs—</i>	Navas de Tolosa,	Lithuania, Grand
Magna Carta	<i>Germany and Low</i>	Battle of Las	Duchy of
Norman Conquest	<i>Countries:</i>	Reconquista	Livonia
Northampton,	Bayern	Tordesillas,	Norman
Assize of	Brabant	Treaty of	<i>national affairs—</i>
Ordainer	Brandenburg	Valencia	<i>Switzerland:</i>
Oxford,	Burgundy	Zamora, Treaty of	Everlasting
Provisions of	elector	<i>national affairs—</i>	League
Paston Letters	Flanders	<i>Italy:</i>	Morat, Battle of
Peasants Revolt	Golden Bull	Campaldino,	Morgarten,
Roses, War of the	of Emperor	Battle of	Battle of
tanistry	Charles IV	Ciampi, Revolt	Näfels, Battle of
Tewkesbury,	Hainaut	of the	Sempach,
Battle of	Hanseatic League	Eight Saints, War	Battle of
Towton, Battle of	Holland	of the	Stans, Diet of
Westminster,	Holy Roman	Guelf and	Toggenburg
Statutes of	Empire	Ghibelline	Succession
(1275–90)	imperial city	Lodi, Peace of	<i>society and</i>
<i>national affairs—east</i>	Limburg	Lombard League	<i>commerce:</i>
<i>central Europe:</i>	Namur	Naples,	Black Death
Cuman	Saxony	kingdom of	commune
Golden Bull of	Swabia	papacy	craft guild
1222	<i>national affairs—</i>	Papal States	feudal land
Koszyce, Pact of	<i>Iberian peninsula:</i>	Sicilian Vespers	tenure
Mazovia	Alarcos, Battle of	Two Sicilies,	feudalism
Moravia	Almohads	Kingdom of the	Hanseatic League
<i>national affairs—</i>	Almoravids	Venetia	knight
<i>France:</i>	Andalusia	<i>national affairs—</i>	manorial court
Albigenses	Aragon	<i>Scandinavia and</i>	manorialism
Aquitaine	Castile	<i>Baltic states:</i>	merchant guild
Brittany	Catalonia	Birka	Middle Ages
Burgundy	converso	Birkarlar	Renaissance
Hundred	Granada	Brothers of the	serfdom
Years' War	Leon	Sword, Order	vassal
Jacquerie	Medina del	of the	
Normandy	Campo, Treaty of	Courland	
	Morisco	Danewirk	

Biographies

British Isles and Angevin Empire:

Alexander I
(Scotland)
Alexander II
(Scotland)
Alexander III
(Scotland)
Beaufort, Henry
Becket, Saint
Thomas
Bruce, House of
Clarence, George
Plantagenet,
duke of
David I (Scotland)
David II (Scotland)
David ap Llywelyn
Despenser, Hugh
Le and 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,
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
Margaret
(Scotland)
Margaret
of Anjou
Matilda

Meath, Hugh de	<i>east central Europe:</i>	Charles (Burgundy)	Artevelde,
Lacy, 1st lord of	Andrew II	Charles IV	Jacob van
Montfort,	(Hungary)	(France)	Charles IV
Simon de	Árpád dynasty	Charles V (France)	(emperor)
Montfort	Béla III (Hungary)	Charles VI	Conrad III
family	Béla IV (Hungary)	(France)	(German king)
Normandy,	Bolesław II	Charles VII	Conrad IV
House of	(Poland)	(France)	(German king)
Northumberland,	Bolesław III	Charles VIII	Frederick I
Henry Percy, 1st	(Poland)	(France)	(Brandenburg)
earl of	Břetislav I	Coeur, Jacques	Frederick I
Oldcastle,	(Bohemia)	Gondi family	(emperor)
Sir John	Casimir I (Poland)	Guesclin,	Frederick II
Pembroke,	Casimir II (Poland)	Bernard du	(emperor)
Richard	Casimir III	Henry I (France)	Guy (Flanders)
de Clare, 2nd	(Poland)	Joan of Arc, Saint	Habsburg,
earl of	Casimir IV	John (IV)	House of
Pembroke,	(Poland)	(Brittany)	Henry II
William Marshal,	Charles I	John IV (or V)	Jasomirgott
1st earl of	(Hungary)	(Brittany)	(Austria)
Percy family	George (Bohemia)	John (Burgundy)	Henry X
Percy, Sir Henry	Hunyadi, János	John II (France)	(Bavaria)
Plantagenet,	Jadwiga	La Trémoille,	Henry III
House of	Jagiellon dynasty	Georges de	(emperor)
Richard I	John (Bohemia)	Louis VII (France)	Henry IV
(England)	John I Albert	Louis VIII	(emperor)
Richard II	(Poland)	(France)	Henry V (emperor)
(England)	Ladislav I	Louis IX (France)	Henry VI
Richard III	(Hungary)	Louis X (France)	(emperor)
(England)	Ladislav IV	Louis XI (France)	Henry VII
Robert II	(Hungary)	Lusignan family	(emperor)
(Normandy)	Ladislav V	Marcel, Étienne	Henry (VII)
Robert I (Scotland)	(Hungary)	Montfort family	(German king)
Robert II	Louis I (Hungary)	Philip II	Henry III
(Scotland)	Matthias I	(Burgundy)	(Saxony)
Robert III	(Hungary)	Philip III	Henry Raspe
(Scotland)	Olesnicki,	(Burgundy)	Hermann von
Roderick	Zbigniew	Philip I (France)	Salza
O'Connor	Otakar I	Philip II (France)	Hohenstaufen
Stephen	(Bohemia)	Philip III (France)	dynasty
Tudor, House of	Otakar II	Philip IV (France)	Jacoba
Tyler, Wat	(Bohemia)	Philip V (France)	Lothair II (or III)
Wallace, Sir	Piast dynasty	Philip VI (France)	(emperor)
William	Stanislaus of	Rais, Gilles de	Louis II
Warwick, Richard	Kraków, Saint	René I (Anjou)	(Flanders)
Beauchamp, 1st	Stephen V	Richemont,	Louis IV
earl of	(Hungary)	Arthur,	(emperor)
Warwick, Richard	Vladislav II	constable de	Otto IV
Neville, earl of	(Bohemia)	Suger	(emperor)
William I	Wenceslas I	Valois dynasty	Philip (emperor)
(England)	(Bohemia)	<i>Germany and the</i>	Richard (German
William II	Władysław I	<i>Low Countries:</i>	king)
(England)	(Poland)	Adalbert	Rudolf I
William I	Władysław II	Adolf (German	(German king)
(Scotland)	Jagiello (Poland)	king)	Rupert (German
William the	Władysław III	Albert I	king)
Aetheling	Warnencyk	(Brandenburg)	Sigismund
Wycliffe, John	(Poland)	Albert III Achilles	(emperor)
York, House of	<i>France:</i>	(Brandenburg)	Welf dynasty
York, Richard	Berry, Jean de	Albert I (German	Wenceslas
Plantagenet, 3rd	France, duc de	king)	(German king)
duke of	Blanche of Castille	Albert II (German	Wettin dynasty
	Caboche, Simon	king)	Wittelsbach,
	Capetian dynasty		House of

<i>Iberian peninsula:</i>	Peter I (Castile/ Leon)	Ladislav (Naples)	Christopher III (Denmark)
Afonso I (Portugal)	Ramón	Lauria,	Erik V (Denmark)
Afonso II (Portugal)	Berenguer I	Ruggiero di	Erik VI (Denmark)
Afonso V (Portugal)	Ramón	Leo IX (pope)	Erik VII (Denmark)
Alfonso I (Aragon)	Berenguer II	Louis (Naples)	Erik XIII (Sweden)
Alfonso II (Aragon)	Ramón	Malaspina family	Eskil
Alfonso III (Aragon)	Berenguer III	Malatesta family	Gediminas
Alfonso IV (Aragon)	Ramón	Martin I (Sicily)	Haakon I
Alfonso V (Aragon)	Berenguer IV	Medici,	Haakon IV
Alfonso VI (Castile/Leon)	Sancho III Garcés (Navarre)	Cosimo de'	Haakon V
Alfonso VII (Castile/Leon)	Urraca	Medici,	Haakon VI
Alfonso IX (Castile/Leon)	<i>Italy and the papacy:</i>	Lorenzo de'	Inge I
Alfonso X (Castile/Leon)	Adorno family	Medici, Piero di	John (Denmark)
Alfonso XI (Castile/Leon)	Alberti family	Cosimo de'	Kestutis
Charles II (Navarre)	Alexander III (pope)	Medici, Piero di	Magnus I (Norway)
Cid, the	Amadeus VI (Savoy)	Lorenzo de'	Magnus III (Norway)
Edward (Portugal)	Amadeus VII (Savoy)	Medici family	Magnus IV (Norway)
Ferdinand II (Aragon)	Amadeus VIII (Savoy)	Mocenigo family	Magnus V (Norway)
Ferdinand I (Castile/Leon)	Bardi family	Montefeltro family	Magnus VI (Norway)
Ferdinand II (Castile/Leon)	Bentivoglio family	Morosini family	Magnus I (Sweden)
Ferdinand III (Castile/Leon)	Boccanegra family	Ordelaifi family	Magnus II (Sweden)
Ferdinand IV (Castile/Leon)	Bonacolsi family	Orsini family	Margaret I (Denmark)
García V (Navarre)	Boniface VIII (pope)	Paschal II (pope)	Mindaugas
Henry II (Castile/ Leon)	Borgia family	Pepoli family	Olaf II (Norway)
Henry III (Castile/ Leon)	Carrara family	Peruzzi family	Olaf III (Norway)
Henry IV (Castile/ Leon)	Castracani,	Piccinino, Niccolò	Olaf (Sweden)
Isabella I	Castruccio	Piccolomini family	Sigurd I
James I (Aragon)	Charles I (Naples)	Polenta family	Sverrir Sigurdsson
James II (Aragon)	Charles II (Naples)	Polo, Marco	Sweyn II (Denmark)
John I (Aragon)	Charles III (Naples)	Robert (Apulia)	Valdemar II (Denmark)
John II (Aragon)	Charles I (Sicily)	Robert (Naples)	Valdemar IV (Denmark)
John II (Castile/ Leon)	Cola di Rienzo	Roger (Apulia)	Valdemar (Sweden)
John I (Portugal)	Colonna family	Roger I (Sicily)	Vytautas
John II (Portugal)	Contarini family	Roger II (Sicily)	the Great
Muhammad XI (Granada)	Corsini family	Sambuccio	Władysław II Jagiello
Peter II (Aragon)	Dandolo, Enrico	d'Alando	
Peter III (Aragon)	Dandolo, Vincenzo	Savonarola,	
Peter IV (Aragon)	Dandolo family	Girolamo	
	della Scala family	Sforza, Francesco	
	Drogo de	Sforza, Ludovico	
	Hauteville	Sforza family	
	Este, House of	Spinola family	
	Ezzelino III da	Uguccione della	
	Romano	Fagginola	
	Fieschi family	Urban II (pope)	
	Gherardesca family	Visconti family	
	Gonzaga dynasty	Visconti, Gian	
	Gregory VII (pope)	Galeazzo	
	Gregory IX (pope)	Visconti, Matteo I	
	Gregory X (pope)	William I (Sicily)	
	Grimaldi family	William II (Sicily)	
	Innocent III (pope)	William de	
	Joan I (Naples)	Hauteville	
	Joan II (Naples)	<i>Scandinavia and the Baltic States:</i>	<i>Switzerland:</i>
		Absalon	Brun, Rudolf
		Algirdas	Bubenberg,
		Canute IV (Denmark)	Adrian von
		Christian I (Denmark)	Nicholas of Flüe, Saint
		Christopher I (Denmark)	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 Khwārazm 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 southern Russia (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 Qūṭuz 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-Wāḍid kingdom of Tīlīmṣān, the Marīnīds in eastern Morocco and their problems with the Arabs, political life, the Naṣrīd kingdom of Granada
 - ii. Religious, intellectual, and artistic life: Ṣūfism, 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

Albania	Crusades, The	Jerusalem	Syria
Balkans	Egypt	North Africa	Turkey and
Bulgaria	Islāmic	Romania	Ancient Anatolia
Byzantine Empire, The History of the	World, The	Spain	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Balkans:</i>	Barghawāṭah	Nicopolis, Battle of	Neva, Battle of the
Bogomil	Granada	Saracen	Novgorod,
Croatia	Moor	<i>Middle East—other:</i>	Treaty of
Epirus,	Morisco	Ak Koyunlu	Pechenegs
Despotate of	Mozarab	Anatolia	Peipus, Battle of
Kosovo, Battle of	Navas de Tolosa,	Ankara, Battle of	Lake
(1389)	Battle of Las	Assassin	Rus
Kosovo, Battle of	Reconquista	‘ayyār	Suzdal,
(1448)	Valencia	Kara Koyunlu	Principality of
Maritsa River,	<i>Middle East—</i>	Little Armenia	Tver,
Battle of the	<i>Crusades:</i>	Mamlūk	Principality of
Moldavia	Antioch,	Myriocephalon,	Ugra, Battle of the
Morea,	Principality of	Battle of	veche
Despotate of	Arsūf, Battle of	Nicaea, empire of	Vladimir
Serbia	Children’s	Seljuq	Volhynia
Thrace	Crusade	<i>Russia:</i>	<i>other:</i>
Vlach	crusade	Crimea, Khanate	Bari, Siege of
Walachia	Haṭṭin, Battle of	of the	bashi-bazouk
Zara, Siege of	Holy Lance	Golden Horde	Jalāyirid
<i>Iberia and</i>	Jérusalem,	Kipchak	pronoia system
<i>northwestern Africa:</i>	Assises de	Kulikovo, Battle of	
Almohads	Jerusalem,	Moscow, Grand	
Almoravids	Kingdom of	Principality of	

Biographies

<i>Christians—Balkans</i>	John III Ducas	Raymond	Baybars I
<i>and Russia:</i>	Vatatzes	(Antioch)	Dānishmend
Alexander Nevsky,	Manuel I	Reginald of	dynasty
Saint	Comnenus	Châtillon	Eldegüzid dynasty
Ivan III	Manuel II	<i>Muslims—Iberia and</i>	Ghāzān, Maḥmūd
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Ivan Asen II	Metochites,	‘Abd al-Mu’min	dynasty
Kotromanić	Theodore	Aḫṣid dynasty	Mehmed II
dynasty	Michael VIII	Ḥaḫṣid dynasty	Murad I
Rurik dynasty	Palaeologus	Ḥammūdīd	Murad II
Stefan Dušan	<i>Christians—Crusader</i>	dynasty	Nizām al-Mulk
Vasily I	<i>states:</i>	Hūdid dynasty	Saladin
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Division III. Peoples and Traditional Civilizations of East, Central, South, and Southeast Asia

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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.

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- B. The emergence of traditional Chinese civilization
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 - 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

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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
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 - 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
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>ancient cultures and</i>	Ch'in tomb	Hsiung-nu	Sha-ch'ing
<i>historic sites:</i>	Great Wall of	Lung-shan culture	<i>dynastic capitals:</i>
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- b. T'ang cultural life: the growing influences of Buddhism, developments in music and the visual arts
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- 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 Chao K'uang-yin's (T'ai Tsu's) reign (960–976), further consolidation under Tseng 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

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 - 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
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 - 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
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 - 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
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China	Peking
Chungking	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>capital cities:</i>	Yang-chou	Sung dynasty	kowtow
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 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): Kirgiz, Uighur tribes, Qarakhanid rule in the 10th century, Mongol conquest and rule in the 13th century, conquest by Manchus (1758–59)
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 - 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
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 - 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 southern Russia 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

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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
China
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Nepal

MICROPAEDIA: Selected entries of reference information

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- 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 (1550–82) and Toyotomi Hideyoshi (1582–98)
- 4. The Tokugawa period (1603–1867): military–bureaucratic rule
 - a. Establishment (1603) and consolidation of the Tokugawa (Edo) *bakufu* 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 *bakuhan* system
 - c. Industrial and commercial developments, advances in literature and the visual arts
 - d. The weakening of the *bakuhan* 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 reform and downfall of the *bakuhan*: 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 (668–918): adoption of Chinese governmental organization and land tenure system, emergence of provincial magnates, cultural developments
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 - b. Invasions by Japan (1592–98) and China (1619–27): 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>Jāpan—government and society:</i>	han	shugo	Hōgen Disturbance
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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	Michinaga	Shimazu Nariaki	Sejong
Tadayoshi	Fujiwara Tokihira	Shōtoku, Taishi	Son Pyōng-hi
Ashikaga Takauji	Hayashi Shihei	Soga Umaku	<i>other:</i>
Ashikaga	Hōjō family	Taira family	Harris, Townsend
Yoshimasa	Hōjō Tokimasa	Taira Kiyomori	Perry, Matthew C.
Ashikaga	Hōjō Tokimune	Takasugi Shinsaku	Valignano,
Yoshimitsu	Hōjō Yasutoki	Tanuma Okitsugu	Alessandro
Minamoto	Hōjō Yoshitoki	Toyotomi	Xavier, Saint
Yoritomo		Hideyoshi	Francis

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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 Baluchistan 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 Brahmin, 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, growth of Magadhan ascendancy
 - b. Invasion of 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 Candragupta Maurya (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, Andhra)
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 Hūṇas (c. mid-5th century), successor states to the Guptas
 2. Various kingdoms of the Deccan: the Vākāṭaka dynasty, the Viṣṇukūṇḍins, 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
 Indian Ocean Islands
 Nepal
 Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

historic regions and sites:
 Bhārhut
 Brahmarṣi-dēsa
 Gandhara
 Gauḍa

Gedrosia
 Halebīd
 Kalibangan
 Kāliṅga
 Mālwa
 Nālandā

Patna
 Śrāvastī
 Taxila
 Vaiśālī
 Valabhī
 Vārānasi

kingdoms and states:
 Anuradhapura,
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 Avanti
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Mauryan Empire <i>peoples and society:</i>	Indus Valley Civilization	Rājput Sūdra	<i>other:</i> Dīpavamsa
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Aśoka	Gaṅga dynasty	Mahendra	Śaiśunāga dynasty
Buddha	Gurjara-Pratihāra dynasty	Maitraka dynasty	Śaka satrap
Cālukya dynasty	Harṣa	Menader	Samudra Gupta
Candra Gupta	Hoysaḥa dynasty	Nanda dynasty	Sātavāhana dynasty
Candra Gupta I	Īśānavarman	Pāla dynasty	Sena dynasty
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 - 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, Bidar, 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 Marāthā 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 Marāthā war of independence
 2. The Marāthās as the major power in India in the early 18th century: the contribution of the peshwas (prime ministers) to Marāthā success, struggle with the Portuguese, establishment of the Marāthā 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
Indian Ocean Islands
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>government and society:</i>	<i>Rājāvaliya</i>	Bengal	<i>kingdoms and states:</i>
Ashta Pradhan	<i>historic events:</i>	Bharatpur	Bahmani
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Habshī	Gogūnda, Battle of	Gokonda	Delhi Sultanate
jāgirdār	Jājau, Battle of	Gulbarga	Hyderābad
Mahāvam̐sa	Karnāl, Battle of	Kāmarūpa	Jaffna
maṇṣabdār	Pānīpat, Battles of	Karnāṭaka	Kōṭṭe kingdom
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<i>Mughal emperors:</i>	Āraṇḍi dynasty	Ḥusayan Shāh	Quṭb-ud-Dīn
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Aurangzeb	Hoysala dynasty	Hyder Ali	Prithvi Nārāyaṇ
Bābur	Khaljī dynasty	Iltutmish	Shah
Humāyūn	Lodī dynasty	Muḥammad ibn	Shēr Shāh of Sūr
Jahāngīr	Mughal dynasty	Tughluq	Sirāj-ud-Dawlah
Shah Jahān	Slave dynasty	Mu'izz-ud-Dīn	Śivājī
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'Adil Shāhī dynasty	Gobind Singh	Sām	

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- B. Mainland Southeast Asia to c. 1600
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 - a. Origins of civilization in Burma: the Anyathian Stone Age culture, the Mons of Lower Burma (c. 3rd century BC–11th century AD), Indian trade and cultural influences
 - b. The Tibeto-Burmese invasions of the Upper Irrawaddy Valley (c. 500 BC) and the establishment of the Pyu state of Upper Burma (c. AD 50)
 - c. The city kingdom of Pagan (849–1287): the influence of Theravāda Buddhism, Pagan as a cultural centre, destruction by the Mongols (1287)
 - d. Burma from c. 1300 to c. 1600: reunification and expansion
 2. The Thai people and the kingdom of Siam to c. 1500
 - a. The origins and settlement of the Thais: the kingdom of Nanchao in Yunnan (8th century AD)
 - b. Establishment of Thai power at Sukhothai (c. 1220): social and cultural developments
 - c. Establishment of the Thai state of Ayutthaya (1350): organization of administrative, social, and legal systems; wars with Cambodia during the reign of King Trailok (1448–88)
 - d. Laos to c. 1600: the Lao as a branch of the Thai people, establishment of the Lan Xang kingdom by Fa Ngum (1353–71), 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 its dominance (c. 598) over Funan
 - c. Establishment of the state of Angkor (c. 800) by the Khmer dynasty, Javanese influences on religion and the concept of kingship, social and administrative structures, expansion (c. 1113) and decline (1177) of state
 - 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, Thai invasions (1369 and 1389) and fall of city of Angkor (1444)
 4. Vietnam from the prehistoric period to c. 1615
 - 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, annexation by Nam Viet in northern Vietnam (1471)
 - c. Chinese political and cultural domination of Nam Viet from 111 BC to AD 939; independence under Ly, Tran, and Le dynasties (939–1600); 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), Chinese aggressions 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; the concept of divine kingship

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
Burma
East Indies, The
Southeast Asia, Mainland

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Burma, Malaya, and Siam:</i>	Ngasaunggyan,	Champa	Kaḍiri,
Dvaravati	Battle of	Dong Son culture	Kingdom of
Hlutdaw	Nong Sa Rai,	Funan	Majapahit Empire
Mon kingdom	Battle of	Lovek	priyayi
Mrohaung,	Pagan	Nam Viet	Singhasāri,
Arakanese	Sadki Na grades	Vyadhapura	Kingdom of
Kingdom of	Śrīvijaya Empire	<i>Indonesian</i>	Tarumanegara
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	Angkor	Buginese	

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<i>Burma, Malaya, and Siam:</i>	Ramathibodi I	Le Loi	Trung Sisters
Anwarahta	Ramkhamhaeng	Le Thanh Tong	<i>Indonesian</i>
Bayinnaung	Toungoo dynasty	Ly Bon	<i>Archipelago:</i>
Mahmud Shah	Trailok	Ngo Quyen	Erlangga
Malacca,	<i>Indochina:</i>	Nguyen dynasty	Gajah Mada
sultanate of	Chan	Setthathirat I	Hayam Wuruk
Mangrai	Dinh Bo Lin	Suryavarman I	Kertanagara
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Division IV. Peoples and Civilizations of Sub-Saharan Africa to 1885

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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.

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- 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	Fulani empire	Royal Niger
Akwamu	Dahomey,	Hausa states	Company
Ashanti empire	Kingdom of	Kanem-Bornu	Songhai empire
Audaghost	Djénné	Kumbi	Tukulor empire
Bambara states	Fanti confederacy	Mali empire	Wolof empire
Benin	French West Africa	Mossi states	Yoruba states
Bono		Oyo empire	

Biographies

Agaja	Mūsā	Sonni 'Ali
Beecroft, John	Osei Tutu	Sumanguru
Faidherbe, Louis	Park, Mungo	Sundiata
Muhammad I	Rābiḥ az-Zubayr	'Umar Tal
Askia	Samory	Usman dan Fodio

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Section 942. The Nilotic Sudan and Ethiopia from c. AD 550 to 1885

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 - 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 Zague dynasty (c. 11th century), the Solomonid restoration (1270), the influence of the Coptic Church on culture and religion
 - 3. Contacts with the Portuguese (1520–1632) and Turkish attacks on Ethiopia (1523–43, 1578, and 1589), brief conciliation with the Roman Catholic Church (1595–1610)
 - 4. Gonder Ethiopia (1632–1855): alliance with Egyptian Coptic Church, friendly relations with Muslims, rivalry between the Gallas and Tigreans

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

MICROPAEDIA: Selected entries of reference information

General subjects

Adal	Darfur	Kordofān
Aksum,	Ethiopia	Sudan, The
Kingdom of	Ifat	

Biographies

Aḥmad Grāñ	Funj dynasty	Mahdī, al-	Sahle Selassie
Amda Tseyon	Gordon, Charles	Menelik II	Yohannes IV
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- 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
 Indian Ocean Islands

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	

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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
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 2. The development of the Bantu states from c. AD 1400: the Luba and Lunda kingdoms, the Mongo people, the Kongo (Congo) kingdom
 3. Development of Portuguese hegemony over Central Africa from 1491: 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	Ngoy, Kingdom of
Association	Conference	Kuba, Kingdom of	Rwanda,
Internationale	Congo Free State	Loango,	Kingdom of
Africaine	Kakongo,	Kingdom of	Wadai,
Bagirmi,	Kingdom of	Luba-Lunda states	Kingdom of
Kingdom of	Kazembe	Lunda Empire	

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Afonso I	Livingstone, David
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- B. Southern Africa before c. 1500
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 2. The southeast coast trade in the Late Iron Age and interior trade routes to Great Zimbabwe (southwestern Rhodesia), Ingombe Ilede (Zambia), and Mapungubwe (northern Transvaal)
- C. Southern Africa from c. 1500 to c. 1885
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 2. The Portuguese in west central Africa: conquests over the Kongo kingdom (1681) and Ndongo kingdom (early 17th century), control of the slave trade
 3. The Dutch settlement at the Cape of Good Hope from 1652: expansion toward the Orange River and relations with 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
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 - 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
 South 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	Kafraria	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.

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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 Chimú 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

Araucanian	Chimú	Machu Picchu	Paracas
Atacama	El Paraíso	Mochica	Quechua
Chan Chan	Huari	Nazca	Tiahuanaco
Chavín	Inca	Pachacamac	

Biographies

Almagro, Diego de	Huascar	Pizarro, Gonzalo
Atahualpa	Pizarro, Francisco	

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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 Ahuitzotl; 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>
Kaminaljuyú	Tikal	Lacandón	Aztec calendar
Mayapán	Tula	Maya	Mayan calendar
Mitla	Uxmal	Olmec	Quetzalcóatl
Monte Albán	Xochicalco	Toltec	

Biographies

Alvarado, Pedro de	Cuauhtémoc
Cortés, Hernán,	Griljalba, Juan
marqués del Valle	Marina
de Oaxaca	Montezuma II

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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 res secularization 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 1648: 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
 - 2. 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 (Goethe and Schiller), 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

Albania	Denmark	Greece	Malta
Amsterdam	Dublin	Habsburg, The	Manchester
Antwerp	Edinburgh	House of	Marseille
Athens	Elizabeth I of	Hamburg	Mediterranean Sea
Austria	England	Holy Roman	Milan
Bacon, Francis	Europe	Empire, The	Naples
Balkans	European Overseas	History of the	Norway
Barcelona	Exploration and	Hungary	Paris
Berlin	Empires, The	Iceland	Portugal
Bourbon, The	History of	Ireland	Rome
House of	Finland	Italy	Spain
Brussels	Florence	Lisbon	Sweden
Cologne	France	London	Switzerland
Columbus	Frederick the Great	Low	United Kingdom
Cromwell, Oliver	Geneva	Countries, The	Venice
Czechoslovakia	Germany	Madrid	Vienna

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural and</i>	Belgrade, Treaty of	Nordlingen,	Stolbovo, Treaty of
<i>economic:</i>	Blenheim, Battle of	Battle of	Thirty Years' War
Baroque period	Breda, Treaty of	Northern War,	Utrecht, treaties of
bullionism	Cambrai,	First	Vienna, Siege of
Classicism and	League of	Northern War,	Westphalia,
Neoclassicism	Carlowitz,	Second	Peace of
Enlightenment	Treaty of	Oudenaarde,	Wittstock, Battle of
mercantilism	Cateau-Cambresis,	Battle of	<i>national affairs—</i>
physiocrat	Peace of	Pavia, Battle of	<i>Britain:</i>
Renaissance	Devolution,	Poland,	Armada
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<i>relations:</i>	Dutch War	Pragmatic Sanction	Boyne, Battle
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Suggested reading in the *Encyclopædia Britannica*:

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- 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 (1828), 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 Karađorđević 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

Albania	Austria	Berlin	Bulgaria
Amsterdam	Balkans	Bismarck	Cologne
Athens	Barcelona	Budapest	Czechoslovakia

Denmark	International	Mediterranean Sea	Sweden
Dublin	Relations,	Milan	Switzerland
Edinburgh	20th-Century	Moscow	Union of Soviet
Europe	Ireland	Naples	Socialist
Finland	Italy	Napoleon	Republics
Florence	Lisbon	Norway	United Kingdom
France	London	Paris	Venice
Geneva	Low	Poland	Victoria and the
Germany	Countries, The	Portugal	Victorian Age
Greece	Madrid	Prague	Vienna
Hamburg	Malta	Romania	Warsaw
Hungary	Manchester	Rome	Wellington
Iceland	Marseille	Spain	World Wars
			Yugoslavia

MICROPAEDIA: Selected entries of reference information

General subjects

<i>culture:</i>	Pressburg,	Entente Cordiale	Constantinople
capitalism	Treaty of	Europe, Concert of	Agreement
Classicism and	Pyramids, Battle	Franco-German War	Corfu Declaration
Neoclassicism	of the	Greco-Turkish	Dardanelles
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Revolution	Alliance (1813)	Hague Convention	Fourteen Points
laissez-faire	Schönbrunn,	Italo-Turkish War	Isonzo, Battles
Marxism	Treaty of	Königgrätz,	of the
nationalism	Tilsit, Treaties of	Battle of	June Offensive
Romanticism	Toulon, Siege of	Moroccan crises	Jutland, Battle of
Socialism	Trafalgar, Battle of	Neuchâtel crisis	Lusitania
<i>international</i>	Troppau,	Novara, Battle of	Marne, First Battle
<i>relations—French</i>	Congress of	Pan-Slavism	of the
<i>Revolutionary</i>	Ulm, Battle of	power, balance of	Marne, Second
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Batavian Republic	Waterloo, Battle of	Treaty	Paris Peace
Borodino, Battle of	<i>international</i>	Russo-Japanese War	Conference
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and Napoleonic	Balkan Wars	Solferino, Battle of	Verdun, Battle of
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Holy Alliance	1908	Villafranca,	World War I
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Lodi, Battle of	Edirne, Treaty of	<i>World War I and</i>	Clapham Sect
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 Fenian
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 Labour Party
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 Lawrence, 1st
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 Lawrence, T.E.
 Liverpool, Robert
 Banks Jenkinson,
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 Livingstone, David
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 David
 Lugard, Frederick
 John Dealtry
 Lugard, Baron
 Macaulay, Thomas
 Babington
 Macaulay, Baron
 Melbourne (of
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 2nd Viscount
 Napier, Robert
 Napier, 1st Baron
 Nelson, Horatio
 Nelson, Viscount
 Northcote, Sir
 Stafford Henry
 O'Connell, Daniel
 Palmerston, Henry
 John Temple, 3rd
 Viscount
 Parnell, Charles
 Stewart
 Pearce, Patrick
 Henry
 Peel, Sir Robert
 Perceval, Spencer
 Pitt, William, the
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 Henry Cavendish
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 James Henry
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 Redmond, John
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 Frederick Samuel
 Robinson, 1st
 marquess and
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 Rosebery,
 Archibald Philip
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 earl of
 Russell, John
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 Salisbury, Robert
 Cecil, 3rd
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 Colley Wellesley,
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 William IV
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 François-Noël
 Barras,
 Paul-François-
 Jean-Nicolas,
 vicomte de
 Berthier,
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 Boulanger, Georges
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 Jean-Jacques-
 Régis de
 Cambon, Joseph
 Carnot, Lazare
 Caulaincourt,
 Armand,
 marquis de
 Charles X
 Clemenceau,
 Georges
 Couthon, Georges

Danton, Georges
 Decazes, Élie,
 duc de
 Delcassé,
 Théophile
 Desmoulins,
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 Charles-François
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 Barthélemy-Prosper
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 Fouché, Joseph
 Gambetta, Léon
 Guizot, François
 Hébert,
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 Joffre,
 Joseph-Jacques-
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 Marie-Joseph-
 Paul-Yves-
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 Lamartine,
 Alphonse de
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Necker, Jacques
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 Ney, Michel
 Ollivier, Émile
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 Louis-Philippe-Joseph,
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 Pichegru, Charles
 Poincaré,
 Raymond
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 Charles-André,
 comte
 Robespierre,
 Maximilien-François-
 Marie-Isadore 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
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 Graf von
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- | | | | |
|--|---|---|--|
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Graf | Rostopchin,
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| | Alexander III | | María Cristina I |
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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
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- C. Norse, English, Dutch, and Swedish discoveries, explorations, and settlements in North America (c. 1000–1763)
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 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

Boston	New Orleans
Canada	New York City
Columbus	North America
Latin America, The History of	Philadelphia
Montreal	South America

MICROPAEDIA: Selected entries of reference information

General subjects

<i>English and French colonization of North America:</i>	Molasses Act	Sovereign Council	mameluco
Acadia	Monongahela,	Sugar Act	New Granada,
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War	Plymouth	Contratación,	Viceroyalty of the
London Company	Company	Casa de	Santo Domingo
Lost Colony	Powhatan War	corregidor	Spanish treasure
Massachusetts Bay	proprietary colony	donatário	fleet
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<i>English explorers and colonizers:</i>	Williams, Roger	La Vérendrye,	Díaz de Solís,
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 - 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
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 - 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
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 - 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
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 - 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
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 - 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
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 - 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)
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 - 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

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 - 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
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Suggested reading in the *Encyclopædia Britannica*:

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Estrada Palma,	Juárez, Benito	Fonseca, Manuel	Rosas, Juan
Tomás	Madero, Francisco	Deodoro da	Manuel de
Martí (y Pérez),	Maximilian	Guzmán Blanco,	San Martín,
José Julian	Morelos (y Pavón),	Antonio	José de
Morazán,	José María	Haya de la Torre,	Silva Xavier,
Francisco	Santa Anna,	Victor Raúl	Joaquim José da
Toussaint-Louverture	Antonio López de	López, Francisco	Sucre, Antonio
Zelaya, José Santos	Villa, Pancho	Solano	José de
<i>Mexico:</i>	Zapata, Emiliano	Miranda,	Uriburu,
Carranza,	<i>South America:</i>	Francisco de	José Félix
Venustiano	Andrada e Silva,	Mitre, Bartolomé	Urquiza, Justo
	José Bonifácio de	Moreno, Mariano	José de

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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	Labour Party
Australian	Kanaka	Van Diemen's	New Zealand
Colonies	Lambing Flat	Land	Political Reform
Government Act	Riots	White Australia	League
Australian Labor	larrikin	Policy	Waitangi,
Party	Liberal Party of	<i>New Zealand:</i>	Treaty of
Australian	Australia	ANZAC	Young Maori
Patriotic	National Party	Hauhau	Party
Association	New South Wales	Maori King	<i>other:</i>
Black War	Corps	Movement	Melanesia
blackbirding	Port Phillip	Maori	Micronesia
bushranger	Association	Representation	Polynesia
Castle Hill Rising	Port Phillip	Act	
Emancipist	District	Maori Wars	
Eureka Stockade	Rum Rebellion	New Zealand	
Exclusive	squatter	Company	

Biographies

<i>Australia:</i>	Sturt, Charles	<i>other:</i>	Mitchell, Sir
Arthur, Sir George,	Torrens, Sir	Bougainville,	Thomas
1st Baronet	Robert Richard	Louis-Antoine de	Livingstone
Barton, Sir	Wentworth, W.C.	Clunies-Ross	Oxley, John
Edmund	<i>New Zealand:</i>	family	Tasman, Abel
Deakin, Alfred	Kingi, Wiremu	Cook, James	Janszoon
Forrest, Sir John	Massey, William	Dumont d'Urville,	Wakefield,
Hughes, William	Ferguson	Jules-Sébastien-César	Edward Gibbon
Morris	Pomare, Sir Maui	Flinders, Matthew	Weld, Sir
Macarthur, John	Seddon, Richard	Kamehameha I	Frederick
Parkes, Sir Henry	John	Kamehameha IV	Aloysius

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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 Marāthās 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): 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
Indian Ocean Islands
Nepal
Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

<i>colonial</i>	Rowlett Acts	Sobraon, Battle of	Servants of India
<i>administration and</i>	Sadr Diwānī 'Adlāt	Vellore Mutiny	Society
<i>policy:</i>	Thesavalamai	Wandiwāsh,	<i>treaties:</i>
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Cameron	Massacre of	Kandy,	Treaties of
Commission	Baksar, Battle of	kingdom of	Bassein, Treaty of
Cornwallis Code	Barrackpore	Saint David, Fort	Kandyan
dastak	Mutiny	Saint George, Fort	Convention
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Durand Line	Carnatic Wars	<i>and movements:</i>	Convention of
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McMahon Line	Rohilla War	Non-cooperation	
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Biographies*Britons:*

Auckland, George
Eden, earl of
Bentinck, Lord
William
Canning, Charles
John Canning,
Earl
Chelmsford,
Frederic John
Napier Thesiger,
1st Viscount and
3rd Baron
Clive, Robert, 1st
Baron Clive of
Plassey
Coote, Sir Eyre
Curzon (of
Kedleston),
George Nathaniel
Curzon,
Marquess
Dalhousie,
James Andrew
Broun Ramsay,
marquess and
10th earl of
Ellenborough,
Edward Law,
earl of

Elphinstone,
Mountstuart
Fitch, Ralph
Frere, Sir Bartle
Hastings, Francis
Rawdon-Hastings,
1st marquess of
Hastings, Warren
Hume, Allan
Octavian
Lansdowne, Henry
Charles Keith
Petty-Fitzmaurice,
5th marquess of
Lawrence,
Sir Henry
Montgomery
Lawrence (of the
Punjab and of
Grately), John
Laird Mair
Lawrence, 1st
Baron
Lytton, Robert
Bulwer-Lytton,
1st earl of
Mayo, Richard
Southwell
Bourke, 6th
earl of

Metcalf (of Fern
Hill), Charles T.
Metcalf, Baron
Minto, Gilbert
Elliot-Murray-
Kynynmound, 1st
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Minto,
Gilbert John
Elliot-Murray-
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Napier of Magdala,
Robert Napier,
1st Baron
Outram, Sir James
Ripon, George
Frederick Samuel
Robinson, 1st
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Dalip Singh
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Mir Ja'far
Ram Singh
Ray, Rammohan
Sankaran Nair,
Sir Chettur
Sapru, Sir Tej
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Shāh 'Ālam II
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a. Burma 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 Burmese administration
- ii. The Third Anglo-Burmese War (1885) and union with British India (1886): effects of British colonialism

b. Malaya from c. 1630 to c. 1920: loss of autonomy through Dutch and British intrusions

- i. Dutch intervention in the Malay states (1633), immigration (c. 1650) of Minangkabau and Bugis people from Sumatra
- ii. British invasions in Malaya (1795), clashes between Malays and Chinese immigrants (1874), British intervention and assumption of power from sultanates of Malaya

2. Indochina and the development of French rule from c. 1615

- a. Portuguese and French missionary involvement in Vietnam and Vietnamese reaction (1615–1858), 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, Tongking, 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. Burmese invasion (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
Burma
East Indies, The
Philippines
Southeast Asia, Mainland

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Indonesian</i>	Muhammadiyah	Annam	Pangkor
<i>Archipelago:</i>	Padri War	Barrackpore	Engagement
Achinese War	Peranakan	Mutiny	Perak War
Amboina	Perhimpunan	Bowring Treaty	Phaulkon-Tachand
Massacre	Indonesia	Cochinchina	conspiracy
Budi Utomo	priyayi	Ghee Hin	Saigon, Treaty of
Buginese	Sarekat Islām	Hai San	Selangor Civil War
Culture System	Volksraad	Hlutdaw	Sino-French War
Dutch East Indies	<i>mainland Southeast</i>	Indochina	Straits Settlements
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Gianti Agreement	Anglo-Burmese	Pahang Civil War	<i>Philippine Islands:</i>
Mataram	Wars		barangay

Cavite Mutiny Friar Lands Question	Manila Bay, Battle of Manila galleon	Philippine Insurrection Philippine Revolution	Spanish–American War Spooner Amendment
Biographies			
<i>Burma:</i>	Pétrus Ky	Burgos, José	Coen, Jan
Alaungpaya	Phan Boi Chau	Mabini, Apolinario	Pieterszoon
Alaungpaya dynasty	Phan Chau Trinh	Osmeña Sergio	Dewey, George
Bagyidaw	Phan Thanh Gian	Quezon, Manuel	Dupré, Marie-Jules
Bandula, Maha	Siribunyan	Rizal, José	Dupuis, Jean
Bodawpaya	Tay Son brothers	<i>Siam and Malaya:</i>	Garnier, Francis
Hsinbyushin	<i>Indonesian</i>	Chakkri dynasty	Legazpi, Miguel
Mindon	<i>Archipelago:</i>	Chulalongkorn	Lôpes de
Nanada Bayin	Agung	Damrong	Pavie, Auguste
Pagan	Dachlan, Kijai	Rajanubhab	Phaulkon,
Toungoo dynasty	Hadji Ahmad	Devawongse	Constantine
<i>Indochina:</i>	Dewantoro, Ki	Varsprakar,	Phayre, Sir
Anu, Chao	Hadjar	Prince	Arthur Purves
Chan II	Dipo Negoro,	Idris ibn Raja	Philastre,
Chanthakuman	Pangeran	Iskandar, Sultan	Paul-Louis-Félix
Cuong De	Imam Bondjol	Mongkut	Pigneau de
De Tham	Iskandar Muda	Narai	Béhaine,
Deo Van Tri	Kartini, Raden	Phetracha	Pierre-Joseph-
Duy Tan	Adjeng	Rama I	Georges
Gia Long	Tjokroaminoto,	Vajiravudh	Poivre, Pierre
Later Le dynasty	Omar Said	<i>other:</i>	Rhodes,
Le Van Duyet	Wahidin	Bonard,	Alexandre de
Minh Mang	Sudirohusodo,	Louis-Adolphe	Rigault de
Nguyen dynasty	Mas Ngabehi	Brooke Raj	Genouilly,
Norodom	<i>Philippine Islands:</i>	Clifford, Sir Hugh	Charles
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	Bonifacio, Andres		

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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: anti-foreign 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>	T'ung-wen kuan	kazoku	Root-Takahira
Chinese	<i>China—international relations:</i>	Meiji Restoration	Agreement
Revolution	Boxer Rebellion	Paulownia Sun, Order of the	Russo-Japanese War
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Hundred Days of Reform	Open Door policy	Gentlemen's Agreement	South Manchurian Railway
Kiangnan Arsenal	Opium Wars	Lansing-Ishii Agreement	treaty port
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Taiping Rebellion	<i>Japan—domestic affairs:</i>		
Three Principles of the People	Charter Oath		
	genrō		
	Kaishintō		

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	Hakushaku
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	Aritome,	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	
Hakushaku	Sanjō Sanetomi,	Lay, Horatio	
Maebara Issei	Koshaku	Nelson	
Matsudaira	Shibusawa Eiichi,	Macartney,	
Yoshinaga	Shishaku	George	
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Koshaku			

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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 ‘Alī 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 Barakzai 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 Menelek 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
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 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 Nationalist 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

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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 Macedonian question Mudros, Armistice of Navarino, Battle of Ottoman Empire Pan-Turanianism	Pan-Turkism Plevna, 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 <i>sub-Saharan Africa:</i> 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 Rwanda, Kingdom of Royal Niger Company Somaliland South Africa Act South African War	Togoland Tukulor Empire Ucciali, Treaty of uitlander Vereeniging, Peace of Wadai, Kingdom of Zanzibar Treaty <i>other:</i> Durrand Line King-Crane Commission Mizrahi Zionism
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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.

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b. Diplomacy after the Paris Peace Conference (1919–20): establishment of the League of Nations; U.S., Soviet Russian, and German diplomatic isolation; crises concerning enforcement of the peace settlement

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- 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)
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 - iii. The UN as a Western organization
 - b. Reconstruction and European political instability
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 - iii. East-West involvement in Africa south of the Sahara
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with international affairs since 1920

Europe
 International Relations, 20th-Century
 World Wars

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General subjects

<i>between the World Wars:</i>	Lausanne Conference (1923)	Russo-Polish War	Arab-Israeli wars
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- ii. British colonial and Commonwealth relations (1920–39): division of Ireland into the Irish Free State (after 1937 named Eire) and Northern 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), Thatcher government (from 1979), Falklands war with Argentina (1982), European Communities budget controversy

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- ii. Northern Ireland since 1922: growing antagonism between Roman Catholics and Protestants, economic stagnation, continuing violence

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- 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)

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 - ii. Rapprochement with Germany, conquest of Ethiopia, effects of the Great Depression, Italian participation in World War II, the fall of Mussolini
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 - 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
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 - 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
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 - ii. The Second Republic: independence in 1945, Allied occupation to 1955, restoration of sovereignty and establishment as a neutral state (1955), Kreisky’s Socialist government (1970–83), coalition government under Sinowatz
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- ii. Discontent among Sudeten German and Slovak minorities: attempts at rapprochement with Germany, the Munich agreement (1938) and German takeover of Czechoslovakia, participation in World War II
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 - c. German invasion and Axis occupation (1940–45): resistance movements and Communist leadership of the partisans
 - d. Postwar developments: 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); Greek military dictatorship (1967–74); return to civilian rule and repudiation of the monarchy (1974); leftist government under Papandreou from 1980; entry into the European Economic Community (1981); Albanian alignment with China (1961–78); increasing international isolation; Romanian nationalism and independence in foreign policy
- 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

Albania	Denmark	International	Manchester
Amsterdam	Dublin	Relations,	Marseille
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Austria	Finland	Italy	Moscow
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Stalin
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Union of Soviet
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| <i>France:</i> | Hitler Youth | Korfanty Line | secret speech |
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| Republican | National Socialism | International | Opposition |
| Movement | Nazi Party | Brigades | <i>United Kingdom:</i> |
| Radical-Socialist | Nürnberg Rally | Rif War | Britain, Battle of |
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| Rally for the | Oder-Neisse Line | Spanish Socialist | Party |
| Republic | Odessa | Workers' Party | general strike |
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| Anschluss | Social Democratic | Accident | Scottish National |
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| Dawes Plan | Irish Republican | German-Soviet | Council of |
| Drang nach Osten | Army | Nonaggression | National |
| East Prussia | Labour Party | Pact | Liberation of |
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 - b. Reform measures of the second New Deal and the election of 1936
 - 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
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- ii. Programs of the Fair Deal: the conversion to a peacetime economy, labour disputes and inflation, the Taft–Hartley Act (1947), the Social Security Act (1950)
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 - iii. Celebration of the bicentennial of the Declaration of Independence (1976), the election of 1976
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- g. Scientific advances in the 1960s, 1970s, and 1980s: nuclear weapons technology, space exploration and development of the space shuttle, the computer revolution
- 5. Cultural developments since the 1920s: the influence of the mass media on popular arts; developments in literature, philosophy, and the visual arts—the weakening of the legacy of European culture and traditions

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 - 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), Canada's constitution (1982), Progressive Conservative government from 1984

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the United States and Canada since 1920

Canada
 North America
 Roosevelt, Franklin D.
 United States of America

MICROPAEDIA: Selected entries of reference information; see also Sections 965 and 971

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- iii. Cuba under Castro: nationalization of foreign-owned property, Cuban emigration, alignment with the Soviet bloc, the 1962 missile crisis, the effort to form a Socialist society, second wave of emigration in 1980, military involvement in Africa
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 - 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)

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- a. The presidency of Alessandri Palma (1920–24, 1925), military coup (1924), return to civilian rule (1925), constitution of 1925 and reduction of legislative power, 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)

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- 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 Ugarte, political repression, economic experimentation and difficulties

F. Argentina, Uruguay, and Paraguay since c. 1930

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- 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 Falklands/Malvinas and defeat by Britain (1982), return to civilian rule under Alfonsín (1983), foreign debt problems

2. Uruguay since 1929

- a. The Great Depression, dictatorship of Gabriel Terra (1933–38), election of Alfredo Baldomir (1938), Uruguayan neutrality until 1945, economic boom and social 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 restoration of presidential powers (1966), Tupamaro insurgency, dismissal of Congress (1973) and assumption of effective control by the military, severe recession of the early 1980s, restoration of civilian government (1985)

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- 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 since 1954

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: restoration of civil and personal liberties and representative government, outlawing of Communist Party (1947)
- b. Re-election of Vargas (1950), economic crises and governmental corruption, Vargas' forced resignation and suicide (1954)
- c. Interim presidency of João Café Filho (1954), election of Juscelino Kubitschek as president and João Goulart as vice president (1955), economic development and inflation

- d. Election of Jânio Quadros as president and Goulart's re-election as vice president (1960), Quadros' resignation (1961), governmental opposition to Goulart, parliamentary experiment with figurehead president and prime minister as head of state, 1963 plebiscite giving Goulart full presidential powers
- e. Social and economic unrest: re-emergence of Communist Party, nationalization of oil refineries, revolution and exile of Goulart (1964), Pascoal Ranieri Mazzilli as interim president and beginning of military rule
- f. Castelo Branco's presidency (1964–67): the First, Second, and Third Institutional acts; suspension of existing political parties; creation of artificial two-party system; constitution of 1967
- g. The presidencies of Costa e Silva, Médici, Geisel, and Figueiredo after 1967: economic growth and reduction of inflation; the constitution of 1967; moves toward democratization; end of controlled two-party system (1979) and formation of new parties; gains by the opposition party in the election of 1982; increased concentration of authority in central government (1983); recession, resurgent inflation, and foreign debt problems of the early 1980s, return to civilian government (1985)
- h. Social developments since 1945: urbanization and education, increased electorate, role of the church and the military in national politics

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	Guianas, The	Mexico City	Uruguay
Buenos Aires	Havana	Paraguay	Venezuela
Central America	Latin America,	Peru	West Indies
Chile	The History of	Rio de Janeiro	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Central America and the Caribbean:</i>	Communist Party of Cuba	<i>Mexico:</i>	descamisado
Bay of Pigs invasion	Cuban missile crisis	Indigenismo	Estado Novo
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Central American Common Market	26th of July Movement	Sinarquismo	Rio de Janeiro, Protocol of
	West Indies Associated States	<i>South America:</i>	Shining Path
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Biographies

<i>Central America and the Caribbean:</i>	Somoza Debayle, Anastasio	Cárdenas, Lázaro	Frei (Montalva), Eduardo
Arias Sánchez, Oscar	Torrijos (Herrera), Omar	Echeverría (Álvarez), Luis	Haya de la Torre, Víctor Raúl
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 - ii. Conflict over entry into the war, formation of a rival southern government, changes brought about by the war
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 - 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
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 - a. Origins and background of modern ideologies: social and political conditions, China's ideological heritage
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 - 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
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 - 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)
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- e. Internal affairs: the 10th Congress of the CCP (August 1973) and the fourth National People's Congress and new national constitution (January 1975), death of Zhou Enlai (January 1976) and factional strife, death of Mao Zedong (September 1976), ascendancy of Deng Xiaoping disgrace and conviction of Maoist Gang of Four, new party and national constitutions (1982), changes in economic structure and introduction of economic incentives
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 - 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
 - b. Antigovernment acts: the seizure of initiative in foreign policy by the military, the outbreak of war with China (1937), Axis leanings
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 - c. South Korea since the armistice: the regimes of Syngman Rhee (1948–60) and Park Chung Hee (1961–79), the assassination of Park and its consequences, economic growth

- 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

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
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MICROPAEDIA: Selected entries of reference information; see also Sections 96/10 and 971

General subjects

<i>China:</i>	May Thirtieth Incident	Japan Socialist Party	Nationalist Party
Chinese Communist Party	Nationalist Party	kamikaze	Pueblo Incident
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May Fourth Movement	Democratic Socialist Party	Korean Provisional Government	Sino-Japanese War (1937-45)
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Biographies

<i>China:</i>	Soong	Kawakami Hajime	Yamamoto
Chang Kuo-t'ao	Ch'ing-ling	Kishi Nobusuke	Gonnohyōe
Chang Ping-lin	Soong, T.V.	Konoe Fumimaro,	Yamamoto
Chen Boda	Soong family	Kōshaku	Isoroku
Chen Duxiu	Sun Yat-sen	Miki Kiyoshi	Yoshida Shigeru
Chiang Ching-kuo	Ts'ai Yüan-p'ei	Miki Takeo	Yoshino Sakuzō
Chiang Kai-shek	Tuan Ch'i-jui	Minobe Tatsukichi	<i>Korea:</i>
Chiang K'ang-hu	Wang Ching-wei	Nagano Osami	Chun Doo Hwan
Deng Xiaoping	Yüan Shih-k'ai	Nosaka Sanzō	Kim Chong Il
Feng Yü-hsiang	Zhao Ziyang	Okawa Shūmei	Kim Dae Jung
Guo Moruo	Zhou Enlai	Ōkuma Shigenobu,	Kim Il-sung
Hu Han-min	Zhu De	Kōshaku	Kim Young Sam
Hu Shih	<i>Japan:</i>	Satō Eisaku	Park Chung Hee
Hu Yaobang	Araki Sadao	Shidehara Kijūrō	Rhee, Syngman
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Jiang Qing	Toguri	Tanaka Giichi	Hurley, Patrick J.
Kang Sheng	Hamaguchi Osachi	Tanaka Kakue	MacArthur,
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Li Dazhao	Hirohito	Ugaki	Reischauer,
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 - b. The Government of India Act (1935), the political and economic effects of World War II, partition and independence (1947), Hindu-Muslim polarization
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 - b. Military government of Ayub Khan (1958–69); economic and political reforms; relations with India and the Western and Socialist powers; administration of Yahya Khan (1969–71); civil war between East and West Pakistan and secession of East Pakistan (Bangladesh, since 1971); administrations of Zulfikar Ali Bhutto (1971–77) and Mohammad Zia ul-Haq; Pakistan under martial law; unrest in North-West Frontier Province, Baluchistan, and Sind; repercussions of Soviet invasion of Afghanistan (1979)
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 - a. Nationalism and the demand for constitutional reform (1920–31), the 1931 constitution, effect of World War II
 - b. Dominion status (1947) and rule by United National Party government (1948–56, 1965–70, and after 1977); Sri Lanka Freedom Party leadership and administrations of S.W.R.D. Bandaranaike (1956–59), Sirimavo Bandaranaike (1960–65, 1970–77), and J.R. Jayawardene; the constitutions of 1972 and 1978; Sinhalese-Tamil tensions; anti-Tamil riots (1983) and continuing unrest
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 - b. Postwar independence (1948) under U Nu, adoption of leftist-neutralist position, internal conflict and military government under U Ne Win after 1962, continued economic problems, socialist state and new constitution (1974), minority insurgencies, U Ne Win's retirement from government (1981)
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- b. Suppression of Communist insurgents (1948–60), creation of Federation of Malaya (1957) and reestablishment as Malaysia (1963), Singapore's withdrawal (1965) from Malaysia and creation of independent Republic of Singapore, dominance of National Front in Malaysia, regime of Lee Kuan Yew in Singapore (from 1965), industrialization and growing prosperity
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 - b. Loss of wartime gains and political instability, military domination (1947–68, 1971–73, and since 1976), border incursions from Cambodia and influx of refugees
 - 4. Indochina since 1920: emergence of independent states and continued strife
 - a. French direct administration of Vietnam and indirect administration of Cambodia and Laos: growth of Vietnamese nationalistic movements and Ho Chi Minh's formation of the Indochina Communist Party (1930), French administration during 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 Agreements and legal "temporary" division of Vietnam (1954), French withdrawal and U.S. limited 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)
 - 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
 - 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; return, and then resignation, of Sihanouk (1975); new constitution of Democratic Kampuchea (1976); ruthless administration and designation of the Communist Party of Kampuchea as the governing body (1977); capture of Phnom Penh by Vietnamese forces (1979) and establishment of Vietnamese-dominated regime; formation of coalition government-in-exile supported by Association of Southeast Asian Nations (1982)
- C. Indonesia and the Philippines
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 - a. Dutch administration of Indonesia from 1920 to independence in 1949
 - i. Dutch administrative 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), purge of Communists, and Sukarno's loss of influence; administration of Suharto (from 1966); takeover of East Timor (1976); economic effects of the oil boom
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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	East Indies, The	Indian Ocean	Philippines
Bangladesh	Gandhi	Islands	Southeast Asia,
Burma	Hong Kong	Nepal	Mainland
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General subjects

<i>Indian subcontinent:</i>	Servants of India	Viet Cong	Hare-Hawes-
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Biographies

<i>Burma and Thailand:</i>	Bandaranaike,	Menon, V.K.	Chu Van Tan
Aung San	S.W.R.D.	Krishna	Cuong De
Ba Maw	Bhutto,	Naidu, Sarojini	Ho Chi Minh
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 2. World War II in the Pacific: the rise and fall of Japanese power, effects of the war on indigenous peoples
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Australia and Oceania since 1920

Australia
 Melbourne
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- v. Kenya: independence (1963) and subsequent domestic politics and foreign relations under Kenyatta's leadership, death of Kenyatta (1978) and succession of Daniel arap Moi, establishment of one-party state (1982)
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 - ii. Central African Republic: independence (1960), subsequent domestic politics and foreign relations, establishment and overthrow (1979) of Central African Empire under Bokassa I
 - iii. The People's Republic of the Congo: independence (1960), ethnic rivalries, domestic politics and foreign relations
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 - v. Burundi and Rwanda: independence (1962), overthrow of Ntare V of Burundi (1966), warfare between Tutsi and Hutu (early 1970s)
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 - ii. White-settler control of Southern Rhodesia: relations with Northern Rhodesia and Nyasaland; colonial government economic, social, and political discrimination against black Africans; Portuguese rule in Angola and Mozambique
 - iii. Indian, Coloured, and black African responses to colonial government-sanctioned 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
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 - iii. Botswana, Lesotho, and Swaziland: British administration of the High Commission Territories, independence (1966, 1968), subsequent relations with South Africa
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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	Sudan
Africa	Eastern Africa	Lebanon	Syria
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General subjects

<i>central Africa:</i>	Druze revolt	<i>North Africa:</i>	banning
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<i>central Africa:</i>	<i>eastern Africa:</i>	<i>Middle East—Egypt:</i>	Zaghlūl, Sa'd
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Bokassa, Eddine	Kenyatta, Jomo	Luṭfi as-Sayyid,	Aḥad Ha'am
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Obote, Milton	Mohammad	Abdel	Peres, Shimon
Tshombe, Moise	Reza Shah Pahlavi	Sādāt, Anwar el-	Shamir, Yitzḥak

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Middle East—other
Arab:
‘Aflaq, Michel
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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. On the one, 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 I. Logic 479
 - II. Mathematics 483
 - III. Science 492
 - IV. History and the Humanities 509
 - V. Philosophy 513

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		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	deduction	modus ponens and	rhetoric
proposition	dichotomy	modus tollens	set theory
axiom	dilemma	mood	sylogistic
axiomatic method	enthymeme	predicate calculus	
categorical	formal system	predication	
proposition	logic	propositional	
condition	metalogic	calculus	
conjunction	modal logic	recursive function	
conversion	modality	reduction	

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 problem transitive law
Bessel function	method of	metatheory	
Boolean algebra	fluxion	Riemannian	
derivative	hyperbolic	geometry	
Dirichlet's theorem	geometry	stochastic process	

Biographies

Abel, Niels Henrik	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	Poisson,
Bernoulli, Daniel	Alexandria	Legendre,	Siméon-Denis
Bernoulli, Johann	Euclid	Adrien-Marie	Ramanujan,
Birkhoff, George	Eudoxos of Cnidus	Leibniz, Gottfried	Srinivasa
David	Euler, Leonhard	Wilhelm	Regiomontanus
Bolyai, János	Fermat, Pierre de	Leonardo Pisano	Riemann,
Boole, George	Fourier, Joseph,	Liouville, Joseph	Bernhard
Brouwer, L.E.J.	Baron	Lobachevsky,	Steiner, Jakob
Cantor, Georg	Frege, Gottlob	Nikolay	Sylvester, James
Carathéodory,	Galois, Évariste	Ivanovich	Joseph
Constantin	Hamilton, Sir	Maclaurin, Colin	Thales of Miletus
Cauchy,	William Rowan	Moivre,	Wallis, John
Augustin-Louis,	Hero of Alexandria	Abraham de	Weierstrass, Karl
Baron	Hilbert, David	Noether, Emmy	
Cayley, Arthur	Kolmogorov, A.N.	Oresme, Nicholas	

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	Matrix Theory
Analysis (in Mathematics)	Number Theory
Arithmetic	Probability Theory
Combinatorics and Combinatorial	Set Theory
Geometry	Trigonometry
Geometry	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>algebra</i> :	exact equation	Riemann zeta	transfinite number
algebra	infinite series	function	Zermelo-Fraenkel
binomial theorem	integration	<i>geometry</i> :	axiom
discriminant	Laplace’s equation	algebraic geometry	<i>topology</i> :
eigenvalue	Markov process	analytical geometry	compactness
exponential	mean-value	Desargues’s	connectedness
function	theorem	theorem	Euler characteristic
Gauss elimination	ordinary	differential	fixed-point
harmonic function	differential	geometry	theorem
homotopy	equation	duality	four-colour map
linear equation	parabolic equation	fractal	problem
logarithm	partial differential	geometry	homology
matrix	equation	hyperbolic	metric space
parameter	perturbation	geometry	topological space
quarter squares	probability theory	projection	<i>other</i> :
root	singular solution	projective	arithmetic function
<i>analysis</i> :	stochastic process	geometry	graph
analysis	<i>combinatorics and</i>	Riemannian	graph theory
calculus	<i>number theory</i> :	geometry	mathematics
differential	combinatorics	<i>set theory</i> :	normal
equation	Fermat prime	Boolean algebra	distribution
differentiation	number theory	Dedekind cut	number system
Dirichlet problem	permutations and	measure	numeral system
elliptic equation	combinations	set theory	trigonometry

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 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.E.]
3. Mechanics of solids
[see also 126.C.]
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
[see also 10/22.C.6.]
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	Information Science
Computer Science	Numerical Analysis
Computers	Optimization, The
Game Theory	Mathematical Theory of
Information Processing	Statistics

MICROPAEDIA: Selected entries of reference information

General subjects

<i>computers and other</i>	input/output	linear	statistics
<i>mathematical</i>	device	programming	Student's t-test
<i>devices:</i>	integrator	mathematical	<i>other:</i>
abacus	microprocessor	programming	algorithm
analogue computer	planimeter	optimization	artificial
calculator	quipu	queuing theory	intelligence
central processing	slide rule	<i>statistics:</i>	automata theory
unit	supercomputer	decision theory	distortion
computer	time-sharing	distribution	dimensional
programs	<i>numerical analysis:</i>	function	analysis
computer	difference equation	estimation	eigenvalue
programming	interpolation	freedom, degree of	fractal
language	numerical analysis	inference	gamma function
differential	<i>optimization:</i>	mean	graph
analyzer	control theory	normal	graph theory
differentiator	cybernetics	distribution	information theory
digital computer	game theory	point estimation	mathematical
harmonic analyzer		sampling	model
			pi theorem

Biographies

Babbage, Charles	Neumann,	Turing, Alan	Wiener, Norbert
Boole, George	John von	M(athison)	
Napier, John	Pascal, Blaise	Weyl, Herman	

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 geological, 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 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	Measurement	the Branches of	History of
Kelvin	Theory	Knowledge	
	Newton		

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 Mendeleyev 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 I, 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	Heisenberg	Newton	Physical
Copernicus	Helmholtz	Pascal	Sciences, The
Einstein	Kepler	Philosophies of	Planck
Faraday	Lavoisier	the Branches of	Rutherford
Galileo	Maxwell	Knowledge	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>major fields and component disciplines:</i>	fluid mechanics	statistical mechanics	bubble chamber
aerodynamics	infrared astronomy	thermodynamics	centrifuge
astronomy	mechanics	ultraviolet	chromatography
biochemistry	optics	astronomy	cloud chamber
celestial mechanics	physics	<i>methodology and instrumentation:</i>	digital computer
chemistry	quantum mechanics	astronomical observatory	laser
cosmology	radio and radar astronomy		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
Amazaspovich
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
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
Libby, Willard F.
Liebig, Justus,
Freiherr von
Mendeleyev,
Dmitry Ivanovich
Mulliken, Robert
Sanderson
Pasteur, Louis

Pauling, Linus
Priestley, Joseph
Ramsay, Sir
William
Rose family
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
Goeppert
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

INDEX: See entries under all of the terms above

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. Geological 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. Geological 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. Geological sciences
 - i. The development of crystallography and the classification of minerals and rocks
 - ii. The concept of faunal succession and organic evolution: 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 geological 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. Geological sciences
 - i. Development of radiometric dating
 - ii. The experimental study of rocks: experimental petrology

- iii. Development of seismology: the study of the internal structure of the Earth
 - iv. Astrogeological 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: an outgrowth 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 particular 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
 - 2. The geological sciences: mineralogy, petrology, economic geology, and geochemistry; geodesy, geophysics, structural geology, and volcanology; geomorphology; glacial geology; engineering, environmental, and urban geology; historical geology, paleontology, stratigraphy, and astrogeology
 - 3. The hydrologic sciences: hydrology, limnology, glaciology, oceanography
 - 4. The atmospheric sciences: meteorology, climatology, aeronomy; the study of the atmospheres of other planets
[see 223 and 723.G.5.]

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</i>	geology	palynology	bathyscaphe
<i>disciplines:</i>	geomorphology	pedology	bathymetograph
astrogeology	geophysics	petrology	dating
bioclimatology	hydrology	sedimentology	digital computer
chemical	hydrometeorology	seismology	gravimeter
hydrology	marine geology	structural geology	ionization chamber
climatology	marine geophysics	tectonics	magnetometer
dendrochronology	meteorology	volcanology	radiosonde
economic geology	mineralogy	<i>methodology and</i>	Richter scale
environmental	oceanography	<i>instrumentation:</i>	seismograph
geology	paleoclimatology	aerial photography	weather map
geochemistry	paleogeography	barometer	
geochronology	paleogeology	bathymetry	

other:

International
Geophysical Year

Biographies

Agassiz, Louis	Gilbert,	Maury, Matthew	Simpson, George
Agricola, Georgius	Grove Karl	Fontaine	Gaylord
Bjerknes, Vilhelm	Goldschmidt,	Mohorovičić,	Smith, William
F.K.	Victor Moritz	Andrija	Suess, Eduard
Buch, Leopold,	Hess, H.H.	Powell, John	Van Hise, Charles
Freiherr von	Holmes, Arthur	Wesley	Richard
Cuvier, Georges,	Humboldt,	Press, Frank	Vernadsky,
Baron	Alexander von	Romer, Alfred	Vladimir
Dana, James D.	Hutton, James	Sherwood	Ivanovich
Daubré,	Köppen, Wladimir	Runcorn, Stanley	Werner, Abraham
Gabriel-Auguste	Leonardi, Piero	Keith	Gottlob
Ekman, V. Walfrid	Lyell, Sir Charles		

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, taxonomy

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
 Darwin
 Genetics and Heredity, The Principles of
 Harvey
 Pasteur
 Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

<i>component disciplines:</i>	ethology	paleontology	classification
agrostology	eugenics	palynology	electrophoresis
anatomy	exobiology	parasitology	fluoroscope
biogeography	genetic engineering	physiology	microscope
biology	genetics	protozoology	nuclear magnetic
biophysics	herpetology	synecology	resonance
biotechnology	human ecology	taxonomy	radioactive isotope
botany	ichthyology	teratology	spectroscopy
cytology	mammalogy	zoology	testcross
ecology	microbiology	<i>methodology and</i>	
embryology	molecular biology	<i>instrumentation:</i>	
entomology	morphology	centrifuge	
	ornithology	chromatography	

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-Baptiste	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	Gray, Asa	Konrad
Elton, Charles	Harry Compton		

Stakman, Elvin	Hérèlle, 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 malignant disease through the application of radiation therapy
 - 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 423.C.2.a.]
 - c. Obstetrics and gynecology
[see 423.F.5.f.]

- d. Urology
[see 423.F.7.]
- e. Ophthalmology and otolaryngology
[see 423.F.9.f. and g.]
- f. Neurology
[see 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
[see 424.B.]
 - 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	gastroenterology	ophthalmology	plastic surgery
anesthesiology	gerontology and	oral surgery	podiatry
cardiology	geriatrics	orthodontics	prosthodontics
dentistry	hematology	orthopedics	psychiatry
dermatology	homeopathy	osteopathy	public health
emergency	immunology	otolaryngology	radiology
medicine	internal medicine	pathology	sports medicine
endocrinology	nephrology	pediatrics	surgery
endodontics	neurology	pedodontics	toxicology
epidemiology	nursing	peridontics	tropical medicine
family practice	obstetrics and	pharmacology	urology
forensic medicine	gynecology	pharmacy	

Biographies

Alexander, Franz	Bekhterev,	Carrel, Alexis	Fleming, Sir
Avicenna	Vladimir	Cohn, Ferdinand	Alexander
Barnard,	Mikhaylovich	De Bakey, Michael	Fracastoro,
Christiaan	Blackwell,	Ellis	Girolamo
Barnard, Claude	Elizabeth	Ehrlich, Paul	Freud, Sigmund
	Blalock, Alfred		Galvani, Luigi

Gesell, Arnold	Malpighi, Marcello	Paracelsus	Semmelweis, Ignaz
Harvey, William	Mayo family	Reed, Walter	Philipp
Hippocrates	Menninger family	Rush, Benjamin	Vesalius, Andreas
Jenner, Edward	Meyer, Adolf	Salk, Jonas	Virchow, Rudolf
Jung, Carl	Nightingale, Florence	Edward	
Koch, Robert	Osler, Sir William	Séguin, Edouard	
Lister, Joseph			

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 Part Five, Division I]
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

Freud	Smith, Adam
Geography	Psychology
Marxism, Marx and	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>anthropology and allied disciplines:</i>	Keynesian economics	sociolinguistics	experimental psychology
anthropological	macroeconomics	structural linguistics	functionalism
linguistics	managerial economics	synchronic linguistics	Gestalt psychology
anthropology	welfare economics	<i>political science:</i>	humanistic psychology
ethnography	<i>linguistics:</i>	geopolitics	individual psychology
neoevolutionism	anthropological linguistics	political science	industrial psychology
particularism	comparative linguistics	<i>psychology:</i>	analytic psychology
structuralism	linguistics	psychology	physiological psychology
<i>economics:</i>	computational linguistics	applied psychology	psychology
Austrian school of economics	dialectology	behaviourism	social psychology
classical economics	ethnolinguistics	clinical psychology	<i>other:</i>
econometrics	historical linguistics	comparative psychology	criminology
economics	linguistics	developmental psychology	demography
historical school of economics	linguistics	psychology	geography
institutional economics	neurolinguistics	educational psychology	penology
	semiotics		sociology

Biographies

<i>anthropologists:</i>	Lauderdale, James	Ritter, Carl	Meyer, Adolf
Benedict, Ruth	Maitland, 8th	Strabo	Piaget, Jean
Boas, Franz	earl of	Varenius,	Rank, Otto
Dart, Raymond	Malthus, Thomas	Bernhardus	Skinner, B.F.
Arthur	Robert	Vidal de La	Thorndike,
Frazer, Sir James	Marshall, Alfred	Blache, Paul	Edward Lee
George	Marx, Karl	<i>linguists:</i>	Thurstone, L.L.
Hale, Horatio	Myrdal,	Chomsky, (Avram)	Watson, John B.
Emmons	Gunnar	Noam	Wertheimer, Max
Kroeber, Alfred	Pareto, Vilfredo	Jakobson, Roman	<i>sociologists:</i>
Louis	Ricardo, David	Jespersen, Otto	Beccaria, Cesare
Leakey, L.S.B.	Samuelson, Paul	Kimhi, David	Comte, Auguste
Leakey, Richard	Sismonde de	Lomonosov,	Cooley, Charles
Lévi-Strauss,	Sismondi, J.C.L.	Mikhail	Horton
Claude	Tawney, Richard	Vasilyevich	Durkheim, Émile
Malinowski,	Henry	Rask, Rasmus	Frazier,
Bronisław	Veblen, Thorstein	Saussure,	E. Franklin
Mead, Margaret	<i>geographers:</i>	Ferdinand de	Geiger, Theodor
Morgan, Lewis	Davis, William	Schleicher, August	Julius
Henry	Morris	<i>psychologists:</i>	Lazarsfeld, Paul
Radin, Paul	Hettner, Alfred	Bleuler, Eugen	Felix
Redfield, Robert	Humboldt,	Bruner, Jerome S.	MacIver, Robert
Sapir, Edward	Alexander von	Cattell, James	Morrison
Thurnwald,	Idrisi,	McKeen	Mauss, Marcel
Richard	ash-Sharif al-	Fechner, Gustav	Merton, Robert K.
Tozzer, Alfred M.	Mackinder, Sir	Theodor	Mumford, Lewis
Taylor, Sir Edward	Halford John	Fromm, Erich	Parsons, Talcott
Burnett	Marsh, George	Hall, G. Stanley	Ratzenhofer,
<i>economists:</i>	Perkins	Hull, Clark L.	Gustav
Bagehot, Walter	Mercator,	James, William	Reisman, David
Bentham, Jeremy	Gerardus	Köhler, Wolfgang	Spencer, Herbert
Enfantin,	Ptolemy	Kraepelin, Emil	Tonnies,
Barthélemy-Prosper	Ratzel, Friedrich	Kretschmer, Ernst	Ferdinand
Keynes, John	Richthofen,	McDougall,	Weber, Max
Maynard	Ferdinand	William	
	Paul Wilhelm,	Menninger family	
	Freiherr von		

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Section 10/37. The Technological Sciences

- A. History of the technological sciences
- B. Nature and scope of engineering
 1. Engineering as a profession
 2. Branches of engineering: civil engineering, aeronautical engineering, chemical engineering, electrical and electronics engineering, mechanical engineering, optical engineering
- C. The nature and scope of agricultural sciences

[see also 731.B., C., and D.]

 1. History of the agricultural sciences

[see A., above]
 2. Subdivisions of the agricultural sciences: soil science, plant production, animal production, agricultural economics and management, agricultural engineering
- D. The nature and scope of recently developed interscience disciplines
 1. Bionics
 - a. Mimicry of nature as the basis for bionics; *e.g.*, design of torpedoes with surface layers similar to a dolphin's skin, 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]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technological sciences

Engineering
Optics, Principles of

MICROPAEDIA: Selected entries of reference information

General subjects

acoustical	chemical	industrial	petroleum
engineering	engineering	engineering	engineering
aeronautical	civil engineering	mechanical	
engineering	electrical and	engineering	
bioengineering	electronics	nuclear	
bionics	engineering	engineering	

Biographies

Beach, Alfred Ely	Eads, James	Mauchly, John W.	Steinmetz,
Brunel, Isambard	Buchanan	Pierce, George	Charles Proteus
Kingdom	Eckert, John P.	Washington	Taylor, Frederick
Brunel, Sir Marc	Edison, Thomas	Roebing, John	Winslow
Isambard	Alva	Augustus	Tsiolkovsky,
Burbank, Luther	Hollerith, Herman	Sikorsky, Igor	Konstantin
Carver, George	McCormick, Cyrus	Stakman, Elvin	Eduardovich
Washington	Hall	Charles	Whitney, Eli

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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. Diplomatics
 - f. Epigraphy
 - g. Genealogy
 - h. Geography
 - i. Heraldry
 - j. Iconography and iconology
 - k. Linguistics
 - l. Paleography
 - m. Psychoanalysis
 - n. Sigillography
 - o. 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

<i>archaeologists:</i>	Arai Hakuseki	Klyuchevsky,	Sallust
Bingham, Hiram	Aulard,	Vasily Osipovich	Sarkar, Sir
Blegen, Carl	François-Alphonse	Lamprecht, Karl	Jadunath
Botta, Paul-Émile	Bancroft, George	Gottfried	Schlesinger,
Boucher de	Barros Arana,	Liutprand of	Arthur M.
Perthes, Jacques	Diego	Cremona	Solovyov, Sergey
Carter, Howard	Beard, Charles A.	Livy	Mikhaylovich
Evans, Sir Arthur	Becker, Carl	Ma Tuan-lin	Ssu-ma Ch'ien
Garstang, John	Bede the	Macaulay, Thomas	Ssu-ma Kuang
Layard, Sir Austen	Venerable, Saint	Babington	Ṭabarī, aṭ-
Henry	Biondo, Flavio	Macaulay, Baron	Tacitus
Mariette, Auguste	Braudel, Fernand	McMaster, John	Tawney, Richard
Petrie, Sir Flinders	Burckhardt, Jacob	Bach	Henry
Pitt-Rivers,	Bury, J.B.	Mas'ūdī, al-	Thierry, Augustin
Augustus Henry	Clarendon, Edward	Meinecke,	Thou,
Lane-Fox	Hyde, 1st earl of	Friedrich	Jacques-Auguste de
Rassam, Hormuzd	Droysen, Johann	Michelet, Jules	Thucydides
Schliemann,	Gustav	Mommsen,	Tocqueville,
Heinrich	Froude, James	Theodor	Alexis de
Squier, E.G.	Anthony	Namier, Sir Lewis	Toynbee, Arnold
Stein, Sir Aurel	Fustel de	Bernstein	Trevelyan, G.M.
Stephens, John	Coulanges, Numa	Niebuhr, Barthold	Turner, Frederick
Lloyd	Denis	Georg	Jackson
Thompson,	Geoffrey of	Pan Ku	Tyler, Moses Coit
Edward Herbert	Monmouth	Parkman, Francis	Woodson,
Thomsen,	Geyl, Pieter	Pasquier, Étienne	Carter G.
Christian	Gibbon, Edward	Pirenne, Henri	<i>other:</i>
Jürgensen	Giovanni da Pian	Polybius	Champollion,
Wheeler, Sir	del Carpini	Prescott,	Jean-François
Mortimer	Guicciardini,	William H.	Rawlinson, Sir
Winckler, Hugo	Francesco	Procopius	Henry Creswicke
Woolley, Sir	Halévy, Élie	Ranke,	Sayce, Archibald
Leonard	Haskins, Charles	Leopold von	Ventris, Michael
Worsaae, Jens	Homer	Robinson, James	
Jacob Asmussen	Herodotus	Harvey	
<i>historians:</i>	Huizinga, Johan	Rostovtzeff,	
Acton, John	Ibn Khaldūn	Michael	
Emerich Edward	Jien	Ivanovich	
Dalberg Acton,			
1st Baron			

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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
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 - h. The growth and proliferation of special disciplines: the knowledge explosion
 - i. The development of the conflict between the humanities and the sciences
 - j. The organization of the contemporary university: questions of its social responsibility, the profession of learning
[see 561.C.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

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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.

Section 10/51 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.

The outline in Section 10/52 presents a synoptic history of philosophy, taken generally. The outline treats problems involved in the writing of the history of philosophy, the history of Western philosophy, the history of non-Western philosophies, and philosophies associated with religions.

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.

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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
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 - 2. Buddhist philosophy
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 - 3. Confucian philosophy
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 - 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, Aristotle and Augustine	Hegelianism, Hegel and Hume	Mill, John Stuart Nietzsche Philosophy, The History of Western	Smith, Adam Socrates Taoism Thomism, Thomas Aquinas and
Cartesianism, Descartes and Christianity	Indian Philosophy Kantianism, Kant and Locke	Platonism, Plato and Rousseau, Jean-Jacques	
Confucianism, Confucius and	Marxism, Marx and		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Arabic philosophy:</i> ahl al-Kitāb Baṭīniyah Dahrīyah fayḍ ghaybah ikhtilāf kalām kasb Māturīdīyah Murji'ah Mu'tazilah Qadariyah Rāfiḍah rahbāniyah rajm Sālimīyah shirk tahajjud talbiyah taqiya tashbih tawḥīd ziyārah	epochē first cause form hylomorphism logos microcosm Not-Being, denial of opposites, table of paradoxes of Zeno sensationalism virtue, teachability of <i>Indian philosophy:</i> Abhidharmakośa abhijñā Advaita aḥaṃkāra ajīva Ājīvika akriyāvāda ālaya-vijñāna ānanda anumāna Artha-śāstra āsana asrāva āstika ātman Bhedābheda Brahman brahmavihāra cakra Cārvāka dravya Dvaita Haṭha Yoga Indian philosophy indriya jīva jñāna kammaṭṭhāna karma Kashmir Śaivism kuṇḍalinī Mādhyaṃika	māyā Mīmāṃsā nirguṇa Nyāya pāramitā prajñapti prakṛti pramāṇa prāṇa prāṇāyāma pratītya-samutpāda pratyakṣa pratyaya puruṣa śabda Śaiva-siddhānta samadhi Sāṃkhya saṃsāra saṃvṛti-satya sat skandha smṛtyupasthāna syādvāda tat tvam asi tri-svabhāva upādhi Vaisheshika Vedānta Viśiṣṭādvaita yama Yoga Yogācāra <i>Japanese philosophy:</i> Japanese philosophy Jōjitsu Kegon Nichiren Buddhism Pure Land Buddhism Ritsu Shingon Zen	<i>medieval Western philosophy:</i> fideism intention Ockham's razor Scholasticism tabula rasa <i>modern Western philosophy:</i> a priori knowledge antinomy as if, philosophy of axiology categorical imperative cogito, ergo sum common sense, philosophy of concept constitution theory deontological ethics deus otiosus dialectical materialism eudaemonism good-reason theory humanism ideal language identity theory innate idea interactionism irrationalism I-Thou leap of faith mathematicism metaethics metalanguage methodic doubt mind-body dualism monad natural law normative ethics noumenon occasionalism
<i>Chinese philosophy:</i> ch'i Chinese philosophy hsien hsu jen Legalism Mohism p'u T'ai Chi Tao te T'ien Ming tzu-jan wu-wei yin-yang			
<i>Greek philosophy:</i> apathy cosmopolitanism emanationism entelechy			

panpsychism	reductionism	sufficient reason,	theodicy
phenomenalism	revisionism	principle of	transcendental
phenomenon	secularism	superman	Idealism
protocol sentence	social contract	synthesis	unified science
radical empiricism	solipsism	teleological ethics	

Biographies

Anaximenes of Miletus	Inoue Tetsujirō Israeli, Isaac ben	Maimonides, Moses	Spinoza, Benedict de
Averroës	Solomon	Nārājunga	
Avicenna	Justin Martyr,	Nishida Kitarō	
Buber, Martin	Saint	Schopenhauer,	
Chuang-tzu	Lao-tzu	Arthur	

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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
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- 11. The philosophy of mathematics
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- 12. The philosophy of art
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- 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>	metaethics	reason	political
aesthetics	moral theology	supernaturalism	philosophy
<i>epistemology:</i>	normative ethics	voluntarism	powers,
a priori knowledge	probabilism	<i>philosophy of mind:</i>	separation of
dualism	teleological ethics	belief	social contract
epistemology	virtue	choice	<i>other:</i>
Idéalogie	<i>metaphysics:</i>	free will	emergence
psychologism	appearance	identity theory	hylozoism
<i>ethics:</i>	dualism	immortality	philosophical
altruism	creative evolution	intentionality	anthropology
axiology	form	interactionism	philosophy
categorical	Great Chain of	mind	spiritualism
imperative	Being	mind-body	teleology
comparative ethics	intuition	dualism	time
conscience	irrationalism	psychophysical	
egoism	metaphysics	parallelism	
ethical relativism	microcosm	<i>political philosophy:</i>	
ethics	naturalism	divine right of	
eudaemonism	ontology	kings	
good-reasons	phenomenon	general will	
theory	pluralism and	human rights	
	monism	nomos	

Biographies

<i>aesthetics:</i>	Bradley, F.H.	Nietzsche,	<i>other:</i>
Baumgarten,	Campanella,	Friedrich	Adler, Mortimer J.
Alexander	Tommaso	Norris, John	Alembert, Jean Le
Gottlieb	Clauberg, Johann	Schelling, Friedrich	Rond d'
Bosanquet,	Descartes, René	Wilhelm	Aron, Raymond
Bernard	Feuerbach, Ludwig	Joseph von	Bayle, Pierre
Croce, Benedetto	Fichte, Johann	Schopenhauer,	Collingwood, R.G.
Gilson, Étienne	Gottlieb	Arthur	Condillac, Étienne
Santayana, George	Geulincx, Arnold	Spinoza,	Bonnot de
<i>epistemology:</i>	Green, T.H.	Benedict de	Cousin, Victor
Cassirer, Ernst	Hegel, Georg	Whitehead, Alfred	Dilthey, Wilhelm
Dühring, Eugen	Wilhelm	North	Gioberti, Vincenzo
Locke, John	Friedrich	<i>political philosophy:</i>	Helvétius,
Mill, John Stuart	Heidegger, Martin	Bentham, Jeremy	Claude-Adrien
<i>ethics:</i>	Husserl, Edmund	Berlin, Sir Isaiah	Hoffer, Eric
Abelard, Peter	Jacobi, Friedrich	Burke, Edmund	Rodó, José
Cudworth, Ralph	Wilhelm	Engels, Friedrich	Enrique
Cumberland,	Jaspers, Karl	Han-Lei-tzu	Spencer, Herbert
Richard	Kant, Immanuel	Herzen, Aleksandr	Strauss, David
Hutcheson, Francis	Kierkegaard, Søren	Hobbes, Thomas	Friedrich
Moore, G.E.	Leibniz, Gottfried	Mill, James	Swedenborg,
Scheler, Max	Wilhelm	Machiavelli,	Emanuel
Whewell, William	Lewes, George	Niccolò	Teilhard de
<i>metaphysics:</i>	Henry	Montesquieu,	Chardin, Pierre
Aurobindo, Śrī	Malebranche,	Charles-Louis de	Vico, Giambattista
Berdyayev,	Nicolas	Secondat, baron	Weil, Simone
Nikolay	Marcel, Gabriel	de La Brède et de	Wittgenstein,
Aleksandrovich	Meinong, Alexius	Paine, Thomas	Ludwig
Berkeley, George			

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- c. Eleaticism
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- f. Aristotelianism
- g. Stoicism
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- i. Skepticism
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- b. Empiricism
[for Empiricist tendencies in earlier philosophy, see A.1.b. and i., above; for contemporary Logical Empiricism, see A.2.i., below]
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- d. Materialism
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- e. Kantianism
- f. Idealism
- g. Hegelianism
- h. Utilitarianism
- i. Positivism and Logical Empiricism
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- 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 principle; 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 Cartesianism, Descartes and Hegelianism, Hegel and Kantianism, Kant and	Marxism, Marx and Philosophical Schools and Doctrines, Western Platonism, Plato and	Religious and Spiritual Belief, Systems of Thomism, Thomas Aquinas and
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MICROPAEDIA: Selected entries of reference information

General subjects

absolute Idealism	eclecticism	Neo-Hegelianism	Skepticism
Academy, Greek	Eleaticism	Nominalism	solipsism
Alexandrist	Empiricism	personalism	Sophist
Analytic philosophy	Epicureanism	Phenomenology	Stoicism
Atomism	Ethical Culture	Positivism	theism
Cambridge	Existentialism	pragmatism	transcendental
Platonists	Idealism	process philosophy	Idealism
Cynic	Latin Averroism	Pythagoreanism	Utilitarianism
Cyrenaic	Logical Positivism	rationalism	Vienna Circle
Deism	Materialism	realism	
determinism	Megarian school	Scholasticism	
	naturalism	sensationalism	

Biographies

Albertus Magnus, Saint	Carnap, Rudolf	Hume, David	Pico della Mirandola,
Apuleius, Lucius	Cohen, Hermann	Husserl, Edmund	Giovanni, Conte di Concordia
Athenagoras	Comte, Auguste	James, William	
Berdyayev, Nikolay Aleksandrovich	Cousin, Victor	Jaspers, Karl	Plotinus
Bernard de Chartres	Dewey, John	Kierkegaard, Søren	Royce, Josiah
Boethius, Anicius Manlius Severinus	Dühring, Eugen	Lewes, George Henry	Sartre, Jean-Paul
Bosanquet, Bernard	Duns Scotus, John	Maine de Biran,	Scheler, Max
Bradley, F.H.	Fichte, Johann Gottlieb	Marie-François-Pierre	Schlick, Moritz
Buridan, Jean	Francis of Meyronnes	Malebranche, Nicolas	Unamuno, Miguel de
	Gentile, Giovanni	Marcel, Gabriel	William de la Mare
	Godfrey of Fontaines	Maritain, Jacques	
	Green, T.H.	More, Henry	
	Heidegger, Martin	Ockham, William of	

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A.E.Cn. Aksel E. Christensen (d. 1981). Professor of History, University of Copenhagen, 1948–76.

DENMARK (in part)

A.E.D. Augustus E. DeMaggio. Professor of Biology, Dartmouth College, Hanover, New Hampshire.

TISSUES AND FLUIDS (in part)

A.E.El. Albert Edward Elsen. Haas Professor of Art History, Stanford University, California. Author of *Origins of Modern Sculpture* and others.

SCULPTURE, THE HISTORY OF WESTERN (in part)

A.E.M. Adolphe Erich Meyer. Emeritus Professor of Educational History, New York University, New York City. Author of *An Educational History of the American People* and others.

EDUCATION, HISTORY OF (in part)

A.E.S. Alan Edouard Samuel. Professor of Greek and Roman History, University College, University of Toronto. Author of *Ptolemaic Chronology* and others.

EGYPT (in part)

A.E.Sa. A. Edward Safarian. Professor of Economics, University of Toronto. Author of *Governments and Multinationals* and others.

ECONOMIC GROWTH AND PLANNING (in part)

A.E.Sc. Alfred Eric Scott. Former Editor in Chief, Editorial and Publications Section, Commonwealth Scientific and Industrial Research Organization. Melbourne.

AUSTRALIA (in part)

A.E.Si. Akiba Ernst Simon. Emeritus Professor of Education, Hebrew University of Jerusalem. Author of *Martin Bubers lebendiges Erbe.*

BUBER, MARTIN (Micropædia)

A.E.Sm. Arthur Eltringham Smailes (d. 1984). Professor of Geography, Queen

Mary College, University of London, 1955–73.

EUROPE (in part)

A.E.Ta. Alfred Edward Taylor (d. 1945). Professor of Moral Philosophy, University of Edinburgh, 1924–41. Author of *Plato; Socrates; and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)
SOCRATES

A.E.W. Albert E. Wood. Emeritus Professor of Biology, Amherst College, Massachusetts.

MAMMALS (in part)

A.F. Anne Foner. Professor of Sociology, Rutgers University, New Brunswick, New Jersey. Coauthor of *Aging and Retirement* and others.

SOCIAL DIFFERENTIATION (in part)

A.F.A.M. Alice F.A. Mutton (d. 1979). Reader in Geography, Queen Mary College, University of London. Author of *Central Europe; Western Europe.*

EUROPE (in part)

A.F.B. The Hon. Alastair Francis Buchan (d. 1976). Montague Burton Professor of International Relations, University of Oxford, 1972–76. Founder and Director, International Institute for Strategic Studies, London, 1958–69. Author of *The Spare Chancellor: The Life of Walter Bagehot.*

BAGEHOT, WALTER (Micropædia)

TISSUES AND FLUIDS (in part)

A.Fe. Albert Feuerwerker. Professor of History, University of Michigan, Ann Arbor. Author of *China's Early Industrialization.*

CHINA (in part)

A.F.H. Alfred F. Havighurst. Emeritus Professor of History, Amherst College, Massachusetts. Author of *Twentieth Century Britain* and others.

UNITED KINGDOM (in part)

A.Fi. Andrew Field. Professor of Comparative Literature, Griffith University, Brisbane, Australia. Author of *Nabokov: His Life in Art; Nabokov: His Life in Part.*

NABOKOV, VLADIMIR (Micropædia)

A.F.L.B. Alfred Felix L. Beeston. Emeritus Professor of Arabic, University of Oxford. Author of *Sabaic Grammar* and others.

ARABIA (in part)

A.Fr. Lady Antonia Fraser. Writer. Author of *Mary, Queen of Scots.*

MARY (SCOTLAND) (Micropædia)

A.F.R. Anne F. Rockwell. Free-lance writer and illustrator. Author of *Glass, Stones and Crown: The Abbé Suger and the Building of St. Denis* and others.

SUGER (Micropædia)

A.F.Sh. Arthur Frank Shore. Brunner Professor of Egyptology, University of Liverpool, England. Author of *Portrait Painting from Roman Egypt.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

A.F.St. Adolf F. Sturmthal (d. 1986). Professor of Labor and Industrial Relations, University of Illinois, Urbana. Author of *Left of Center: European Labor since World War II* and others.

WORK AND EMPLOYMENT (in part)

A.Fu. André Fu-Kiau kia Bunseki-L. Director, Centre of Development and Scientific Research in African Languages, Kumba, Zaire.

CENTRAL AFRICA (in part)

A.F.W. Arthur F. Wright (d. 1976). Charles Seymour Professor of History, Yale University, 1961–76. Author of *The Formation of Sui Ideology* in Chinese Thought and Institutions.

WEN TI (SUI DYNASTY) (Micropædia)

A.F.We. Arthur Frederick Wells (d. 1966). Praelector in Classics, University College, University of Oxford.

LUCRETIVS (Micropædia)

A.G. Allen Guttman. Professor of English and American Studies, Amherst College, Massachusetts. Author of *From Ritual to Record; A Whole New Ball Game; and others.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

A.G.B.H. Åke Gunnar Birger Hultkrantz. Professor and Chairman, Department of Comparative Religion, University of Stockholm. Author of *The Study of American Indian Religions.*

AMERICAN INDIANS (in part)

A.G.Bo. Allan G. Bogue. Frederick Jackson Turner Professor of History, University of Wisconsin, Madison.

NORTH AMERICA (in part)

A.Ge. Arthur Gelb. Deputy Managing Editor, The New York Times. Coauthor of *O'Neill.*

O'NEILL, EUGENE (in part) (Micropædia)

A.G.H. A. Gordon Hammer. Emeritus Professor of Psychology, Macquarie University, North Ryde, Australia.

Author of *Elementary Matrix Algebra for Psychologists and Social Scientists.*

HYPNOSIS (in part) (Micropædia)

A.G.Ha. The Rev. Adalbert G. Hamman. Professor at Patristic Institute, Rome. Editor, *Patrologiae Latinae Supplementum.* Author of *La Prière.*

rites and CEREMONIES, SACRED (in part)

A.Gi. Alexander Gillies (d. 1977). Professor of German Language and Literature, University of Leeds, England, 1945–72. Author of *Goethe's Faust: An Interpretation* and many other books on German writers and literature.

GERMAN LITERATURE (in part)

A.G.J. Adriaan G. Jongkees. Professor of Medieval History, State University of Groningen, The Netherlands. Author of *Het koninkrijk Friesland in de vijftiende eeuw* and others.

WILLIAM I (NETHERLANDS STADHOLDER) (in part) (Micropædia)

A.G.L. Andrew George Lehmann. Professor, School of European Studies, University of Buckingham, England.

Author of Sainte-Beuve: A Portrait of the Critic and others.

SAINTE-BEUVE, CHARLES-AUGUSTIN
(Micropædia)

A.G.Ly. **A. Gordon Lyne.** *Honorary Research Associate, Queen Victoria Museum, Launceston, Australia. Former Senior Principal Research Scientist, Division of Wildlife Research, Commonwealth Scientific and Industrial Research Organization, Blacktown, Australia. Author of Marsupials and Monotremes of Australia.*
MAMMALS (in part)

Ag.M. **Agnes Mongan.** *Emeritus Curator of Drawings, Fogg Art Museum, Harvard University. Coauthor of Ingres Centennial Exhibition, 1867-1967; Drawings in the Fogg Museum.*

INGRES, JEAN-AUGUSTE-DOMINIQUE
(Micropædia)

A.G.M. **Alan Gibbs Massey.** *Reader in Inorganic Chemistry, Loughborough University of Technology, England. Coauthor of Inorganic Chemistry in Non-aqueous Solvents.*

CHEMICAL ELEMENTS (in part)

A.G.Ma. **Alla Genrikhovna Massevitch.** *Vice President, Astronomical Council, Academy of Sciences of the U.S.S.R., Moscow. Author of Life of the Sun.*

AMBARTSUMIAN, VIKTOR
AMAZASPOVICH (Micropædia)

A.G.M.v.M. **Andrew G.M. van Melsen.** *Professor of Philosophy, Catholic University of Nijmegen, The Netherlands. Author of From Atomos to Atom and others.*

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN (in part)

A.Gn. **Alfonz Gspan** (d. 1977). *Scientific Adviser, Slovene Academy of Sciences and Arts, Ljubljana. Editor, Slovenski biografski leksikon. Coauthor of Incunabule v Sloveniji and others.*

YUGOSLAV LITERATURE (in part)

A.G.N.F. **Antony Garrard Newton Flew.** *Professor of Philosophy, University of Reading, England. Author of God and Philosophy; The Presumption of Atheism.*

RELIGIOUS AND SPIRITUAL BELIEF,
SYSTEMS OF (in part)

A.G.P. **Alexis G. Pincus.** *Visiting Professor of Ceramics, Rutgers University, New Brunswick, New Jersey. Coauthor of Utilization of Ceramics in Microelectronics.*

INDUSTRIAL GLASS AND CERAMICS
(in part)

A.G.W. **A. Geoffrey Woodhead.** *Fellow of Corpus Christi College, Cambridge; Emeritus Lecturer in Classics, University of Cambridge. Adjunct Professor of Classics, Ohio State University, Columbus. Author of The Greeks in the West and others.*

HISTORY, THE STUDY OF (in part)

A.G. y B. **Antonio García y Bellido** (d. 1972). *Professor of Archaeology,*

University of Madrid, Spain. Director, Spanish Institute of Archaeology. Member, Royal Academy of History. Author of Las Colonizaciones Púnica y Griega en la península ibérica.
SPAIN (in part)

A.H.A. **A. Hilary Armstrong.** *Gladstone Professor Emeritus of Greek, University of Liverpool. Editor of The Cambridge History of Later Greek and Early Mediaeval Philosophy; translator of Plotinus.*

PLATONISM, PLATO AND (in part)
PLOTINUS (Micropædia)

A.H.Ao. **Anselm H. Amadio.** *Chaplain; Instructor in Philosophy, Illinois Institute of Technology, Chicago. Staff Writer, Philosophy and Religion, Encyclopædia Britannica, Chicago, 1970-73.*

ARISTOTELIANISM, ARISTOTLE AND
(in part)

PALAMAS, SAINT GREGORY
(Micropædia)

A.H.Ca. **Arthur H. Cash.** *Professor of English, State University of New York College at New Paltz. Author of Laurence Sterne: The Early and Middle Years and others.*

STERNE, LAURENCE (Micropædia)

A.H.D. **Andrew Hutchinson Dawson.** *Lecturer in Geography and Modern Russian Studies, University of St. Andrews, Scotland. Author of many papers on the geography of Poland.*

POLAND (in part)
WARSAW (in part)

A.H.De. **Armand H. Delsemme.** *Professor of Astrophysics, University of Toledo, Ohio. Editor of Comets, Asteroids, Meteorites.*

SOLAR SYSTEM, THE (in part)

A.H.E. **Archie H. Easton.** *Emeritus Professor of Mechanical Engineering, University of Wisconsin, Madison. Honorary Chairman of the Board, Safety Engineering Associates, Inc. (consulting engineers), Madison.*

TRANSPORTATION (in part)

A.H.F. **Rabbi Albert H. Friedlander.** *Dean of Rabbinic Studies, Leo Baeck College, London. Minister, Westminster Synagogue, London. Author of Leo Baeck: Teacher of Theresienstadt.*
BAECK, LEO (Micropædia)

A.H.H. **A.H. Hanson** (d. 1971). *Professor of Politics, University of Leeds, England. Author of Public Enterprise and Economic Development.*

PUBLIC ENTERPRISES
(in part)

A.H.Ho. **Albert Habib Hourani.** *Former Reader in the Modern History of the Middle East, University of Oxford. Author of Arabic Thought in the Liberal Age, 1798-1939.*

SYRIA (in part)

A.H.K. **Andrew H. Knoll.** *Associate Professor of Biology, Harvard University. Author of numerous papers on Precambrian paleontology and paleobotany.*

GEOCHRONOLOGY (in part)

A.H.McD. **Alexander Hugh McDonald** (d. 1979). *Lecturer in Ancient History, University of Cambridge, 1952-73. Author of Republican Rome.*
TACITUS (Micropædia)

A.H.M.J. **Arnold Hugh Martin Jones** (d. 1970). *Professor of Ancient History, University of Cambridge, 1951-70.*
PALESTINE (in part)

A.H.P. **Arnold H. Price.** *Bibliographer, American Historical Association, Washington, D.C. Former Area Specialist for Central Europe, Library of Congress, Washington, D.C.*

CLAUSEWITZ, CARL VON (Micropædia)

A.H.S. **Anna Hester Smith.** *Former Head Librarian, Johannesburg Public Library. Former Director, Africana Museum, Johannesburg.*

JOHANNESBURG

A.H.Sa. **A.H. Saxon.** *Free-lance writer. Author of The Life and Art of Andrew Drocrow and the Romantic Age of the English Circus; P.T. Barnum: The Legend and the Man.*

CIRCUS (in part)

A.H.St. **Alan Howard Stratford.** *Chairman, Alan Stratford and Associates (air transport consultants), Lymington, England. Author of Air Transport Economics in the Supersonic Era and others.*

TRANSPORTATION (in part)

A.I.I. **Aleksandr Ilyich Imshenetsky.** *Senior Research Associate, Scientific Council on the Location of U.S.S.R. Productive Forces, Academy of Sciences of the U.S.S.R., Moscow.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

A.I.M. **Albert I. Mendeloff, M.D.** *Emeritus Physician in Chief, Sinai Hospital, Baltimore. Professor of Medicine, Johns Hopkins University, Baltimore. Coauthor of Digestive Diseases.*

DIGESTION AND DIGESTIVE SYSTEMS
(in part)

Ai.S. **Aidan William Southall.** *Professor of Anthropology, University of Wisconsin, Madison. Editor of Social Change in Modern Africa; coeditor of Madagascar: Society and History.*
INDIAN OCEAN ISLANDS (in part)

A.J.A. **A. John Arnfield.** *Associate Professor of Geography, Ohio State University, Columbus.*

CLIMATE AND WEATHER (in part)

A.J.B. **Alan John Barnard.** *Lecturer in Social Anthropology, University of Edinburgh. Coauthor of Research Practices in the Study of Kinship.*

FAMILY AND KINSHIP

A.J.Bo. **Arthur James Boucot.** *Professor of Geology, Oregon State University, Corvallis. Authority on Silurian paleontology and stratigraphy.*
GEOCHRONOLOGY (in part)

A.J.Ca. **A.J. Cain.** *Derby Professor of Zoology, University of Liverpool. Editor of Function and Taxonomic Importance.*

BIOLOGICAL SCIENCES, THE
(in part)

A.J.E. Armand J. Eardley (d. 1972). *Professor of Geology, University of Utah, Salt Lake City, 1965–70; Dean, College of Mines and Mineral Industries, 1954–65. Author of Structural Geology of North America.*

NORTH AMERICA (in part)

A.J.H. Arlen J. Hansen. *Professor of English, University of the Pacific, Stockton, California.*

LITERATURE, THE ART OF (in part)

A.J.I. Aaron J. Ihde. *Emeritus Professor of Chemistry and History of Science, University of Wisconsin, Madison. Author of The Development of Modern Chemistry.*

PAULING, LINUS (Micropædia)

A.J.K. Anthony John Kirby. *University Lecturer in Chemistry, University of Cambridge. Coauthor of Organic Chemistry of Phosphorus.*

CHEMICAL COMPOUNDS (in part)

A.J.P. Anthony J. Podlecki. *Professor and Head, Department of Classics, University of British Columbia, Vancouver. Author of The Political Background of Aeschylean Tragedy.*

GREEK DRAMATISTS, THE CLASSICAL
(in part)

A.J.P.T. A.J.P. Taylor. *Lecturer in International History, University of Oxford, 1953–63; Fellow of Magdalen College, Oxford, 1938–76. Author of Bismarck; The Struggle for Mastery in Europe, 1848–1918; and others.*

BISMARCK (in part)

GERMANY (in part)

A.J.Sc. Alvin J. Schumacher. *Author of Thunder on Capitol Hill: The Life of Chief Justice Roger B. Taney.*

TANEY, ROGER BROOKE (Micropædia)

A.J.Sh. Aaron J. Sharp. *Alumni Distinguished Service Professor Emeritus of Botany, University of Tennessee, Knoxville. Associate Editor, Journal of the Hattori Botanical Laboratory, devoted to bryology.*

BRYOPHYTES AND PRIMITIVE VASCULAR
PLANTS (in part)

A.J.So. Alan James Southward. *Zoologist and Senior Principal Scientific Officer, Marine Biological Association of the United Kingdom, Plymouth. Author of Life on the Sea-Shore.*

ECOSYSTEMS (in part)

A.J.T. Arnold Joseph Toynbee (d. 1975). *Director of Studies, Royal Institute of International Affairs, London, 1925–55. Research Professor of International History, University of London, 1925–55. Author of A Study of History and many others.*

CAESAR (in part)

TIME (in part)

A.J.V. Alan John Villiers (d. 1982). *Free-lance writer. President, Society for Nautical Research, London. Author of Captain James Cook; The Way of a*

Ship; and many others.

COOK, JAMES (Micropædia)

A.Ka. Adrienne L. Kaeppler. *Curator of Oceanic Ethnology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Lecturer in Music, University of Hawaii, Honolulu. Author of several publications on Polynesian dance.*

OCEANIC ARTS (in part)

A.K.B. Alan K. Bowman. *Lecturer in Ancient History, University of Oxford; Student and Tutor, Christ Church, Oxford. Author of Egypt After the Pharaohs.*

EGYPT (in part)

A.K.C. The Rt. Rev. Albert Kenneth Cragg. *Assistant Bishop, Diocese of Oxford. Reader in Religious Studies, University of Sussex, Brighton, England, 1973–78. Author of Counsels in Contemporary Islam and others.*

ISLĀM, MUḤAMMAD AND THE RELIGION
OF (in part)

A.K.Ca. Alan K. Campbell. *Vice Chairman of the Board and Executive Vice President, Management and Public Affairs, ARA Services, Inc., Philadelphia. Dean, Maxwell Graduate School of Citizenship and Public Affairs, Syracuse University, New York, 1969–76. Author of The States and the Urban Crisis.*

UNITED STATES OF AMERICA (in part)

A.K.Ch. Abdel Kader Chandlerli. *Senior Adviser, the Arab Fund, Kuwait. President and General Manager, C.A.M.E.L. Petroleum Company, Algiers, 1969–75. Ambassador of Algeria to the United Nations, 1962.*

NORTH AFRICA (in part)

A.Ke. Annajane Kennard. *Former Librarian, Straits Times Press, Malaysia.*

EAST INDIES, THE (in part)

SOUTHEAST ASIA, MAINLAND (in part)

A.K.H. A. Kent Hieatt. *Professor of English, University of Western Ontario, London. Author of Chaucer, Spenser, Milton: Mythopoetic Continuities and Transformations; coeditor of Spenser's Selected Poetry.*

SPENSER, EDMUND (in part)

(Micropædia)

A.K.McC. Arthur Kilgore McComb (deceased). *Author of The Baroque Painters of Italy and others.*

SCULPTURE, THE HISTORY OF WESTERN
(in part)

A.Kn. Arthur Knight. *Professor of Cinema, University of Southern California, Los Angeles. Film Critic, The Hollywood Reporter. Author of The Liveliest Art; The Hollywood Style.*

CHAPLIN, CHARLIE (Micropædia)

A.Ko. Arthur Koestler (d. 1983). *Author of The Act of Creation; Darkness at Noon; and many others.*

HUMOUR AND WIT

A.K.O. Anders Kristian Orvin. *Director, Norwegian Polar Research Institute, Oslo, 1958–61.*

ARCTIC, THE (in part)

A.K.P. A. Keith Pierce. *Astronomer, Solar Division, Kitt Peak National Observatory, Tucson, Arizona.*

SOLAR SYSTEM, THE (in part)

A.K.Pa. Andrew K. Pawley. *Associate Professor of Linguistics, University of Auckland, New Zealand. Author of "Samoan Phrase Structure: The Morphology-Syntax of a Western Polynesian Language" in Anthropological Linguistics and other articles on the languages of Oceania.*

LANGUAGES OF THE WORLD
(in part)

A.K.R. A.K. Ramanujan. *Professor, Departments of South Asian Languages and Civilizations and of Linguistics and Committee on Social Thought, University of Chicago. Author of Speaking of Śiva and others.*

SOUTH ASIAN ARTS (in part)

A.K.S. Arthur K. Solomon. *Professor of Biophysics, Medical School, Harvard University. Author of numerous scientific papers and of Why Smash Atoms?*

BIOLOGICAL SCIENCES, THE (in part)

A.K.Se. Anna K. Seidel. *Member, French School of the Far East, Kyōto. Author of La divinisation de Lao tseu dans le taoisme des Han.*

TAOISM (in part)

Ak.W. Akira Watanabe (deceased). *Chairman, Department of Geography, Ochanomizu Women's University, Tokyo. Editor of Gazetteer of Japan.*

JAPAN (in part)

A.Ky. Ado Kyrou. *Writer and motion-picture and television director. Author of Le Surréalisme au cinéma; Luis Buñuel; and others.*

BUÑUEL, LUIS (Micropædia)

A.L. Alberto Lecco. *Novelist, poet, essayist, and reviewer. Author of Anteguerra and others.*

MILAN

A.La. Abdallah Laroui. *Professor of History, Mohammed V University, Rabat, Morocco. Author of History of the Maghrib and others.*

NORTH AFRICA (in part)

A.L. al-S.M. Afaf Lutfi al-Sayyid Marsot. *Professor of History, University of California, Los Angeles. Author of Egypt and Cromer.*

CROMER, EVELYN BARING, 1ST EARL OF
(Micropædia)

Al.B. Alfredo Bosisio. *Professor of Medieval History, University of Pavia, Italy. Author of Storia di Milano.*

SFORZA, LUDOVICO (Micropædia)

A.L.B. Arthur Llewellyn Basham (d. 1986). *Professor of Asian Civilizations, Australian National University, Canberra. Author of History and Doctrines of the Ajivikas and others.*

HINDUISM (in part)

Al.Be. Alfons Becker. *Professor of Medieval History, Johannes Gutenberg University of Mainz, West Germany. Author of Papst Urban II (1088–1099)*

and others.

URBAN II (Micropædia)

Al.Bo. Alan Bowness. *Director, Tate Gallery, London. Author of Modern European Art; Recent British Painting. COROT, CAMILLE (Micropædia) MOORE, HENRY (in part) (Micropædia)*

Al.C. Alphonse Chapanis. *Professor of Psychology, Johns Hopkins University, Baltimore. Author of Research Techniques in Human Engineering. INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)*

A.L.C. Arthur L. Cohen. *Emeritus Professor of Botany and of Biological Sciences, Washington State University, Pullman; Director, Electron Microscope Center, 1962-79.*

PROTOPHYTES (in part)

A.Le. Aureliano Leite (d. 1976). *President of the São Paulo Historical and Geographical Institute. Member of the São Paulo Academy of Letters. Member of the Brazilian Historical and Geographical Institute. Author of História da Civilização Paulista. SÃO PAULO (in part)*

Al.G. Albert Goodwin. *Emeritus Professor of Modern History, Victoria University of Manchester. Author of The French Revolution and others. LOUIS XVI (FRANCE) (Micropædia) NECKER, JACQUES (Micropædia)*

Al.Go. Alan Gowans. *Professor of History in Art, University of Victoria, British Columbia. Author of Building Canada, An Architectural History of Canadian Life; The Unchanging Arts; Images of American Living; and others. ARCHITECTURE, THE ART OF (in part)*

Al.Gr. Alan Gregg, M.D. (d. 1957). *Vice President, Rockefeller Foundation, 1951-56; Director of Medical Sciences, 1930-51.*

MEDICINE (in part)

A.L.-Ho. Alexander Marie Norbert Lernet-Holenia (d. 1976). *Novelist and playwright. Author of Prinz Eugen and others. EUGENE OF SAVOY (Micropædia)*

A.Li. Assar Lindbeck. *Professor of International Economics; Director, Institute for International Economics Studies, University of Stockholm. Author of A Study in Monetary Analysis and others.*

GOVERNMENT FINANCE (in part)

A.Lip. Adolf Lippold. *Professor of History, University of Regensburg, West Germany. Author of Theodosius der Grosse und seine Zeit and others. THEODOSIUS I (ROMAN AND BYZANTINE EMPIRE) (Micropædia)*

A.L.Ll. Albert Lancaster Lloyd (d. 1982). *Ethnomusicologist. Member, Editorial Board, English Folk Dance and Song Society, London. Member, International Folk Music Council. Author of Folk Song in England and others.*

POPULAR ARTS (in part)

A.L.M. Akinlawon Ladipo Mabogunje. *Pro-Chancellor, Ogun State University, Ago-Iwoye, Nigeria. Vice President, International Geographical Union. Author of Urbanization in Nigeria. AFRICA (in part)*

Al.N. Allan Nevins (d. 1971). *Historian. Senior Research Associate, Henry E. Huntington Library and Art Gallery, San Marino, California, 1958-69. Dewitt Clinton Professor of History, Columbia University, 1931-58. Author of The American States During and After the Revolution; The Emergence of Modern America; and many biographies. WASHINGTON, GEORGE (in part)*

Al.R. Alfredo Riva. *Assistant Professor of Industrial Chemistry, University of Bologna, Italy. MALPIGHI, MARCELLO (in part) (Micropædia)*

A.L.R. Alexander L. Ringer. *Professor of Musicology, University of Illinois, Urbana. Author of The Hunt as a Musical Topic: A Brief History of the Chasse. MUSIC, THE ART OF (in part)*

A.L.Ra. Arthur Lionel Rawlings (d. 1959). *Chief Research Engineer, Bulova Research and Development Laboratories, Woodside, New York. NAVIGATION (in part)*

Al.Re. Albert Resis. *Associate Professor of History, Northern Illinois University, DeKalb. Author of articles on Russian and Soviet history. LENIN*

Al.S. Albert M. Soboul (d. 1982). *Professor of the History of the French Revolution, University of Paris I. Author of Précis d'histoire de la révolution française and others.*

CARNOT, LAZARE (Micropædia)
DANTON, GEORGES (Micropædia)
FRANCE (in part)

A.L.S. A.L. Srivastava (deceased). *Professor of History, Āgra College, Āgra University, India. Author of The Mughal Empire and others. INDIA (in part)*

A.L.T. Sir A. Landsborough Thomson (d. 1977). *President, British Ornithologists' Union, 1948-55. President, Zoological Society of London, 1954-60. Chairman of Trustees, British Museum (Natural History), London, 1967-69. Author of Problems of Bird Migration. BIRDS (in part)*

A.Lu. Ante Lui. *Former Professor of Biology, University of Zagreb, Yugoslavia. BALKANS (in part)*

A.L.W. A.L. Waddams. *Manager, Market Research and Information Division, BP Chemicals (UK) Ltd., London. Author of Chemicals from Petroleum and others. INDUSTRIES, EXTRACTION AND PROCESSING (in part)*

A.M. Abdou Moumouni. *Director, Office of Solar Energy, Niamey, Niger. Author of L'Education en Afrique. EDUCATION, HISTORY OF (in part)*

A.Ma. Andrew Henry Robert Martindale. *Professor of Visual Arts, University of East Anglia, Norwich, England. Author of Gothic Art.*

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

A.M.B. Alfred M. Beeton. *Professor of Natural Resources and Atmospheric and Oceanic Science; Director, Great Lakes and Marine Waters Center, University of Michigan, Ann Arbor. Author of numerous scientific articles on the Great Lakes.*

NORTH AMERICA (in part)

A.M.-C. Arturo Morales-Carrión. *Executive Director, Puerto Rican Endowment for the Humanities, San Juan. Author of Puerto Rico: A Political and Cultural History and others. WEST INDIES, THE (in part)*

A.M.C.L. Agnes M.C. Latham. *Former Reader in English, Bedford College, University of London. Editor of The Poems of Sir Walter Raleigh and others. RALEIGH, SIR WALTER (Micropædia)*

A.M.G. Alan M. Gaines. *Program Director for Experimental and Theoretical Geochemistry, National Science Foundation, Washington, D.C. MINERALS AND ROCKS (in part)*

A.M.Ga. Aleksandr Mikhaylovich Gavrillov. *Senior Scientist, Leningrad Hydrological Institute.*

EUROPE (in part)

A.M.G.-G. Angel M. García-Gómez. *Head, Department of Spanish and Latin-American Studies, University College, University of London. Author of The Legend of the Laughing Philosopher and Its Presence in Spanish Literature, 1500-1700.*

SPANISH LITERATURE (in part)

A.Mi. Arthur Mizener (d. 1988). *Mellon Foundation Professor of Humanities, Cornell University, Ithaca, New York. Author of The Far Side of Paradise: A Biography of F. Scott Fitzgerald and others.*

FITZGERALD, F. SCOTT
(Micropædia)

A.M.N. Alois M. Nagler. *Henry McCormick Professor Emeritus of Dramatic History and Criticism, Yale University. Author of Sources of Theatrical History and others. BERNHARDT, SARAH (Micropædia) DUSE, ELEONORA (Micropædia)*

A.Mo. Alberto Monroy, M.D. *Former Director, Zoological Station, Naples. Author of Chemistry and Physiology of Fertilization.*

REPRODUCTION AND REPRODUCTIVE
SYSTEMS (in part)

A.Moz. Asokendu Mozumder.

Associate Faculty Fellow, Radiation Laboratory and Department of Chemistry, University of Notre Dame, Indiana. Coauthor of *Advances in Radiation Chemistry*.

RADIATION (in part)

A.M.P. Andrew M. Pullen. Computer graphics researcher. Coauthor of *Creative Computer Graphics*.

COMPUTERS (in part)

A.M.Q. Anthony M. Quinton, Baron Quinton. Chairman, British Library Board. President, Trinity College, Oxford, 1978-87; former Lecturer in Philosophy, University of Oxford. Author of *The Nature of Things and others*.

BACON, FRANCIS (in part)

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

A.M.Sl. Axel Mose Sløk. Managing Director and Editor, Confederation of Danish Agricultural Employers' Associations, Copenhagen. Coauthor and editor of *The Danish Legislation 1968-71*.

DENMARK (in part)

A.M.W. A.M. Winchester. Emeritus Professor of Biology, University of Northern Colorado, Greeley. Author of *Genetics and others*.

BIOLOGICAL SCIENCES, THE (in part)

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

A.N. Alvin Novick. Associate Professor of Biology, Yale University. Researcher on the biology of bats. Coauthor of *The World of Bats*.

MAMMALS (in part)

A.Na. Arata Naka. Former Professor of Japanese History of Education, University of Tokyo. Author of *The Formation of the Modern Textbook System*.

EDUCATION, HISTORY OF (in part)

A.N.A. Antony Nicolas Allott. Professor of African Law, School of Oriental and African Studies, University of London. Author of *New Essays in African Law and others*.

CRIME AND PUNISHMENT (in part)

An.A.A. Anwar Abdel Aleem. Professor of Biological Oceanography; Chairman, Department of Oceanography, University of Alexandria, Egypt.

ASIA (in part)

An.B. Anthony Burgess. Novelist and critic. Author of *A Clockwork Orange*; *The Novel Now*; *Urgent Copy*.

LITERATURE, THE ART OF (in part)

An.Br. André Brincourt. Director of Cultural Services, Le Figaro, Paris. Author of *André Malraux ou le temps du silence*.

MALRAUX, ANDRÉ (Micropædia)

An.C.B. Andrew C. Brix. Second Secretary, International Bureau of the Universal Postal Union, Berne, Switzerland.

POSTAL SYSTEMS (in part)

A.Ne. Andries Nel. Professor of Geography, University of Stellenbosch, South Africa. Author of *Stad en dorps*; *Die warm Reënstreke*.

SOUTH AFRICA (in part)

A.Ni. Arnold Niederer. Former Professor of European Ethnology, University of Zürich, Switzerland. Coauthor of *Atlas der schweizerischen Volkskunde*.

EUROPE (in part)

A.N.J. Alexander Norman Jeffares. Professor of English, University of Stirling, Scotland. Author of *W.B. Yeats: Man and Poet*; *A New Commentary on the Poems of W.B. Yeats*. Editor of *Selected Poems and Prose: Whitman*. *WHITMAN, WALT* (Micropædia)

A.N.K. Aleksey Nilovich Kosarev. Head, Regional Oceanographic Laboratory, Department of Oceanology, Moscow M.V. Lomonosov State University.

ASIA (in part)

An.L. Antonino Lombardo. Inspector General of National Archives, Rome. Professor of the Study of Archives, University of Rome. Coauthor of *Documenti del commercio veneziano nei secoli XI-XIII*.

DANDOLO, ENRICO (Micropædia)

A.N.L.W. Arthur N.L. Wina. Member of Parliament, 1962-68 and 1973-; Minister of Finance, 1963-67; Minister of Education, 1967-68, Government of Northern Rhodesia, renamed Zambia in 1964.

AFRICA (in part)

A.No. Alexander Nove. Emeritus Professor of Economics, University of Glasgow, Scotland. Author of *An Economic History of the U.S.S.R*. *ECONOMIC GROWTH AND PLANNING* (in part)

An.Pa. Angel Palerm (d. 1980). Director, Institute of Social Sciences, Universidad Iberoamericana, Mexico City.

MEXICO (in part)

A.N.R.N. Alastair N.R. Niven. Fellow, Institute of Commonwealth Studies, University of London. Special Assistant to the Secretary General, Association of Commonwealth Universities. Author of *D.H. Lawrence: The Novels*; editor of *The Commonwealth Writer Overseas*.

AFRICAN ARTS (in part)

AUSTRALIA AND NEW ZEALAND, LITERATURES OF (in part)

A.N.R.R. Arthur Napoleon Raymond Robinson. Chairman, Tobago House of Assembly. Author of *The Mechanics of Independence: Patterns of Political and Economic Transformation in Trinidad and Tobago*.

WEST INDIES, THE (in part)

An.S. Ailon Shiloh. Professor and Director of Graduate Studies, Department of Anthropology, University of South Florida, Tampa. Editor of *Peoples and Cultures of the Middle East*. *ASIA* (in part)

An.Sc. Annemarie Schimmel.

Professor of Indo-Muslim Culture, Harvard University. Author of *Gabriel's Wing*; *Islamic Calligraphy*; *Mystical Dimensions of Islam*; and *others*.

ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

ISLĀMIC ARTS (in part)

JALĀL AD-DIN AR-RŪMĪ (Micropædia)

An.Sh. Ann Sheehy. Research Associate, Central Asian Research Centre, London.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

A.N.W. Alfred North Whitehead (d. 1947). Professor of Philosophy, Harvard University, 1924-36. Author of *Process and Reality* and many *others*.

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

A.N.Y. A.N. Yiannopoulos. W.R. Irby. Professor of Law, Tulane University, New Orleans. Author of *Civil Law Property and others*.

PROPERTY LAW (in part)

TRANSPORTATION LAW (in part)

A.O.J.C. A.O.J. Cockshut. G.M. Young Lecturer in 19th-century English Literature, University of Oxford; Fellow of Hertford College, Oxford. Author of *The Achievement of Walter Scott*; *Anglican Attitudes: A Study of Victorian Religious Controversies*; and *others*.

CARLYLE, THOMAS (Micropædia)

A.O.K. Anne O. Krueger. Arts and Sciences Professor of Economics, Duke University, Durham, North Carolina. Author of *Exchange Rate Determination*. *ECONOMIC GROWTH AND PLANNING* (in part)

A.Pa. André Parrot (d. 1980). Archaeologist. Director of the Louvre, Paris, 1968-72. Member of the Institute of France. Author of *Abraham and His Times and others*.

ABRAHAM (Micropædia)

A.P.D. Anatoly Petrovich Domanitsky. Senior Scientist, Leningrad Hydrological Institute.

EUROPE (in part)

A.P.E. Adolphus Peter Elkin (d. 1979). Professor of Anthropology, University of Sydney, 1934-56. Editor of *Archaeology and Physical Anthropology in Oceania*. *AUSTRALIA* (in part)

A.P.F. Alfred P. Fishman, M.D. William Maul Measey. Professor of Medicine; Director, Cardiovascular-Pulmonary Division, University of Pennsylvania, Philadelphia. Editor of *Handbook of Physiology*, sect. 3, *The Respiratory System and others*. *RESPIRATION AND RESPIRATORY SYSTEMS* (in part)

A.P.G. Alberto Passos Guimarães. Geography Editor, Enciclopédia Mirador Internacional, Rio de Janeiro.

RIO DE JANEIRO (in part)

A.P.L. Aleksandr Petrovich Lisitsin. Head, Laboratory of Physical Methods

of Research, Institute of Oceanology, Academy of Sciences of the U.S.S.R., Moscow. Author of Processes of Recent Sedimentation in the Bering Sea; Sedimentation in the World Ocean; and others.

NORTH AMERICA (in part)

A.P.M. Aleksandr Pavlovich Muranov. Senior Scientist, Leningrad Hydrological Institute. Author of Velichayshiye reki mira.

ASIA (in part)

A.P.Ma. Arthur Paul Mattuck. Professor of Mathematics, Massachusetts Institute of Technology, Cambridge.

MATHEMATICS, THE HISTORY OF (in part)

A.R. Alan Ryalls. Former Editor, Camping and Caravanning magazine, Camping Club of Great Britain and Ireland. Author of Modern Camping. CAMPING (Micropædia)

A.Ra. Agatha Ramm. Former Fellow of Somerville College, Oxford; former Lecturer in Modern History, University of Oxford.

GERMANY (in part)

Ar.B. Arnaldo Bruschi. Professor of the History of Architecture, University of Rome. Author of Bramante architetto.

BRAMANTE, DONATO (Micropædia)

A.R.B. A. Richard Baldwin. Vice President and Executive Director of Research, Cargill, Inc., Minneapolis, Minnesota, 1964–73. Editor, Journal of the American Oil Chemists' Society.

FOOD PROCESSING (in part)

Ar.Br. Sir Arthur Bryant (d. 1985). Author of Samuel Pepys and many others.

PEPYS, SAMUEL (Micropædia)

A.R.Bu. Andrew Robert Burn. Visiting Professor, A College Year in Athens, Inc., 1969–72. Reader in Ancient History, University of Glasgow, 1965–69. Author of Persia and the Greeks and others. THEMISTOCLES (Micropædia)

A.R.C. A. Robert Caponigri (d. 1983). Professor of Philosophy, University of Notre Dame, Indiana. Author of History and Liberty: The Historical Writings of Benedetto Croce.

CROCE, BENEDETTO (Micropædia)

Ar.D. Arthur J.M. Doucy. Professor of Social Economics; former Director, Institute of Sociology, Free University of Brussels. Author of Traité d'économie sociale.

LOW COUNTRIES, THE (in part)

A.Re. Alan Reed (deceased). Head, Department of Architecture, Faculty of Construction Technology and Design, Polytechnic of the South Bank, London. Fellow of the Royal Institute of British Architects.

BUILDING CONSTRUCTION (in part)

Ar.H. Rabbi Arthur Hertzberg. Adjunct Professor of History, Columbia University. Author of Being Jewish in America and others. Editor of The

Zionist Idea.

JUDAISM (in part)

A.-R.H. Abdul-Rahman Hamidé. Professor of Geography, Damascus University. Author of La Région d'Alep. SYRIA (in part)

Ar.Hü. Arthur Hübscher. Former Director, Schopenhauer Archives, Frankfurt. Senior President, International Schopenhauer Society, Frankfurt. Author of many books on Schopenhauer. Editor of Schopenhauer's Works.

SCHOPENHAUER, ARTHUR (Micropædia)

A.Ri. Alan Rich. Music Critic, Newsweek magazine. Author of Music: Mirror of the Arts and others.

MUSIC, THE ART OF (in part)

A.R.J. Alan R. Jefferson. Light Orchestral Manager, British Broadcasting Corporation, London, 1968–73. Professor of Vocal Interpretation, Guildhall School of Music and Drama, London, 1967–74. Author of The Lieder of Strauss and others.

STRAUSS, RICHARD (Micropædia)

A.R.K. Alan Roy Katritzky. Kenan Professor of Organic Chemistry, University of Florida, Gainesville. Coauthor of Principles of Heterocyclic Chemistry.

CHEMICAL COMPOUNDS (in part)

A.R.Ki. Albert Roland Kiralfy. Emeritus Professor of Law, King's College, University of London. Author of The English Legal System.

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

Ar.Kn. Arthur Kelman. L.R. Jones Professor of Plant Pathology, University of Wisconsin, Madison. Editor of Sourcebook of Exercises in Plant Pathology.

DISEASE (in part)

Ar.L.S. Arthur L. Schawlow. Professor of Physics, Stanford University, California. Co-winner, Nobel Prize for Physics, 1981, for the development of laser spectroscopy.

LASER (in part) (Micropædia)

MASER (in part) (Micropædia)

Ar.M. Arthur Mitzman. Professor of History, University of Amsterdam. Author of The Iron Cage: An Historical Interpretation of Max Weber.

WEBER, MAX (in part) (Micropædia)

A.R.M. Alexander Reginald Myers (d. 1980). Professor of Medieval History, University of Liverpool, 1967–80. Author of The Household of Edward IV.

EDWARD IV (ENGLAND AND GREAT BRITAIN) (Micropædia)

HENRY VII (ENGLAND) (in part) (Micropædia)

A.R.McB. Alexander R. McBirney. Professor of Geology, Center for Volcanology, University of Oregon, Eugene. Author of Igneous Petrology. MINERALS AND ROCKS (in part)

A.Ro. Arnold Rood. Professor of Dramatic Art, Dowling College, Oakdale, New York. Author of Edward Gordon Craig, Artist of the Theatre, 1872–1966; coauthor of Edward Gordon Craig: A Bibliography; editor of Gordon Craig on Movement and Dance.

CRAIG, EDWARD GORDON (Micropædia)

A.R.P. Allison R. Palmer. Centennial Science Program Coordinator, Geological Society of America, Boulder, Colorado. Professor of Paleontology, State University of New York at Stony Brook, 1966–80. Coauthor of Cambrian of the New World.

GEOCHRONOLOGY (in part)

Ar.R. Arthur Robinson, M.D. Professor of Biochemistry, Biophysics, and Genetics and of Pediatrics, University of Colorado, Denver. Director, Cytogenetics Laboratory, National Jewish Hospital and Research Center—National Asthma Center, Denver.

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

A.R.R. Allien R. Russon. Emeritus Professor of Management, College of Business, University of Utah, Salt Lake City. Author of Methods of Teaching Shorthand.

WRITING (in part)

A.R.S. Alarich R. Schultz. Professor of Botany, Federal University of Rio Grande do Sul, Pôrto Alegre, Brazil. Author of Estudo Prático da Botânica Geral.

SOUTH AMERICA (in part)

Ar.Sp. Arnold Spekke (d. 1972). Author of History of Latvia and others. UNION OF SOVIET SOCIALIST REPUBLICS (in part)

A.R.T. Archie Rule Turnbull. Chief Executive, Edinburgh University Press. Editor of The Making of Classical Edinburgh.

EDINBURGH (in part)

A.R.W. Almon Robert Wright. Senior Historian, U.S. Department of State, Washington, D.C., 1958–66. Coeditor of Foreign Relations: The American Republics, 1941–48.

CENTRAL AMERICA (in part)

A.S. Alvin Seiff. Senior Staff Scientist, Space Science Division, Ames Research Center, National Aeronautics and Space Administration, Moffett Field, California. Author of scientific papers on the atmospheres of Mars and Venus.

SOLAR SYSTEM, THE (in part)

A.S.A. Ass'ad Sulaiman Abdo. Former Lecturer in Geography, University of Riyadh, Saudi Arabia. Author of Land and Air Transport in Saudi Arabia.

MECCA AND MEDINA (in part)

As.B. Asa Briggs, Baron Briggs. Provost of Worcester College, University of Oxford. Author of The Age of Improvement, 1783–1867 and others.

COBDEN, RICHARD (Micropædia)
UNITED KINGDOM (in part)

A.Sc. **Aaron Scharf.** *Professor of Art History, Open University, Milton Keynes, England, 1969–82. Author of Art and Photography; Pioneers of Photography.*

CARTIER-BRESSON, HENRI
(Micropædia)

A.S.Cu. **Alan S. Curtis.** *Professor of Music, University of California, Berkeley. Author of Sweetlinck's Keyboard Music.*

RAMEAU, JEAN-PHILIPPE (Micropædia)

A.S.D. **A.S. Davidsohn.** *Consulting Chemist. Coauthor of Soap Manufacture; Synthetic Detergents.*

INDUSTRIES, CHEMICAL PROCESS (in part)

A.Se. **Amulya Chandra Sen.** *Former Editor, The Indo-Asian Culture. Author of Asoka's Edicts and others.*

AŚOKA (Micropædia)

As.F. **Astrid Friis** (d. 1966). *Professor of History, University of Copenhagen.*

DENMARK (in part)

A.S.F. **Angus Stewart Fletcher.** *Distinguished Professor of English and Comparative Literature, City University of New York. Author of Allegory: The Theory of a Symbolic Mode and others.*

LITERATURE, THE ART OF (in part)

A.Sg. **Alfred Steinberg.** *Free-lance writer. Author of Man from Missouri: The Life and Times of Harry S. Truman.*

TRUMAN, HARRY S. (Micropædia)

A.S.G. **Arthur S. Gelston, Jr.** *Former Assistant in History, University of California, Berkeley.*

BRAZIL (in part)

A.Sh. **Amnon Shiloah.** *Professor of Musicology, Hebrew University of Jerusalem. Author of The Theory of Music in Arabic Writings and others.*

ISLAMIC ARTS (in part)

A.S.K. **Arvid S. Kapelrud.** *Professor of Old Testament, University of Oslo. Author of Israel.*

AARON (Micropædia)

A.S.K.-F. **Alexander Sydney Kanya-Forstner.** *Professor of History, York University, Downsview, Ontario. Author of The Conquest of the Western Sudan.*

FAIDHERBE, LOUIS (Micropædia)

A.S.L. **Arthur Stanley Link.** *George H. Davis '86 Professor of American History; Director of the Woodrow Wilson Papers, Princeton University. Author of Wilson. Editor of The Papers of Woodrow Wilson.*

UNITED STATES OF AMERICA
(in part)

A.S.M. **Arve Sverre Moen** (d. 1976). *Cultural Editor, Arbeiderbladet (newspaper), Oslo. Member of the Board, Edvard Munch Museum, Oslo. Author of Edvard Munch and others.*

MUNCH, EDVARD (Micropædia)

A.So. **Angelo Solmi.** *Film critic, Oggi (weekly literary periodical), Former Managing Editor, Rizzoli Editore, Milan. Author of Storia di Federico*

Fellini and others.

FELLINI, FEDERICO (in part)
(Micropædia)

A.S.Pa. **Ante S. Pavelić.** *Writer. Author of Dr. Ante Trumbić: Problemi hrvatsko-srpskih odnosa and others.*

YUGOSLAVIA (in part)

A.S.R. **Alfred S. Romer** (d. 1973). *Alexander Agassiz Professor of Zoology, Harvard University, 1947–65.*

SIMPSON, GEORGE GAYLORD
(Micropædia)

A.St. **Anthony Standen.** *Executive Editor, Kirk-Othmer Encyclopedia of Chemical Technology, New York City, 1963–70. Author of Science Is a Sacred Cow.*

INDUSTRIES, CHEMICAL PROCESS
(in part)

A.S.T. **A. Stewart Truswell.** *Boden Professor of Human Nutrition, University of Sydney. Author of ABC of Nutrition.*

NUTRITION (in part)

A.T. **Armen Leonovich Takhtajan.** *Director; Chief, Department of Higher Plants, Komarov Botanical Institute, Academy of Sciences of the U.S.S.R., Leningrad. Author of Flowering Plants: Origin and Dispersal.*

ANGIOSPERMS (in part)

A.Ta. **Allen Tate** (d. 1979). *Poet and critic. Regents' Professor of English, University of Minnesota, Minneapolis, 1966–68. Editor of T.S. Eliot: The Man and His Work, A Critical Evaluation by Twenty-six Distinguished Writers.*

ELIOT, T.S. (Micropædia)

A.Te. **Ahmet Temir.** *Emeritus Professor of Turcology and Mongolian Language, University of Ankara.*

TURKEY AND ANCIENT ANATOLIA
(in part)

A.T.L. **Anthony Thornton Luttrell.** *Former Assistant Director, British School at Rome.*

ITALY (in part)

A.T.T. **Alan T. Thomas.** *Technical Consultant, Distilled Spirits Council of the United States. Former Technical Director, Brown-Forman Corporation, Louisville, Kentucky.*

BEVERAGE PRODUCTION (in part)

A.T.v.M. **Arthur Taylor von Mehren.** *Story Professor of Law, Harvard University. Author of The Civil Law System.*

BUSINESS LAW (in part)

A.U. **Arne Unhjem.** *Professor of Philosophy, Wagner College, Staten Island, New York. Author of Dynamics of Doubt: A Preface to Tillich.*

TILlich, PAUL (Micropædia)

Au.L.R. **Austin L. Rand** (d. 1982). *Research Associate, Archbold Biological Station, Lake Placid, Florida. Chief Curator of Zoology, Field Museum of Natural History, Chicago, 1955–70. Author of Ornithology: An Introduction; coauthor of Birds of New Guinea.*

BIRDS (in part)

Au.T. **Auguste Toussaint.** *Director of Mauritius Archives, Port Louis, 1945–70. Author of History of the Indian Ocean and others.*

INDIAN OCEAN ISLANDS (in part)

A.Va. **Amry Vandenbosch.** *Emeritus Professor of Political Science, University of Kentucky, Lexington. Coauthor of The United Nations.*

UNITED NATIONS (in part)

A.v.B. **Andres R.F.T. von Brandt.** *Emeritus Professor of Fish Catching Techniques, University of Hamburg. Director, Institute for Fish Catching Techniques, Ministry for Food and Agriculture, Hamburg, 1936–71. Author of Fish Catching Methods of the World.*

FISHING, COMMERCIAL (in part)

A.V.B.N. **A.V.B. Norman.** *Master of the Armouries, Tower of London. Author of Arms and Armour and others.*

WAR, THE TECHNOLOGY OF (in part)

A.V.D. **A. Vibert Douglas.** *Emeritus Professor of Astronomy, Queen's University at Kingston, Ontario. Author of Arthur Stanley Eddington.*

EDDINGTON, SIR ARTHUR STANLEY
(Micropædia)

A.Vo. **Arthur Voyce.** *Historian of Russian art and architecture. Author of The Art and Architecture of Medieval Russia and others.*

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

A.W. **Alan Walker.** *Professor of Music, McMaster University, Hamilton, Ontario. Author of An Anatomy of Musical Criticism; A Study in Musical Analysis; and others.*

MUSIC, THE ART OF (in part)

A.Wa. **Andrew Warren.** *Senior Lecturer in Geography, University College, University of London.*

CONTINENTAL LANDFORMS (in part)

A.W.C. **Alan William Cuthbert.** *Sheild Professor of Pharmacology, University of Cambridge. Editor of Calcium and Cellular Function.*

DRUGS AND DRUG ACTION (in part)

A.We. **Albert Wendt.** *Professor of English, University of Auckland, New Zealand. Author of Leaves of the Banyan Tree and others.*

PACIFIC ISLANDS (in part)

A.W.G. **Alan William Gentry.** *Principal Scientific Officer, Department of Palaeontology, British Museum (Natural History), London. Author of numerous research papers on Old World hoofed mammals.*

MAMMALS (in part)

A.W.Ge. **Arnold Wycombe Gomme** (d. 1959). *Professor of Greek, University of Glasgow, 1946–57. Author of Historical Commentary on Thucydides; Greece; and others.*

THUCYDIDES (Micropædia)

A.W.Gr. **Alic William Gray** (d. 1981). *Head, Agricultural Advisory and Development Section, Electricity Council, London, 1966–70; Principal Assistant, 1948–65.*

AGRICULTURE, THE HISTORY OF (in part)

A.Wh. **Alwyne Wheeler**. *Principal Scientific Officer, Fish Section, Zoology Department, British Museum (Natural History), London. Author of Fishes of the World and others.*

FISHES (in part)

A.W.J. **A. Walter James**. *Principal, St. Catharine's, Windsor, England, 1974–82. Editor, The Times (London) Educational Supplement, 1952–69. Author of The Christian in Politics.*

ACTON OF ALDENHAM, JOHN EMERICH
EDWARD DALBERG ACTON, 1ST BARON
(Micropædia)

A.W.Ke. **A.W. Keuffel** (deceased). *Director, Vice President, and Secretary, Keuffel and Esser Company (manufacturers of slide rules and other equipment), Morristown, New Jersey.*

MATHEMATICS, THE HISTORY OF
(in part)

A.W.L. **Albert William Levi**. *David May Distinguished University Professor Emeritus of Humanities, Washington University, St. Louis, Missouri. Author of Philosophy and the Modern World.*

PHILOSOPHY, THE HISTORY OF WESTERN
(in part)

A.W.M. **Anne Wood Murray**. *Emeritus Curator of American Costume, Division of Costume, Department of Social and Cultural History, National Museum of American History, Smithsonian Institution, Washington, D.C.*

DRESS AND ADORNMENT
(in part)

A.Wo. **Albert Wolfson**. *Professor of Biological Sciences, Northwestern University, Evanston, Illinois.*

BEHAVIOUR, ANIMAL (in part)

A.W.P. **Alois Wilhelm Podhajsky** (d. 1973). *Director, Spanish Riding School of Vienna, 1939–64. Winner, Olympic Bronze Medal for Dressage (equestrian event), 1936. Author of The Complete Training of Horse and Rider and others.*

HORSES AND HORSEMANSHIP
(in part)

A.W.R. **Alan Westcott Richards**. *Development Manager, Imperial Smelting Ltd., Bristol, England. Author of articles on zinc smelting and zinc metallurgy.*

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

A.W.Re. **Allen Walker Read**. *Emeritus Professor of English, Columbia University. Author of "Approaches to Lexicography and Semantics" in Current Trends in Linguistics.*

ENCYCLOPAEDIAS AND DICTIONARIES
(in part)

A.W.S. **Albert Wilbur Schlechten** (d. 1984). *Director, W.J. Kroll Institute for Extractive Metallurgy, Colorado School*

of Mines, Golden.

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

A.Y. **Atsuhiko Yoshida**. *Professor of Comparative Mythology, Gakushuin University, Tokyo. Author of Origins of Japanese Myths and others.*

LITERATURE, THE ART OF (in part)

Ay.Sy. **Anthony Sillery** (d. 1976). *Secretary to the Curators of the Taylor Institution, University of Oxford, 1951–70. Resident Commissioner, Bechuanaland Protectorate, 1947–50.*

SOUTHERN AFRICA (in part)

A.Zy. **Antoni Zygmund**. *Gustavus F. and Anne M. Swift Distinguished Service Professor Emeritus of Mathematics, University of Chicago. World authority on Fourier analysis. Author of Trigonometric Series; coauthor of Analytic Functions.*

ANALYSIS (IN MATHEMATICS) (in part)

B. **Robert Norman William Blake, Baron Blake**. *Provost, Queen's College, University of Oxford. Author of The Conservative Party from Peel to Churchill and others.*

ASQUITH, H.H., 1ST EARL OF OXFORD
AND ASQUITH (Micropædia)

DISRAELI, BENJAMIN, EARL OF
BEACONSFIELD (in part) (Micropædia)
LLOYD GEORGE, DAVID (Micropædia)

B.A. **Bruno Accordi**. *Former Director, Geology and Paleontology Institute, University of Rome. Author of numerous publications on geology.*

EUROPE (in part)

B.A.B. **Bruce A. Bolt**. *Professor of Seismology, University of California, Berkeley. Author of Earthquakes: A Primer and others.*

EARTHQUAKES

B.A.C. **Bruce Alan Carr**. *Music Administrator, Pittsburgh Symphony Orchestra.*

MUSIC, THE ART OF (in part)

B.A.D. **Boyce A. Drummond, Jr.** *Emeritus Professor of History, Henderson State University, Arkadelphia, Arkansas. Author of Arkansas, Politics and Government.*

UNITED STATES OF AMERICA (in part)

B.A.F. **Boris Aleksandrovich Fedorovich** (d. 1981). *Senior Scientist, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow.*

ASIA (in part)

B.A.J. **Benjamin A. Jones, Jr.** *Professor of Agricultural Engineering, University of Illinois, Urbana. Coauthor of Engineering Applications in Agriculture.*

FARMING AND AGRICULTURAL
TECHNOLOGY (in part)

B.A.L.C. **Bryan A. L. Cranstone**. *Curator, Pitt-Rivers Museum, Oxford, England. 1976–85. Author of Melanesia.*

EAST INDIES, THE (in part)

B.Am. **Barthélemy Amengual**. *Editor, Études Cinématographiques. Author of*

René Clair; Clés pour le cinéma.

CLAIR, RENÉ (Micropædia)

B.A.M. **Boyd A. Martin**. *Distinguished Borah Professor of Political Science; Director, Boyd and Grace Martin Institute of Human Behavior; Director, Bureau of Public Affairs Research, University of Idaho, Moscow. Author of Idaho Voting Trends and others.*

UNITED STATES OF AMERICA (in part)

B.A.R. **Barbara A. Ringer**. *Attorney. Former Register of Copyrights, Copyright Office, Library of Congress, Washington, D.C. Coauthor of Copyrights.*

PROPERTY LAW (in part)

B.A.-S. **Brian Abel-Smith**. *Professor of Social Administration, London School of Economics and Political Science, University of London. Author of The Poor and the Poorest and others.*

SOCIAL WELFARE (in part)

B.As. **Bernard Ashmole** (d. 1988). *Lincoln Professor of Classical Archaeology and Art, University of Oxford, 1956–61.*

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

B.A.St. **Barbara A. Standley**. *Free-lance editor. Former Associate Editor, Encyclopædia Britannica, Chicago.*

INDIA (in part)

B.B. **Bela Balassa**. *Professor of Political Economy, Johns Hopkins University, Baltimore, Maryland. Consultant, International Bank for Reconstruction and Development. Author of Trade Liberalization Among Industrial Countries: Objectives and Alternatives and others.*

INTERNATIONAL TRADE (in part)

B.B.De. **Barbara B. Decker**. *Coauthor of Volcanoes.*

VOLCANISM (in part)

B.Be. **Bernard Beckerman** (d. 1985). *Brander Matthews Professor of Dramatic Literature, Columbia University, 1977–85. President, American Society for Theatre Research, 1973–79. Author of Shakespeare at the Globe; Dynamics of Drama; and others.*

THEATRICAL PRODUCTION (in part)

B.B.H. **Bruce B. Hanshaw**. *Assistant Director for Research, Geological Survey, U.S. Department of the Interior, Reston, Virginia. An authority on the geochemistry of groundwater.*

MINERALS AND ROCKS (in part)

B.Bl. **Brand Blanshard** (d. 1987). *Professor of Philosophy, Yale University, 1945–61. Author of The Nature of Thought; Reason and Analysis.*

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN (in part)

B.Ble. **Brebis Bleaney**. *Dr. Lee's Professor Emeritus of Experimental Philosophy, University of Oxford. Coauthor of Electricity and Magnetism and others.*

ELECTRICITY AND MAGNETISM
(in part)

B.Bo. Baruch Boxer. *Professor of Geography and Human Ecology, Rutgers University, New Brunswick, New Jersey. Author of Ocean Shipping in the Evolution of Hong Kong.*

CHINA (in part)
SHANGHAI
TIENTSIN

B.Br. Barbara Buckmaster (the Hon. Mrs. Barbara Miller) (d. 1966). *Writer on Balkan affairs. Member of the Staff, Foreign Research and Press Service, Royal Institute of International Affairs, London.*

ROMANIA (in part)

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

B.C. Barnaby Conrad. *Free-lance writer. Student of bullfighting with Juan Belmonte, 1943-46; bullfighter, 1946. Author of Matador; La Fiesta Brava; Encyclopedia of Bullfighting.*

BULLFIGHTING (Micropædia)

B.Ch. Brian Chapman (d. 1981). *Professor of Government, Victoria University of Manchester, England, 1961-81. Author of The Profession of Government and others.*

PUBLIC ADMINISTRATION (in part)

B.C.H. Bruce C. Heezen (d. 1977). *Associate Professor of Geology, Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York, 1964-77. Coauthor of The Floors of the Oceans.*

OCEANS (in part)

B.Cr. Bosley Crowther (d. 1981). *Creative consultant, Columbia Pictures, New York City, 1968-73. Screen critic and editor, The New York Times, 1940-68. Author of The Great Films: Fifty Golden Years of Motion Pictures.*

DISNEY, WALT (Micropædia)

B.C.R. Bruce Carlisle Robertson. *Specialist in Oriental studies. Former Instructor in Philosophy and Religion, Towson State College, Maryland.*

RAY, RAMMOHAN (Micropædia)

B.C.S. B. Charlotte Schreiber. *Professor of Geology, Queens College, City University of New York, Flushing. Coeditor of Sedimentology, "Earth Science Series."*

ASIA (in part)

B.C.So. Brian C. Southam. *Publisher, Athlone Press, London. Author of Jane Austen's Literary Manuscripts; Tennyson; and others.*

AUSTEN, JANE (in part) (Micropædia)

B.D.H. Baxter D. Honeycutt. *Manager, Exploration Support, ARCO Oil and Gas Company, Dallas, Texas.*

ENGINEERING (in part)

B.Di. Bern Dibner (d. 1988). *Historian of science and technology. Founder and Director, Burnaby Library, Norwalk, Connecticut, 1935-88. Author of Heralds of Science.*

GALVANI, LUIGI (Micropædia)

B.E. Blake Ehrlich (d. 1974). *Free-lance writer. Author of Paris on the Seine; London on the Thames.*

ATHENS (in part)
DUBLIN
EDINBURGH (in part)
FLORENCE
ISTANBUL
LISBON (in part)
LONDON (in part)
MADRID (in part)
MARSEILLE (in part)
PARIS (in part)
ROME (in part)
VENICE (in part)
VIENNA (in part)

Be.J. Bernard Jaffe (d. 1986). *Free-lance science writer. Chairman, Science Department, James Madison High School, Brooklyn, New York, 1944-58. Author of Men of Science in America and others.*

FERMI, ENRICO (Micropædia)

Be.M. Bernd Magnus. *Professor of Philosophy, University of California, Riverside. Executive Secretary, North American Nietzsche Society. Author of Nietzsche's Existential Imperative.*

NIETZSCHE

B.E.M. Bernard E. Meland. *Emeritus Professor of Constructive Theology, University of Chicago. Author of The Realities of Faith and others.*

OTTO, RUDOLF (Micropædia)

B.E.Ma. Bernard Edward Matthews. *Lecturer in Zoology, University of Edinburgh. Coauthor of Biology of Nematodes.*

CIRCULATION AND CIRCULATORY
SYSTEMS (in part)

B.E.McK. Brian E. McKnight. *Professor of History, University of Hawaii, Honolulu. Author of Village and Bureaucracy in Southern Sung China.*

CHINA (in part)

Be.N. Beaumont Newhall. *Visiting Professor of Art, University of New Mexico, Albuquerque. Director, George Eastman House, Rochester, New York, 1958-71. Author of The History of Photography; Latent Image; and others.*

PHOTOGRAPHY (in part)

B.E.N. Brian E. Newton. *Professor of Linguistics, Simon Fraser University, Burnaby, British Columbia. Author of The Generative Interpretation of Dialect: A Study of Modern Greek Phonology.*

LANGUAGES OF THE WORLD (in part)

B.F. Basil Alais Fletcher (d. 1983). *Professor and Director, Institute of Education, University of Leeds, England, 1961-67. Author of A Philosophy for the Teacher and others.*

EDUCATION, HIGHER

B.F.S. Bradford Fuller Swan (d. 1976). *Theatre and Art Critic, The Providence Journal and Evening Bulletin, Rhode Island.*

UNITED STATES OF AMERICA (in part)

B.Fu. Bruce Furie, M.D. *Chief, Coagulation Unit, New England Medical Center; Professor of Medicine, Tufts*

University, Boston.

BLOOD (in part)

B.F.W. Brian Frederick Windley. *Professor of Geology, University of Leicester, England. Author of The Evolving Continents.*

EARTH SCIENCES, THE (in part)

B.G. Branko Grünbaum. *Professor of Mathematics, University of Washington, Seattle. Author of Convex Polytopes.*

COMBINATORICS AND COMBINATORIAL
GEOMETRY (in part)

B.Ga. Balwant Gargi. *Playwright. Former Professor and Head, Department of Indian Theatre, Panjab University, Chandigarh, India. Author of Folk Theater of India and others.*

SOUTH ASIAN ARTS (in part)

B.Ge. Barbara Gelb. *Writer. Coauthor of O'Neill.*

O'NEILL, EUGENE (in part)

B.G.M. Barbara G. Mertz. *Historian and writer. Author of Temples, Tombs and Hieroglyphs and others.*

MEMPHIS (EGYPT) (Micropædia)

B.Gr. Benny Green. *Record reviewer, British Broadcasting Corporation. Jazz Critic, The Observer, London, 1958-77. Author of The Reluctant Art; Drums in My Tears; and others.*

MUSICAL FORMS AND GENRES
(in part)

B.G.S. Bernice Giduz Schubert. *Curator, Arnold Arboretum, Harvard University. Coauthor of The Begoniaceae of Colombia.*

ANGIOSPERMS (in part)

B.Gu. B. Gungaadash. *Head of section, Institute of Geography and Geocryology, Academy of Sciences of the Mongolian People's Republic, Ulaanbaatar.*

MONGOLIA (in part)

B.H. The Rev. Basil Hall. *Fellow and Dean, St. John's College, University of Cambridge, 1974-79. Professor of Ecclesiastical History, Victoria University of Manchester, 1968-74.*

CALVINISM, CALVIN AND (in part)

B.H.C. Ben H. Caudle. *B.J. Lancaster Professor of Petroleum Engineering, University of Texas at Austin. Author of Reservoir Engineering Fundamentals.*

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

B.-h.H. Bae-ho Hahn. *Professor of Political Science, Korea University, Seoul. Author of Theoretical Political Science.*

KOREA (in part)

B.H.J. Burgess H. Jennings. *Emeritus Professor of Mechanical Engineering, Northwestern University, Evanston, Illinois. Author of Environmental Engineering and others.*

REFRIGERATION (in part)

B.H.M. Brian H. Mason. *Chairman, Department of Mineral Sciences, Smithsonian Institution, Washington, D.C. An authority on the distribution of elements in the Earth's crust. Author of*

Principles of Geochemistry.

CHEMICAL ELEMENTS (in part)

B.H.W. Brian H. Warmington. *Reader in Ancient History, University of Bristol, England. Author of The Roman North African Provinces and others.*

NORTH AFRICA (in part)

B.H.We. Byron H. Webb. *Consultant in dairy technology. Former Chief, Dairy Products Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. Coeditor of Fundamentals of Dairy Chemistry.*

FARMING AND AGRICULTURAL

TECHNOLOGY (in part)

FOOD PROCESSING (in part)

B.I.B. Boris Ivan Balinsky. *Emeritus Professor of Zoology, University of the Witwatersrand, Johannesburg, South Africa. Author of An Introduction to Embryology.*

GROWTH AND DEVELOPMENT,
BIOLOGICAL (in part)

Bi.C. Bin Cheng. *Professor of Air and Space Law, University College, University of London. Author of The Law of International Air Transport.*

INTERNATIONAL LAW (in part)

TRANSPORTATION LAW (in part)

B.Ja. Bernard Jacobson. *Director of Promotion, Boosey & Hawkes Ltd. (music publisher), London; Deputy Director of Publications, 1979–81. Author of The Music of Johannes Brahms.*

MUSICAL FORMS AND GENRES (in part)

B.J.C. Bryant J. Cratty. *Professor of Kinesiology; Director, Perceptual-Motor Learning Laboratory, University of California, Los Angeles. Author of Movement Behavior and Motor Learning; Perceptual and Motor Development in Infants and Children.*

LEARNING AND COGNITION, HUMAN
(in part)

B.J.D.M. Bastiaan J.D. Meeuse. *Professor of Botany, University of Washington, Seattle. Author of The Story of Pollination.*

REPRODUCTION AND REPRODUCTIVE
SYSTEMS (in part)

B.Je. Barbara Jelavich. *Professor of History, Indiana University, Bloomington. Author of History of the Balkans and others.*

BALKANS (in part)

B.J.M. Sir Basil John Mason. *Pro-Chancellor, University of Surrey, England. Director General, Meteorological Office, Bracknell, England, 1965–83. Author of The Physics of Clouds; Clouds, Rain and Rainmaking.*

CLIMATE AND WEATHER (in part)

B.J.McG. Bernard J. McGinn. *Professor of Historical Theology and the History of Christianity, University of Chicago. Author of The Calabrian Abbot.*

CHRISTIANITY (in part)

B.Jo. Bernard Joy. *Former football correspondent, Evening Standard, London. Author of Soccer Tactics.*

SPORTS, MAJOR TEAM AND INDIVIDUAL
(in part)

B.J.R. Brian James Roud (deceased).
Historian.

SPAIN (in part)

B.J.T. Brian J. Thompson. *William F. May Professor of Engineering and Professor of Optics; Dean, College of Engineering and Applied Science, University of Rochester, New York. Author of Physical Optics Notebook.*

OPTICS, PRINCIPLES OF (in part)

B.J.U. Benton J. Underwood. *Stanley G. Harris Professor Emeritus of Social Science, Northwestern University, Evanston, Illinois. Author of Experimental Psychology; coauthor of Meaningfulness and Verbal Learning.*

MEMORY (in part)

B.K. Benjamin Keen. *Emeritus Professor of History, Northern Illinois University, De Kalb. Editor of Readings in Latin American Civilization, 1492 to the Present and others.*

BALBOA, VASCO NÚÑEZ DE (Micropædia)
LATIN AMERICA, THE HISTORY
OF (in part)

B.Ke. Bettyann Kevles. *Science Editor, University of California Press, Los Angeles. Science Columnist, Los Angeles Times. Author of Females of the Species.*

DARWIN

B.K.M. Barrie K. Macdonald. *Reader in History, Massey University, Palmerston North, New Zealand. Author of Cinderellas of the Empires: Towards a History of Kiribati and Tuvalu.*

PACIFIC ISLANDS (in part)

B.K.N. Basheer K. Nijim. *Professor and Head, Department of Geography, University of Northern Iowa, Cedar Falls. Coeditor of The Arab World: A Handbook.*

ARABIA (in part)

B.K.S. Brian K. Smith. *Assistant Professor of Religion, Barnard College, Columbia University. Author of Reflections on Resemblance, Ritual and Religion.*

HINDUISM (in part)

B.Ku. Bernhard Kummel (d. 1980). *Professor of Geology, Harvard University, 1962–80. Investigator of Mesozoic stratigraphy in the Himalayas and Peru. Author of History of the Earth.*

GEOCHRONOLOGY (in part)

B.L. Barnabas Lindars. *Rylands Professor of Biblical Criticism and Exegesis, Victoria University of Manchester. Author of Jesus Son of Man.*

PAUL, THE APOSTLE

B.L.C. Barbara Lovett Cline. *Biology teacher. Author of The Questioners: Physicists and the Quantum Theory.*

BROGLIE, LOUIS-VICTOR, 7^e DUC
DE (Micropædia)

DIRAC, P.A.M. (Micropædia)

B.L.K. Barry L. Karger. *Professor of Chemistry, Northeastern University, Boston, Massachusetts. Coauthor of Introduction to Separation Science.*

ANALYSIS AND MEASUREMENT,
PHYSICAL AND CHEMICAL (in part)

B.L.S. Bruce Lannes Smith. *Emeritus Professor of Political Science, Michigan State University, East Lansing. Coauthor of Propaganda, Communication and Public Opinion.*

PROPAGANDA

B.L.T. B.L. Turner. *Professor of Botany; Director, Plant Resources Center, University of Texas at Austin. Author of Legumes of Texas; coeditor of Chemotaxonomy of the Leguminosae.*

ANGIOSPERMS (in part)

B.L.v.d.W. Bartel Leendert van der Waerden. *Emeritus Professor of Mathematics, University of Zürich. Author of Science Awakening and others.*

EUCLID (Micropædia)

B.M. Björn Matthíasson. *Economist, Central Bank of Iceland, Reykjavik.*

ICELAND (in part)

B.Ma. Benjamin March (d. 1940). *Curator of Asiatic Art, Detroit Institute of Arts. Author of The History of Chinese Painting in Outline.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

B.M.A. Bruce M. Alberts. *Professor of Biochemistry and Biophysics, University of California, San Francisco. Coauthor of The Molecular Biology of the Cell.*

CELLS (in part)

B.M.H. Bernice Margaret Hamilton. *Associate of St. Edmund's House, University of Cambridge. Former Senior Lecturer in Politics, University of York, Heslington, England. Author of Political Thought in 16th-Century Spain.*

VITORIA, FRANCISCO DE (Micropædia)

B.M.M. Barbara Mary Middlehurst. *Visiting Scientist, Lunar Science Institute, Houston, Texas, 1973–74. Associate Editor, Astronomy, Encyclopædia Britannica, Chicago, 1968–72. Coeditor of Moon, Meteorites and Comets.*

MECHANICS (in part)

B.Mo. Brita Maud Ellen Mortensen (d. 1958). *Lecturer in Swedish, University of Cambridge, 1950–58. Coauthor of An Introduction to Scandinavian Literature.*

SCANDINAVIAN LITERATURE (in part)

STRINDBERG, AUGUST (Micropædia)

B.N. Bruno Nettl. *Professor of Music and of Anthropology, University of Illinois, Urbana. Author of The Study of Ethnomusicology; Folk and Traditional Music of the Western Continents.*

FOLK ARTS (in part)

B. Ne. Bert Nelson. *Editor, Track & Field News. Editor of Little Gold Book; Olympic Track & Field.*

SPORTS, MAJOR TEAM AND INDIVIDUAL
(in part)

B.N.P. Baij Nath Puri. *Emeritus Professor of Ancient Indian History and*

Archaeology, University of Lucknow, India. Author of Cities of Ancient India. TAXILA (Micropædia).

B.N.T. B.N. Taylor. *Chief, Electricity Division, Center for Basic Standards, National Bureau of Standards, Washington, D.C. Coauthor of The Fundamental Constants and Quantum Electrodynamics.*

PHYSICAL PRINCIPLES AND CONCEPTS (in part)

B.O'G. Brendan Anthony O'Grady. *Professor of English, University of Prince Edward Island, Charlottetown. CANADA (in part)*

B.O'K. Bernard O'Kelly. *Dean, College of Arts and Sciences; Professor of English, University of North Dakota, Grand Forks.*

UNITED STATES OF AMERICA (in part)

B.R. Bayard Rankin. *Associate Editor, Mathematics, Encyclopædia Britannica, Chicago, 1971-73. Associate Professor of Mathematics, Case Western Reserve University, Cleveland, 1960-71. Coauthor and editor of Differential Space, Quantum Systems, and Prediction.*

AUTOMATA THEORY (in part)

PROBABILITY THEORY

B.R.N. B.R. Nanda. *Former Director, Nehru Memorial Museum and Library, New Delhi. Author of Mahatma Gandhi: A Biography and others.*

GANDHI

B.R.S. B. Raphael Sealey. *Professor of History, University of California, Berkeley. Author of A History of the Greek City States, ca. 700-338 B.C.*

GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

B.R.W. Bryan R. Wilson. *Reader in Sociology, University of Oxford. Author of Religion in Sociological Perspective. MORMON (Micropædia)*

B.S.B. Benedikt Sigurdur Benedikz. *Head of Special Collections, Library, University of Birmingham, England. Author of Iceland: The Spread of Printing.*

ARCTIC, THE (in part)

ICELAND (in part)

SCANDINAVIAN LITERATURE (in part)

B.Sc. Bobb Schaeffer. *Emeritus Curator of Vertebrate Paleontology, American Museum of Natural History, New York City.*

FISHES (in part)

B.S.-E. Bickham A.C. Sweet-Escott. *Group Finance Coordinator, The British Petroleum Company Ltd., 1957-72. Manager, Ionian Bank Ltd., 1950-57. Author of Greece: A Political and Economic Survey, 1939-1953. GREECE (in part)*

B.S.F. Bernard S. Finn. *Curator, Division of Electricity and Modern Physics, Smithsonian Institution, Washington, D.C.*

TELECOMMUNICATIONS SYSTEMS (in part)

B.S.L. Bruce Sween Liley. *Professor of Physics, University of Waikato, Hamilton, New Zealand.*

MATTER (in part)

B.S.Lo. Barry Steven Lorge. *Sports Editor, The San Diego Union, California. Contributing Editor, Tennis Magazine.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

B.S.M. Basil S. Markesinis. *Denning Professor of Comparative Law, Queen Mary College, University of London. Professor of Anglo-American Law, State University of Leiden, The Netherlands. Author of The German Law of Torts: A Comparative Introduction.*

TORTS

B.Sv. B. Shirendev. *Historian. Former President, Academy of Sciences of the Mongolian People's Republic, Ulaanbaatar.*

MONGOLIA (in part)

B.T.D. Bernard Thomas Donovan. *Professor of Neuroendocrinology, Institute of Psychiatry, University of London.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

B.T.S. Bradley Titus Scheer. *Emeritus Professor of Biology, University of Oregon, Eugene. Author of Animal Physiology.*

BIOLOGICAL SCIENCES, THE (in part)

B.T.Sh. Byron Thomas Shaw. *Assistant to Administrator, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C., 1965-68.*

AGRICULTURAL SCIENCES (in part)

Bu.H.W. Burns H. Weston. *Bessie Dutton Murray Distinguished Professor of Law, University of Iowa, Iowa City. Coauthor of International Law and World Order: An Introductory Problem-oriented Coursebook.*

HUMAN RIGHTS

B.V. Birgit Vennesland. *Head, Vennesland Research Laboratory, Max Planck Society, 1970-81; Director, Max Planck Institute for Cell Physiology, Berlin, 1968-70.*

BIOLOGICAL SCIENCES, THE (in part)

B.V.Gy. Bo Vilhelm Gyllensvärd. *Former Director, Museum of Far Eastern Antiquities, Stockholm. Assistant Professor, Far Eastern Section, Institute of History of Art, University of Stockholm. Author of T'ang Gold and Silver and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

B.V.S. Brian Vincent Street. *Lecturer in Social Anthropology, University of Sussex, Brighton, England. Author of The Savage in Literature and others.*

TYLOR, SIR EDWARD BURNETT (Micropædia)

B.W. Basil Willey (d. 1978). *King Edward VII Professor of English Literature, University of Cambridge,*

1946-64. Author of Darwin and Butler: Two Versions of Evolution; Nineteenth Century Studies; and others.

ARNOLD, MATTHEW (in part) (Micropædia)

BUTLER, SAMUEL (Micropædia)
WORDSWORTH, WILLIAM (in part) (Micropædia)

B.W.B. Bernard Winslow Beckingsale. *Former Senior Lecturer in Modern History, University of Newcastle upon Tyne, England. Author of Burghley: Tudor Statesman and others.*

CECIL, WILLIAM, 1ST BARON BURGHLEY (in part) (Micropædia)

B.-W.C. Byong-Wuk Chong. *Professor of Korean Literature, Seoul National University. Author of Essays on Korean Literature; Complete Anthology of Sijo.*

KOREAN LITERATURE (in part)

B.We. Bruce Webster. *Senior Lecturer in History, University of Kent at Canterbury, England.*

ROBERT I (SCOTLAND) (Micropædia)

B.W.H. Bruce W. Halstead, M.D. *Director, World Life Research Institute, Colton, California. Author of Poisonous and Venomous Marine Animals of the World.*

POISONS AND POISONING (in part)

B.W.M. Bernard W. Minifie. *Consultant, Knechtel Laboratories, Inc. (consultants to the candy industry), Skokie, Illinois. Author of Science and Technology of Chocolate, Cocoa and Confectionery.*

FOOD PROCESSING (in part)

B.W.Ma. B.W. Mazur. *Lecturer in Polish Language and Literature, School of Slavonic and East European Studies, University of London. Author of Colloquial Polish.*

POLISH LITERATURE (in part)

B.Wn. Brian Weinstein. *Professor of Political Science, Howard University, Washington, D.C. Author of Eboué; coauthor of Introduction to African Politics.*

CENTRAL AFRICA (in part)

B.Wo. Bernard Wood. *Derby Professor of Anatomy, University of Liverpool. Author of Human Evolution; Evolution of Early Man.*

EVOLUTION, HUMAN (in part)

MUSCLES AND MUSCLE SYSTEMS (in part)

B.W.W. Bruce Withington Wilshire. *Professor of Philosophy, Rutgers University, New Brunswick, New Jersey. Author of Metaphysics: An Introduction to Philosophy and others. METAPHYSICS (in part)*

B.Z.B. Rabbi Ben Zion Bokser (d. 1984). *Rabbi, Forest Hills Jewish Center, Forest Hills, New York. Adjunct Professor of Political Science, Queens College, City University of New York. Author of The Legacy of Maimonides. MAIMONIDES, MOSES (Micropædia)*

Ca.B. Carl Bode. *Professor of English, University of Maryland, College Park.*

Editor of *Collected Poems of Henry Thoreau*.

THOREAU, HENRY DAVID (Micropædia)

C.A.B. Clifford A. Barnes. *Emeritus Professor of Oceanography, University of Washington, Seattle. Author of numerous articles on oceanography.*

OCEANS (in part)

C.A.Bl. Conrad Alexander Blyth. *Professor of Economics, University of Auckland, New Zealand. Author of Inflation in New Zealand and others.*

NEW ZEALAND (in part)

Ca.C. Camille Camara. *Expert in Curriculum Development, United Nations Development Program, Abidjan, Ivory Coast. Author of Saint-Louis du Senegal.*

WESTERN AFRICA (in part)

C.A.E. Clive Arthur Edwards. *Senior Principal Scientific Officer, Rothamsted Experimental Station, Harpenden, England. Author of Principles of Agricultural Entomology and others.*

SOIL ORGANISMS

Ca.G. Carlton Gamer. *Composer. Professor of Music, Colorado College, Colorado Springs.*

MUSICAL INSTRUMENTS
(in part)

C.A.G.W. C.A.G. Wiersma (d. 1979). *Professor of Biology, California Institute of Technology, Pasadena, 1947–76. Editor of Invertebrate Nervous Systems.*

SENSORY RECEPTION (in part)

C.A.L. Carl Adam Lawrence (d. 1972). *Director, Bureau of Laboratories, Los Angeles County Health Department, California, 1953–70. Author of Surface-Active Quaternary Ammonium Germicides.*

ANTIMICROBIAL AGENT (in part)
(Micropædia)

C.-A.La. Charles-André Laffargue. *General, French Army (retired). Author of Foch et la Bataille de 1918 and others.*

FOCH, FERDINAND (Micropædia)

C.A.M. Carlile Aylmer Macartney (d. 1978). *Research Fellow, All Souls College, University of Oxford, 1936–65. Montagu Burton Professor of International Relations, University of Edinburgh, 1951–57. Author of Hungary: A Short History and others.*

DEÁK, FERENC (Micropædia)

HUNGARY (in part)

KOSSUTH, LAJOS (Micropædia)

C.A.McC. Charles A. McClelland. *Emeritus Professor of International Relations, University of Southern California, Los Angeles. Author of Theory and the International System.*

SOCIAL SCIENCES, THE (in part)

C.A.McI. Christopher Angus McIntosh. *Editor and writer, Mitchell Beazley (publisher), London. Author of The Swan King: Ludwig II of Bavaria and others.*

COLOGNE (in part)

HAMBURG (in part)

C.A.M.K. Cuchlaine Audrey Muriel King. *Emeritus Professor of Physical Geography, University of Nottingham, England. An authority on coastal geomorphology. Author of Beaches and Coasts; An Introduction to Oceanography.*

OCEANS (in part)

C.A.P. Christopher A. Pallis. *Emeritus Reader in Neurology, Royal Postgraduate Medical School, University of London. Author of The ABC of Brain Stem Death.*

DEATH

C.A.R. Colin Alistair Ronan. *Science writer and lecturer. Editor, Journal of the British Astronomical Association. Author of The Cambridge Illustrated History of the World's Science and many others.*

CALENDAR (in part)

COPERNICUS (in part)

HIPPARCHUS (in part) (Micropædia)

PTOLEMY (Micropædia)

RUSSELL, HENRY NORRIS (Micropædia)

C.A.Ro. C. Ambrose Rogers. *Astor Professor of Mathematics, University College, University of London. Author of Hausdorff Measures.*

NUMBER THEORY (in part)

C.A.T. Cornelius A. Tobias. *Professor of Biophysics and Medical Physics, University of California, Berkeley. Author of papers on radiation biophysics and cancer research.*

RADIATION (in part)

C.A.Tr. Constantine Athanasius Trypanis. *Minister of Culture and Science, Government of Greece, 1974–77. Professor of Classical Languages and Literatures, University of Chicago, 1968–74. Author of Medieval and Modern Greek Poetry.*

GREEK LITERATURE (in part)

C.Au. Charlotte Auerbach. *Emeritus Professor of Animal Genetics, University of Edinburgh. Author of The Science of Genetics; Mutation Research: Problems, Results, and Perspectives.*

GENETICS AND HEREDITY, THE
PRINCIPLES OF (in part)

C.A.V. Claude A. Villee. *Andelot Professor of Biological Chemistry, Medical School, Harvard University, Boston, Massachusetts. Author of Biological Principles and Processes.*

BIOLOGICAL SCIENCES, THE
(in part)

C.A.W. Charles A. Wert. *Professor of Metallurgy; Head, Department of Metallurgy and Mining Engineering, University of Illinois, Urbana. Coauthor of Physics of Solids.*

MATTER (in part)

C.B. Colin Boocock (d. 1973). *Director of Geological Survey, Republic of Botswana, Lobatse. Coauthor of Notes on the Geology and Hydrogeology of the Central Kalahari Region.*

AFRICA (in part)

C.Ba. Clive Barker. *Senior Lecturer in Theatre Studies, University of Warwick, England. Coeditor, New Theatre Quarterly. Author of Theatre Games. THEATRICAL PRODUCTION (in part)*

C.B.B. Carl B. Boyer (d. 1976). *Professor of Mathematics, Brooklyn College, City University of New York, 1952–76. Author of The History of the Calculus and Its Conceptual Development; History of Analytic Geometry; A History of Mathematics; and others.*

EULER, LEONHARD (Micropædia)

FERMAT, PIERRE DE (Micropædia)

C.B.Co. Carl B. Cone. *Emeritus Professor of History, University of Kentucky, Lexington. Author of Burke and the Nature of Politics; The English Jacobins.*

UNITED KINGDOM (in part)

C.B.H. Charles B. Hunt. *Professor of Geology, Johns Hopkins University, Baltimore, Maryland, 1961–73. A principal investigator of the geology of the western United States. Author of Physiography of the United States.*

GEOCHRONOLOGY (in part)

C.B.He. Charles B. Heiser, Jr. *Distinguished Professor of Botany, Indiana University, Bloomington. Author of Seed to Civilization: The Story of Food.*

ANGIOSPERMS (in part)

C.Bi. Cyril Bibby (d. 1987). *Principal, Kingston upon Hull College of Education, University of Hull Institute of Education, England, 1959–76. Author of T.H. Huxley: Scientist, Humanist, and Educator and others.*

HUXLEY, SIR ANDREW FIELDING
(Micropædia)

HUXLEY, SIR JULIAN (Micropædia)

HUXLEY, T.H. (Micropædia)

C.Bl. Claude Blair. *Keeper of Metalwork, Victoria and Albert Museum, London, 1972–82. Author of European Armour; European and American Arms; and others.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

C.B.MacD. Charles B. MacDonald. *Deputy Chief Historian, U.S. Army Center of Military History, Washington, D.C., 1967–80. Author of The Mighty Endeavor: American Armed Forces in the European Theater in World War II.*

WAR, THE TECHNOLOGY OF (in part)

C.B.Mo. C.B. Monk, Jr. *Senior Consultant, Wiss, Janney, Elstner, and Associates (consulting engineers), Northbrook, Illinois.*

BUILDING CONSTRUCTION (in part)

C.B.My. Charles B. Morrey, Jr. *Professor of Mathematics, University of California, Berkeley, 1945–73. Author of Multiple Integrals in the Calculus of Variations.*

ANALYSIS (IN MATHEMATICS) (in part)

C.C. Claude Cahen. *Emeritus Professor of Islâmic History, University of Paris.*

Author of La Syrie du nord à l'époque des croisades and others.

ALP-ARSLAN (Micropædia)

C.C.A. Claude C. Albritton. *Hamilton Professor Emeritus of Geology; Vice President and Senior Scientist, Institute for the Study of Earth and Man, Southern Methodist University, Dallas, Texas. Coauthor and editor of The Fabric of Geology; Uniformity and Simplicity.*

EARTH SCIENCES, THE (in part)

GEOCHRONOLOGY (in part)

C.C.B. Charles Calvert Bayley. *Kingsford Professor of History, McGill University, Montreal. Author of The Formation of the German College of Electors in the Mid-Thirteenth Century and others.*

GERMANY (in part)

C.Ce. Charles Cestre (d. 1959). *Professor of American Literature and Civilization, University of Paris, 1917-42. Author of Histoire de la littérature américaine and others.*

POE, EDGAR ALLAN (in part)

(Micropædia)

C.Ch. Charles Chadwick. *Carnegie Professor of French, University of Aberdeen, Scotland. Author of Mallarmé, sa pensée dans sa poésie; Symbolism. MALLARMÉ, STÉPHANE (Micropædia)*

C.Cl. Cecil Clutton. *Secretary, Organs Advisory Committee, Council for Places of Worship, England. Consultant for the rebuilding of the organ, St. Paul's Cathedral, London. Fellow, Society of Antiquaries, London. Author of The Organ: Its Tonal Structure and Registration; The British Organ. MUSICAL INSTRUMENTS (in part)*

C.C.M. Claudius Cornelius Müller. *Head, East Asian Department, State Museum of Ethnology, Munich. Author of Untersuchungen zum Erdalter she im China der Chou- und Han-Zeit. SHIH HUANG-TI (in part) (Micropædia)*

C.C.MacD. C.C. MacDuffee (d. 1961). *Professor of Mathematics, University of Wisconsin, Madison, 1943-61. President, Mathematical Association of America, 1945-46. Author of The Theory of Matrices and others.*

ARITHMETIC (in part)

C.C.O'B. Conor Cruise O'Brien. *Pro-Chancellor, University of Dublin. Editor in Chief, The Observer, London, 1978-81. Member, Seanad Éireann, Dublin, 1977-79; Dáil Éireann, 1969-77. Author of Parnell and His Party.*

PARNELL, CHARLES STEWART (Micropædia)

C.C.P. Cuthbert Coulson Pounder. *Marine engineering consultant. Director and Chief Technical Engineer, Harland and Wolff Ltd., Belfast, Northern Ireland, 1930-65. Coauthor of Marine Diesel Engines.*

INDUSTRIES, MANUFACTURING (in part)

C.C.T. Clifford Charles Townsend. *Principal Scientific Officer, Royal Botanic Gardens, Kew, England. Editor*

and coauthor of Flora of Iraq.

ANGIOSPERMS (in part)

C.D. Carlo Diano (d. 1974). *Professor of Greek Literature, University of Padua, Italy. Author of Lettere di Epicuro e dei suoi; editor of Epicuri Ethica.*

EPICURUS (Micropædia)

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

C.D.Cu. Charles D. Cuttler. *Emeritus Professor of Art History, University of Iowa, Iowa City. Author of Northern Painting from Pucelle to Bruegel.*

SLUTER, CLAUS (Micropædia)

C.De. Charles Dédéyan. *Emeritus Professor of Comparative Literature, University of Paris IV. Author of Montaigne chez ses amis Anglo-Saxons. FRANCE (in part)*

C.D.G. C. David Gutsche. *Professor of Chemistry, Washington University, St. Louis, Missouri. Author of Chemistry of Carbonyl Compounds.*

CHEMICAL COMPOUNDS (in part)

C.D.H. Chauncy D. Harris. *Samuel N. Harper Distinguished Service Professor Emeritus of Geography, University of Chicago. Author of Cities of the Soviet Union: Studies in Their Functions, Size, Density, and Growth.*

GEOGRAPHY MONGOLIA (in part)

C.D.K. Carol D. Kiesinger. *Arts consultant. Hiker and mountain climber. Coeditor of The Armchair Mountaineer. MOUNTAINEERING (in part)*

(Micropædia)

C.Do. Clifford Dowdey (d. 1979). *Lecturer in Creative Writing, University of Richmond, Virginia, 1958-69. Author of Lee and others; editor of The Wartime Papers of Robert E. Lee.*

LEE, ROBERT E. (Micropædia)

C.D.O. Clifford David Ollier. *Professor of Geography, University of New England, Armidale, Australia. ECOSYSTEMS (in part)*

C.D.R. C.D. Ross (d. 1986). *Professor of Medieval History, University of Bristol, England. Author of The Wars of the Roses and others.*

HENRY V (ENGLAND)

(Micropædia)

C.D.T. Conrad D. Totman. *Professor of History, Northwestern University, Evanston, Illinois. Author of Ieyasu: Shogun and others.*

TOKUGAWA IEYASU (Micropædia)

C.E.B.B. Charles Edmond Bradlaugh Bonner (d. 1976). *Principal Curator, Conservatory and Botanical Garden, Geneva. Author of Index Hepaticarum. ANGIOSPERMS (in part)*

C.E.B.C. Charles E.B. Conybeare (d. 1982). *Reader in Geology, Australian National University, Canberra.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

C.E.C. Charles Edward Casolani. *Lieutenant Colonel, British Army (retired). Amateur rider, show jumper,*

and trainer, 1919-56.

HORSES (in part)

C.E.Ca. Concepción E. Castañeda. *Associate Professor of Spanish, Millikin University, Decatur, Illinois. Professor of Geography, University of Havana, 1960-62.*

SOUTH AMERICA (in part)

C.E.Co. Charles E. Cornelius. *Director, California Primate Research Center, University of California, Davis. Dean, College of Veterinary Medicine, University of Florida, Gainesville, 1971-81. Editor of Advances in Veterinary Science and Comparative Medicine.*

DISEASE (in part)

C.E.E. Cyril Ernest Everard. *Senior Lecturer in Geography, Queen Mary College, University of London. Editor, Physical Geography, Encyclopedia of Geography.*

EUROPE (in part)

C.E.G. Creighton E. Gilbert. *Professor of History of Art, Yale University. Author of Michelangelo; editor and translator of Complete Poems and Selected Letters of Michelangelo.*

MICHELANGELO

C.E.He. Charles E. Hecht. *Professor of Chemistry, Hunter College, City University of New York. Author of papers on physical and chemical processes occurring at very low temperatures.*

MATTER (in part)

C.E.McL. Charles E. McLure, Jr. *Senior Fellow, Hoover Institution on War, Revolution and Peace, Stanford, California. Author of The Value Added Tax: Key to Deficit Reduction and others.*

TAXATION (in part)

C.E.N. Clyde Everett Noble. *Professor of Experimental Psychology, University of Georgia, Athens. Author of Outline of Psychological Measurement; The Psychology of Cornet and Trumpet Playing; and others.*

LEARNING AND COGNITION, HUMAN (in part)

C.E.No. Charles E. Nowell. *Emeritus Professor of History, University of Illinois, Urbana. Author of The Great Discoveries and the First Colonial Empires and others.*

EUROPEAN OVERSEAS EXPLORATION AND EMPIRES, THE HISTORY OF (in part)

HENRY THE NAVIGATOR (Micropædia)

C.E.R. Charles Edward Reynolds (d. 1971). *Managing Editor, Concrete Publications Ltd., London, 1960-69. Author of Reinforced Concrete Designer's Handbook and others. BUILDING CONSTRUCTION (in part)*

C.E.S. Courtenay Edward Stevens. *Former Fellow and Tutor in Ancient History, Magdalen College, University of Oxford.*

GERMANY (in part)

C.E.T. Cecil Edgar Tilley (d. 1973). *Professor of Mineralogy and Petrology,*

University of Cambridge, 1931–61.
World authority on igneous petrology.
BOWEN, NORMAN L. (Micropædia)
 MINERALS AND ROCKS (in part)

C.Fa. Clifton Fadiman. *Writer and editor. Member, Board of Editors, Encyclopædia Britannica. Member, Editorial Board, Book-of-the-Month Club. Advisory Editor, Cricket: The Children's Magazine. Author of The Lifetime Reading Plan and many others.*
 LITERATURE, THE ART OF (in part)

C.F.A.S. Claude Frédéric Armand Schaeffer (d. 1982). *Professor of the Archaeology of Western Asia, College of France, Paris, 1954–69. Director of the French Archaeological Expeditions to Ras Shamra-Ugarit, Syria, and Enkomi-Alasia, Cyprus. Editor of Ugaritica I to VII.*
 UGARIT (Micropædia)

C.Fe. Cyrille Felteau. *Journalist and historian. Former Editorial and News Writer, La Presse, Montreal.*
 MONTREAL (in part)

C.F.F. Charles F. Fuechsel (d. 1977). *Atlantic Region Engineer, Topographic Division, Geological Survey, U.S. Department of the Interior, Washington, D.C., 1959–65. Author of numerous articles on mapping and surveys.*
 MAPPING AND SURVEYING (in part)

C.F.M. Clovis F. Maksoud. *Permanent Observer of the League of Arab States to the United Nations. Author of The Crisis of the Arab Left and others.*
 LEBANON (in part)

C.F.O. Christian F. Otto. *Professor of Architecture, Cornell University, Ithaca, New York.*
 BORROMINI, FRANCESCO (Micropædia)

C.F.S. Carl Fredrik Sandelin. *Novelist. Former General Manager and Editor in Chief, Finnish News Agency, Helsinki.*
 FINLAND (in part)

C.F.V. Charles F. Voegelin (d. 1986). *Distinguished Professor of Anthropology and of Linguistics, Indiana University, Bloomington, 1967–76. Editor, International Journal of American Linguistics. Coauthor of Classification and Index of the World's Languages.*
 LANGUAGES OF THE WORLD (in part)

C.Fy. Christopher Fyfe. *Reader in African History, University of Edinburgh. Author of A History of Sierra Leone.*
 WESTERN AFRICA (in part)

C.G. Christiaan Glasz. *Former Professor of Public Finance, State University of Leiden, The Netherlands. Royal Commissioner, De Nederlandsche Bank.*
 MARKETS (in part)

C.Ga. Clemente Garavito. *Vice President, Colombian Geographical Society, Bogotá. Author of numerous articles on geography.*
 COLOMBIA (in part)

C.G.B. Carl G. Baker, M.D. *Medical Director, Ludwig Institute for Cancer Research, Zurich, 1977–82. Director,*

National Cancer Institute, U.S. Department of Health, Education, and Welfare, Bethesda, Maryland, 1969–72.
 CANCER (in part)

C.G.G. Charles Goode Gomillion. *Emeritus Professor of Sociology, Tuskegee Institute, Alabama.*
 UNITED STATES OF AMERICA (in part)

C.G.H. Carl G. Hempel. *Stuart Professor Emeritus of Philosophy, Princeton University. University Professor of Philosophy, University of Pittsburgh, Pennsylvania. Author of Philosophy of Natural Science.*
 CARNAP, RUDOLF (Micropædia)

C.G.P. Charles G. Pearson. *Associate Professor of Journalism, Wichita State University, Kansas.*

UNITED STATES OF AMERICA (in part)

C.G.S. Charles Gordon Smith. *Research Fellow of Keble College, Oxford; former Lecturer in Geography, University of Oxford. Editor of Oxford Regional Economic Atlas: The Middle East and North Africa.*

ARABIA (in part)

EGYPT (in part)

SYRIA (in part)

C.G.Se. Claudio G. Segre. *Associate Professor of History, University of Texas at Austin. Author of Fourth Shore: The Italian Colonization of Libya.*

ITALY (in part)

C.G.St. Chester G. Starr. *Bentley Professor of Ancient History, University of Michigan, Ann Arbor. Author of Rise and Fall of the Ancient World and others.*

PEISISTRATUS (Micropædia)

C.G.T. Constantine Gennadiyevich Tikhotskiy. *Professor, Moscow M.V. Lomonosov State University. Author of numerous articles on hydrology.*
 ASIA (in part)

C.H. Claude Harmel. *Editor, Les Études Sociales et Syndicales, Paris. Former Secretary, Institute for Social History, Paris. Author of Lettre à Léon Blum sur le socialisme et la paix.*
 JAURÈS, JEAN (Micropædia)

C.Ha. Carl Hanson (d. 1985). *Pro-Vice-Chancellor; Professor of Chemical Engineering, University of Bradford, England. Editor of Recent Advances in Liquid-Liquid Extraction.*

ENGINEERING (in part)

C.H.A. Clyde H. Amundson. *Director, Aquaculture Research Center; Professor and Chairman, Department of Food Science; Professor of Oceanography and Limnology, University of Wisconsin, Madison.*

FISHING, COMMERCIAL (in part)

C.H.B.R. Christopher Hanby Baillie Reynolds. *Lecturer in Sinhalese, School of Oriental and African Studies, University of London.*

INDIAN OCEAN ISLANDS (in part)

Ch.C. Christopher Chow. *Student of Biology, Massachusetts Institute of*

Technology, Cambridge.

CELLS (in part)

C.H.C. Charles Henry Cotter (deceased). *Senior Lecturer in Maritime Studies. University of Wales Institute of Science and Technology, Cardiff. Author of The Physical Geography of the Oceans.*

OCEANS (in part)

C.H.D. Calaway H. Dodson. *Director, Marie Selby Botanical Gardens, Sarasota, Florida. Coauthor of Orchid Flowers: Their Pollination and Evolution; The Biology of the Orchids.*
 ANGIOSPERMS (in part)

C.H.G. Cyrus H. Gordon. *Professor of Hebraic Studies; Director, Center for Ebla Research, New York University, New York City. Emeritus Professor of Mediterranean Studies, Brandeis University, Waltham, Massachusetts. Author of The Ancient Near East and others.*

MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

SOLOMON (Micropædia)

C.H.Gi. Charles Hugh Giles. *Former Reader in Surface Chemistry and Dyeing, University of Strathclyde, Glasgow, Scotland. Author of A Laboratory Course in Dyeing.*
 CHEMICAL COMPOUNDS (in part)

C.H.G.-S. Charles Harvard Gibbs-Smith (d. 1981). *Research Fellow, Science Museum, London, 1976–81. Keeper, Public Relations and Education Department, Victoria and Albert Museum, London, 1947–71. Author of Aviation: An Historical Survey; The Wright Brothers; and others.*

WRIGHT, ORVILLE AND WILBUR (Micropædia)

C.H.H. Charles Harold Hayward. *Free-lance writer and artist. Editor, Woodworker, 1939–65. Author of English Period Furniture and others.*
 INDUSTRIES, MANUFACTURING (in part)

C.H.Ha. Cadet H. Hand, Jr. *Professor of Zoology, University of California, Berkeley; Director, Bodega Marine Laboratory, Bodega Bay, California.*
 CNIDARIANS (in part)

C.H.Ho. Cyrus Henry Hoy. *John B. Trevor Professor of English, University of Rochester, New York. Author of The Hyacinth Room: An Investigation into the Nature of Comedy, Tragedy, and Tragicomedy.*

LITERATURE, THE ART OF (in part)

C.Hi. Christopher Hibbert. *Historian and biographer. Author of Benito Mussolini; The Rise and Fall of Il Duce; and others.*

MUSSOLINI, BENITO (in part)
 (Micropædia)

Ch.L. Chao Lin. *Visiting Associate Professor of History, National Chung-hsing University, Tai-chung, Taiwan. Author of Marriage, Inheritance and Lineage Organization in Shang-Chou China.*

CALENDAR (in part)

C.H.L. Clarence H. Lorig (d. 1975). Assistant Director, Battelle Memorial Institute, Columbus, Ohio, 1947–65. Author of *Copper as an Alloying Element in Steel and Cast Iron*.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

C.H.Li. Carter H. Lindberg. Professor of Church History, Boston University. Author of *The Third Reformation? Christianity* (in part)

C.H.Lo. Charles H. Long. William Rand Kenan, Jr., Professor of the History of Religion, University of North Carolina at Chapel Hill. Professor of the History of Religions, Duke University, Durham, North Carolina. Author of *Alpha: Myths of Creation*.

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

C.Ho. Charles Hose (d. 1929). Member, Sarawak State Advisory Council at Westminster, London, 1919. *EAST INDIES, THE* (in part)

C.H.P. Clifford Hillhouse Pope (d. 1974). Science writer. Curator, Division of Reptiles and Amphibians, Field Museum of Natural History, Chicago, 1941–53. Author of *The Reptile World; Turtles of the United States and Canada*.

REPTILES (in part)

C.H.Ps. Sir Cyril Henry Philips. Professor of Oriental History, University of London, 1946–80; Director, School of Oriental and African Studies, 1957–76. *ASIA* (in part)

Ch.R. Chaim Rabin. Former Professor of Hebrew Language, Hebrew University of Jerusalem. Author of *Qumran Studies: A Short History of the Hebrew Language*.

HEBREW LITERATURE (in part)

Ch.S. Charles Süsskind. Professor of Engineering Science, University of California, Berkeley. Editor of *The Encyclopedia of Electronics*. *CAVENDISH, HENRY* (in part)

(Micropædia)

Ch.Su. Christine Sutton. Free-lance science writer; physics consultant to New Scientist. Author of *The Particle Connection*; coauthor of *The Particle Explosion*.

SUBATOMIC PARTICLES

C.H.T. Charles Henri Toupet. Professor of Tropical Geography, University of Lyon III. Author of *Étude du milieu physique de massif de l'Assaba, Mauritanie*.

WESTERN AFRICA (in part)

C.Hu. Charles Y. Hu. Former Professor of Geography, University of Maryland, College Park. Author of monographs on the military geography of China.

CHINA (in part)

C.H.V.S. Carol Humphrey Vivian Sutherland (d. 1986). Student of Christ Church, Oxford, 1945–75; Keeper of the Heberden Coin Room, Ashmolean

Museum, University of Oxford, 1957–75. Author of *Roman Coins and others*.

COINS AND COINAGE (in part)

C.H.W. Conrad H. Waddington (d. 1975). Buchanan Professor of Genetics, University of Edinburgh, Scotland, 1947–75. Author of *Principles of Embryology*.

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

C.H.Wi. Charles Henry Wilson. Professor of Modern History, University of Cambridge, 1965–79; Fellow of Jesus College, Cambridge. Author of *Anglo-Dutch Commerce and Finance in the Eighteenth Century and others*; coeditor of *Cambridge Economic History of Europe*.

EUROPE (in part)

MAURICE (NETHERLANDS) (Micropædia)

C.I. Charles Issawi. Bayard Dodge Professor of Near Eastern Studies, Princeton University. Author of *An Arab Philosophy of History and others*. *IBN KHALDON* (Micropædia)

C.I.C. Carleton Ivers Calkin. Painter and restorer. Curator, Historic St. Augustine Preservation Board, Florida, 1966–73.

SCULPTURE, THE HISTORY OF WESTERN (in part)

C.J. Charles Jelavich. Professor of History, Indiana University, Bloomington. Coauthor of *The Balkans and others*.

BALKANS (in part)

C.J.A. Charles Joseph Adams. Professor of Islamic Studies, McGill University, Montreal. Editor of *A Reader's Guide to the Great Religions*. *RELIGIONS, THE STUDY AND CLASSIFICATION OF* (in part)

C.J.Al. Constantine John Alexopoulos (d. 1986). Professor of Botany, University of Texas at Austin, 1962–77. Author of *Introductory Mycology*.

PROTOPHYTES (in part)

C.J.D. Cornelius J. Dyck. Professor of Anabaptist and Sixteenth-Century Studies, Mennonite Biblical Seminary, Elkhart, Indiana. Editor of *A Legacy of Faith; An Introduction to Mennonite History and others*.

MENNO SIMONS (Micropædia)

C.J.F.D. Charles James Frank Dowsett. Calouste Gulbenkian Professor of Armenian Studies, University of Oxford; Fellow of Pembroke College, Oxford. Translator (with commentary) of *Movsēs Daxuranci's The History of the Caucasian Albanians and others*. *UNION OF SOVIET SOCIALIST REPUBLICS* (in part)

C.J.G. Coleman Jett Goin. Emeritus Professor of Biological Sciences, University of Florida, Gainesville. Coauthor of *Introduction to Herpetology*; author of numerous articles on reptiles and amphibians.

AMPHIBIANS (in part)

C.J.Ga. Cyril John Gadd (d. 1969). Professor of Ancient Semitic Languages and Civilizations, University of London, 1955–60. Keeper, Egyptian and Assyrian Antiquities, British Museum, London, 1948–55.

SYRIA (in part)

C.J.L.P. Cecil John Layton Price. Emeritus Professor of English Language and Literature, University College of Swansea, University of Wales.

SHERIDAN, RICHARD BRINSLEY (Micropædia)

C.J.M. Charles John Merdinger. Captain, Civil Engineer Corps, U.S. Navy (retired). Deputy Director, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1974–80. Author of *Civil Engineering Through the Ages*.

PUBLIC WORKS (in part)

C.J.Mo. Cyril John Morley. Former Honorary Secretary, British Falconers' Club and International Association of Falconry and Conservation of Birds of Prey.

FALCONRY (in part) (Micropædia)

C.Jo. Charles Joys. Coauthor of *Vårt folks historie*.

NORWAY (in part)

C.J.S. Charles J. Sippl. Consultant in the computer, communications, and video fields. Coauthor of *Computer Dictionary and Handbook*. *COMPUTERS* (in part)

C.K.B. C.K. Bertram. President, Lucy Cavendish College, University of Cambridge, 1970–79. *MAMMALS* (in part)

C.-K.L. Chi-Keung Leung. Reader in Geography, University of Hong Kong. Editor, *Journal of Oriental Studies and Asian Geographer*. Author of *China: Railway Patterns and National Goals*. *CHINA* (in part)

HONG KONG

C.K.S. Carl Keenan Seyfert. Professor of Geology, State University of New York College at Buffalo. Coauthor of *Earth History and Plate Tectonics*.

EARTH, THE (in part)

C.K.W. Charles Kipp Weichert (d. 1970). Dean, College of Arts and Sciences, University of Cincinnati, Ohio, 1958–70; Professor of Zoology, 1943–70. Author of *Anatomy of the Chordates*. *ORGANS AND ORGAN SYSTEMS, PLANT AND ANIMAL* (in part)

C.L.C. C. Lockard Conley, M.D.. Distinguished Service Professor Emeritus of Medicine, Johns Hopkins University and Hospital, Baltimore, Maryland; Head, Hematology Division, 1947–80. Contributor to *Medical Physiology*. *BLOOD* (in part)

C.L.Cl. C.L. Cline. Ashbel H. Smith Professor Emeritus of English, University of Texas at Austin. Author of *Byron, Shelley, and Their Pisan Circle*; Editor of *The Letters of George Meredith*. *MEREDITH, GEORGE* (Micropædia)

C.Le. Chan Lee. Professor of Geography, Seoul National University, Korea.

KOREA (in part)
SEOUL

C.L.F. Charles L. Fefferman. Professor of Mathematics, Princeton University. ANALYSIS (IN MATHEMATICS) (in part)

C.L.Ha. C. Lowell Harriss. Emeritus Professor of Economics, Columbia University. Coauthor of *American Public Finance and others*. TAXATION (in part)

C.Li. Chan Lien. Professor of Political Science, National Taiwan University, Taipei. Coauthor of *Taiwan: From Pre-history to Modern Times*. HU SHIH (Micropædia)

C.L.K. Charlotte L. Kellner. Former Lecturer in Physics, Imperial College of Science and Technology, University of London. Author of *Alexander von Humboldt*. HUMBOLDT, ALEXANDER VON (Micropædia)

Cl.L. Clifford Leech. (d. 1977). Professor of English, University of Toronto, 1963–74. Author of *The Dramatist's Experience with Other Essays in Critical Theory and others*; editor of *Marlowe: A Collection of Critical Essays*. JONSON, BEN (in part) (Micropædia)

C.L.M. Charles L. Mantell. Consulting engineer. Emeritus Professor of Chemical Engineering, New Jersey Institute of Technology, Newark. Coauthor of *Calcium Metallurgy and Technology*. INDUSTRIES, EXTRACTION AND PROCESSING (in part)

C.L.Ma. Clyde L. Manschreck. Chavanne Professor of Religious Studies, Rice University, Houston, Texas. Emeritus Professor of the History of Christianity, Chicago Theological Seminary. Editor of *Melanchthon on Christian Doctrine and others*. MELANCHTHON, PHILIPP (Micropædia)

C.Lo. Constance Lowenthal. Assistant Museum Educator, Département of Public Education, Metropolitan Museum of Art, New York City. GIBERTI, LORENZO (Micropædia)

C.L.P.P. Charles L.P. Pellat. Professor of Arabic Language and Civilization, University of Paris IV, 1956–78. Author of *L'Arabe vivant and others*. IRAQ (in part)

C.L.Q. Charles Loreaux Quittmeyer. Floyd Dewey Gottwald Professor Emeritus of Business Administration, College of William and Mary, Williamsburg, Virginia. Author of *The Virginia Travel Trade and others*. UNITED STATES OF AMERICA (in part)

C.L.R.J. C.L.R. James. Star Professor of History, University of the District of Columbia, Washington, D.C. Secretary, West Indian Federal Labor Party, 1958–62. Author of *The Black Jacobins*. WEST INDIES, THE (in part)

C.L.S. Craig L. Stark. Technical writer and consultant. Contributing Editor, *Stereo Review* magazine. Owner, Starksonic Studio (audio testing laboratory), Montclair, New Jersey. SOUND (in part)

C.L.T. Carol Lewis Thompson. Editor, *Current History*, Philadelphia. UNITED STATES OF AMERICA (in part)

C.L.W. Carl Louis Wilson. Emeritus Professor of Botany, Dartmouth College, Hanover, New Hampshire. Coauthor of *Botany*. TISSUES AND FLUIDS (in part)

C.M. Christopher Marriage Marsh. Special Engineering Adviser, British Waterways Board, 1964–66; North Western Divisional Manager, 1948–64. Author of many papers on waterways. PUBLIC WORKS (in part)

C.Ma. Carleton Mabree. Professor of History, State University of New York College at New Paltz. Author of *The American Leonardo: A Life of Samuel F.B. Morse*. MORSE, SAMUEL F.B. (Micropædia)

C.M.A. Sister Consuelo Maria Aherne. Professor of History, Chestnut Hill College, Philadelphia. Assistant Staff Editor for Mediaeval Church History; contributor to the *New Catholic Encyclopedia*. BONIFACE, SAINT (Micropædia)

C.McH. Christine McHugh. Associate, Joseph D. Kaplan & Son, P.C. (law firm), Trenton, New Jersey. ADAMS, HENRY (Micropædia)

C.M.E. Chester Monroe Edelmann, Jr., M.D. Professor of Pediatrics; Associate Dean for Clinical Affairs, Albert Einstein College of Medicine, Yeshiva University, Bronx, New York. Editor of *Pediatric Nephrology*. CHILDHOOD DISEASES AND DISORDERS (in part)

C.-M.H. Chiao-Min Hsieh. Professor of Geography, University of Pittsburgh, Pennsylvania. Author of *China: A Geography in Perspective and others*. CHINA (in part)

C.M.K. Cecelia M. Kenyon. Clarke Professor of Government, Smith College, Northampton, Massachusetts. Editor of *The Antifederalists*. JEFFERSON

C.M.N. C.M. Naim. Associate Professor of Urdu, University of Chicago. Editor of *Readings in Urdu: Prose and Poetry*. SOUTH ASIAN ARTS (in part)

C.M.W. Charles Morrow Wilson (d. 1977). Free-lance writer. Author of *Diesel: His Engine Changed the World and others*; coauthor of *Rudolf Diesel*. DIESEL, RUDOLF (Micropædia)

C.M.Wi. C. Martin Wilbur. George Sansom Professor Emeritus of Chinese History, Columbia University. Author of *Sun Yat-sen: Frustrated Patriot*; coauthor of *Documents on Communism*,

Nationalism and Soviet Advisers in China, 1918–1927. CHINA (in part)

C.M.Wo. Christopher Montague Woodhouse. Member of Parliament for Oxford, 1959–66, 1970–74. Fellow of the Royal Society of London. Fellow of Trinity Hall, University of Cambridge. Coauthor of *Rhodes*. GREECE (in part) RHODES, CECIL (in part) (Micropædia)

C.M.Y. Sir C. Maurice Yonge (d. 1986). Regius Professor of Zoology, University of Glasgow, Scotland, 1944–64; Research Fellow in Zoology, 1965–70. Author of *Oysters*. MOLLUSKS (in part)

C.N. Curtis L. Newcombe. Emeritus Professor of Marine Biology, San Francisco State University. Director, San Francisco Bay Marine Research Center, Richmond, California. Author of *An Experimental Study of Shock Effects on Surface and Subsurface Organisms*. ECOSYSTEMS (in part)

C.N.B. Cyril Nelson Barclay (d. 1979). Brigadier, *The Cameronians* (Scottish Rifles). Editor, *The Army Quarterly and Defence Journal*, 1950–66; coeditor, *Brassey's Annual: The Armed Forces Year Book*, 1950–69. WAR, THE TECHNOLOGY OF (in part) WAR, THE THEORY AND CONDUCT OF (in part) MOLTKE, HELMUTH VON (Micropædia)

C.N.C. Charles N. Cofer. Professor of Psychology, University of Houston, Texas, 1976–81. Coauthor of *Motivation: Theory and Research*. EMOTION AND MOTIVATION, HUMAN (in part)

C.N.Ca. Cesar N. Caviedes. Professor of Geography, University of Florida, Gainesville. Author of *The Politics of Chile and others*. CHILE (in part)

C.N.M. Charles Nicholas Morris. Deputy Director, Institute for Fiscal Studies, London. Coauthor of *The Reform of Social Security*. GOVERNMENT FINANCE (in part)

C.O. Carola Oman (Lady Lenanton) (d. 1978). Biographer. Author of *David Garrick and others*. GARRICK, DAVID (Micropædia)

C.O.Hu. Charles O. Hucker. Emeritus Professor of Chinese and of History, University of Michigan, Ann Arbor. Author of *The Traditional Chinese State in Ming Times and others*. CHINA (in part) YUNG-LO (Micropædia)

Co.L. Colin Legum. Associate Editor, *The Observer*, London, 1949–82; Editor, *Africa Contemporary Record*, 1968–83. Author of *Pan-Africanism and others*. SOUTHERN AFRICA (in part)

Co.S.B. Cole S. Brembeck. Director, Institute for International Studies in Education; Associate Dean, College of Education, Michigan State University,

East Lansing. Author of Social Foundations of Education.

EDUCATION, SOCIAL AND ECONOMIC ASPECTS OF (in part)

C.P. Colin Patterson. *Curator of Fossil Fishes, British Museum (Natural History), London. Co-editor of Fossil Vertebrates.*

FISHES (in part)

C.P.D. Carlos Pablo Dubois. *Head of Information Services, International Coffee Organization, London.*

URUGUAY (in part)

C.Pe. Chaim Perelman (d. 1984). *Professor of Logic and Ethics, Free University of Brussels. Author of The New Rhetoric and others.*

RHETORIC (in part)

C.Pf. Carl Pfaffmann. *Emeritus Professor of Physiological Psychology, Rockefeller University, New York City. Editor of Olfaction and Taste, proceedings of the Third International Symposium on Olfaction and Taste.*

SENSORY RECEPTION (in part)

C.P.F. Charles Patrick FitzGerald. *Emeritus Professor of Far Eastern History, Australian National University, Canberra. Author of Son of Heaven (T'ang T'ai Tsung); The Empress Wu; and others.*

T'AI TSUNG (T'ANG DYNASTY) (Micropædia)

WU HOU (Micropædia)

C.P.L. Charles P. Loomis. *Emeritus Professor of Sociology, University of Houston, Texas. Coauthor of Rural Sociology, The Strategy of Change.*

RURAL SOCIETY AND AGRICULTURE,

MODERN (in part)

C.Ra. Chakravarthi Raghavan. *Correspondent, IPS Third World News Agency, Geneva. Chief Editor, SUNS newsletter, Nyon, Switzerland, and Rome.*

BOMBAY

INDIA (in part)

C.R.B. Charles R. Bawden. *Emeritus Professor of Mongolian, University of London. Author of The Modern History of Mongolia.*

GENGHIS KHAN

KUBLAI KHAN (Micropædia)

C.R.G. C. Robin Ganellin. *Vice-President, Chemical Research, Smith Kline & French Research Limited, Welwyn, England. Coeditor of Frontiers in Histamine Research and others.*

DRUGS AND DRUG ACTION (in part)

C.R.H. Campbell Ronald Harler (deceased). *Adviser on tea to the Central Treaty Organization. Author of The Culture and Marketing of Tea.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

C.R.N. Charles R. Noback. *Professor of Anatomy, College of Physicians and Surgeons, Columbia University. Author of The Human Nervous System.*

NERVES AND NERVOUS SYSTEMS (in part)

C.R.No. Carl R. Noller (d. 1980).

Professor of Chemistry, Stanford University, California. Author of Chemistry of Organic Compounds.

CHEMICAL COMPOUNDS (in part)

C.Ro. Christopher Robinson. *Official Student in Modern Languages, Christ Church, University of Oxford. Author of French Literature in the 19th Century and others.*

FRENCH LITERATURE (in part)

C.R.R. Charles R. Russell. *Former Professor of Mechanical Engineering, California Polytechnic State University, San Luis Obispo. Author of Elements of Energy Conversion.*

ENERGY CONVERSION (in part)

C.R.S. C. Ronald Seeger. *Professor of Geology and Geophysics, Western Kentucky University, Bowling Green. Author of Problems for Exploration Geophysics.*

CONTINENTAL LANDFORMS (in part)

C.R.T. Charles Rowland Twidale. *Reader in Geography, University of Adelaide, Australia. Author of Geomorphology with Special Reference to Australia and others.*

AUSTRALIA (in part)

GEOMORPHIC PROCESSES (in part)

C.S. Calambur Sivaramamurti. *Director, National Museum of India, New Delhi, 1966-69, 1971-75; Hony Adviser on Museums, Government of India, 1969-70. Author of Indian Sculpture and others.*

SOUTH ASIAN ARTS (in part)

C.Sa. Claudio Sartori. *Chief, Office of Research and Indexing of the Italian Musical Funds, Braidense National Library, Milan. Author of Puccini and others.*

PUCCINI, GIACOMO (Micropædia)

C.S.B. Cyril S. Belshaw. *Professor of Anthropology, University of British Columbia, Vancouver. Editor, Current Anthropology. Internationally known scholar in areas of social change and economics. Author of Traditional Exchange and Modern Markets and others.*

ECONOMIC SYSTEMS (in part)

C.S.Br. C.S. Breed. *Geological Survey, U.S. Department of the Interior, Flagstaff, Arizona. Coauthor of Landscapes of Arizona: The Geological Story.*

CONTINENTAL LANDFORMS (in part)

C.S.C. Carleton Stevens Coon (d. 1981). *Research Associate in Ethnology, Peabody Museum, Harvard University, 1968-81. Curator of Ethnology, University Museum, University of Pennsylvania, Philadelphia, 1948-63. Author of The Origin of Races and others.*

EVOLUTION, HUMAN (in part)

C.-S.Ch. Cheng-Siang Chen. *Former Professor of Geography; former Director, Geographical Research Center, Chinese University of Hong Kong. Author of Taiwan: An Economic and Social*

Geography and several reports on Hong Kong.

CHINA (in part)

C.Se. Charles Seymour (d. 1963). *President, Yale University, 1937-50; Professor of History, 1918-37. Author of The Diplomatic Background of the War; Woodrow Wilson and the World War.*

WILSON, WOODROW (in part) (Micropædia)

C.S.F. Catherine S. Fowler. *Professor of Anthropology, University of Nevada, Reno. Author of Great Basin Anthropology: A Bibliography.*

AMERICAN INDIANS (in part)

C.S.G.P. Courtenay Stanley Goss Phillips. *University Lecturer in Inorganic Chemistry, University of Oxford; Fellow of Merton College, Oxford. Coauthor of Inorganic Chemistry.*

CHEMICAL ELEMENTS (in part)

C.S.Ha. Craig S. Harbison. *Associate Professor of Art, University of Massachusetts, Amherst. Author of The Last Judgment in Sixteenth Century Northern Europe and others.*

GRÜNEWALD, MATTHIAS (Micropædia)

HOLBEIN, HANS, THE YOUNGER (Micropædia)

C.S.J. Christopher Stewart Jackson. *Former Senior Lecturer in English, University of the West Indies, Cave Hill, Barbados.*

WEST INDIES, THE (in part)

C.Sm. Colin Smethurst. *Marshall Professor of French, University of Glasgow, Scotland. Author of Émile Zola, Germinal.*

FRENCH LITERATURE (in part)

C.Sn. Carl Sagan. *Director, Laboratory for Planetary Studies; David Duncan Professor of Astronomy, Cornell University, Ithaca, New York. Coauthor of Planets; Intelligent Life in the Universe.*

LIFE (in part)

SOLAR SYSTEM, THE (in part)

C.S.S. Sir Charles Scott Sherrington, M.D. (d. 1952). *Waynflete Professor of Physiology, University of Oxford, 1913-35. Co-winner, Nobel Prize for Physiology or Medicine, 1932, for discoveries regarding the function of neurons. Author of The Integrative Action of the Nervous System.*

NERVES AND NERVOUS SYSTEMS (in part)

C.Su. Chusei Suzuki. *Professor of Asian History, Aichi University, Toyohashi, Japan. Author of A Study of Mid-Ch'ing History.*

CHINA (in part)

C.S.W. C. Stuart Welch, M.D. (d. 1981). *Professor of Surgery, Albany Medical College, Union University, New York. Coauthor of The Essence of Surgery.*

DIAGNOSIS AND THERAPEUTICS (in part)

C.S.Wh. Charles S. Whewell. *Emeritus Professor of Textile Industries, University of Leeds, England.*

INDUSTRIES, TEXTILE (in part)

C.S.-y. Chuang Shang-yen. *Former Deputy Director, National Palace Museum, Taipei, Taiwan.*
MI FEI (Micropædia)

C.T. Curt Teichert. *Adjunct Professor of Geological Sciences, University of Rochester, New York. Regents Distinguished Professor of Geology, University of Kansas, Lawrence, 1964–75. An authority on the Permian stratigraphy of the world.*

GEOCHRONOLOGY (in part)

C.-t.C. Chen-tung Chang. *Senior Lecturer in Sociology, National University of Singapore. Author of Fertility Transition in Singapore.*
CHINA (in part)

C.T.M., Jr. Charles T. Mason, Jr. *Professor of Plant Sciences; Curator of the Herbarium, University of Arizona, Tucson.*

ANGIOSPERMS (in part)

C.T.Mo. Charles Thomas Morrissey. *Editor, Vermont Life. Former Chairman, Vermont Council on Humanities and Public Issues. Adjunct Professor of History, University of Vermont, Burlington, 1969–71; 1974–84.*

UNITED STATES OF AMERICA (in part)

C.T.R. C.T. Ritchie. *Historian, writer, and artist. Author of The First Canadian: The Story of Champlain and others.*
CHAMPLAIN, SAMUEL DE (Micropædia)

C.T.W. Cheves T. Walling. *Distinguished Professor of Chemistry, University of Utah, Salt Lake City. Author of Free Radicals in Solution.*
RADICAL (in part) (Micropædia)

C.V.B. Clinton V. Black. *Archivist, Jamaica Archives, Spanish Town. Author of The Story of Jamaica.*
WEST INDIES, THE (in part)

C.v.d.K. C. van de Kieft. *Professor of Medieval History, University of Amsterdam. Coauthor of 500 Jaren Staten-Generaal in de Nederlanden.*
LOW COUNTRIES, THE (in part)

C.V.-F. Claudio Vita-Finzi. *Reader in Geography, University College, University of London. Author of Recent Earth History; Archaeological Sites in Their Setting; and others.*

GEOMORPHIC PROCESSES (in part)

C.V.N. Chakravarthi V. Narasimhan. *Senior Fellow, United Nations Institute for Training and Research, New York City; Under-Secretary-General of the United Nations, 1973–78. Author of The Mahābhārata: An English Version Based on Selected Verses.*

ASIA (in part)

C.V.W. Dame C.V. Wedgwood. *Free-lance writer and historian. Fellow, University College, University of London. Fellow, Lady Margaret Hall, University of Oxford. Author of Thomas Wentworth, First Earl of Strafford, 1593–1641: A Revaluation and others.*
STRAFFORD, THOMAS WENTWORTH, 1ST EARL OF (Micropædia)

C.W. Claus Westermann. *Professor of Old Testament Exegesis, University of Heidelberg. Author of Handbook to the Old Testament.*

SACRED OFFICES AND ORDERS (in part)

C.W.A. Charles W. Arnade. *Professor of International Studies and History, University of South Florida, Tampa. Author of The Emergence of the Republic of Bolivia, and others.*
BOLIVIA (in part)

C.W.B. Curt W. Beck. *Matthew Vassar, Jr., Professor of Chemistry, Vassar College, Poughkeepsie, New York.*

STAHL, GEORG ERNST (Micropædia)

C.W.G. Carol W. Gelderman. *Professor of English, University of New Orleans. Author of Henry Ford, the Wayward Capitalist.*

FORD, HENRY (in part)

C.W.Ge. Charles William Gear. *Professor and Head, Department of Computer Science, University of Illinois at Urbana-Champaign. Author of Numerical Initial Value Problems for Ordinary Differential Equations and others.*

NUMERICAL ANALYSIS

C.W.H. Charles W. Hayford. *Associate, Department of History, Northwestern University, Evanston, Illinois, and Center for Far Eastern Studies, University of Chicago.*

LIN TSE-HSÜ (Micropædia)

C.W.H.H. C. William H. Havard, M.D. *Consultant Physician, Royal Free Hospital and Royal Northern Hospital, London. Author of Lectures in Medicine.*
DIAGNOSIS AND THERAPEUTICS (in part)

C.W.Ho. C. Warren Hollister. *Professor of History, University of California, Santa Barbara. Author of The Impact of the Norman Conquest and others.*

HENRY I (ENGLAND) (Micropædia)

C.W.J. C. Wilfred Jenks (d. 1973). *Director General of the International Labour Office, Geneva, Switzerland, 1970–73. Author of Human Rights and International Labour Standards.*
BUSINESS LAW (in part)

C.W.M. C.W. Minkel. *Vice Provost; Dean, Graduate School, University of Tennessee, Knoxville. Coauthor of Latin America.*

CARACAS (in part)

SÃO PAULO (in part)

C.W.Pa. Charles William Parkin. *Fellow and Lecturer of Clare College, University of Cambridge. Author of The Moral Basis of Burke's Political Thought.*

BURKE, EDMUND (in part) (Micropædia)

C.W.S. Clyde William Sanger. *Visiting Lecturer, Zimbabwe Institute of Mass Communication, 1982. Director of Information, Commonwealth Secretariat, London, 1977–79. Author of Central African Emergency.*

SOUTHERN AFRICA (in part)

C.W.T. Charlton W. Tebeau. *Emeritus Professor of History, University of Miami, Coral Gables, Florida. Author of A History of Florida.*

JACKSON, THOMAS JONATHAN (Micropædia)

C.W.W. Charles W. Wagley. *Graduate Research Professor Emeritus of Anthropology and Latin American Studies, University of Florida, Gainesville. Author of Introduction to Brazil and others.*

BRAZIL (in part)

C.Y. Chiang Yee (d. 1977). *Painter, Professor of Chinese, Columbia University, 1968–71. Author of Chinese Calligraphy and others.*

WRITING (in part)

C.-y.C. Chu-yuan Cheng. *Professor of Economics, Ball State University, Muncie, Indiana. Consultant, National Science Foundation, Washington, D.C. Author of China's Economic Development: Growth and Structural Change and others.*

CHINA (in part)

Cy.Do. Cyril Domb. *Professor of Physics, Bar Ilan University, Ramat Gan, Israel. Editor of Clerk Maxwell and Modern Science.*

MAXWELL

C.-y.H. Cho-yun Hsu. *University Professor of History and Sociology, University of Pittsburgh. Author of Ancient China in Transition; Han Agriculture.*

CHINA (in part)

C.Z. Conway Zirkle (d. 1972). *Professor of Biology, University of Pennsylvania, Philadelphia, 1937–66. Author of Death of a Science in Russia.*

LYSENKO, TROFIM DENISOVICH (Micropædia)

Cz.L. Czesław Lejewski. *Emeritus Professor of Philosophy, Victoria University of Manchester. Author of "Logic and Existence," British Journal for the Philosophy of Science, and numerous other journal articles.*

LOGIC, THE HISTORY AND KINDS OF (in part)

D.A. Dudley Andrew. *Professor and Chair, Department of Comparative Literature; Head of Film Studies, University of Iowa, Iowa City. Author of Film in the Aura of Art and others.*
MOTION PICTURES (in part)

D.A.B. Dirk Anthony Ballendorf. *Professor of History and Micronesian Studies, University of Guam. Coeditor of Oceania Today: Towards New Directions and Political Self-Actualization.*

PACIFIC ISLANDS (in part)

Da.Br. David Brown. *Professor of Musicology, University of Southampton, England. Author of Mikhail Glinka; Tchaikovsky; and others.*

SHOSTAKOVICH, DMITRY (Micropædia)

D.A.C. David A. Cook. *Professor and Director of Film Studies Program,*

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Author of *A History of Narrative Film*.
MOTION PICTURES (in part)

Da.D. David Dooling, Jr. Science
Editor, *The Huntsville (Alabama) Times*.
Editor of *Shuttle to the Next Space Age*.
EXPLORATION (in part)

D.A.E.S. David A.E. Spalding.
Free-lance writer and consultant.
Former Head Curator of Natural
History, Provincial Museum of Alberta,
Edmonton. Senior editor of *A Nature*
Guide to Alberta.
CANADA (in part)

Da.H. David Harris (d. 1975).
Professor of History, Stanford University,
California, 1941–66. Author of *A*
Diplomatic History of the Balkan Crisis
of 1875–1878; *The First Year*.
EUROPE (in part)

D.A.H. Donald August Holm.
Senior Geologist, Arabian American
Oil Company, Dhahran, Saudi
Arabia, 1946–61. Author of “Desert
Geomorphology of the Arabian
Peninsula” in *Science*.
ASIA (in part)

D.A.He. D. Alan Heslop. Director,
Rose Institute of State and Local
Government, Claremont McKenna
College, California. Editor of
Californians in Congress.
POLITICAL SYSTEMS (in part)

D.A.K.B. Sir Douglas A.K. Black,
M.D. Emeritus Professor of Medicine,
Victoria University of Manchester;
Physician, Manchester Royal Infirmary,
1959–77. Editor of *Renal Disease*.
EXCRETION AND EXCRETORY SYSTEMS
(in part)

D.A.L. Daniel A. Livingstone. J.B.
Duke Professor of Zoology, Duke
University, Durham, North Carolina.
Limnologist, Geological Survey, U.S.
Department of the Interior, 1956–63.
ECOSYSTEMS (in part)

D.A.Lo. D. Anthony Low. Smuts
Professor of Commonwealth History,
University of Cambridge. Author of
Buganda in Modern History.
EASTERN AFRICA (in part)

Da.Ma. David Magarshack (d. 1977).
Author of *Chekhov the Dramatist*;
Dostoevsky; *Pushkin: A Biography*.
RUSSIAN LITERATURE (in part)

D'A.McN. D'Arcy McNickle (d. 1977).
Professor of Anthropology, University
of Saskatchewan, Regina, 1966–71.
Director, American Indian Development,
Inc., Boulder, Colorado, 1952–66.
Author of *The Indian Tribes of the*
United States and others.
NORTH AMERICA (in part)

D.An. Donald M. Anderson. Emeritus
Professor of Art, University of Wisconsin,
Madison. Author of *The Art of*
Written Forms.
WRITING (in part)

D.A.N. David A. Norris. Lecturer
in Slavonic Studies, University of
Nottingham, Eng. Translator of *Edvard*

Kardelj's Reminiscences.

YUGOSLAV LITERATURE (in part)

D.Ar. Daniel Argov. Former Lecturer
in Modern Indian History, Institute
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University of Jerusalem. Author of
Moderates and Extremists in the Indian
Nationalist Movement, 1883–1920.
PATEL, VALLABHBHAI JHAVERBHAI
(Micropædia)

D.A.Sa. Dawlat Ahmed Sadek.
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Faculty of Arts, Ain Shams University,
Cairo, Egypt.
ARABIA (in part)

D.At. Donald Attwater (d. 1977).
Author of *Penguin Dictionary of Saints*;
St. John Chrysostom, Pastor and
Preacher.
CHRYSOSTOM, SAINT JOHN
(Micropædia)

D.A.T. David A. Thomas. Lecturer in
Criminology, University of Cambridge;
Fellow of Trinity Hall, Cambridge.
Author of *Principles of Sentencing*.
CRIME AND PUNISHMENT (in part)

D.B. Douglas Bush (d. 1983). Gurney
Professor of English Literature, Harvard
University, 1957–66. Author of *Paradise*
Lost in Our Time and others.
MILTON (in part)

D.Ba. D. Banzragch. Scientific
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MONGOLIA (in part)

D.B.C. David B. Chan. Professor of
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Hayward. Author of *The Yung Lo*
Usurpation.
HUNG-WU (Micropædia)

D.B.E. David Barnard Ericson. Senior
Research Scientist, Lamont-Doherty
Geological Observatory, Columbia
University. Coauthor of *The Ever*
Changing Sea.
OCEANS (in part)

D.B.-G. David Ben-Gurion (d. 1973).
Prime Minister and Minister of Defense,
Government of Israel, 1948–53, 1955–63.
Author of *The Struggle and others*.
HERZL, THEODOR (Micropædia)

D.B.H. Dwight B. Heath. Professor
of Anthropology, Brown University,
Providence, Rhode Island. Editor of
Contemporary Cultures and Societies of
Latin America.
AMERICAN INDIANS (in part)

D.Bi. David Birmingham. Professor
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The Portuguese Conquest of Angola
and others.
CENTRAL AFRICA (in part)

SOUTHERN AFRICA (in part)
WESTERN AFRICA (in part)

D.B.J.F. David B.J. Frost. Subeditor
and rugby writer, *The Guardian*
(London). Author of *No Prisoners*:
Background to Rugby Touring.

SPORTS, MAJOR TEAM AND INDIVIDUAL
(in part)

D.Bn. David Brown. Research
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University of Birmingham, England.
WESTERN AFRICA (in part)

D.B.O.S. Douglas B. O. Savile.
Emeritus Research Associate,
Biosystematics Research Institute,
Canada Department of Agriculture,
Ottawa; Principal Mycologist, 1957–75.
Author of *Arctic Adaptations in Plants*.
ARCTIC, THE (in part)

D.Br. Doris Bry. Writer on
photography, art history, and natural
science. Representative for the paintings
of Georgia O'Keeffe. Author of *Alfred*
Stieglitz: Photographer.
STIEGLITZ, ALFRED (Micropædia)

D.B.S. David B. Stewart. Research
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D.C.
MINERALS AND ROCKS (in part)

D.B.W. David B. Wake. Director,
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Professor of Zoology, University of
California, Berkeley.
AMPHIBIANS (in part)

D.B.Wa. Duncan Bruce Waterson.
Professor of History, Macquarie
University, North Ryde, Australia.
AUSTRALIA (in part)

D.C. Douglas Cooper (d. 1984). Art
historian and critic. Author of *Toulouse*
Lautrec and many other works on
French artists of the late 19th and 20th
centuries.
GAUGUIN, PAUL (Micropædia)

D.Ca. David Carson. Emeritus
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Boston University. Author of
International Marketing: A Comparative
Systems Approach.
MARKETING AND MERCHANDISING
(in part)

D.C.A. Dorothy C. Adkins (d. 1975).
Psychologist. Professor of Education,
University of Hawaii, Honolulu, 1965–
74. Author of *Test Construction*.
PSYCHOLOGICAL TESTS AND
MEASUREMENT (in part)

D.C.B. Douglas C. Baxter. Associate
Professor of History, Ohio University,
Athens.
LOUVOIS, FRANÇOIS-MICHEL LE
TELLIER, MARQUIS DE (Micropædia)

D.C.C. Donald C. Clarke. Lecturer
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Studies, University of London.
CRIME AND PUNISHMENT (in part)

D.C.G.S. David C.G. Sibley. Free-lance
writer and artist. Author of *With La Salle*
Down the Mississippi and others.
LA SALLE, RENÉ-ROBERT CAVELIER,
SIEUR DE (Micropædia)

D.C.H. David C. Hoaglin.
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Harvard University. Senior Scientist,
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STATISTICS (in part)

D.C.Hu. David C. Hughes. Architect. BUILDING CONSTRUCTION (in part)

D.C.J. D. Clayton James. Professor of History, Mississippi State University, Mississippi State. Author of *The Years of MacArthur* and others.

MACARTHUR, DOUGLAS (Micropædia)

D.C.P. David C. Pieri. Member of the Technical Staff and Viking Lander Monitor Mission Project Scientist, Earth and Space Sciences Division, Jet Propulsion Laboratory, California Institute of Technology, Pasadena.

SOLAR SYSTEM, THE (in part)

D.C.S. Domingo C. Salita. Emeritus Professor of Geology and Geography, University of the Philippines, Quezon City.

MANILA

D.C.T. Denis C. Twitchett. Gordon Wu Professor of Chinese Studies, Princeton University. Author of *The Financial Administration Under the T'ang Dynasty*; editor of *Cambridge History of China*.

CHINA (in part)

SSU-MA CH'EN (Micropædia)

D.C.Th. David Christopher Traherne Thomas. Former Assistant Director of Art, Arts Council of Great Britain, London. Joint compiler of *The First Hundred Years of the Royal Academy, 1769–1868 (catalog of the Royal Academy Winter Exhibition, London, 1951–52)*.

DEGAS, EDGAR (Micropædia)

D.D. David Diringer (d. 1975). Reader in Semitic Epigraphy, University of Cambridge, 1966–68. Founder and Director, Alphabet Museum, Tel Aviv, Israel. Author of *The Alphabet*.

WRITING (in part)

D.Da. David Daiches. Emeritus Professor of English, University of Sussex, Brighton, England. Author of *Robert Burns*; *Robert Burns and His World*; *R.L. Stevenson and His World*. BURNS, ROBERT (in part) (Micropædia) STEVENSON, ROBERT LOUIS (Micropædia)

D.D.B. Dimitry Dimitriyevich Blagoy. Correspondent Member, Academy of Sciences of the U.S.S.R., Moscow; Member, Academy of Pedagogical Sciences of the U.S.S.R., Moscow. Author of *Tvorchesky put Pushkina*. PUSHKIN, ALEKSANDR (in part) (Micropædia)

D.D.Br. Donald Dilworth Brand (d. 1984). Professor of Geography, University of Texas at Austin, 1949–75. Author of *Mexico: Land of Sunshine and Shadow*.

NORTH AMERICA (in part)

D.D.F. Don D. Fowler. Professor of Anthropology; Director, Historic Preservation Program, University of Nevada, Reno. Coeditor of *Anthropology of the Numu*, Smithsonian

Contributions to Anthropology, vol. 14. AMERICAN INDIANS (in part)

D.Dn. D. Dashtseren. Journalist and publicist.

MONGOLIA (in part)

D.Do. Denis Donoghue. Henry James Professor of Letters, New York University, New York City. Author of *Yeats*; editor of *Yeats: Memoirs*.

YEATS, WILLIAM BUTLER (in part) (Micropædia)

D.D.R.O. D.D.R. Owen. Professor of French, University of St. Andrews, Scotland. Author of *The Evolution of the Grail Legend* and others.

FRENCH LITERATURE (in part)

D.D.T. Donald D. Trunkey. Professor of Surgery, University of California, San Francisco. Chief of Surgery, San Francisco General Hospital. Editor of *Current Trauma Therapy*.

BURNS (in part)

D.E. David A. Ede. Associate Professor of Religion, Western Michigan University, Kalamazoo.

HASAN AL-BASRI, AL- (Micropædia)

D.E.B. D. E. Berlyne (d. 1976). Professor of Psychology, University of Toronto. Author of *Structure and Direction in Thinking*.

THOUGHT AND THOUGHT PROCESSES (in part)

D.E.C.Y. David Eryl Corbet Yale. Reader in English Legal History, University of Cambridge; Fellow of Christ's College, Cambridge.

HALE, SIR MATTHEW (Micropædia)

D.E.K. Daniel E. Koshland, Jr. Professor of Biochemistry, University of California, Berkeley. Editor of *Protein Structure and Function*.

BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

D.E.L. David Edward Luscombe. Professor of Medieval History, University of Sheffield, England. Author of *The School of Peter Abelard*; editor of *Peter Abelard's Ethics*.

ABELARD, PETER (Micropædia)

De.M.S. Denis Mack Smith. Senior Research Fellow and Dean of Visiting Fellows, All Souls College, University of Oxford. Author of *Garibaldi*; editor of *Garibaldi*.

GARIBALDI, GIUSEPPE (Micropædia)

D.E.P. David E. Pingree. Professor of the History of Mathematics, Brown University, Providence, Rhode Island. Author of *Gregory Chionades and Palaeologan Astronomy* and others.

OCCULTISM (in part)

D.Er. Donald James Erb. Meadows Professor of Composition, Southern Methodist University, Dallas, Texas. Composer of *"The Seventh Trumpet."*

MUSIC, THE ART OF (in part)

MUSICAL FORMS AND GENRES (in part)

D.E.S. David Eugene Smith (d. 1944). Professor of Mathematics, Teachers

College, Columbia University, 1901–26. Author of *History of Modern Mathematics* and others.

ARITHMETIC (in part)

MATHEMATICS, THE HISTORY OF (in part)

D.E.S.M. D.E.S. Maxwell. Professor of English, York University, Toronto. Author of *Herman Melville; American Fiction*; and others.

MELVILLE, HERMAN (in part) (Micropædia)

DeW.C.R. DeWitt C. Reddick (d. 1980). Jesse H. Jones Professor of Journalism and Education, University of Texas at Austin, 1970–75.

UNITED STATES OF AMERICA (in part)

D.E.W.W. Donald Ernest Wilson Wormell. Professor of Latin, University of Dublin, 1942–78. Coauthor of *The Delphic Oracle*.

PINDAR (Micropædia)

D.F. David Foulkes. Research Scientist, Georgia Mental Health Institute, Atlanta. Author of *The Psychology of Sleep*.

SLEEP AND DREAMS (in part)

D.F.B. Donald F. Bond (d. 1987). Emeritus Professor of English, University of Chicago, 1952–67. Editor of *The Spectator*.

ADDISON, JOSEPH (Micropædia)

D.F.Do. Douglas F. Dowd. Professor of Economics, San Jose State University, California.

OWEN, ROBERT (Micropædia)

D.Fe. David Fellman. Vilas Professor Emeritus of Political Science, University of Wisconsin, Madison. Author of *The Defendant's Rights Today*.

CONSTITUTIONAL LAW (in part)

D.F.G. David Frank Gordon. Assistant Professor of International Relations, Michigan State University, East Lansing.

SOUTH AFRICA (in part)

D.Fl. David Flusser. Professor of the History of Religions, Hebrew University of Jerusalem. Author of *Jesus and others*.

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

D.F.R. Dale F. Ritter. Professor of Geology, Southern Illinois University, Carbondale. Author of *Process Geomorphology*.

RIVERS (in part)

D.G.Ch. Donald Geoffrey Charlton. Professor of French; Chairman, Department of French Studies, University of Warwick, Coventry, England. Author of *Positivist Thought in France, 1852–1870* and others.

TAINE, HIPPOLYTE (Micropædia)

D.G.D. Denys G. Dyer. University Lecturer in German, University of Oxford; Fellow of Exeter College, Oxford.

GERMAN LITERATURE (in part)

D.Ge. Deno John Geanakoplos. Professor of History and Religious Studies, Yale University. Author of *Emperor Michael Palaeologus* and the

West and others.

MICHAEL VIII PALAEOLOGUS
(BYZANTINE EMPIRE)
(Micropædia)

D.G.F. Donald G. Fink. Emeritus Director, Institute of Electrical and Electronics Engineers, New York. Author of Television Engineering.

BROADCASTING (in part)

ENGINEERING (in part)

D.G.Fa. Daphne Gail Fautin. Associate Curator, Department of Invertebrate Zoology, California Academy of Sciences, San Francisco. Author of The Clownfish Sea Anemones, Transactions of the American Philosophical Society.

CNIDARIANS (in part)

D.Gi. Douglas Stuart Gilbert (d. 1979). Sports columnist, Edmonton Sun, 1978–79. Sports reporter, Montreal Gazette, 1970–78.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

D.G.J. D. Gale Johnson. Eliakim Hastings Moore Distinguished Service Professor of Economics, University of Chicago. Author of World Agriculture in Disarray and others.

RURAL SOCIETY AND AGRICULTURE, MODERN (in part)

D.G.J.S. David Grenville John Sellwood. Principal Lecturer in Mechanical Engineering, Kingston Polytechnic, England. Author of An Introduction to the Coinage of Parthia.

COINS AND COINAGE (in part)

D.G.MacR. Donald Gunn MacRae. Martin White Professor Emeritus of Sociology, London School of Economics and Political Science, University of London.

MALTHUS, THOMAS ROBERT (Micropædia)

D.Gr. David Greene (d. 1981). Senior Professor, School of Celtic Studies, Dublin Institute for Advanced Studies. Author of The Irish Language.

LANGUAGES OF THE WORLD (in part)
CELTIC LITERATURE (in part)

D.G.R. Donald G. Rea. Assistant Laboratory Director, Technology and Space Programs Development, Jet Propulsion Laboratory, California Institute of Technology, Pasadena.

SOLAR SYSTEM, THE (in part)

D.G.Sc. Dante G. Scarpelli, M.D. Ernest J. and Hattie H. Magerstadt Professor and Chairman, Department of Pathology, Northwestern University, Chicago.

CANCER (in part)

D.G.T. David Gordon Tucker. Professor and Head, Department of Electronic and Electrical Engineering, University of Birmingham, England, 1955–73.

MEASUREMENT AND OBSERVATION, PRINCIPLES, METHODS AND INSTRUMENTS OF (in part)

D.H. Derek Hopwood. Director, Middle East Centre, University of

Oxford. Author of Egypt: Politics and Society, 1945–84.

EGYPT (in part)

D.H.B. Daryle H. Busch. Roy A. Roberts Distinguished Professor of Chemistry, University of Kansas, Lawrence. Coauthor of Introduction to Qualitative Analysis; Chemistry.

CHEMICAL COMPOUNDS (in part)

D.H.D. David Herbert Donald. Charles Warren Professor of American History and Professor of American Civilization, Harvard University. Author of Lincoln Reconsidered and others.

UNITED STATES OF AMERICA (in part)

D.H.E. David H. Elliott. Professor of Occupational Health, Robens Institute of Industrial and Environmental Health and Safety, University of Surrey, England. Coauthor and coeditor of The Physiology and Medicine of Diving.

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

D.Hi. Dorothy Hill. Research Professor Emeritus of Geology, University of Queensland, St. Lucia, Brisbane, Australia. Author of Paleozoic Corals; coauthor of Elements of the Stratigraphy of Queensland.

OCEANS (in part)

D.H.J. Douglas Henry Jones. Former Senior Lecturer in the History of West Africa, School of Oriental and African Studies, University of London.

WESTERN AFRICA (in part)

D.H.P. D.H. Pennington. Former Fellow and Tutor in History, Balliol College, Oxford; former Lecturer in Modern History, University of Oxford. Author of Seventeenth Century Europe.

LAUD, WILLIAM (in part)
(Micropædia)

D.H.Pe. Douglas Henry Pike (d. 1974). General Editor, Australian Dictionary of Biography, 1962–73. Author of Australia: The Quiet Continent and others.

AUSTRALIA (in part)

D.H.R.B. Sir Derek Harold Richard Barton. Director, Institute of Chemistry of Natural Substances, National Centre for Scientific Research, Gif-sur-Yvette, France. Co-winner, Nobel Prize for Chemistry, 1969, for the development of conformational analysis.

MOLECULES (in part)

D.H.T. David H. Tucker. Free-lance researcher and writer. Author of The World Health Market and others.

PUBLISHING (in part)

D.Hus. Dyneley Hussey (d. 1972). Music Critic, The Times, London, 1923–46; The Listener, 1946–60. Author of Verdi; Some Composers of Opera.

DONIZETTI, GAETANO (Micropædia)
VERDI, GIUSEPPE (Micropædia)

D.I. David Irwin. Chairman, Department of History of Art, University of Aberdeen, Scotland. Author of English Neoclassical Art and others.

CANOVA, ANTONIO, MARCHESE D'ISCHIA (Micropædia)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

Di.B. Dieter Brunnschweiler (d. 1983). Professor of Geography, Michigan State University, East Lansing. Coauthor of Geography in Latin America: Prospect for the Seventies.

SOUTH AMERICA (in part)

Di.C. Dieter Christensen. Professor of Music; Director, Center for Studies in Ethnomusicology, Columbia University, Author of Die Musik der Kate und Sialum; coauthor of Die Musik der Ellice-Inseln.

OCEANIC ARTS (in part)

D.I.D. Denis Ian Duveen. Consultant to the cosmetics industry in Brazil. President, Duveen Soap Corporation, Brooklyn, New York, 1949–69. Coauthor of A Bibliography of the Works of Antoine Laurent Lavoisier.

LAVOISIER

Di.L. Diouldé Laya. Director of the Centre for Linguistic and Historical Studies by Oral Tradition, Organization of African Unity, Niamey, Niger. Author of "Tradition orale et recherche historique en Afrique," Journal of World History (Unesco).

WESTERN AFRICA (in part)

D.J.B. D. Joseph Bodin. Manager, Sales and Marketing Division, Technicolor, Inc., Chicopee, Massachusetts. Editor, Grits & Grinds magazine, 1967–70.

INDUSTRIAL GLASS AND CERAMICS (in part)

D.J.Ba. D. James Baker. President, Joint Oceanographic Institutions Incorporated, Washington, D.C.

EXPLORATION (in part)

D.J.C. Daniel J. Crowley. Professor of Anthropology and Art, University of California, Davis. Author of I Could Talk Old-Story Good: Creativity in Bahamian Folklore.

WEST INDIES, THE (in part)

D.J.F. Douglas John Foscett. Director of Central Library Services and Goldsmiths' Librarian, University of London, 1978–83. Author of Classification and Indexing in the Social Sciences and others.

LIBRARIES (in part)

D.J.G. Douglas James Guthrie, M.D. (d. 1975). Medical historian. Lecturer on the History of Medicine, University of Edinburgh, 1945–56. Author of A History of Medicine and others.

MEDICINE (in part)

D.J.H. Donald J. Hanahan. Professor of Biochemistry, University of Texas Health Science Center at San Antonio. Author of Lipide Chemistry.

BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

D.J.M.H. David J.M. Higgins (d. 1975). Associate Professor of English,

Monmouth College, West Long Branch, New Jersey. Author of *Portrait of Emily Dickinson*.

DICKINSON, EMILY (Micropædia)

D.J.R. Donald J. Reish. Emeritus Professor of Biology, California State University, Long Beach. Author of *Marine Life of Southern California*. ANNELIDS

D.J.Ro. David J. Robinson. Dellplain Professor of Latin American Geography, Syracuse University, New York. Editor of *Studying Latin America*.

LIMA

D.J.S. Dirk Jan Struik. Emeritus Professor of Mathematics, Massachusetts Institute of Technology, Cambridge. Author of *Concise History of Mathematics and others*.

FOURIER, JOSEPH, BARON (Micropædia)

LAGRANGE, JOSEPH-LOUIS, COMTE DE L'EMPIRE (Micropædia)

LOBACHEVSKY, NIKOLAY IVANOVICH (Micropædia)

D.J.W. Donald John Wiseman. Emeritus Professor of Assyriology, School of Oriental and African Studies, University of London. Author of *Chronicles of Chaldean Kings*.

ASHURBANIPAL (Micropædia)

TIGLATH-PILESER III (Micropædia)

D.J.Wa. David John Watkin. Lecturer in the History of Art, University of Cambridge. Author of *Thomas Hope 1769–1831 and the Neo-Classical Idea and others*.

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

D.K. Delmar Karlen. Emeritus Professor of Law, New York University, New York City. Author of *Judicial Administration: The American Experience and others*.

JUDICIAL AND ARBITRATIONAL SYSTEMS (in part)

D.Ke. Donald Keene. Professor of Japanese, Columbia University. Translator into English of many of the great literary works in Japanese; and author of *World Within Walls: Japanese Literature of the Pre-Modern Era*.

JAPANESE LITERATURE (in part)

D.K.R. David K. Rycroft. Former Senior Lecturer in Bantu Studies, School of Oriental and African Studies, University of London. Composer of national anthem of Swaziland. Author of *Concise siSwati Dictionary*.

AFRICAN ARTS (in part)

D.La. David Ladd. Register of Copyrights, Copyright Office, Library of Congress, Washington, D.C.

PROPERTY LAW (in part)

D.L.D. Decima L. Douie. Former Reader in Medieval History, University of Hull, England. Author of *The Nature and the Effect of the Heresy of the Fraticelli and others*.

JOHN XXII (PAPACY) (Micropædia)

D.Le. Dominica Legge (d. 1986). Professor of Anglo-Norman Studies,

University of Edinburgh, 1968–73.

Author of *Anglo-Norman Literature and Its Background and others*.

ANGLO-NORMAN LITERATURE (Micropædia)

D.LeV. David Le Vay. Consultant Surgeon, National Health Service, United Kingdom. Author of *Human Anatomy and Physiology*.

EXCRETION AND EXCRETORY SYSTEMS (in part)

D.L.F. Denis Llewellyn Fox (d. 1983). Professor of Marine Biochemistry, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1948–69. Author of *Animal Biochromes and Structural Colours*.

COLORATION, BIOLOGICAL (in part)

D.L.L. David L. Lack (d. 1973). Director, Edward Grey Institute of Field Ornithology, University of Oxford, 1945–73. Author of *Natural Regulation of Animal Numbers*.

BIOSPHERE, THE (in part)

D.L.Le. David L. Lewis. Professor of History, Howard University, Washington, D.C. Author of *King: A Critical Biography and others*.

KING, MARTIN LUTHER, JR. (Micropædia)

D.L.M. David Livingstone Mueller. Professor of Christian Theology, Southern Baptist Theological Seminary, Louisville, Kentucky. Author of *An Introduction to the Theology of Albrecht Ritschl and others*.

RITSCHL, ALBRECHT (Micropædia)

D.L.N. David Lawrence Niddrie. Professor of Geography, University of Florida, Gainesville. Author of *Caribbean Geography and others*.

WEST INDIES, THE (in part)

D.L.P. David Leo Pawson. Curator of Echinoderms, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Contributor to *Physiology of Echinodermata*.

ECHINODERMS (in part)

D.L.S. David Llewelyn Snellgrove. Emeritus Professor of Tibetan, University of London. Author of *Buddhist Himālaya and others*.

BUDDHISM, THE BUDDHA AND (in part)

CENTRAL ASIAN ARTS (in part)

D.L.Se. D.L. Serventy. Principal Research Scientist, Division of Wildlife Research, Commonwealth Scientific and Industrial Research Organization, Nedlands, Australia; Officer in Charge, Western Australia Station, 1951–69. Researcher on the distribution and ecology of Australian birds. Author of *Birds of Western Australia*.

BIRDS (in part)

D.L.Sh. D.L. Shineberg. Reader in History, The Faculties, Australian National University, Canberra. Author of *They Came for Sandalwood*.

PACIFIC ISLANDS (in part)

D.M. Dieter Meischner. Professor of Geology, Georg August University of

Göttingen, West Germany.

GEOCHRONOLOGY (in part)

D.Ma. The Most Rev. David Mathew (d. 1975). Archbishop of Apamea; Assistant at the Pontifical Throne. Author of *James I*.

JAMES I (GREAT BRITAIN) (Micropædia)

D.M.A. David M. Armstrong. Associate Professor of Natural Sciences; Museum Associate Curator, University of Colorado, Boulder.

MAMMALS (in part)

D.M.Ar. Denis Midgley Arnold (d. 1986). Heather Professor of Music, University of Oxford, 1975–86. Author of *Monteverdi and others*.

MONTEVERDI, CLAUDIO (in part) (Micropædia)

D.M.B. D. Mary Benson. Writer. Author of *Chief Albert Lutuli of South Africa and others*.

LUTULI, ALBERT (Micropædia)

D.M.Be. Dewey M. Beegle. Professor of Old Testament, Wesley Theological Seminary, Washington, D.C. Author of *Moses, the Servant of Yahweh and others*.

MOSES (in part)

D.M.Bo. David Michael Bonavia. Chinese affairs specialist. Author of *The Chinese: A Portrait*; Hong Kong 1997; and others.

PEKING (in part)

D.McI. Donald McIntyre. Professor of Chemistry and of Polymer Science, University of Akron, Ohio. Editor of *Characterization of Macromolecular Structure*.

MOLECULES (in part)

D.M.DeL. Dwight Moore DeLong. Emeritus Professor of Entomology, Ohio State University, Columbus. Coauthor of *An Introduction to the Study of Insects*.

INSECTS (in part)

D.Mé. Daniel Ménager. Professor of French Literature, University of Paris X. Author of *Introduction à la vie littéraire du seizième siècle and others*.

FRENCH LITERATURE (in part)

D.M.Ea. David Magarey Earl. Former Professor of History, Eastern Michigan University, Ypsilanti. Author of *Emperor and Nation in Japan: Political Thinkers of the Tokugawa Period*.

SAIGŌ TAKAMORI (Micropædia)

D.M.F. Donald M. Frame. Emeritus Professor of French, Columbia University. Author of *Montaigne: A Biography*; translator of *Montaigne: The Complete Works*.

MONTAIGNE

D.M.G. David M. Gates. Professor of Botany; Director, Biological Station, University of Michigan, Ann Arbor. Author of *Energy Exchange in the Biosphere and others*.

BIOSPHERE, THE (in part)

D.M.Gi. Donald M. Ginsberg. Professor of Physics, University of Illinois, Urbana. Author of many papers

on superconductivity.

MATTER (in part)

D.M.H. Donald M. Hunten. *Professor of Planetary Sciences, University of Arizona, Tucson.*

ANALYSIS AND MEASUREMENT,
PHYSICAL AND CHEMICAL (in part)

D.M.Ha. David M. Hayne. *Professor of French, University of Toronto. Coauthor of Bibliographie Critique du Roman Canadien-Français, 1837-1900.*

CANADIAN LITERATURE (in part)

D.Mi. Dorothy Middleton. *Assistant Editor, Geographical Journal, 1953-71. Author of Baker of the Nile and others.*

STANLEY, SIR HENRY MORTON
(Micropædia)

D.M.J. Dorothy M. Johnson (d. 1984). *Free-lance writer. Author of The Hanging Tree; A Man Called Horse; Montana.*

UNITED STATES OF AMERICA (in part)

D.M.K. David Marcus Knight. *Senior Lecturer in History of Science, University of Durham, England. Author of Atoms and Elements and others.*

ARRHENIUS, SVANTE (Micropædia)

D.M.Ke. David M. Kunzle. *Professor of Art, University of California, Los Angeles. Author of The Early Comic Strip and others.*

CARICATURE, CARTOON, AND COMIC STRIP (in part)

D.M.L. David Malcolm Lewis. *Student and Tutor in Ancient History, Christ Church, Oxford; Lecturer in Greek Epigraphy, University of Oxford. Coauthor of A Selection of Greek Historical Inscriptions to the End of the Fifth Century B.C.*

PERICLES (Micropædia)

D.M.La. David Marshall Lang. *Emeritus Professor of Caucasian Studies, University of London. Author of A Modern History of Georgia; The Georgians; and others.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

D.M.L.-J. David Mathias Lloyd-Jones. *Musicologist and conductor; specialist in Slavic music. Artistic Director, Opera North, Leeds, England.*

DVOŘÁK, ANTONÍN (Micropædia)

D.M.Lo. David Morrice Low (d. 1972). *Classical Lecturer and Sub-dean, Arts Faculty, King's College, University of London, 1945-57. Author of Edward Gibbon, 1737-94 and others.*

GIBBON, EDWARD (Micropædia)

D.M.N. Donald MacGillivray Nicol. *Koraës Professor of Byzantine and Modern Greek History, Language, and Literature, King's College, University of London, 1970-88. Author of The Despotate of Epiros and others.*

BYZANTINE EMPIRE, THE HISTORY OF THE (in part)

CONSTANTINE THE GREAT (in part)

D.M.Ne. David M. Nelson. *Dean, College of Physical Education, Athletics and Recreation, University of Delaware, Newark. Former football coach. Author*

of Football: Principles and Play.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

D.M.P. Dorothy M. Pickles. *Writer, lecturer, and broadcaster. Author of The Fifth French Republic; The Government and Politics of France; and others.*

GAULLE, CHARLES DE (in part)
(Micropædia)

D.M.Po. David Morris Potter (d. 1971). *William R. Coe Professor of American History, Stanford University, California, 1961-71.*

UNITED STATES OF AMERICA (in part)

D.M.S. D.M. Sen. *Vice Chancellor, University of Burdwan, West Bengal, India, 1965-69.*

INDIA (in part)

D.M.Sm. Dale M. Smith. *Professor of Botany, University of California, Santa Barbara. Coauthor of The North American Sunflowers.*

ANGIOSPERMS (in part)

D.M.W. David M. Warshaw. *Assistant Professor of Physiology and Biophysics, University of Vermont, Burlington.*

MUSCLES AND MUSCLE SYSTEMS (in part)

D.M.W.A. Douglas M.W. Anderson. *Reader in Chemistry, University of Edinburgh. Editor of series of monographs on analysis of organic materials and functional groups.*

ANALYSIS AND MEASUREMENT,
PHYSICAL AND CHEMICAL (in part)

D.M.Wh. D. Maxwell White. *Professor and Head, Department of Italian Language and Literature, University of Leeds, England. Author of Zaccaria Seriman and others.*

ITALIAN LITERATURE (in part)

D.N. Dika Newlin. *Composer. Professor of Music, Virginia Commonwealth University, Richmond. Author of Bruckner-Mahler-Schoenberg; Schoenberg Remembered.*

SCHOENBERG, ARNOLD (in part)
(Micropædia)

D.N.K. David N. Keightley. *Professor of History, University of California, Berkeley. Author of Sources of Shang History: The Oracle-Bone Inscriptions of Bronze Age China.*

CHINA (in part)

D.N.P. Devavrat Nanubhai Pathak. *Former Vice Chancellor, Saurāshtra University, Rājkot, India. Coauthor of Three General Elections in Gujarat.*

INDIA (in part)

D.N.W. Donald N. Wilber. *Free-lance writer and consultant on the Middle East and Southeast Asia. Author of Iran Past and Present and others.*

SHĀPŪR II (PERSIA) (Micropædia)

Do.A.H. Donald Albert Heath. *George Holt Professor of Pathology, University of Liverpool. Coauthor of The Human Pulmonary Circulation.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

D.O.B. Donald O. Bushman (d. 1973). *Associate Professor of Geography, University of South Carolina, Columbia, 1960-73.*

UNITED STATES OF AMERICA (in part)

D.O.D.W. David O.D. Wurfel. *Professor of Political Science, University of Windsor, Ontario. Coauthor of The United States and the Philippines.*

PHILIPPINES (in part)

D.O.E. Dietz O. Edzard. *Professor of Assyriology, Ludwig Maximilian University of Munich. Author of Die zweite Zwischenzeit Babylonien.*

IRAQ (in part)

D.Ol. Daria Olivier. *Writer, translator, book reviewer, and historian. Author of Alexandre I^{er} and others.*

ALEXANDER I (RUSSIA) (Micropædia)

D.O.N. David O. Norris. *Professor of Biology, University of Colorado, Boulder. Author of Vertebrate Endocrinology.*

ENDOCRINE SYSTEMS (in part)

D.O'N. Denis O'Neill (d. 1981). *Under Secretary, Ministry of Transport, London, 1951-68.*

TRANSPORTATION (in part)

Do.S. Donald Southgate. *Former Reader in Political and Constitutional History, University of Dundee, Scotland. Author of The Most English Minister—The Policies and Politics of Palmerston.*

PALMERSTON, HENRY JOHN TEMPLE,
3RD VISCOUNT (in part)
(Micropædia)

D.P. Dimitris Pournaras. *Former Publisher and Editor of Eleutheros (newspaper), Athens. Former Chairman, Greek Broadcasting Corporation. Author of Eleuthérios Venizélos and others.*

VENIZÉLOS, ELEUTHÉRIOS (Micropædia)

D.P.C. Douglas Parodé Capper. *Commander, Royal Navy and Royal Navy Volunteer Reserve. Naval historian. Author of Famous Sailing Ships of the World and others.*

TRANSPORTATION (in part)

D.P.Ch. David P. Chandler. *Research Director, Centre of Southeast Asian Studies, Monash University, Clayton, Australia. Author of A History of Cambodia.*

SOUTHEAST ASIA, MAINLAND (in part)

D.P.Cl. Derek Plint Clifford. *Free-lance writer. Author of A History of Garden Design.*

GARDEN AND LANDSCAPE DESIGN (in part)

D.P.G. Derek Peter Gregory. *Director, Building Services Research and Information Association, Bracknell, England.*

ENERGY CONVERSION (in part)

D.P.Ga. David P. Gamble. *Emeritus Professor of Anthropology, San Francisco State University. Author of The Wolof of Senegambia.*

WESTERN AFRICA (in part)

D.Pi. Dag Pike. *Marine surveyor and consultant. Author of Fishing Boats*

and Their Equipment; Powerboats in Rough Seas.

FISHING, COMMERCIAL (in part)

D.P.L. Donald P. Little. *Professor and Director, Institute of Islamic Studies, McGill University, Montreal. Author of An Introduction to Mamlūk Historiography and others.*

EGYPT (in part)

MU'AWIYAH I (Micropædia)

D.P.O'C. Daniel Patrick O'Connell (d. 1979). *Chichele Professor of International Law, University of Oxford, 1972–79. Author of Richelieu and others.*

RICHELIEU, ARMAND-JEAN DU PLESSIS, CARDINAL ET DUC DE (in part) (Micropædia)

D.P.T. David P. Thelen. *Professor of History, University of Missouri, Columbia. Author of Robert M. La Follette and the Insurgent Spirit.*

LA FOLLETTE, ROBERT M. (Micropædia)

D.R. Don Russell (d. 1986). *Free-lance writer. Author of The Wild West: A History of the Wild West Shows.*

RODEO (Micropædia)

D.R.C. David R. Coffin. *Howard Crosby Buller Memorial Professor of the History of Architecture, Princeton University. Author of Villa d'Este at Tivoli and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

D.R.D. Donald Reynolds Dudley (d. 1972). *Professor of Latin, University of Birmingham, England, 1955–72. Author of The Romans.*

SENECA, LUCIUS ANNAEUS (Micropædia)

D.Re. Donald Read. *Professor of Modern English History, University of Kent at Canterbury, England. Author of Cobden and Bright and others.*

BRIGHT, JOHN (Micropædia)

D.R.G. Denis Rolleston Gwynn (d. 1971). *Research Professor of Modern Irish History, University College, Cork, National University of Ireland, 1946–63. Author of The History of Partition.*

DE VALERA, EAMON (in part) (Micropædia)

D.R.H. Delbert R. Hillers. *W.W. Spence Professor of Semitic Languages, Johns Hopkins University, Baltimore, Maryland. Author of Treaty-Curses and Old Testament Prophets.*

MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

D.R.Ha. David Russell Harris. *Professor of Human Environment, Institute of Archaeology, University of London.*

WEST INDIES, THE (in part)

D.R.M. Donald R. Morris. *News analyst, The Houston (Texas) Post. Author of The Washing of the Spears: A History of the Rise of the Zulu Nation Under Shaka and Its Fall in the Zulu War of 1879.*

SHAKA (Micropædia)

D.Ro. Dov Ronen. *Associate, Center for International Affairs, Harvard University.*

Author of Dahomey: Between Tradition and Modernity.

WESTERN AFRICA (in part)

D.R.O. David R. Olson. *Professor of Applied Psychology, Ontario Institute for Studies in Education, Toronto. Co-Director, McLuhan Program in Culture and Technology, University of Toronto. Coeditor of Literacy, Language and Learning: The Nature and Consequences of Reading and Writing.*

WRITING (in part)

D.R.O.-H. Dayrell Reed Oakley-Hill. *Inspector of the Albanian Gendarmerie, 1929–38; British Liaison Officer to Albanian resistance, 1940–41; Chief of United Nations Relief and Rehabilitation Administration mission to Albania, 1945–46.*

ALBANIA (in part)

D.R.P. Donald Rahl Pettersen (d. 1966). *Professor of Geography, East Carolina College, Greenville, North Carolina.*

WESTERN AFRICA (in part)

D.R.S. Dale R. Simpson. *Professor of Geology, Lehigh University, Bethlehem, Pennsylvania.*

MINERALS AND ROCKS (in part)

D.R.Sh. Donald Raymond Shuster. *Dean, Guam Community College. Author of articles on Palau.*

PACIFIC ISLANDS (in part)

D.S.B. Daniel Stephen Barker. *Professor of Geology, University of Texas at Austin.*

MINERALS AND ROCKS (in part)

D.S.D. Donald Stephen Dugdale. *Professor of Mechanical Engineering, University of Sheffield, England. Author of Elements of Elasticity.*

MECHANICS (in part)

D.Še. Drago Šega. *Scientific adviser, Institute for the Slovene Literature and Literary Sciences, Slovene Academy of Sciences and Arts, Ljubljana, Yugoslavia. Editor of Anthologie de la poésie slovène.*

YUGOSLAV LITERATURE (in part)

D.S.H.W.N. Davidson S.H.W. Nicol. *Under-Secretary-General, United Nations, and Executive Director, United Nations Institute for Training and Research, New York City, 1972–82. Permanent Representative and Ambassador for Sierra Leone to the United Nations, 1969–71. Author of Africa: A Subjective View; editor of Black Nationalism: The Writings of Africanus Horton.*

AFRICA (in part)

WESTERN AFRICA (in part)

D.Si. Denis Sinor. *Distinguished Professor of Uralic and Altaic Studies, and of History; Director, Inner Asian and Uralic Natural Resource Center, Indiana University, Bloomington. Author of Inner Asia; History of Hungary; and others.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

HUNGARIAN LITERATURE (in part)

D.S.J. David Starr Jordan, M.D. (d. 1931). *Chancellor, Stanford University, California, 1913–16; President, 1891–1913. President, Indiana University, Bloomington, 1885–91; Professor of Zoology, 1879–85. Author of A Guide to the Study of Fishes.*

AGASSIZ, LOUIS (Micropædia)

D.S.La. David S. Landes. *Coolidge Professor of History and Professor of Economics, Harvard University. Editor of The Rise of Capitalism; Contributor to The Cambridge Economic History of Europe, vol. 6.*

EUROPE (in part)

D.S.Lr. David Sievert Lavender. *Historian and writer. Author of The Great West; The Rockies; and others.*

UNITED STATES OF AMERICA (in part)

D.So. Dominique Sourdel. *Professor of Muslim Civilization, University of Paris IV. Author of Le Vizirat abbâside de 749 à 936 and others.*

MA'MÜN, AL- (Micropædia)

D.Sp. David Spring. *Professor of History, Johns Hopkins University, Baltimore. Author of The English Landed Estate in the Nineteenth Century.*

RUSSELL OF KINGSTON RUSSELL, JOHN RUSSELL, 1ST EARL (Micropædia)

D.S.R. Daniel Sommer Robinson (d. 1977). *Professor and Director, School of Philosophy, University of Southern California, Los Angeles, 1946–54. Author of Royce and Hocking: American Idealists and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

D.S.Ri. D.S. Richards. *Lecturer in Arabic, University of Oxford. Editor of Islamic Civilisation, 950–1150.*

EGYPT (in part)

D.S.T. Derick S. Thomson. *Professor of Celtic, University of Glasgow. Author of An Introduction to Gaelic Poetry.*

CELTIC LITERATURE (in part)

D.Su. Denys Sutton. *Editor, Apollo magazine. Art Critic, Financial Times. Author of Bonnard; Nocturne: The Art of James McNeill Whistler; and others.*

BONNARD, PIERRE (Micropædia)

WHISTLER, JAMES MCNEILL (in part)

(Micropædia)

D.T. David Turnock. *Reader in Geography, University of Leicester, England. Author of An Economic Geography of Romania and others.*

ROMANIA (in part)

D.T.E. Dudley Tate Easby, Jr. (d. 1973). *Secretary, Metropolitan Museum of Art, New York City, 1945–69; Chairman, Department of Primitive Art, 1969–71.*

DECORATIVE ARTS AND FURNISHINGS (in part)

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ANALYSIS (IN MATHEMATICS)
(in part)

D.t.H. Dirk ter Haar. *Reader in Theoretical Physics, University of Oxford; Fellow of Magdalen College, Oxford. Author of Elements of Thermodynamics.*

LANDAU, LEV DAVIDOVICH
(Micropædia)

D.T.J. The Rev. Daniel T. Jenkins. *Weyerhaeuser Professor of Systematic Theology, Princeton Theological Seminary, New Jersey, 1981-84. Author of Christian Maturity and Christian Success and others.*

PROTESTANTISM (in part)

D.Tn. David Thomson (d. 1970). *Master, Sidney Sussex College, University of Cambridge, 1957-70. Author of Europe Since Napoleon.*

EUROPE (in part)

D.T.R. David Talbot Rice (d. 1972). *Watson-Gordon Professor of the History of Fine Art, University of Edinburgh, 1934-72; Vice Principal, 1968-71. Author of Byzantine Art and others.*

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

D.V. Dora Vallier. *Art critic. Author of Henri Rousseau: Catalogue raisonné de l'oeuvre; Henri Rousseau; and others.*

ROUSSEAU, HENRI (Micropædia)

D.V.B. David V. Bates, M.D. *Emeritus Professor of Medicine, University of British Columbia, Vancouver. Coauthor of Respiratory Function in Disease.*

RESPIRATION AND RESPIRATORY
SYSTEMS (in part)

D.V.C. Dorothy V. Carrington. *Fellow, Royal Historical Society and Royal Literary Society. Author of Granite Island: A Portrait of Corsica; This Corsica; and others.*

FRANCE (in part)

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LEGAL SYSTEMS, THE EVOLUTION OF
MODERN WESTERN (in part)

D.V.Co. Deryck V. Cooke (d. 1976). *Musicologist. Music Presentation Editor, British Broadcasting Corporation, London, 1965-76. Author of Mahler, 1860-1911; Completed Mahler's unfinished 10th Symphony.*

MAHLER, GUSTAV (Micropædia)
WAGNER, RICHARD (in part)
(Micropædia)

D.V.D. Dimitrije V. Djordjevic. *Professor of History, University of California, Santa Barbara. Author of Révolutions nationales des peuples balkaniques, 1804-1914 and others.*

BALKANS (in part)
GREECE (in part)

D.W. Dorothy Whitelock (d. 1982). *Elrington and Bosworth Professor of Anglo-Saxon, University of Cambridge, 1957-69. A leading authority on Anglo-Saxon England. Author of Beginnings of English Society; editor of English Historical Documents c. 500-1042.*

ALFRED (Micropædia)
CANUTE (Micropædia)

UNITED KINGDOM (in part)

D.Wa. David Waines. *Lecturer in Arabic and Islamic Studies, University of Lancaster, England. Author of The Unholy War.*

TABARI, AT- (Micropædia)

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LANGUAGES OF THE WORLD (in part)

D.We. Donald Weinstein. *Professor of History, University of Arizona, Tucson. Author of Savonarola and Florence; Ambassador from Venice.*

EUROPE (in part)

D.W.F. Don W. Fawcett, M.D. *Professor Emeritus of Anatomy, Harvard Medical School, Harvard University. Coauthor of Textbook of Histology.*

SUPPORTIVE AND CONNECTIVE
TISSUES (in part)

D.W.Fi. Donald W. Fiske. *Emeritus Professor of Psychology, University of Chicago. Author of Measuring the Concepts of Personality and others.*

PSYCHOLOGICAL TESTS AND
MEASUREMENT (in part)

D.W.G. David W. Goodall. *Honorary Fellow, Division of Wildlife and Rangelands Research, Commonwealth Scientific and Industrial Research Organization, Perth, Australia; Senior Principal Research Scientist, Division of Land Resources Management, 1975-79.*

ECOSYSTEMS (in part)

D.W.I. Donald W. Insall. *Principal Architect, Donald W. Insall and Associates (architects and planning consultants), London. Commissioner, the Historic Buildings and Monuments Commission for England. Author of The Care of Old Buildings Today and others.*

ART CONSERVATION AND RESTORATION
(in part)

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KRUGER, PAUL (Micropædia)

D.W.K.-J. Douglas W. Kent-Jones (d. 1978). *President, British Industrial Biological Research Association, Carshalton, England. Coauthor of Modern Cereal Chemistry.*

FARMING AND AGRICULTURAL
TECHNOLOGY (in part)

FOOD PROCESSING (in part)

NUTRITION (in part)

D.W.L. Donald William Lucas (d. 1985). *P.M. Laurence Reader in*

Classics, University of Cambridge, 1952-69. Author of The Greek Tragic Poets; A Commentary on Aristotle's Poetics.

GREEK LITERATURE (in part)

D.W.M. D.W. Maurer (d. 1981). *Professor of Linguistics, University of Louisville, Kentucky. Author of Whiz-Mob: A Correlation of the Argot of Professional Pick-Pockets with Their Behavior Patterns and numerous articles and papers on slang.*

LANGUAGE (in part)

D.Wo. Douglas Woodruff (d. 1978). *Editor, The Tablet, London, 1936-67. Author of Church and State in History.*

PIUS IX (in part) (Micropædia)

PIUS V, SAINT (in part) (Micropædia)

D.W.O'C. Daniel William O'Connor. *Charles A. Dana Professor of Religious Studies, Saint Lawrence University, Canton, New York. Author of Peter in Rome: The Literary, Liturgical and Archeological Evidence.*

PETER THE APOSTLE, SAINT
(Micropædia)

D.W.S. Denis William Stevens. *Professor of Musicology, Columbia University, 1964-76. Author of Tudor Church Music.*

MUSICAL FORMS AND GENRES (in part)
PALESTRINA, GIOVANNI PIERLUIGI DA
(Micropædia)

D.W.S.H. Sir David Wathen Stather Hunt. *Director, Observer Newspapers Ltd., London. High Commissioner for the U.K. in Cyprus, 1965-67; Ambassador to Brazil, 1969-73. Coauthor and editor of Footprints in Cyprus.*

CYPRUS (in part)

E.A. Eric Axelsson. *Emeritus Professor of History, University of Cape Town, former Assistant Principal. Author of Congo to Cape: Early Portuguese Explorers and others.*

CAPE TOWN

E.A.A. Edward Alter Alpers. *Professor of History, University of California, Los Angeles.*

SOUTHERN AFRICA (in part)

E.A.B. Ernest Amano Boateng. *Senior consultant and adviser to the Executive Director, United Nations Environment Programme, Nairobi, Kenya. Executive Chairman, Environmental Protection Council of Ghana, Accra, 1973-81. Vice Chancellor, University of Cape Coast, Ghana, 1971-73. President, Ghana Academy of Arts and Sciences, 1973-77. Author of A Geography of Ghana.*

WESTERN AFRICA (in part)

E.A.D. Eugene A. Davidson. *Professor and Chairman, Department of Biological Chemistry, Milton S. Hershey Medical Center, Pennsylvania State University, Hershey. Author of Carbohydrate Chemistry.*

BIOCHEMICAL COMPONENTS OF
ORGANISMS (in part)

E.A.Ha. Eric Alfred Havelock (d. 1988). *Sterling Professor of Classics, Yale University, 1963-71. Author of The*

Lyric Genius of Catullus and others.

CATULLUS, GAIUS VALERIUS
(Micropædia)

E.A.J.D. Ernest Albert John Davies. *Publisher, Traffic Engineering and Control; Editor, 1960–76. Member of Parliament for Enfield East, England, 1945–59. Chairman, Labour Party Transport Committee, 1945–59. Author of Traffic Engineering Practice.*

PUBLIC WORKS (in part)

TRANSPORTATION (in part)

E.A.K. E.A. Kracke, Jr. (d. 1976). *Professor of Chinese Literature and Institutions, University of Chicago, 1960–73. Author of Civil Service in Early Sung China, 960–1067.*

T'AI TSU (SUNG DYNASTY)
(Micropædia)

Ea.L. Earl Latham (d. 1977). *Joseph B. Eastman Professor of Political Science, Amherst College, Mass., 1948–73. Author of The Group Basis of Politics and others.*

SOCIAL SCIENCES, THE (in part)

E.AI. Edward Allworth. *Professor of Turco-Soviet Studies; Director, Program on Soviet Nationality Problems; Executive Secretary, Center for the Study of Central Asia, Columbia University. Author of Soviet Asia; The Soviet Asian Controversy; and others.*

UNION OF SOVIET SOCIALIST REPUBLICS
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E.A.M. Edith A. Müller. *Professor of Astrophysics, University of Geneva, Switzerland.*

SOLAR SYSTEM, THE (in part)

E.An. Edgar Anderson. *Professor of History, San Jose State University, California. Author of History of Latvia, 1920–1940 and others.*

UNION OF SOVIET SOCIALIST REPUBLICS
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GEOCHRONOLOGY (in part)

E.A.P. Edwin A. Peel. *Professor of Education, University of Birmingham, England, 1950–78. Editor, Educational Review. Author of The Psychological Basis of Education.*

TEACHING (in part)

E.Ar. Endel Aruja. *Author of Estonian Books and Periodicals.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

E.A.R. The Rev. Edward A. Ryan, S.J. (d. 1964). *Rector, Our Lady of Martyrs Tertianship, Auriesville, New York, 1962–64. Professor of Church History, Woodstock College, Maryland, 1936–62.*

LOYOLA, SAINT IGNATIUS OF
(Micropædia)

E.A.R.B. Elizabeth A.R. Brown. *Professor of History, Brooklyn College and the Graduate Center, City University*

of New York.

PHILIP IV (FRANCE) (Micropædia)

E.A.T. E.A. Thompson. *Professor of Classics, University of Nottingham, England, 1948–79. Author of The Early Germans; A History of Attila and the Huns; and others.*

ATTILA (Micropædia)

EUROPE (in part)

STILICHO, FLAVIUS (Micropædia)

THEODORIC (ITALY) (Micropædia)

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HIPPOCRATES (Micropædia)

MEDICINE (in part)

NIGHTINGALE, FLORENCE (Micropædia)

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VIRCHOW, RUDOLF (Micropædia)

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TAIWAN (in part)

E.A.W.G. Elizabeth Ann Wynne Gunner. *Leverhulme Research Fellow in African Languages and Cultures, School of Oriental and African Studies, University of London. Author of A Handbook for Teaching African Literature.*

AFRICAN ARTS (in part)

E.B. Edward Bridges, 1st Baron Bridges (d. 1969). *Privy Councillor. Permanent Secretary to H.M. Treasury, London, 1945–56. Author of Portrait of a Profession.*

PUBLIC ADMINISTRATION (in part)

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GRECO-ROMAN CIVILIZATION, CLASSICAL
(in part)

E.B.B. E. Bradford Burns. *Professor of History, University of California, Los Angeles. Author of A History of Brazil and others.*

BRAZIL (in part)

E.B.D. Edward Bronson Diethrich, M.D. *Director; Chief of Cardiovascular Surgery, Arizona Heart Institute, Phoenix.*

CIRCULATION AND CIRCULATORY
SYSTEMS (in part)

E.Be. Edward Kamau Brathwaite. *Poet and critic. Professor of History, University of the West Indies, Mona (Kingston), Jamaica. Author of Rights of Passage; The Development of Creole Society in Jamaica.*

CARIBBEAN LITERATURE (Micropædia)

E.B.E. Edward B. Evenson. *Professor of Geological Sciences, Lehigh University, Bethlehem, Pennsylvania. Coeditor of Tills and Related Deposits.*

CONTINENTAL LANDFORMS

(in part)

E.B.F. E. Bert Fowler. *Vice President, Engineering, Waste Management of Illinois, Inc., Palos Heights. Author of Application of Component Construction to Multi-story, Low-Income Housing.*

BUILDING CONSTRUCTION (in part)

E.B.Fr. Edmund B. Fryde. *Professor of History, University College of Wales, Aberystwyth, University of Wales. Coeditor of Handbook of British Chronology.*

HISTORY, THE STUDY OF (in part)

E.B.G. Elizabeth Belmont Gasking (d. 1973). *Senior Lecturer in the History and Philosophy of Science, University of Melbourne, Australia. Author of Investigations into Generation, 1651–1828.*

SPALLANZANI, LAZZARO (Micropædia)

E.B.H. Earl B. Hunt. *Professor of Psychology, University of Washington, Seattle. Author of Concept Learning.*

LEARNING AND COGNITION, HUMAN
(in part)

Eb.R. Eberhard Ruhmer. *Former Curator in Chief, Bavarian State Painting Collection, Munich. Author of Cosimo Tura; Grünewald; and others.*

DÜRER, ALBRECHT (in part)
(Micropædia)

E.Br. Ernle Bradford (d. 1986). *Author of The Wind Commands Me: A Life of Sir Francis Drake and others.*

DRAKE, SIR FRANCIS (Micropædia)

E.B.R. Elwyn B. Robinson. *University Professor Emeritus of History, University of North Dakota, Grand Forks. Author of History of North Dakota.*

NORTH AMERICA (in part)

UNITED STATES OF AMERICA (in part)

E.B.W. E. Bright Wilson. *Theodore William Richards Professor Emeritus of Chemistry, Harvard University. Robert A. Welch Award in Chemistry, 1978. Coauthor of Molecular Vibrations.*

ANALYSIS AND MEASUREMENT,
PHYSICAL AND CHEMICAL (in part)

E.B.Wo. Everett B. Woodruff. *Consultant, A.M. Kinney, Inc., Cincinnati, Ohio. Coauthor of Steam-Plant Operation.*

ENERGY CONVERSION (in part)

E.Ca. Enzo Carli. *Director, Cathedral Museum, Siena, Italy. Author of Duccio.*

DUCCIO DI BUONINSEGNA (Micropædia)

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ANGIOSPERMS (in part)

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HINDUISM (in part)

SOUTH ASIAN ARTS (in part)

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ANGIOSPERMS (in part)

E.C.G. Ernst C. Griffin. *Professor and Chairman, Department of Geography, San Diego State University, California.*
MEXICO (in part)

E.C.H. Edgar Crawshaw Holt (d. 1975). *Author and journalist. Author of The Making of Italy, 1815-1870.*
MAZZINI, GIUSEPPE (Micropædia)

E.Cl. Eugene Clark. *Professor of Economics, Washington State University, Pullman; Dean, College of Economics and Business, 1957-77.*
UNITED STATES OF AMERICA (in part)

E.C.LaF. Eugene C. LaFond. *General Manager, LaFond Oceanic Consultants, San Diego, California. Secretary General, International Association for the Physical Sciences of the Ocean. Author of Processing Oceanographic Data.*
ASIA (in part)

E.C.N. E. Clifford Nelson. *Emeritus Professor of Religion, St. Olaf College, Northfield, Minnesota. Author of Lutheranism in North America, 1914-70.*
PROTESTANTISM (in part)

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ROMER, ALFRED SHERWOOD (Micropædia)

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CERVANTES

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GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

E.D.D. Ethel Deikman Dunn. *Executive Secretary, Highgate Road Social Science Research Station, Inc., Berkeley, California. Coauthor of The Peasants of Central Russia.*
UNION OF SOVIET SOCIALIST REPUBLICS (in part)

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KĀLIDĀSA (Micropædia)

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NERVES AND NERVOUS SYSTEMS (in part)

E.D.H. Earl Dorchester Hanson. *Professor of Biology and Science in Society, Wesleyan University, Middletown, Connecticut. Author of*

Animal Diversity.
BIOLOGICAL SCIENCES, THE (in part)

Ed.R. Edward Rosen (d. 1985). *Distinguished Professor of the History of Science, City University of New York. Author of Three Imperial Mathematicians: Kepler Trapped Between Brake and Ursus.*
KEPLER (in part)

E.D.S. Evgeny Dmitrievich Silaev. *Head, Department of the North and Transcaucasus, Council for Research on Productive Forces, U.S.S.R. Planning Committee, Moscow. Author of articles on Transcaucasian republics.*
UNION OF SOVIET SOCIALIST REPUBLICS (in part)

E.Du. Enrique Dussel. *Professor of Ethics, National Autonomous University of Mexico, Mexico City. Author of Les Evêques hispano-américaine (1504-1620) and others.*
LAS CASAS, BARTOLOMÉ DE (Micropædia)

E.E. Eliahu Elath. *Emeritus President, Hebrew University of Jerusalem. Chairman, Board of Governors, Afro-Asian Institute for Co-operative and Labour Studies, Tel Aviv, Israel. Ambassador of Israel to U.S., 1948-50, and to U.K., 1952-59. Author of Israel and Her Neighbours and others.*
ISRAEL (in part)

E.E.E. E. Earle Ellis. *Research Professor of New Testament Literature, New Brunswick Theological Seminary, New Jersey. Author of The Gospel of Luke and others.*
LUKE, SAINT (Micropædia)

E.Eg. Emil Egli. *Professor of Geography, Zürich Gymnasium. Lecturer, University of Zürich and Swiss Federal Institute of Technology, Zürich. Author of Switzerland and others.*
SWITZERLAND (in part)

E.E.L. Edward Ernest Long (d. 1956). *British journalist.*
EAST INDIES, THE (in part)

E.E.La. Eric Edwin Lampard. *Professor of History, State University of New York at Stony Brook.*
CITIES (in part)

E.E.R. Edgar Eugene Robinson (d. 1977). *Margaret Byrne Professor of American History, Stanford University, California, 1931-52. Author of Evolution of American Political Parties and others.*
UNITED STATES OF AMERICA (in part)

E.E.S. Eustace E. Suckling. *Honorary Professor of Electrical Engineering, University of Auckland, New Zealand. Author of Bioelectricity; The Living Battery.*
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NUTRITION (in part)

E.F. Enno Franzius. *Historian. Author of History of the Byzantine Empire.*
HERACLIUS (Micropædia)

E.F.B. Edgar F. Borgatta. *Professor of Sociology; Director, Institute on Aging, University of Washington, Seattle. Coeditor of Handbook of Personality Theory and Research.*
PERSONALITY (in part)

E.F.C. Eduardo F. Catalano. *Emeritus Professor of Architecture, Massachusetts Institute of Technology, Cambridge. Author of Structures of Warped Surfaces.*
NERVI, PIER LUIGI (Micropædia)

E.F.G.D. Emilio Fernando González Díaz. *Professor of Geomorphology, University of Buenos Aires.*
SOUTH AMERICA (in part)

E.F.S. Edward Fairbrother Strange (d. 1925). *Keeper of Woodwork, Victoria and Albert Museum, London. Author of Chinese Lacquer and others.*
DECORATIVE ARTS AND FURNISHINGS (in part)

E.F.T. Edward F. Tedesco. *Member of the Technical Staff, Jet Propulsion Laboratory, California Institute of Technology, Pasadena.*
SOLAR SYSTEM, THE (in part)

E.Fu. Edmund Fuller. *Writer and editor. Book Reviewer, Wall Street Journal. Coeditor of Four American Biographies and others.*
HOLMES, OLIVER WENDELL, JR. (Micropædia)

E.F.W. Edward F. Wente. *Professor of Egyptology, Oriental Institute and Department of Near Eastern Languages and Civilizations, University of Chicago. Author of Late Ramesside Letters.*
EGYPT (in part)

E.G. Evel Gasparini (d. 1982). *Professor of Slavic Philology, University of Padova, Italy. Author of Il matriarcato slavo.*
EUROPEAN RELIGIONS, ANCIENT (in part)

E.G.Bor. Edwin Garrigues Boring (d. 1968). *Edgar Pierce Professor of Psychology, Harvard University, 1956-57; Professor of Psychology, 1928-56.*
PSYCHOLOGY (in part)

E.G.C. Edward Gordon Couzens (d. 1971). *Technical Director, Bexford Ltd., Manningtree, England, 1952-62. Coauthor of Plastics in the Modern World.*
INDUSTRIES, CHEMICAL PROCESS (in part)

E.Ge. Ettore Gelpi. *Director of life-long education activities, United Nations Educational, Scientific and Cultural Organization (Unesco), Paris. Author of Storia dell'educazione and others.*
EDUCATION, HISTORY OF (in part)

E.G.K. E. Gordon Keith. *Emeritus Professor of Finance, University of Pennsylvania, Philadelphia. Editor of Foreign Tax Policies and Economic Growth.*
TAXATION (in part)

E.G.P. Edwin G. Pulleyblank. *Professor of Chinese, University of British Columbia, Vancouver. Author of The Background of the Rebellion of An Lu-shan; Chinese History and World History and others.*

AN LU-SHAN (Micropædia)

E.Gr. Endre Grastyán, M.D. *Professor of Physiology, Medical University of Pécs, Hungary. Author of Exp. Beiträge zur Pathogenese der Commotio Cerebri.*

EMOTION AND MOTIVATION, HUMAN (in part)

E.G.R. The Rev. Ernest Gordon Rupp (d. 1986). *Dixie Professor of Ecclesiastical History, University of Cambridge, 1968–77. Author of Luther's Progress to the Diet of Worms; coauthor of Erasmus and Luther and others.*

LUTHER

Eg.S. Egon Schaden. *Professor of Communication and Arts, University of São Paulo, Brazil. Author of Mitologia Heróica de Tribos Indígenas do Brasil.*

AMERICAN INDIANS (in part)

E.G.T. Sir Eric Gardner Turner (d. 1983). *Professor of Papyrology, University College, University of London, 1950–78; Director, Institute of Classical Studies, 1953–63. Author of Greek Papyri and many other works on papyri.*

WRITING (in part)

E.Gu. Erna Gunther (d. 1982). *Professor of Anthropology, University of Washington, Seattle, 1941–67; Director, Thomas Burke Memorial Washington State Museum, 1929–67. Author of Art in the Life of the Northwest Coast Indians and others.*

AMERICAN INDIANS (in part)

E.G.W. Ernest Glen Wever. *Higgins Professor Emeritus of Psychology, Auditory Research Laboratories, Princeton University. Author of Theory of Hearing.*

SENSORY RECEPTION (in part)

E.Ha. Enriqueta Harris. *Honorary Fellow of the Warburg Institute, University of London. Author of Goya; Velázquez; and others.*

GOYA, FRANCISCO DE (Micropædia)
VELÁZQUEZ (in part)

E.H.B. Edward Howland Burt, Jr. *Associate Professor of Zoology, Ohio Wesleyan University, Delaware, Ohio. Editor of The Biological Significance of Color.*

COLORATION, BIOLOGICAL (in part)

E.H.C. Edward H. Carr (d. 1982). *Wilson Professor of International Politics, University College of Wales, Aberystwyth, 1936–47. Author of Michael Bakunin; A History of Soviet Russia; and others.*

BAKUNIN, MIKHAIL ALEKSANDROVICH (Micropædia)

E.H.H. Eckhard H. Hess (d. 1986). *Professor of Psychology, University of Chicago, 1959–86. Author of Imprinting.*

LORENZ, KONRAD (Micropædia)

E.H.K. E.H. Kossmann. *Professor of Modern History, State University of Groningen, The Netherlands. Author of La Fronde and others.*

LOW COUNTRIES, THE (in part)

E.H.P.B. Ernest Henry Phelps Brown. *Emeritus Professor of the Economics of Labour, University of London. Author of The Economics of Labor.*

WORK AND EMPLOYMENT (in part)

E.H.St. Elmer H. Stotz (d. 1987). *Professor of Biochemistry, School of Medicine and Dentistry, University of Rochester, New York. Editor of Comprehensive Biochemistry.*

BIOLOGICAL SCIENCES, THE (in part)

E.H.T. Elias H. Tuma. *Professor of Economics, University of California, Davis. Author of Twenty-six Centuries of Agrarian Reform: A Comparative Analysis and others.*

LAND REFORM AND TENURE

E.H.T.W. E.H. Timothy Whitten. *Vice President for Academic Affairs; Professor of Geology, Michigan Technological University, Houghton. Author of Structural Geology of Folded Rocks.*

MINERALS AND ROCKS (in part)

E.H.W., Jr. Edmund H. Worthy, Jr. *Associate Director, Resident Associate Program, Smithsonian Institution, Washington, D.C. Founder, Bulletin of Sung Studies.*

WANG AN-SHIH (Micropædia)

E.Hy. Eric Halfpenny (d. 1979). *Editor, The Galpin Society Journal, 1963–70.*

MUSICAL INSTRUMENTS (in part)

E.I.G. Estill I. Green (d. 1974). *Electrical engineer. Executive Vice President, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey, 1959–60.*

SOUND (in part)

Ei.H. Einar Haugen. *Victor S. Thomas Professor Emeritus of Linguistics and Scandinavian, Harvard University. Author of Norwegian Language in America; Language Conflict and Language Planning: The Case of Modern Norwegian; and others.*

LANGUAGES OF THE WORLD (in part)

E.I.J.R. Erwin I.J. Rosenthal. *Emeritus Reader in Oriental Studies, University of Cambridge. Author of Political Thought in Medieval Islam; editor of Averroës' Commentary on Plato's Republic.*

AVERROËS (Micropædia)

E.I.U. Economist Intelligence Unit, *The Economist, London.*

AUSTRALIA (in part)

BRAZIL (in part)

CANADA (in part)

CHINA (in part)

CZECHOSLOVAKIA (in part)

EAST INDIES, THE (in part)

EGYPT (in part)

FRANCE (in part)

GERMANY (in part)

GREECE (in part)

INDIA (in part)

ITALY (in part)

JAPAN (in part)

POLAND (in part)

SOUTH AFRICA (in part)

SPAIN (in part)

SUDAN (in part)

TURKEY AND ANCIENT ANATOLIA (in part)

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

UNITED KINGDOM (in part)

UNITED STATES OF AMERICA (in part)

WESTERN AFRICA (in part)

E.J. Emrys Jones. *Professor of Geography, London School of Economics and Political Science, University of London. Author of Social Geography of Belfast and others.*

UNITED KINGDOM (in part)

E.J.B. Ernest J. Briskey. *Dean, College of Agricultural Sciences; Professor of Animal Science and Food Science and Technology, Oregon State University, Corvallis. Coeditor of The Physiology and Biochemistry of Muscle as a Food.*

FOOD PROCESSING (in part)

E.J.Bi. E.J. Bickerman (d. 1981). *Professor of Ancient History, Columbia University, 1952–67. Author of Chronology of the Ancient World.*

CALENDAR (in part)

E.J.C. Eric J. Chaisson. *Senior Research Physicist, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington. Author of Cosmic Dawn and others.*

STARS AND STAR CLUSTERS (in part)

E.J.C.G. Edward J.C. Garden. *Professor and Head, Department of Music, University of Sheffield, England. Author of Tchaikovsky; Balakirev.*

TCHAIKOVSKY, PETER ILICH (in part)
(Micropædia)

E.Je. Elizabeth Jenkins. *Author of Elizabeth the Great and others.*

ELIZABETH I OF ENGLAND (in part)

E.J.E. Eugene J. Enrico. *Professor of Music, University of Oklahoma, Norman. Author of Giuseppe Torelli's Music for Instrumental Ensemble with Trumpet.*

MUSICAL INSTRUMENTS (in part)

E.J.F. Sir Edgar John Forsdyke (d. 1979). *Director and Principal Librarian, British Museum, London, 1936–50; Keeper of Greek and Roman Antiquities, 1932–36.*

DECORATIVE ARTS AND FURNISHINGS (in part)

E.J.G. Elmer J. Guthertz. *Division Chief, Resource Assessment Surveys, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Pascagoula, Mississippi. Researcher on the biology of a variety of marine fishes.*

FISHES (in part)

E.J.J. E. Jaakko Järvinen. *Chief of Department, Finnish Institute*

of *Leadership*, Helsinki. Editor of *Contemporary Research in Psychology of Perception*.

PERCEPTION, HUMAN (in part)

E.J.Ke. Edward John Kenney. *Kennedy Professor Emeritus of Latin, University of Cambridge; Fellow of Peterhouse, Cambridge. Author of The Classical Text; Lucretius; and others.*

OID (Micropædia)

PETRONIUS ARBITER, GAIUS (in part)
(Micropædia)

E.J.M. Elbert John Minarcik. *Former Chief Metallurgist, Metal Division, NL Industries, Inc., Hightstown, New Jersey.*

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

E.J.M.R. Edward J.M. Rhoads. *Associate Professor of History, University of Texas at Austin. Author of China's Republican Revolution: The Case of Kwangtung, 1895-1913.*

LIN PIAO (Micropædia)

E.J.S. Sir Edward James Salisbury (d. 1978). *Director, Royal Botanic Gardens, Kew, England, 1943-56. Author of The Living Garden; The Reproductive Capacity of Plants; and others.*

LINNAEUS, CAROLUS (Micropædia)

E.J.Si. Ernest J. Simmons (d. 1972). *Professor of Russian Literature; Chairman, Department of Slavic Languages, Columbia University, 1946-59. Author of Dostoyevsky: The Making of a Novelist and others.*

DOSTOYEVSKY (in part)

RUSSIAN LITERATURE (in part)
TOLSTOY

E.J.W. Edwin J. Westermann. *Emeritus Professor of History, University of Missouri, Kansas City.*

UNITED STATES OF AMERICA (in part)

E.J.W.B. Ernest J.W. Barrington. *Emeritus Professor of Zoology, University of Nottingham, England. Author of Introduction to General and Comparative Endocrinology.*

BIOCHEMICAL COMPONENTS OF
ORGANISMS (in part)

E.J.Wi. E.J. Wiesenbergl. *Member, Taylor-Schechter Cairo Genizah Research Unit, University of Cambridge Library. Former Reader in Hebrew, University College, University of London. Editor and translator of Abraham Maimonides' Commentary on Genesis and Exodus.*

CALENDAR (in part)

HISTORY, THE STUDY OF (in part)

E.J.Wo. Edward J. Wormley. *Products and interior designer. Former Design Director, Dunbar Furniture Corporation of Indiana, New York City.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

E.K. Edgar Kaufmann, Jr. *Emeritus Professor of the History of Architecture, Columbia University. Director, Department of Industrial Design, Museum of Modern Art, New York City, 1946-50. Coauthor and editor of The Rise of an American Architecture;*

coeditor of Frank Lloyd Wright: Writings and Buildings.

WRIGHT, FRANK LLOYD (in part)
(Micropædia)

E.K.B. Eugene Kornel Balon. *Professor of Zoology, University of Guelph, Ontario. Editor in Chief, Environmental Biology of Fishes.*

FISHES (in part)

E.Ke. Elie Kedourie. *Professor of Politics, London School of Economics and Political Science, University of London. Author of Afghani and 'Abduh: An Essay on Religious Unbelief and Political Activism in Modern Islam.*

JAMAL AD-DIN AL-AFGHANI
(Micropædia)

E.K.H. Earl K. Hyde. *Senior Staff Scientist and Associate Director-at-Large, Lawrence Berkeley Laboratory, University of California, Berkeley. Coauthor of Nuclear Properties of the Heavy Elements.*

SEABORG, GLENN T. (Micropædia)

E.K.W. Sir Ellis K. Waterhouse (d. 1985). *Director of Studies, Paul Mellon Centre for Studies in British Art, London, 1970-73. Barber Professor of Fine Arts, University of Birmingham, England, 1952-70. Author of Italian Baroque Painting and others.*

CORREGGIO (Micropædia)

E.L. Edward Lockspeiser (d. 1973). *Writer and broadcaster on music. Author of Debussy: His Life and Mind.*

DEBUSSY, CLAUDE (Micropædia)

DIAGHILEV, SERGEY (Micropædia)

MENDELSSOHN, FELIX (Micropædia)

E.L.H. The Most Rev. Edward Louis Heston, C.S.C. (d. 1973). *Chairman, Pontifical Social Communications Commission, Vatican City, 1971-73. Author of The Holy See at Work.*

PAUL VI (PAPACY) (Micropædia)

E.Li. Edwin Lieuwen (deceased). *Professor of Latin American History, University of New Mexico, Albuquerque. Author of Venezuela and others.*

VENEZUELA (in part)

E.L.K. Edward Louis Keenan. *Professor of History, Harvard University. Author of The Kurbskii-Groznyi Apocrypha: The Seventeenth-Century Genesis of the 'Correspondence' Between Ivan IV and A.M. Kurbskii.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

E.Lo. Elizabeth Pakenham, Countess of Longford. *Writer. Author of Wellington: The Years of the Sword; Wellington: The Pillar of State; and others.*

WELLINGTON

E.L.O.M. Ernesto La Orden Miracle. *Diplomat. Spanish Ambassador to Costa Rica, 1972-76, and to Nicaragua, 1966-69.*

SPAIN (in part)

El.R. Elliott Rudwick (d. 1985). *Professor of Sociology and of History;*

Senior Research Fellow, Center for Urban Regionalism, Kent State University, Ohio. Author of W.E.B. Du Bois: Propagandist of the Negro Protest.

DU BOIS, W.E.B. (Micropædia)

E.L.T. Edward Lewis Turner, M.D. (d. 1960). *Secretary, Council on Medical Education and Hospitals, American Medical Association, Chicago, 1953-59. Professor of Medicine; Dean, School of Medicine, University of Washington, Seattle, 1945-53.*

MEDICINE (in part)

E.Lu. Evan Luard. *Fellow, St. Antony's College, University of Oxford. Member of Parliament, 1966-70; 1974-79. Author of The United Nations: How It Works and What It Does and others.*

UNITED NATIONS (in part)

E.L.Y. Ellen Louise Young. *Historical research specialist (manufactures).*

DECORATIVE ARTS AND FURNISHINGS
(in part)

E.M. Eric Mendoza. *Professor of Science Teaching, Hebrew University of Jerusalem. Editor of Sadi Carnot's Reflections on the Motive Power of Fire.*

CARNOT, SADI (Micropædia)

E.Ma. Erich Matthias (d. 1983). *Professor of Contemporary History and Political Science, University of Mannheim, West Germany. Author of Sozialdemokratie und Nation and others.*

BEBEL, AUGUST (Micropædia)

E.M.B. Eugene M. Berkman, M.D. *Medical Director, Blood Bank, New England Medical Center Hospital; Professor of Medicine, Tufts University, Boston. Editor of Fundamentals of a Pheresis Program.*

BLOOD (in part)

E.McC. Elizabeth McClintock. *Research Associate, Department of Botany, University of California, Berkeley.*

ANGIOSPERMS (in part)

E.McN.E. Ernest McNeill Eller. *Rear Admiral, U.S. Navy (retired). Author of The Soviet Sea Challenge and others; coeditor of Dictionary of American Naval Fighting Ships.*

WAR, THE TECHNOLOGY OF
(in part)

E.M.G. Ernest M. Gifford, Jr. *Professor of Botany, University of California, Davis. Coauthor of Comparative Morphology of Vascular Plants.*

BRYOPHYTES AND PRIMITIVE VASCULAR
PLANTS (in part)

E.M.J.C. Eila M.J. Campbell. *Emeritus Professor of Geography, Birkbeck College, University of London.*

GAMA, VASCO DA, IER CONDE DA
VIDIGUEIRA (Micropædia)

GIOVANNI DA PIAN DEL CARPINI
(Micropædia)

E.M.R. Edwin M. Ripin (d. 1975). *Assistant Curator, Musical Instruments*

Department, Metropolitan Museum of Art, New York City, 1970–73. Editor of *Keyboard Instruments*.

MUSICAL INSTRUMENTS (in part)

Em.Š. Emil Štampar. Professor of Modern Serbo-Croatian Literature, University of Ljubljana, Yugoslavia.

YUGOSLAV LITERATURE (in part)

E.M.W. Edmund Merriman Wise (d. 1972). Assistant to the Vice President of Research, International Nickel Company, New York City, 1955–61. Author of *Palladium: Recovery, Properties, and Uses*; editor of *Gold: Recovery, Properties, and Applications*; coeditor of *Platinum Metals and Their Alloys*.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

E.M.Wn. Elizabeth M. Wilkinson. Emeritus Professor of German, University of London. Coauthor of *Goethe: Poet and Thinker and others*.

GOETHE (in part)

E.N. Edward Norbeck. Professor of Anthropology, Rice University, Houston, Texas. Author of *Religion in Primitive Society and others*.

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

rites and ceremonies, sacred (in part)

E.N.A. Edward Noah Abrahart. Former Assistant Research Manager, Clayton Aniline Co. Ltd., Manchester, England. Author of *Dyes and Their Intermediates*.

INDUSTRIES, CHEMICAL PROCESS (in part)

INDUSTRIES, TEXTILE (in part)

En.S. Enid Starkie (d. 1970). Reader in French Literature, University of Oxford; Fellow, Somerville College, Oxford, 1934–65. Author of *André Gide*; *Arthur Rimbaud*; *Baudelaire*; and *others*.

BAUDELAIRE, CHARLES (Micropædia)
RIMBAUD, ARTHUR (in part)
(Micropædia)

E.N.S. Eric Norman Simons (d. 1983). Author of *The Queen and the Rebel: Mary Tudor and Wyatt the Younger and others*.

MARY I (ENGLAND AND GREAT BRITAIN) (Micropædia)

E.N.So. Estanislao Navarro Sosa. Manager, Advanced Development Department, Electron Dynamics Division, Hughes Aircraft Company, Torrance, California.

ELECTRONICS (in part)

E.O. Eberhard Otto (d. 1974). Professor of Egyptology, Rupert Charles University of Heidelberg. Author of *Osiris und Amun*; *Gott und Mensch nach den ägyptischen Tempelinschriften der griechisch-römischen Zeit*; and *others*.

MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

E.O.G.T.-P. E.O.G. Turville-Petre (d. 1978). Professor of Ancient Icelandic Literature and Antiquities, University of Oxford, 1953–75. Author of *Myth and Religion of the North*; *Origins of*

Icelandic Literature; and *others*.

EUROPEAN RELIGIONS, ANCIENT (in part)
SCANDINAVIAN LITERATURE (in part)

E.O.J. The Rev. Edwin Oliver James (d. 1972). Chaplain of All Souls College, University of Oxford. Professor of the History and Philosophy of Religion, University of London. Author of *Seasonal Feasts and Festivals* and numerous other works in the comparative study of religions.

rites and ceremonies, sacred (in part)

sacred offices and orders (in part)

E.O.W. Edwin O. Willis. Associate Professor of Zoology, Paulo State University "Julio de Mesquita Filho," Rio Claro, Brazil. Author of *The Behavior of Bicolored Antbirds*.

BEHAVIOUR, ANIMAL (in part)

E.P. Eva Paproth. Director, Geological Office of Nordrhein-Westfalen, Krefeld, West Germany.

GEOCHRONOLOGY (in part)

E.P.A. E. Paul Albury, D.D.S. Former Senator of The Bahamas. Author of *The Story of the Bahamas*.

WEST INDIES, THE (in part)

E.Pe. Edward Pessen. Distinguished Professor of History, Baruch College and the Graduate Center, City University of New York. Author of *Jacksonian America and others*.

UNITED STATES OF AMERICA (in part)

E.P.G. Elias Panayiotis Gyftopoulos. Ford Professor of Engineering, Massachusetts Institute of Technology, Cambridge. Coauthor of *Thermionic Energy Conversion*.

THERMODYNAMICS, PRINCIPLES OF (in part)

E.P.H. Eric P. Hamp. Robert Maynard Hutchins Distinguished Service Professor of Linguistics, of Behavioral Sciences, and of Slavic Languages; Director, Center for Balkan and Slavic Studies, University of Chicago. Coeditor of *Readings in Linguistics*, vol. 2.

LANGUAGES OF THE WORLD (in part)
LINGUISTICS (in part)

E.P.Ha. Earl Parker Hanson (d. 1978). Consultant, Department of State, Commonwealth of Puerto Rico, 1956–69. Professor of Geography; Chairman, Department of Geography and Geology, University of Delaware, Newark, 1949–56. Author of *The Amazon, a New Frontier*.

VENEZUELA (in part)

E.Po. Ernesto Pontieri (deceased). Professor of Medieval and Modern History, University of Naples. Author of *Tra i Normanni nell'Italia meridionale*.

ITALY (in part)

ROBERT (APULIA) (Micropædia)

E.P.O. Eugene P. Odum. Alumni Foundation Distinguished Professor of Zoology; Director, Institute of Ecology, University of Georgia, Athens. Author of *Fundamentals of Ecology*; *Ecology*.

ECOSYSTEMS (in part)

E.P.S. Ellis P. Steinberg. Director, Chemistry Division, Argonne National Laboratory, Illinois, 1982–88; Section Head, Nuclear and Inorganic Chemistry, 1974–82.

ATOMS (in part)

E.P.Y. Ernest P. Young. Professor of History, University of Michigan, Ann Arbor. Author of *The Presidency of Yuan Shih-k'ai: Liberalism and Dictatorship in Early Republican China*.

CHINA (in part)

E.R.A.F. Enid R.A. Forde. Associate Professor of Geography, Fourah Bay College, University of Sierra Leone, Freetown.

WESTERN AFRICA (in part)

E.R.C. Eli Rush Crews, M.D. (d. 1972). Clinical Professor of Surgery, University of Texas Medical School at San Antonio. Chief of the Burn Service, Bexar County Teaching Hospital, Texas. Author of *A Practical Manual for the Treatment of Burns*.

BURNS (in part)

E.R.G. Edna R. Green. Former Head, Science Department, Philadelphia High School for Girls. Coauthor of *Biology*.

BIOLOGICAL SCIENCES, THE (in part)

E.R.Ha. Edward R. Hardy (d. 1981). Lecturer in Early Church History, University of Cambridge, 1969–75. Professor of Church History, Berkeley Divinity School, New Haven, Connecticut, 1947–69. Author of *Christian Egypt: Church and People*; editor of *Christology of the Later Fathers*; *Faithful Witnesses*.

ATHANASIUS, SAINT (Micropædia)

BASIL THE GREAT, SAINT (Micropædia)

GREGORY OF NAZIANZUS, SAINT (Micropædia)

GREGORY OF NYSSA, SAINT (Micropædia)

Er.L. Erik Lassen. Director, Museum of Decorative Art, Copenhagen, 1966–82. Author of *Danish Furniture of the Classical Age and others*.

DECORATIVE ARTS AND FURNISHINGS (in part)

E.R.-M. Emir Rodríguez-Monegal. Professor of Latin American and Comparative Literature, Yale University. Author of *Borges par lui-même*.

BORGES, JORGE LUIS (Micropædia)

E.Rn. Edward Robinson. Former Professor and Head, Department of Geology, University of the West Indies, Kingston, Jamaica.

WEST INDIES, THE (in part)

E.R.S. Ernest R. Sandeen (d. 1982). Professor of History, Macalester College, St. Paul, Minnesota, 1973–82. Author of *The Roots of Fundamentalism: British and American Millenarianism 1800–1930*.

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

FUNDAMENTALISM (in part)
(Micropædia)

E.R.Se. Elman R. Service. Professor of Anthropology, University of California,

Santa Barbara. Investigator of the economic and social organization of primitive cultures. Author of Primitive Social Organization.

CULTURE, THE CONCEPT AND COMPONENTS OF (in part)
PARAGUAY (in part)

Er.St. Erich Steingraber. *Director General, Bavarian State Art Galleries, Munich.*

DRESS AND ADORNMENT (in part)

E.Ru. Eleanor Ruggles. *Biographer. Author of Prince of Players: Edwin Booth and others.*
BOOTH, EDWIN (Micropædia)

E.R.W. Ewald R. Weibel, M.D. *Professor and Chairman, Department of Anatomy, University of Bern. Author of The Pathway for Oxygen.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

E.Sa. Emilio Sáez (d. 1988). *Professor of Medieval Spanish History, University of Barcelona, Spain, 1959–78. Professor of Medieval History, University of Madrid, 1980–86. Author of Colección diplomática de Sepúlveda.*

ALFONSO V (SPAIN: ARAGON)
(Micropædia)

ALFONSO VI (SPAIN: CASTILE AND LEON)
(Micropædia)

JAMES I (SPAIN: ARAGON)
(Micropædia)

E.S.D. Eleanor Shipley Duckett (d. 1976). *Professor of Classical Languages and Literature, Smith College, Northampton, Massachusetts, 1928–49. Author of The Gateway to the Middle Ages; Carolingian Portraits; and others.*
CHARLES MARTEL (Micropædia)
PEPIN III (CAROLINGIAN DYNASTY)
(Micropædia)

E.S.H. Eric S. Higgs (d. 1976). *Director of Research, Faculty of Archaeology and Anthropology, University of Cambridge. Coeditor of Science in Archaeology.*
AGRICULTURE, THE HISTORY OF (in part)

E.Si. Edith Simon. *Historian, writer, and artist. Author of The Making of Frederick the Great and others.*
FREDERICK THE GREAT

E.S.M. Edmund S. Muskie. *United States Secretary of State, 1980–81. U.S. Senator from Maine, 1959–80; Governor, 1955–59. Author of Journeys.*
UNITED STATES OF AMERICA (in part)

E.S.Mi. Earl Schenck Miers (d. 1972). *Historian, editor, and writer. Author of The General Who Marched to Hell; The American Civil War; and many others.*
SHERMAN, WILLIAM TECUMSEH
(Micropædia)

E.Sn. Edward Salmon (d. 1955). *Honorary Editor, United Empire, journal of the Royal Empire Society, 1941–46; Editor 1920–37.*
EAST INDIES, THE (in part)

E.S.P. Edward S. Perkins, M.D. *Professor of Ophthalmology, University of Iowa, Iowa City. Coauthor of Atlas of*

Diseases of the Eye.

SENSORY RECEPTION (in part)

E.S.R. Evelyn S. Rawski. *Professor of History, University of Pittsburgh. Author of Education and Popular Literacy in Ch'ing China.*
CHINA (in part)

E.Sy. Edmond Sylvain. *Attorney. Former Editor and Publisher, La Patrie (daily newspaper). Former Rector, State University of Haiti, Port-au-Prince.*
WEST INDIES, THE (in part)

E.T. Ettore Toffoletto, M.D. *President of the Administration Council, Arts Academy, Bologna, Italy. Author of Discorso sul Malpighi and others.*
MALPIGHI, MARCELLO (in part)
(Micropædia)

E.T.B. Eric Temple Bell (d. 1960). *Professor of Mathematics, California Institute of Technology, Pasadena, 1926–60. Author of Development of Mathematics; The Magic of Numbers.*
MATHEMATICS, THE HISTORY OF
(in part)

E.t.H. Ernst ten Haaf. *Professor of Structural Geology, State University of Utrecht, The Netherlands.*

MINERALS AND ROCKS (in part)

E.Th. Sir Eric Thompson (d. 1975). *Staff Member, Department of Archaeology, Carnegie Institution of Washington, D.C., 1935–58. Author of The Rise and Fall of Maya Civilization and others.*

HISTORY, THE STUDY OF (in part)

E.To. Elisabeth Tooker. *Professor of Anthropology, Temple University, Philadelphia. Author of An Ethnography of the Huron Indians, 1615–1649; The Iroquois Ceremonial of Midwinter.*
AMERICAN INDIANS (in part)

E.T.S. Edward Togo Salmon. *Messecar Professor Emeritus of History, McMaster University, Hamilton, Ontario. Author of A History of the Roman World from 30 B.C. to A.D. 138 and others.*

GRECO-ROMAN CIVILIZATION, CLASSICAL
(in part)

E.T.Sa. Emilie T. Sander (d. 1976). *Associate Professor of New Testament, Yale University, 1973–75. Coeditor and translator of The Bible and the Role of Women.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

E.T.W. Sir Edgar Trevor Williams. *Secretary, Rhodes Trust, 1951–80. Pro-Vice-Chancellor, University of Oxford, 1966–80; Emeritus Fellow of Balliol College, Oxford. Editor, Dictionary of National Biography, 1940–80.*

VICTORIA AND THE VICTORIAN AGE

E.U.C. Edward U. Condon (d. 1974). *Professor of Physics; Fellow, Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder, 1963–70. Coauthor of Handbook of Physics.*

MECHANICS (in part)

Eu.M.A. Eufonio M. Alip (deceased). *President, Philippine National Historical Society. Editor, Journal of History (quarterly). President and Manager, Alip & Sons, Inc. (publishing firm), Manila. Author of Political and Cultural History of the Philippines and others.*
PHILIPPINES (in part)

E.V. Eugene Vanderpool. *Professor of Archaeology, American School of Classical Studies at Athens.*
ATHENS (in part)
OLYMPIA (Micropædia)

E.Va. Ernesto Valgiglio. *Professor of Greek and Latin Grammar, University of Genoa. Author of Silla e la crisi repubblicana.*

SULLA, LUCIUS CORNELIUS (Micropædia)

E.V.B.B. Eric V.B. Britter (d. 1977). *Foreign Correspondent, The Times (London), 1944–69.*
WEST INDIES, THE (in part)

E.V.G. Elsa Vesta Goveia. *Former Professor of West Indian History, University of the West Indies, Kingston, Jamaica. Author of Slave Society in the British Leeward Islands.*

WEST INDIES, THE (in part)

E.v.H. Ernst van Heerden. *Poet. Emeritus Professor of Afrikaans and Netherlands, University of the Witwatersrand, Johannesburg. Author of Die klop and many others.*

SOUTH AFRICAN LITERATURE (in part)
(Micropædia)

E.Vi. Eugène Vinaver (d. 1979). *Professor of French Language and Literature, Victoria University of Manchester, 1933–66. Author of The Rise of Romance; editor of The Works of Sir Thomas Malory.*

LITERATURE, THE ART OF
(in part)

Ev.S. Eva Schaper. *Professor of Philosophy, University of Glasgow, Scotland. Author of Prelude to Aesthetics.*

TROELTSCH, ERNST (Micropædia)

Ev.W. Evert Werkman. *Columnist, Het Parool, Amsterdam. Author of Amsterdam, 'n stad op palen and others.*
AMSTERDAM (in part)

E.W. Edward Weintal (d. 1973). *Diplomatic Correspondent, Chief European Correspondent, and Contributing Editor, Newsweek magazine, 1944–69. Coauthor of Facing the Brink: An Intimate Study of Crisis Diplomacy.*

DULLES, JOHN FOSTER (Micropædia)

E.W.A. Edward W. Anderson (d. 1983). *Navigational Adviser, Aviation Division, Smiths Industries Ltd., Cheltenham, England. Author of Principles of Navigation.*
NAVIGATION (in part)

E.W.B. Ernst Wilhelm Benz (d. 1978). *Professor of Church History, Philipps University of Marburg, West Germany. Author of Evolution and Christian Hope.*
CHRISTIANITY (in part)

E.We. Elisabeth Weis. *Professor of Film, Brooklyn College, City University of New York. Coeditor of Film Sound: Theory and Practice.*

MOTION PICTURES (in part)

E.W.G. Eric William Gray. *Lecturer in Ancient History, University of Oxford; Official Student and Tutor in Roman History, Christ Church, Oxford, 1939–77. Editor of Greenridge and Clay's Sources for Roman History (133–70 B.C.)*

POMPEY THE GREAT (in part) (Micropædia)

E.Wi. Edward Wichers (d. 1984). *Associate Director, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C., 1958–62; Chief, Division of Chemistry, 1948–58. Author of papers on chemical reagents, pure substances, and atomic weights.*

ATOMIC WEIGHT (in part) (Micropædia)

E.Wn. Elizabeth Wiskemann (d. 1971). *Montague Burton Professor of International Relations, University of Edinburgh, 1958–61. Tutor in Modern History, University of Sussex, England, 1961–64. Author of Czechs and Germans and others.*

CZECHOSLOVAKIA (in part)

GERMANY (in part)

E.W.S. Edward W. Smykay. *Professor and Chairman, Department of Marketing, University of Baltimore. Coauthor of Physical Distribution Management.*

HANDLING, PACKAGING, AND STORAGE (in part)

E.W.W. Eric Walter White. *Former Assistant Secretary and Literature Director, Arts Council of Great Britain, London. Author of Stravinsky: The Composer and His Works and others.*

STRAVINSKY, IGOR (in part)

(Micropædia)

E.W.Z. Ernst Walter Zeeden. *Professor of Modern and Medieval History, Eberhard Karl University of Tübingen, West Germany.*

GERMANY (in part)

STEIN, KARL, REICHSFREIHERR VOM UND ZUM (Micropædia)

E.Z. Erik Zürcher. *Professor of East Asian History, State University of Leiden, The Netherlands. Author of The Buddhist Conquest of China.*

CHINA (in part)

E.Z.H. E. Zudaire Huarte. *Instructor, Good Counsel Academy, Lecaroz, Spain. Author of El conde-duque y Cataluña.*

OLIVARES, GASPARD DE GUZMÁN Y PIMENTAL, CONDE-DUQUE DE (Micropædia)

E.Zö Erich Zöllner. *Professor of Austrian History, University of Vienna. Author of Geschichte Österreichs von den Anfängen bis zur Gegenwart and others.*

AUSTRIA (in part)

F.A. Frederick Alexander. *Emeritus Professor of Modern History, University*

of Western Australia, Nedlands. Author of Australia Since Federation.

AUSTRALIA (in part)

F.A.A. Francis A. Allen. *Edson R. Sunderland Professor of Law, University of Michigan, Ann Arbor. Author of The Borderland of Criminal Justice.*

BECCARIA, CESARE (Micropædia)

ERSKINE OF RESTORMEL, THOMAS ERSKINE, 1ST BARON (Micropædia)

F.A.B. Frank A. Brown, Jr. (d. 1983). *Morrison Professor of Biology, Northwestern University, Evanston, Illinois, 1956–76. Coauthor of Comparative Animal Physiology; The Biological Clock: Two Views.*

BEHAVIOUR, ANIMAL (in part)

COLORATION, BIOLOGICAL (in part)

F.A.C. F. Albert Cotton. *Robert A. Welch Professor of Chemistry, Texas A & M University, College Station. Author of Chemical Applications of Group Theory.*

CHEMICAL ELEMENTS (in part)

F.A.L. Frank Andrew Leeming. *Senior Lecturer in Geography, University of Leeds, England.*

CHINA (in part)

F.A.P. Frank A. Paine. *Secretary-General, International Association Packaging Research Institutes, England. Editor of Fundamentals of Packaging.*

HANDLING, PACKAGING, AND STORAGE (in part)

F.A.V. Frederick Albert Valentine. *Emeritus Professor of Mathematics, University of California, Los Angeles. Author of Convex Sets.*

GEOMETRY (in part)

F.B. François Bernard. *Maître des Requêtes, a judicial rank in the Council of State; Director, Civil and Military Cabinet, Ministry of Defense, Government of France, Paris.*

FRANCE (in part)

F.Ba. Frank Barlow. *Emeritus Professor of History, University of Exeter, England. Author of William I and the Norman Conquest and others.*

WILLIAM I (ENGLAND AND GREAT BRITAIN) (Micropædia)

F.B.B. Frank Bagnall Bessac. *Professor of Anthropology, University of Montana, Missoula. Author of Culture Types of Northern and Western China.*

ASIA (in part)

F.B.C. Floyd Barton Chapman. *Ecologist, Metropolitan Park District, Columbus, Ohio. Author of The Ruffed Grouse and Its Management in Ohio.*

FALCONRY (in part) (Micropædia)

F.Be. Fernando Benítez. *Editor, La Cultura en México. Professor of Journalism, National Autonomous University of Mexico, Mexico City. Author of Los Indios Mexicanos.*

MEXICO CITY (in part)

F.B.G. Frank B. Gibney. *Vice-Chairman, Board of Editors,*

Encyclopædia Britannica, Inc., Chicago. Vice-Chairman, TBS-Britannica Company Ltd., Tokyo. Author of The Khrushchev Pattern.

KHRUSHCHEV, NIKITA (Micropædia)

F.Br. Friedrich Blendinger. *Director of Archives, Augsburg, West Germany, 1966–77. Author of Bevölkerungsgeschichte einer deutschen Reichsstadt im Zeitalter der Glaubenskämpfe.*

FUGGER FAMILY (Micropædia)

F.B.S. Frederick Bernard Singleton (d. 1988). *Reader and Chairman, Postgraduate School of Yugoslav Studies, University of Bradford, England. Author of Twentieth Century Yugoslavia and others.*

YUGOSLAVIA (in part)

F.C. Françoise Choay. *Professor of Urban Studies, University of Paris VIII. Author of Le Corbusier; Planning in the XIXth Century; and others.*

CORBUSIER, LE (in part) (Micropædia)

F.C.B. Frederick C. Barghoorn. *Emeritus Professor of Political Science, Yale University. Author of Politics in the U.S.S.R.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

F.C.C. Frederick C. Crews. *Professor of English, University of California, Berkeley. Author of Out of My System: Psychoanalysis, Ideology, and Critical Method and others.*

LITERATURE, THE ART OF (in part)

F.-C.Ce. Fay-Cooper Cole (d. 1961). *Professor of Anthropology, University of Chicago, 1929–48. Research Associate, Field Museum of Natural History, Chicago. Author of Peoples of Malaysia and others.*

EAST INDIES, THE (in part)

F.C.D.III Frederick C. Durant III. *Aerospace historian. Assistant Director, Astronautics, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1965–81.*

ENERGY CONVERSION (in part)

EXPLORATION (in part)

WAR, THE TECHNOLOGY OF (in part)

F.C.F. Sir Frank C. Francis (d. 1988). *Director and Principal Librarian, British Museum, London, 1959–68. Editor of The Bibliographical Society, 1892–1942: Studies in Retrospect; The Treasures of the British Museum.*

HISTORY, THE STUDY OF (in part)

LIBRARIES (in part)

F.C.Gi. Frances Carney Gies. *Coauthor of Leonard of Pisa and the New Mathematics of the Middle Ages and others.*

LEONARDO PISANO (Micropædia)

F.Ch. Frank Chapman. *Former Senior English Master, High School for Boys, Oswestry, England. Author of "Hardy the Novelist" in Scrutiny.*

HARDY, THOMAS (Micropædia)

F.C.H. F. Clark Howell. *Professor of Anthropology, University of California,*

Berkeley. Author of *Early Man*.
EVOLUTION, HUMAN (in part)

F.C.Ke. Fenton Crosland Kelley. Associate Professor of Zoology, Boise State University, Idaho.
EXCRETION AND EXCRETORY SYSTEMS (in part)

F.C.M. Frederick C. Mosher. White Burkett Miller Professor of Public Affairs, University of Virginia, Charlottesville. Author of *Democracy and the Public Service*.
PUBLIC ADMINISTRATION (in part)

F.C.N. Frederick C. Nachod. Consultant. Director of Special Projects, Sterling-Winthrop Research Institute, Rensselaer, New York, 1974–78; Chemical Liaison Staff Director, 1964–74. Coauthor of *Determination of Organic Structures by Physical Methods*.
MOLECULES (in part)

F.C.O. Francis Christopher Oakley. President; Professor of History, Williams College, Williamstown, Massachusetts. Author of *Council Over Pope? Towards a Provisional Ecclesiology and others*.
ROMAN CATHOLICISM (in part)

F.C.P. Forrest C. Pogue. Director, Dwight D. Eisenhower Institute for Historical Research, Smithsonian Institution, Washington, D.C. Director, George C. Marshall Research Library, Lexington, Virginia, 1964–74. Author of *George C. Marshall*.
MARSHALL, GEORGE C. (Micropædia)

F.C.S. Frank C. Shoemaker. Professor of Physics, Princeton University. Authority on the design of apparatus for studying subatomic particles.
PARTICLE ACCELERATORS (in part)

F.Ct. François Marie-Joseph Crouzet. Professor of the History of Northern Europe, University of Paris IV. Author of *L'Economie Britannique et le Blocus Continental (1806–1813)*.
FRANCE (in part)

F.D.G. Frank Denby Gunstone. Professor of Chemistry, University of St. Andrews, Scotland. Author of *An Introduction to the Chemistry and Biochemistry of the Fatty Acids and Their Glycerides and others*.
CHEMICAL COMPOUNDS (in part)

F.D.H. F.D. Hobbs. Head, Environmental Modelling and Survey Unit, University of Birmingham, England. Author of *Traffic Planning and Engineering*.
TRANSPORTATION (in part)

F.Do. Filippo Donini. Cultural Expert, Cultural Relations Department, Italian Ministry of Foreign Affairs, Rome, 1972–76. Director, Italian Institute, London, 1961–72. Author of *Vita e poesia di Sergio Corazzini*.
ITALIAN LITERATURE (in part)

F.D.O. Francis D. Ommanney (d. 1980). Reader in Marine Biology, University of Hong Kong, 1957–60. Scientific staff member, *Discovery*

Committee, 1929–39. Author of *South Latitude and North Cape and others*.
BYRD, RICHARD E. (Micropædia)

F.D.P. Franklin D. Parker. Emeritus Professor of History, University of North Carolina at Greensboro. Author of *The Central American Republics and others*.
CENTRAL AMERICA (in part)

F.d.Pe. Franco della Peruta. Professor of the History of the Risorgimento, University of Milan. Author of *I democratici e la rivoluzione italiana*.
ITALY (in part)

F.Dr. Franz Dölger (d. 1968). Professor of Byzantine and Modern Greek Studies, University of Munich. Author of *Die byzantinische Dichtung in der Reinsprache*.
GREEK LITERATURE (in part)

F.E.B. Frederick E. Bacon. Former Metallurgical Engineer, Metals Division, Union Carbide Corporation, Niagara Falls, New York.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

F.E.Bl. Floyd E. Bloom, M.D. Director, Division of Preclinical Neuroscience and Endocrinology, Scripps Clinic and Research Foundation, La Jolla, California. Coauthor of *Biochemical Basis of Neuropharmacology and others*.
DRUGS AND DRUG ACTION (in part)

F.E.D. Fram E. Dinshaw. Fellow of St. Catherine's College, University of Oxford.

ENGLISH LITERATURE (in part)

F.Ek. Frank Eyck. Professor of History, University of Calgary, Alberta.
GERMANY (in part)

F.E.K. Frank E. Keating. Fishing Editor, *Newsday*, Garden City, New York.

FISHING (in part) (Micropædia)

F.E.Ki. F.E. Kirby. Professor of Music, Lake Forest College, Illinois. Author of *A Short History of Keyboard Music; An Introduction to Western Music; and others*.

MUSICAL FORMS AND GENRES (in part)

F.E.M. Frank Edward Manuel. Emeritus Professor of History, Brandeis University, Waltham, Massachusetts. Author of *Shapes of Philosophical History and others*.

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

F.E.McE. Frank E. McElroy. Director, Technical Publications, National Safety Council, Chicago. Editor in Chief of *Accident Prevention Manual for Industrial Operations*.

FIRE PREVENTION AND CONTROL (in part)

F.E.R. Frank E. Reynolds. Professor of Buddhist Studies and History of Religions, University of Chicago.
ANGKOR (Micropædia)
JAYAVARMA VII (Micropædia)

F.F.B. Frederick Fyvie Bruce. Rylands Professor Emeritus of Biblical Criticism and Exegesis, Victoria University of Manchester. Author of *The Books and the Parchments*.

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

F.F.C. Frederick F. Cartwright. Emeritus Senior Lecturer in the History of Medicine, King's College Hospital, University of London. Author of *Joseph Lister*.

LISTER, JOSEPH, BARON LISTER, OF LYME REGIS (Micropædia)

F.Fe. Fritz Fellner. Professor of Modern History, University of Salzburg, Austria. Author of *Schicksaljahre Österreichs*.
AUSTRIA (in part)

F.Fo. Frieda Fordham. Training analyst, Society of Analytical Psychology, London. Author of *An Introduction to Jung's Psychology and others*.
JUNG, CARL (in part) (Micropædia)

F.Fr. Frank Freidel. Professor of History, University of Washington, Seattle. Emeritus Professor of History, Harvard University. Author of *Franklin D. Roosevelt and others*.
ROOSEVELT, FRANKLIN D.
UNITED STATES OF AMERICA (in part)

F.G.A.S. F. Gordon A. Stone. Professor of Inorganic Chemistry, University of Bristol, England. Editor of *Advances in Organometallic Chemistry*.
CHEMICAL COMPOUNDS (in part)

F.Go. Frederick Goldbeck (d. 1981). Critic and musicologist. Adviser for Music, Radiotélévision Française. Author of *The Perfect Conductor and others*.
GOUNOD, CHARLES (Micropædia)

F.Gre. Frank Greenaway. Keeper, Department of Chemistry, Science Museum, London, 1967–80. Author of *John Dalton and the Atom; editor of Lavoisier's Essays, Physical and Chemical*.
MENDELEYEV, DMITRY IVANOVICH (Micropædia)

F.Gu. The Rev. Franco Guerello, S.J. Professor of Italian Literature, Social Institute, Turin, Italy. Editor of *Lettere di Innocenzo IV dai cartolari notari genovesi*.
INNOCENT IV (Micropædia)

F.H. François Haverschmidt. Ornithologist. Author of *Birds of Surinam and numerous articles on neotropical birds*.
BIRDS (in part)

F.Ha. Felix Haurowitz (d. 1987). Distinguished Professor of Chemistry, Indiana University, Bloomington. Author of *Chemistry and Function of Proteins*.
BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

F.H.B. Frederick Henry Boland (d. 1985). Chancellor, University of Dublin, 1964–82. Representative of Ireland to the United Nations, 1956–64.
IRELAND (in part)

F.Hi Finn Hiorthøy. *Judge of the Supreme Court of Norway, Oslo, 1955–73.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

F.H.M. Franz H. Michael. *Emeritus Professor of Far Eastern History and International Affairs, George Washington University, Washington, D.C. Author of The Origin of Manchu Rule in China; The Taiping Rebellion; and others.*

NURHACHI (Micropædia)

F.H.O. Frederick Henry Osborn (d. 1981). *Chairman, Executive Committee, Population Council, New York City, 1930–68; President, 1952–59. Secretary-treasurer, American Eugenics Society, 1959–70. Author of Preface to Eugenics; coauthor of Dynamics of Population.*

BIOLOGICAL SCIENCES, THE (in part)
GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

F.H.S. Frank Harold Spedding (d. 1984). *Principal Scientist, U.S. Atomic Energy Commission, Ames Laboratory, Iowa State University, Ames, 1968–74; Director, Ames Laboratory, 1947–68. Coauthor of The Rare Earths.*

CHEMICAL ELEMENTS (in part)

F.H.Sh. Frank H. Shu. *Professor and Chairman, Astronomy Department, University of California, Berkeley. Author of The Physical Universe.*

COSMOS, THE

F.Hu. Frederick Fu Hung. *Emeritus Professor of Geography, University of Guelph, Ontario. Author of a geography series for schools (in Chinese) and others.*

CHINA (in part)

F.H.W. Fred H. Wilt. *Professor of Zoology, University of California, Berkeley. Editor of Methods in Developmental Biology.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

F.İ. Fahir İz. *Professor of Turkish Literature, Boğaziçi University, Istanbul. Author of Ottoman Turkish Prose; Ottoman Turkish Verse; and others.*

CENTRAL ASIAN ARTS (in part)

F.J.A. Francisco Jose Ayala. *Distinguished Professor of Ecology and Evolutionary Biology, University of California, Irvine. Author of Evolving: The Theory and Processes of Organic Evolution and others.*

EVOLUTION, THE THEORY OF

F.J.B. Fred J. Benson. *Emeritus Dean, College of Engineering, Texas A & M University, College Station.*

PUBLIC WORKS (in part)

F.J.B.W. Sir F.J.B. Watson. *Director of the Wallace Collection, London, 1963–74. Surveyor of the Queen's Works of Art, 1963–72. Author of Fragonard; Canaletto; and others.*

FRAGONARD, JEAN-HONORÉ (Micropædia)

F.J.D. Frederick J. Dockstader. *Museum consultant and art historian.*

Director, Museum of the American Indian, Heye Foundation, New York City, 1960–75. Author of Indian Art in North America; Indian Art in South America; and others.

AMERICAN INDIANS (in part)

F.J.E.R. Frederic James Edward Raby (d. 1966). *Fellow and Lecturer, Jesus College, University of Cambridge, 1948–54. Author of A History of Christian Latin Poetry and others.*

LATIN LITERATURE (in part)

F.J.G.E. F. John G. Ebling. *Emeritus Professor of Zoology; Independent Research Worker in Dermatology, University of Sheffield, England. Coeditor of and contributor to Textbook of Dermatology.*

INTEGUMENTARY SYSTEMS (in part)

F.J.M. Francis J. Murray. *Professor of Mathematics, Duke University, Durham, North Carolina. Author of Mathematical Machines.*

ARITHMETIC (in part)

F.J.Ma. Frank J. Malina (d. 1981). *Trustee, International Academy of Astronautics, Paris, 1963–81; President, 1963. Founder–Editor, Leonardo (international journal of the contemporary artist). Editor of the first–fifth Lunar International Laboratory Symposia.*

KÁRMÁN, THEODORE VON (Micropædia)

F.J.S. Frederick J. Streng. *Professor of the History of Religions, Southern Methodist University, Dallas, Texas. Author of Emptiness: A Study of Religious Meaning; Understanding Religious Life.*

NĀGĀRJUNA (Micropædia)

RITEs AND CEREMONIES, SACRED (in part)

F.-J.Se. Franz-Josef Schmale. *Professor of Medieval History, University of the Ruhr, Bochum, West Germany. Editor of Quellen zur Geschichte Kaiser Heinrichs IV.*

HENRY IV (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

HENRY V (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

F.J.W. Francis James West. *Pro Vice Chancellor (Research and Development), Deakin University, Geelong, Australia. Author of Political Advancement in the South Pacific and others.*

PACIFIC ISLANDS (in part)

F.K. The Most Rev. Franz Cardinal König. *Archbishop of Vienna. Author of Zarathustras Jenseitsvorstellungen und das Alte Testament and others.*

ZOROASTER (Micropædia)

F.K.A. Franklin K. Anderson. *Senior Environmental Scientist, Ford, Bacon & Davis, Inc. (engineers), Salt Lake City, Utah. Associate Editor, Life Sciences (Botany), Encyclopædia Britannica, Chicago, 1970–72.*

ANGIOSPERMS (in part)

F.K.H. F. Kenneth Hare. *University Professor Emeritus of Geography and of Physics, University of Toronto. An*

authority on meteorology and the general circulation of the atmosphere. Author of The Restless Atmosphere.

CLIMATE AND WEATHER (in part)

F.K.L. Fang Kuei Li (d. 1987). *Professor of Chinese Linguistics and Anthropology, University of Washington, Seattle, 1959–69. Professor of Asian Linguistics, University of Hawaii, Honolulu, 1969–73. Authority on the languages of South China. Author of The Tai Dialect of Lungchow.*

LANGUAGES OF THE WORLD (in part)

F.L. Fred Lukoff. *Associate Professor of Korean Language and Linguistics, University of Washington, Seattle. Author of Spoken Korean and others.*

LANGUAGES OF THE WORLD (in part)

F.La. François Lasserre. *Emeritus Professor of Classical Greek, University of Lausanne, Switzerland. Translator and editor of Strabon, Géographie, books 3–6, 10–12.*

STRABO (Micropædia)

F.L.J. Frederick L. Jones (d. 1973). *Professor of English, University of Pennsylvania, Philadelphia. Coauthor of An Examination of the Shelley Legend; editor of The Letters of Percy Bysshe Shelley.*

SHELLEY, PERCY BYSSHE (in part) (Micropædia)

Fl.M. Florence Moog. *Rebstock Professor Emeritus of Biology, Washington University, St. Louis, Missouri. Author of Structure and Development of Vertebrates.*

CHORDATES (in part)

F.M. Fosco Maraini. *Lecturer in Japanese, University of Florence. Author of Where Four Worlds Meet and others.*

ASIA (in part)

POLO, MARCO (Micropædia)

F.M.B. Fawn McKay Brodie (d. 1981). *Professor of History, University of California, Los Angeles, 1971–77. Author of The Devil Drives: A Life of Sir Richard Burton.*

BURTON, SIR RICHARD (Micropædia)

F.McD. Forrest McDonald. *Professor of History, University of Alabama, University. Author of E Pluribus Unum.*

UNITED STATES OF AMERICA (in part)

F.M.Kg. Felix M. Keesing (d. 1961). *Professor of Anthropology, Stanford University, California, 1942–61. Author of Cultural Anthropology and others.*

PREHISTORIC PEOPLES AND CULTURES (in part)

F.M.L. Sir Frederick M. Lea (d. 1984). *Director of Building Research, Department of Scientific and Industrial Research, Watford, England, 1946–65. Author of The Chemistry of Cement and Concrete.*

ADHESIVES (in part)

F.Mo. Francis Moran (d. 1975). *Golf writer, The Scotsman, Edinburgh. President, Association of Golf Writers. Author of Golfers' Gallery.*

SPORTS, MAJOR TEAM AND INDIVIDUAL
(in part)

F.M.S. Frank M. Shipman (deceased). *Member, Board of Directors, Brown-Forman Distillers Corporation, Louisville, Kentucky, 1951-70; Technical Director, 1940-65; Vice President, 1945-65.*

BEVERAGE PRODUCTION (in part)

F.M.Sw. Frederick M. Swain. *Professor of Geology, University of Delaware, Newark. Emeritus Professor of Geology, University of Minnesota, Minneapolis. Author of Non-Marine Organic Geochemistry.*

GEOCHRONOLOGY (in part)

F.M.V. Florence M. Voegelin. *Editor, Anthropological Linguistics, Indiana University, Bloomington; former Director, Archives of Languages of the World. Coauthor of Classification and Index of the World's Languages and others.*

LANGUAGES OF THE WORLD (in part)

F.N. Fritz Neumark. *Emeritus Professor of Political Economy, Johann Wolfgang Goethe University of Frankfurt, Frankfurt am Main, West Germany. Author of Grundsätze gerechter und ökonomisch rationaler Steuerpolitik.*

TAXATION (in part)

F.N.D. Frank N. Dauster. *Professor of Spanish, Rutgers University, New Brunswick, New Jersey. Author of Historia del teatro hispanoamericano.*

LATIN-AMERICAN LITERATURE (in part)

F.N.H.R. Frank Neville H. Robinson. *Senior Research Officer, Clarendon Laboratory, University of Oxford; Fellow and Tutor in Physics, St. Catherine's College, Oxford. Author of Noise and Fluctuations in Electronic Devices and Circuits and others.*

ELECTRICITY AND MAGNETISM (in part)

F.N.M. Fyodor Nikolayevich Milkov. *Professor and Head, Department of Physical Geography, Voronezh Lenin Komsomol State University, U.S.S.R. UNION OF SOVIET SOCIALIST REPUBLICS (in part)*

F.N.S. Fyodor Nikolayevich Sukhopara. *Head of Section, Scientific Council on the Location of the U.S.S.R. Productive Forces, Academy of Sciences of the U.S.S.R., Moscow. Coauthor of Development of Large Economic Regions of the U.S.S.R.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

F.N.W. Fred N. White. *Professor of Physiology; Director, Physiological Research Laboratory, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla. Coauthor of Animal Function: Principles and Adaptations.*

RESPIRATION AND RESPIRATORY
SYSTEMS (in part)

F.Om. Farouk Omar. *Professor of History, College of Arts, University of Baghdad, Iraq. Author of History of the*

Early 'Abbasids.

BARMAKIDS (Micropædia)

F.O.W. Frank Osborne Wood. *Technical Director, Salt Institute, Alexandria, Virginia.*

FOOD PROCESSING (in part)

F.O.Wa. Frederick O. Waage. *Emeritus Professor of the History of Art and Archaeology, Cornell University, Ithaca, New York; Chairman, Department of Fine Arts, 1942-60. Author of Prehistoric Art and others.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

F.P.B. Frederick P. Bargebuhr (d. 1978). *Professor of Religion, University of Iowa, Iowa City, 1962-70. Author of The Alhambra: A Cycle of Studies on the Eleventh Century in Moorish Spain.*

IBN GABIROL (Micropædia)

F.P.K. Frank P. Kolb. *Professor of Ancient History, Christian Albrecht University of Kiel, West Germany. Author of Literarische Beziehungen zwischen Cassius Dio, Herodian und der Historia Augusta and others.*

CARACALLA (Micropædia)

F.P.L. Fritz P. Loewe (d. 1974). *Senior Lecturer in Charge, Department of Meteorology, University of Melbourne, Australia, 1938-61. A world authority on the meteorology of the Southern Hemisphere. Author of Études de glaciologie en Terre Adélie.*

CLIMATE AND WEATHER (in part)

F.Po. Frederik Pohl. *Author of Tiberius (under the pseudonym Ernst Mason) and of many works of science fiction.*

TIBERIUS (in part) (Micropædia)

F.P.S. Francis P. Shepard (d. 1985). *Professor of Marine Geology, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1948-67. World authority on marine geology and submarine canyons. Coauthor of Submarine Canyons and Other Sea Valleys.*

OCEANS (in part)

F.R. Fazlur Rahman (d. 1988). *Professor of Islamic Philosophy, University of Chicago, 1969-88. Author of Islam; Islam and Modernity; and others.*

ISLAM, MUHAMMAD AND THE RELIGION
OF (in part)

F.R.A. Francis R. Aumann. *Emeritus Professor of Political Science, Ohio State University, Columbus. Coauthor of The Government and Administration of Ohio.*

UNITED STATES OF AMERICA (in part)

F.R.Al. Frank Raymond Allchin. *Reader in Indian Studies, University of Cambridge. Author of "The Culture Sequence of Bactria" in Antiquity; coauthor of The Rise of Civilization in India and Pakistan.*

AFGHANISTAN (in part)

INDIA (in part)

Fr.H. Sir Frank Hartley. *Chairman, British Pharmacopoeia Commission, 1970-80. Vice-Chancellor, University of London, 1976-78; Dean, School of Pharmacy, 1962-76.*

MEDICINE (in part)

Fr.J.M. Francis J. Terence Maloney. *Product development executive. Author of Glass in the Modern World.*

INDUSTRIAL GLASS AND CERAMICS
(in part)

Fr.M. Frederick Mosteller. *Professor of Mathematical Statistics, Harvard University. Coauthor of Probability with Statistical Applications; Data Analysis and Regression.*

STATISTICS (in part)

F.R.M. Frank R. Moraes (d. 1974). *Editor in Chief, The Indian Express, New Delhi, 1957-72. Author of India Today; Jawaharlal Nehru: A Biography.*

INDIA (in part)

NEHRU, JAWAHARLAL (in part)
(Micropædia)

F.S. Franklin Sherman. *Professor of Christian Ethics; Dean of the Faculty, Lutheran School of Theology at Chicago. Coauthor of The Place of Bonhoeffer.*

BONHOEFFER, DIETRICH (Micropædia)

F.S.A. Frederick S. Arkhurst. *Managing Director, Ideas Ltd., Accra, Ghana. Editor of Africa in the Seventies and Eighties: Issues in Development.*

AFRICA (in part)

F.Sc. Friedrich Schreyvogel (d. 1976). *Novelist and free-lance writer. Vice Director, Vienna Burgtheater, 1954-59. Author of Ein Jahrhundert zu früh: das Schicksal Josephs II and others.*

JOSEPH II (GERMANY/HOLY ROMAN
EMPIRE) (Micropædia)

F.So. Friedrich Solmsen. *Moses Slaughter Professor Emeritus of Classical Studies, University of Wisconsin, Madison. Author of Hesiod and Aeschylus.*

HESIOD (Micropædia)

F.S.P. Francis S. Pierce. *Editor, Congressional Budget Office, Washington, D.C. Associate Editor, Economics, Encyclopædia Britannica, Chicago, 1967-73.*

INTERNATIONAL TRADE (in part)

VEBLEN, THORSTEIN (Micropædia)

F.T. Frederick Tepper. *General Manager, Instrument Division, Mine Safety Appliances Company, Pittsburgh. Coauthor of Alkali Metal Handling and System Operating Techniques.*

CHEMICAL ELEMENTS (in part)

F.Th. Friedrich Thöne (deceased). *Art historian. Author of Lucas Cranach der Ältere and others; coauthor of Thieme-Becker: Künstler-Lexikon.*

CRANACH, LUCAS, THE ELDER
(Micropædia)

F.T.M. Fred T. Mackenzie. *Professor of Oceanography, University of Hawaii, Honolulu. Adjunct Professor of Geology, Northwestern University, Evanston, Illinois. Coauthor of The Evolution of*

Sedimentary Rocks.

HYDROSPHERE, THE (*in part*)
OCEANS (*in part*)

F.Tr. François Treves. *Professor of Mathematics, Rutgers University, New Brunswick, New Jersey. Author of Topological Vector Spaces, Distributions and Kernels; Linear Partial Differential Equations with Constant Coefficients. ANALYSIS (IN MATHEMATICS) (in part)*

Fu.M. Fujimura Michio. *Professor of History, Sophia University, Tokyo. Author of Yamagata Arimoto and others. YAMAGATA ARITOMO, KOSHAKU (Micropædia)*

F.V.O'C. Francis Valentine O'Connor. *Director, Raphael Research Enterprises (fine arts consultants), New York City. Editor, Federal Art Patronage Notes. Author of Federal Support for the Visual Arts: The New Deal and Now; Coeditor of Jackson Pollock: A Catalogue Raisonné of Paintings, Drawings, and Other Works.*

DE KOONING, WILLEM (Micropædia)

F.V.Sn. Fernand Van Steenberghe. *Emeritus Professor of Medieval Philosophy, Catholic University of Louvain, Belgium.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (*in part*)

F.W.C. Francis William Carter. *Joint Hayter Lecturer in the Geography of Eastern Europe, University College and School of Slavonic and East European Studies, University of London. Editor of An Historical Geography of the Balkans. BULGARIA (in part) CZECHOSLOVAKIA (in part) PRAGUE (in part)*

F.W.G. Frederick William Gibbs (d. 1966). *Deputy Secretary and Editor, Royal Institute of Chemistry, London. DAVY, SIR HUMPHRY, BARONET (Micropædia)*

F.Wh. Frederick Whitehead (d. 1971). *Reader in Old French Language and Literature, Victoria University of Manchester. Editor of La Chanson de Roland; La Chastelaine de Vergi. LITERATURE, THE ART OF (in part)*

F.Wi. Frank Willett. *Director and Titular Professor, Hunterian Museum and Art Gallery, University of Glasgow. Author of African Art; Ife in the History of West African Sculpture. AFRICAN ARTS (in part)*

F.W.K. Francis W. Karasek. *Professor of Chemistry, University of Waterloo, Ontario.*

MEASUREMENT AND OBSERVATION, PRINCIPLES, METHODS, AND INSTRUMENTS OF (*in part*)

F.W.Kn. Franklin W. Knight. *Professor of History, Johns Hopkins University, Baltimore, Maryland. Author of Slave Society in Cuba during the Nineteenth Century and others.*

WEST INDIES, THE (*in part*)

F.W.McB. F. Webster McBryde. *Director, McBryde Center for Human*

Ecology, Potomac, Maryland. Author of Cultural and Historical Geography of Southwest Guatemala and others.

CENTRAL AMERICA (*in part*)

F.W.W. Frank W. Walbank. *Rathbone Professor Emeritus of Ancient History and Classical Archaeology, University of Liverpool. Author of A Historical Commentary on Polybius and others.*

ALEXANDER THE GREAT (*in part*)

GRECO-ROMAN CIVILIZATION, CLASSICAL (*in part*)

PLUTARCH (*in part*) (Micropædia)

POLYBIUS (Micropædia)

YUGOSLAVIA (*in part*)

F.W.We. Frits W. Went. *Emeritus Professor of Botany, Desert Research Institute, University of Nevada System, Reno. Author of The Experimental Control of Plant Growth. ECOSYSTEMS (in part)*

F.W.W.-S. Francis William Wentworth-Sheilds (d. 1969). *Artist. Principal Lecturer, Department of Printing and Graphic Design, Twickenham College of Technology, England, 1966-69.*

PAINTING, THE HISTORY OF WESTERN (*in part*)

F.X.H. The Rev. Francis X. Hezel, S.J. *Director, Micronesian Seminar, Truk, Federated States of Micronesia. Author of The First Taint of Civilization: A History of the Caroline and Marshall Islands in Pre-Colonial Days, 1521-1885.*

PACIFIC ISLANDS (*in part*)

F.X.M. The Rev. Francis Xavier Murphy, C.S.S.R. *Emeritus Professor of Patristic Moral Theology, Academia Alfonsiana, Rome. Staff editor for Patrology, New Catholic Encyclopedia. ALEXANDER VI (PAPACY) (Micropædia) PAUL III (PAPACY) (Micropædia)*

G.A. Giovanni Aquilecchia. *Professor of Italian, University College, University of London. Author of Giordano Bruno; editor of Pietro Aretino's Sei giornate.*

ARIOSTO, LUDOVICO (Micropædia)

BRUNO, GIORDANO (Micropædia)

ITALIAN LITERATURE (*in part*)

TASSO, TORQUATO (Micropædia)

G.A.B. Georg A. Borgstrom. *Emeritus Professor of Food Science and of Geography, Michigan State University, East Lansing. Editor of Fish as Food.*

FISHING, COMMERCIAL (*in part*)

G.A.C. G. Arthur Cooper. *Emeritus Paleobiologist, Smithsonian Institution, Washington, D.C. Author of Chazy and Related Brachiopods.*

LAMP SHELLS

G.A.C.H. Geoffrey A.C. Herklots (d. 1986). *Colombo Plan Botanical Adviser to Government of Nepal, 1961-63. Principal and Director of Research, Imperial College of Tropical Agriculture, Trinidad, 1953-60. Author of Vegetables in South-East Asia and others.*

GARDENING AND HORTICULTURE (*in part*)

G.A.F.K. George Angus Fulton Knight. *President, Pacific Theological College, Suva, Fiji, 1965-72. Author of A Christian Theology of the Old Testament; Deutero-Isaiah, a Theological Commentary; and others.*

MACCABEES (Micropædia)

G.A.G.M. G.A.G. Mitchell. *Professor of Anatomy; Director, Anatomical Laboratories, Victoria University of Manchester, 1946-74. Author of The Anatomy of the Autonomic Nervous System and others.*

EXCRETION AND EXCRETORY SYSTEMS (*in part*)

G.A.H. Geoffrey Alan Hosking. *Professor of Russian History, School of Slavonic and East European Studies, University of London. Author of Beyond Socialist Realism: Soviet Fiction Since Ivan Denisovich and others.*

RUSSIAN LITERATURE (*in part*)

G.Ak. George Akita. *Professor of History, University of Hawaii, Honolulu. Author of Foundations of Constitutional Government.*

ITÔ HIROBUMI, KOSHAKU (Micropædia)

G.A.K. Gregory A. Kimble. *Professor of Psychology, Duke University, Durham, North Carolina. Author of Foundations of Conditioning and Learning.*

LEARNING AND COGNITION, HUMAN (*in part*)

G.A.L. George Arthur Lindbeck. *Pitkin Professor of Historical Theology, Yale University. Author of The Nature of Doctrine: Religion and Theology in a Post-Liberal Age and others.*

rites and CEREMONIES, SACRED (*in part*)

G.An. George Anastaplo. *Professor of Law, Loyola University, Chicago. Lecturer in the Liberal Arts, University of Chicago. Emeritus Professor of Political Science and of Philosophy, Rosary College, River Forest, Illinois. Author of The Constitutionalist and others.*

CENSORSHIP

GREECE (*in part*)

G.A.O. George A. Olah. *Professor of Chemistry, University of Southern California, Los Angeles. Coeditor of Carbonium Ions.*

CARBONIUM ION (*in part*)
(Micropædia)

Ga.P. Gary William Poole. *Associate Editor, Encyclopædia Britannica, Chicago, 1970-72.*

CHAMBERLAIN, JOSEPH (Micropædia)

JOSEPHUS, FLAVIUS (Micropædia)

G.A.P. George A. Pettitt (d. 1976). *Assistant to the President, University of California, Berkeley, 1936-66; Lecturer in Anthropology, 1940-66. Author of Prisoners of Culture.*

GESNER, CONRAD (Micropædia)

G.A.Po. Gary A. Polis. *Associate Professor of Biology, Vanderbilt University, Nashville, Tennessee. Author of Biology of Scorpions and others. ARACHNIDS (in part)*

Ga.S. Gabriel Smith. *Barrister-at-Law. Lecturer in Industry and Finance, City of London College. Departmental Editor, Journal of Business Law.*
TAXATION (in part)

G.A.S. George Albert Shepperson. *William Robertson Professor of Commonwealth and American History, University of Edinburgh. Author of David Livingstone and the Rovuma.*
LIVINGSTONE, DAVID (Micropædia)

G.A.Sa. George A. Sacher (d. 1981). *Senior Biologist, Division of Biological and Medical Research, Argonne National Laboratory, 1959–80. President, Gerontological Society, 1978–79. Coeditor of Aging and Levels of Biological Organization.*

GROWTH AND DEVELOPMENT,
BIOLOGICAL (in part)

G.A.Sm. George Alan Smith. *Arts consultant. Hiker and mountain climber. Author of Introduction to Mountaineering; The Armchair Mountaineer.*

MOUNTAINEERING (in part)
(Micropædia)

G.A.So. G. Alan Solem. *Curator of Invertebrates, Field Museum of Natural History, Chicago. Author of Land and Freshwater Mollusca of the New Hebrides.*

MOLLUSKS (in part)

G.B. Giovanni Bognetti. *Professor of Public Law, University of Milan. Author of Costituzione economica e Corte costituzionale and others.*

CONSTITUTIONAL LAW (in part)

G.Ba. George Barany. *Professor of History, University of Denver, Colorado. Author of Stephen Szechenyi and the Awakening of Hungarian Nationalism.*

HUNGARY (in part)

G.B.Cl. George B. Clark. *Professor of Mining Engineering; Research Associate, Earth Mechanics Institute, Colorado School of Mines, Golden. Coauthor of Elements of Mining.*

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

G.B.D. George B. Dantzig. *Professor of Operations Research and Computer Science, Stanford University, California. Author of Linear Programming and Extensions.*

OPTIMIZATION, THE MATHEMATICAL
THEORY OF (in part)

G.Be. George Benneh. *Associate Professor of Geography, University of Ghana, Legon.*

WESTERN AFRICA (in part)

G.Bh. Geoffrey Barraclough (d. 1984). *Chichele Professor of Modern History, University of Oxford, 1970–73. President, The Historical Association, 1964–67.*

HOLY ROMAN EMPIRE, THE HISTORY OF
THE (in part)

G.Bi. Garrett Birkhoff. *George Putnam Professor Emeritus of Pure and Applied*

Mathematics, Harvard University. Coauthor of Algebra.

ALGEBRA (in part)

G.B.K. George Briscoe Kerferd. *Hulme Professor Emeritus of Greek, Victoria University of Manchester.*

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN (in part)

G.Bl. Georges Blond. *Novelist and historian. Author of Pétain, 1856–1951.*
PÉTAİN, PHILIPPE (Micropædia)

G.B.L. Gerhart B. Ladner. *Emeritus Professor of History, University of California, Los Angeles. Author of Die Papstbildnisse des Altertums und des Mittelalters.*

BONIFACE VIII (PAPACY)
(Micropædia)

INNOCENT III (Micropædia)

G.Bor. Günther Bornkamm. *Emeritus Professor of New Testament Studies, Rupert Charles University of Heidelberg. Author of Jesus of Nazareth.*

JESUS (in part)

G.C. Guido Calogero. *Former Professor of Theoretical Philosophy, University of Rome. Author of Studi sull'eleatismo.*

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN (in part)

G.Car. Giovanni Carsaniga. *Professor of Italian, La Trobe University, Bundoora, Australia.*

ITALIAN LITERATURE (in part)

G.C.B. Gregorio C. Borlaza (d. 1987). *Editorial Consultant, Philippine Christian University, Manila. Former President, Philippine Normal College.*

PHILIPPINES (in part)

G.C.C. George C. Cromer. *Manager, Administrative Services, General Motors Current Product Engineering, Warren, Michigan.*

TRANSPORTATION (in part)

G.C.E. George C. Engerrand (d. 1961). *Graduate Professor of Anthropology, University of Texas at Austin. Chief Geologist, Mexican Geological Survey, 1907–15.*

NORTH AMERICA (in part)

G.C.G. George C. Gorman. *Professor of Biology, University of California, Los Angeles, 1980–82. Researcher on the evolution, behaviour, and systematics of lizards.*

REPTILES (in part)

G.C.H. Gerald C. Hickey. *Research Fellow, East-West Center, Honolulu. Research Anthropologist, the RAND Corporation, Saigon, 1964–73. Author of Village in Vietnam and others.*

SOUTHEAST ASIA, MAINLAND
(in part)

G.C.Ha. Gladys Cox Hansen. *City Archivist, San Francisco. Author of San Francisco Almanac; editor of San Francisco: The Bay and Its Cities.*

SAN FRANCISCO (in part)

G.C.H.B. Göran C.H. Bauer, M.D. *Professor and Chairman, Department of Orthopedic Surgery, Medical School,*

University of Lund, Sweden.

SUPPORTIVE AND CONNECTIVE
TISSUES (in part)

G.C.I. George C. Izenour. *Emeritus Professor of Theater Design and Technology, Yale University.*

THEATRICAL PRODUCTION (in part)

G.C.K. George C. Kent, Jr. *Alumni Professor Emeritus of Zoology, Louisiana State University, Baton Rouge. Author of Comparative Anatomy of the Vertebrates.*

REPRODUCTION AND REPRODUCTIVE
SYSTEMS (in part)

G.C.L.B. G.C.L. Bertram. *Former Senior Tutor, St. John's College, University of Cambridge. Author of In Search of Mermaids: The Manatees of Guiana and others.*

MAMMALS (in part)

G.Cr. Gerhard Croll. *Professor of Musicology, University of Salzburg, Austria. General editor of Christoph Willibald Gluck, Complete Edition of His Works.*

GLUCK, CHRISTOPH (Micropædia)

G.C.R. George Clarence Robinson (d. 1976). *Professor of Political Science, University of Northern Iowa, Cedar Falls. Editor of Dictionary of Presidential Disapprovals.*

POLK, JAMES K. (Micropædia)

G.C.T. Gordon Conrad Thomasson. *Instructor in Secondary Education, Brigham Young University, Provo, Utah. Editor of War, Conscription, Conscience and Mormonism.*

RELIGIOUS EDUCATION (in part)

G.d'A. Guido d'Agostino. *Associate in Institutional Parliamentary History, University of Naples.*

ITALY (in part)

G.D.B. Georgy Dmitriyevich Bessarabov. *Head, Department of Agrarian Resources, Government Research Institute of Agrarian Resources, Moscow.*

ASIA (in part)

G.D.C. Gerson D. Cohen. *Jacob H. Schiff Professor of History, The Jewish Theological Seminary of America, New York City; Chancellor, 1972–85. Editor and translator of Abraham ibn Daud's Sefer ha-Kabbala.*

JUDAISM (in part)

G.De. George G. Dekker. *Professor of English, Stanford University, California. Author of James Fenimore Cooper: The Novelist and others.*

COOPER, JAMES FENIMORE (Micropædia)

G. de B. Sir Gavin de Beer (d. 1972). *Professor of Embryology, University College, University of London, 1945–50. Director, British Museum (Natural History), London, 1950–60. Author of Charles Darwin; Atlas of Evolution; and others.*

DARWIN (in part)

OWEN, SIR RICHARD (Micropædia)

G. de R.-C. G. de Rohan-Csermak (deceased). *Professor of Sociology, King's*

College, University of Western Ontario, London. Founder and Editor, *Ethnologia Europaea*.

EUROPE (in part)

G. de S. Giorgio D. de Santillana (d. 1974). Professor of the History and Philosophy of Science, Massachusetts Institute of Technology, Cambridge. Author of *The Crime of Galileo and others*.

GALILEO (in part)

G.Det. Georges Dethan. Archivist, French Foreign Ministry Archives, Paris. Chief Editor, *Revue d'Histoire Diplomatique*. Author of *Mazarin et ses amis and others*.

MAZARIN, JULES, CARDINAL (Micropædia)

G.D.G. George D. Garland. Professor of Physics, University of Toronto. Author of *The Earth's Shape and Gravity and others*.

EARTH, THE (in part)

G.Di. Gérard Diffloth. Associate Professor of Linguistics, University of Chicago.

LANGUAGES OF THE WORLD (in part)

G.D.L. Geoffrey D. Lewis. Director of Museum Studies, University of Leicester, England. Coeditor of *Manual of Curatorship: A Guide to Museum Practice*.

MUSEUMS

G.D.M. George Daniel Mostow. Henry Ford II Professor of Mathematics, Yale University. Editor, *American Journal of Mathematics*. Author of *Strong Rigidity of Locally Symmetric Spaces*.

ALGEBRA (in part)

GEOMETRY (in part)

G.D.P. George Duncan Painter. Assistant Keeper in charge of incunabula, Department of Printed Books, British Library, London, 1954–74. Author of *Proust: The Early Years; Proust: The Later Years; and others*.

PROUST, MARCEL (Micropædia)

G.D.W. G. Donald Whedon, M.D. Medical research consultant. Director, National Institute of Arthritis, Metabolism, and Digestive Diseases, U.S. Department of Health and Human Services, Bethesda, Maryland, 1962–81.

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

G.Dy. George Dykhuizen. Emeritus Professor of Philosophy, University of Vermont, Burlington. Author of *The Life and Mind of John Dewey*.

DEWEY, JOHN (Micropædia)

G.E. Gordon Epperson. Professor of Music, University of Arizona, Tucson. Author of *The Musical Symbol: A Study of the Philosophic Theory of Music*.

MUSIC, THE ART OF (in part)

G.E.A. Godfrey Edward Arnold, M.D. Professor and Director, Division of Otolaryngology, University of Mississippi Medical Center, Jackson, 1963–79. Coauthor of *Voice, Speech, Language;*

Clinical Communicology.

SPEECH (in part)

G.E.Al. Garland Edward Allen. Professor of Biology, Washington University, St. Louis, Missouri. Author of *Thomas Hunt Morgan: The Man and His Science*.

MORGAN, THOMAS HUNT (in part) (Micropædia)

Ge.B. Gerald Bonner. Reader in Church History, University of Durham, England.

ARTS, PRACTICE AND PROFESSION OF THE (in part)

Ge.C. George S. Cansdale. Superintendent, Zoological Society of London, Regent's Park, 1948–53. Author of *All the Animals of the Bible Lands and others*.

PETS (in part)

G.Ec. Garrett Eckbo. Landscape architect and consultant in urban and environmental planning and design. Emeritus Professor of Landscape Architecture, University of California, Berkeley. Author of *Landscape for Living and others*.

GARDEN AND LANDSCAPE DESIGN (in part)

Ge.Ca. George Cardona. Professor of Linguistics, University of Pennsylvania, Philadelphia. Author of *Studies in Indian Grammarians and others; coeditor of Indo-European and Indo-Europeans*.

LANGUAGES OF THE WORLD (in part)

G.E.D. Glyn Edmund Daniel (d. 1986). Disney Professor of Archaeology, University of Cambridge, 1974–81; Fellow of St. John's College, Cambridge. Author of *The First Civilizations; A Hundred and Fifty Years of Archaeology; and others*.

HISTORY, THE STUDY OF (in part) SCHLIEMANN, HEINRICH (Micropædia)

Ge.E. Brother George Every, S.S.M. (deceased). Lecturer, Kelham Theological College, Newark, England. Lay brother of the Society of the Sacred Mission. Author of *The Byzantine Patriarchate, 451–1204 and others*.

PHOTIUS (Micropædia)

G.E.F. George Edwin Fussell. Former President, British Agricultural History Society. Author of *Farming Technique from Prehistoric to Modern Times*.

AGRICULTURE, THE HISTORY OF (in part)

G.E.F.C. Guy Edward Farquhar Chilver (d. 1982). Professor of Classical Studies, University of Kent at Canterbury, England, 1964–76. Author of *"Vespasian" in Oxford Classical Dictionary*.

DOMITIAN (Micropædia)

ROMANIA (in part)

VESPASIAN (Micropædia)

G.E.H. The Rev. G.E. Hughes. Professor of Philosophy, Victoria University of Wellington, New Zealand, 1951–84. Coauthor of *The Elements of Formal Logic*.

LOGIC, THE HISTORY AND KINDS OF (in part)

G.E.H.A. Gerald E.H. Abraham (d. 1988). President, Royal Musical Association, 1970–74. Assistant Controller of Music, British Broadcasting Corporation, London, 1962–67. James and Constance Alsop Professor of Music, University of Liverpool, 1947–62. Author of *A Hundred Years of Music; Slavonic and Romantic Music; and others*.

SCHUMANN, ROBERT (Micropædia)

G.E.Ma. Gene E. Martin. Professor of Geography, California State University, Chico. Author of *La división de la tierra en Chile central*.

SOUTH AMERICA (in part)

G.E.Me. George Emery Mendenhall. Professor of Ancient and Biblical Studies, University of Michigan, Ann Arbor. Author of *Law and Covenant in Israel and the Ancient Near East and others*.

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

G.E.Mi. Gordon E. Misner. Professor of Criminal Justice, University of Illinois, Chicago. Coauthor of *The Police and Society: An Environment for Collaboration and Confrontation*.

POLICE (in part)

G.E.M.M. Gladstone E.M. Mills. Professor of Public Administration; Dean, Faculty of Social Sciences, University of the West Indies, Kingston, Jamaica. Coeditor of *The Role of Small Nations in a Big World*.

WEST INDIES, THE (in part)

G.E.P. G. Etzel Percy (d. 1980). Professor of Geography, California State University, Los Angeles, 1969–73. Geographer, U.S. Department of State, 1950–69. Author of *World Sovereignty; coauthor of An Introduction to Geography*.

UNITED STATES OF AMERICA (in part)

Ge.S. George Savage (d. 1982). Free-lance writer. Author of *Concise History of Interior Decoration; French Decorative Art; Porcelain Through the Ages; and many other works on the decorative arts*.

DECORATIVE ARTS AND FURNISHINGS (in part)

G.Es. Gerald Eskenazi. Sportswriter, The New York Times. Free-lance writer. Author of *Hockey; A Year on Ice*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

G.E.S. George E. Shambaugh, Jr., M.D. Emeritus Professor of Otolaryngology, Northwestern University, Chicago. Chief Editor, *Archives of Otolaryngology*, 1960–70. Author of *Surgery of the Ear*.

SENSORY RECEPTION (in part)

G.E.T. Gordon Ernest Taylor. Senior Scientific Officer, Royal Greenwich Observatory, Herstmonceux, England. President of the British Astronomical Association, 1968–70.

SOLAR SYSTEM, THE (in part)

G.Ev. Graham Evans. Reader in Sedimentology, Imperial College of

Science and Technology, University of London.

ASIA (in part)

G.E.W. Glen E. Woolfenden. *Professor of Zoology, University of South Florida, Tampa.*

BIRDS (in part)

G.E.Wh. Geoffrey Edleston Wheeler. *Lieutenant Colonel, Indian Army (retired). Director, Central Asian Research Centre, London, 1953–68. Author of The Modern History of Soviet Central Asia and others.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

G.F.A. Geoffrey Freeman Allen. *Editor, Jane's World Railways. Author of Modern Railways and others.*

TRANSPORTATION (in part)

G.F.B. George F. Bertsch. *Hannah Professor of Physics, Michigan State University, East Lansing. Author of Practitioner's Shell Model.*

ATOMS (in part)

G.F.E. George F. Ekstrom (deceased). *Professor of Agricultural Education, University of Missouri, Columbia.*

AGRICULTURAL SCIENCES (in part)

G.F.H. Gregory F. Herzog. *Professor of Chemistry, Rutgers University, New Brunswick, New Jersey.*

ATOMS (in part)

G.Fi. Gilbert Fielder. *Head, Lunar and Planetary Unit; Reader in Environmental Sciences, University of Lancaster, England. Author of Lunar Geology, editor of Geology and Physics of the Moon.*

SOLAR SYSTEM, THE (in part)

G.F.K. George Frederick Kneller. *Emeritus Professor of Education, University of California, Los Angeles. Author of Movements of Thought in Modern Education and others.*

EDUCATION, SYSTEMS OF (in part)

G.Fo. Gabriel Fournier. *Professor of Medieval History, University of Clermont-Ferrand, France. Author of Les Mérovingiens and others.*

FRANCE (in part)

G.F.P. Gabor F. Peterdi. *Painter and printmaker. Professor of Printmaking, Yale University. Author of Printmaking; Great Prints of the World.*

PRINTMAKING

G.F.S. Gilles François Sautter. *Professor of Geography, University of Paris I (Panthéon-Sorbonne). Author of De l'Atlantique au fleuve Congo.*

AFRICA (in part)

G.F.W. Gilbert F. White. *Gustavson Distinguished Professor Emeritus of Geography, University of Colorado, Boulder. Consultant, Lower Mekong Coordinating Committee, 1961–62. Coauthor of The Lower Mekong.*

ASIA (in part)

G.G. George Gömöri. *Lecturer in Slavonic Studies, University of*

Cambridge. Author of Polish and Hungarian Poetry, 1945 to 1956.

HUNGARIAN LITERATURE (in part)

G.Ge. Gino Germani (d. 1979). *Monroe Gutman Professor of Latin American Studies, Harvard University. Author of Política y sociedad en una época de transición.*

MODERNIZATION AND URBANIZATION (in part)

SOUTH AMERICA (in part)

G.Gr. Guido Gregoriotti. *Former Director, Poldi Pezzoli Museum, Milan. Author of The Jewel Through the Centuries.*

DRESS AND ADORNMENT (in part)

Gg.S. Georg Schnath. *Professor of History, Georg August University of Göttingen, West Germany, 1949–67.*

GERMANY (in part)

G.G.V.D. Glyndon G. Van Deusen. *Research Professor Emeritus of History, University of Rochester, New York. Author of The Life of Henry Clay.*

CLAY, HENRY (Micropædia)

G.G.Wd. Guido Gustav Weigend. *Professor of Geography, Arizona State University, Tempe.*

MEDITERRANEAN SEA (in part)

G.Ha. Georg Hazai. *Corresponding Member; Deputy Director, Oriental Studies Research Group, Hungarian Academy of Sciences, Budapest; General Manager, Akadémiai Kiadó és Nyomda (publishing house of the academy). Author of Sovietico-Turcica.*

LANGUAGES OF THE WORLD (in part)

G.H.B. Geoffrey H. Beale. *Royal Society Research Professor of Genetics, University of Edinburgh, Scotland, 1963–78. Author of The Genetics of Paramedus Aurelia.*

WEISMANN, AUGUST (Micropædia)

G.H.D. George Harry Dury. *Emeritus Professor of Geography and Geology, University of Wisconsin, Madison. World authority on fluvial processes in geomorphology. Author of The Face of the Earth.*

RIVERS (in part)

G.He. George Hendricks (d. 1979). *Professor of Social Sciences, Georgia Institute of Technology, Atlanta, 1962–69. Author of Union Army Occupation of the Southern Seaboard, 1861–1865.*

UNITED STATES OF AMERICA (in part)

G.Hi. Gilbert Highet (d. 1978). *Author Professor of Latin Language and Literature, Columbia University, 1950–72. Author of Juvenal the Satirist; The Classical Tradition: Greek and Roman Influences on Western Literature.*

JUVENAL (Micropædia)

G.H.J. Gareth H. Jones. *Downing Professor of the Laws of England, University of Cambridge; Fellow of Trinity College, Cambridge.*

COKE, SIR EDWARD (Micropædia)

G.H.K. George Hall Kirby. *Free-lance writer, editor, and translator. Author of*

Looking at Germany and others.

GERMANY (in part)

G.H.S. Genjun H. Sasaki. *Professor of Buddhism, Otani University, Kyōto. Author of A Study of Buddhist Psychology.*

SHINRAN (Micropædia)

G.H.S.B. Geoffrey H.S. Bushnell (d. 1978). *Reader in New World Archaeology, University of Cambridge, 1966–70; Fellow of Corpus Christi College, Cambridge; Curator, University Museum of Archaeology and Ethnology, 1948–70. Author of Peru and others.*

PRE-COLUMBIAN CIVILIZATIONS (in part)

G.H.T.K. George H.T. Kimble. *Director, Survey of Tropical Africa, Twentieth Century Fund, New York City, 1953–60. Professor of Geography, Indiana University, Bloomington, 1957–66. Author of Tropical Africa.*

AFRICA (in part)

G.H. von W. Georg Henrik von Wright. *Research Professor, Academy of Finland, Helsinki. Former Chancellor, Swedish University of Åbo, Finland. Professor of Philosophy, University of Helsinki, 1946–61. Author of A Treatise on Induction and Probability and others.*

MATHEMATICS, THE HISTORY OF (in part)

G.I.B. George I. Blanksten. *Professor of Political Science, Northwestern University, Evanston, Illinois. Author of Perón's Argentina; Ecuador: Constitutions and Caudillos; and others.*

BRAZIL (in part)

URUGUAY (in part)

G.I.Bk. George I. Back (d. 1972). *Major General, U.S. Army.*

WAR, THE TECHNOLOGY OF (in part)

Gi.M. Giovanni Macchia. *Professor of French Language and Literature, University of Rome. Author of L'opera completa di Watteau and others.*

WATTEAU, ANTOINE (Micropædia)

Gi.Ma. Giuseppe Martini. *Former Professor of Medieval History; Director, Institute of Medieval and Modern History, University of Milan. Author of Cattolicesimo e storicismo and others.*

ITALY (in part)

Gi.T. Giuseppe Tucci (d. 1984). *Professor of Oriental Religion and Philosophy, University of Rome, 1933–65. Author of Il buddhismo; Minor Buddhist Texts; and others.*

BUDDHISM, THE BUDDHA AND (in part)

G.J. Gordon Jackson. *Reader in Economic History, University of Strathclyde, Glasgow. Author of The British Whaling Trade and others.*

FISHING, COMMERCIAL (in part)

G.J.A. George J. Annas. *Edward R. Utley Professor of Health Law; Chief, Health Law Section, School of Public Health, Boston University. Author of The Rights of Hospital Patients.*

MEDICINE (in part).

G.J.B. Gilbert James Butland. *Emeritus Professor of Geography, University of New England, Armidale, Australia.*

PARAGUAY (in part)
SPAIN (in part)

G.J.G. George J. Goodman. *Regents Professor Emeritus of Botany, University of Oklahoma, Norman. Author of Spring Flora of Central Oklahoma.*

ANGIOSPERMS (in part)

G.J.N. Gareth Jon Nelson. *Chairman and Curator, Department of Ichthyology, American Museum of Natural History, New York City. Author of articles on the anatomy and systematics of fishes.*

FISHES (in part)

G.J.P. Gray Johnson Poole. *Free-lance writer. Author of Architects and Man's Skyline; coauthor of Men Who Dig Up History and others.*

PETRIE, SIR FLINDERS
(Micropædia)

G.J.S. George J. Stigler. *Charles R. Walgreen Distinguished Service Professor Emeritus of American Institutions, University of Chicago. Nobel Prize for Economics, 1982. Author of The Theory of Price.*

ECONOMIC THEORY (in part)

G.J.Si. Gustavus J. Simmons. *Manager, Applied Mathematics Department, Sandia National Laboratories, Albuquerque, New Mexico. Researcher in command and control of nuclear weapons. Author of numerous articles on cryptology and authentication.*

CRYPTOLOGY

G.J.T. Gerald J. Toomer. *Professor of the History of Mathematics, Brown University, Providence, Rhode Island. Author of Diocles on Burning Mirrors.*

ARCHIMEDES

G.J.W. Gerald James Whitrow. *Emeritus Professor of the History and Applications of Mathematics, Imperial College of Science and Technology, University of London. Author of The Natural Philosophy of Time and others.*

HAMILTON, SIR WILLIAM ROWAN
(Micropædia)

LAPLACE, PIERRE-SIMON, MARQUIS DE
(Micropædia)

POINCARÉ, HENRI (Micropædia)

G.J.Wh. Gershon J. Wheeler. *Free-lance writer and microwave engineer. Author of Introduction to Microwaves; Radar Fundamentals.*

MEASUREMENT AND OBSERVATION,
PRINCIPLES, METHODS, AND
INSTRUMENTS OF (in part)

G.K. Gerhard Kubik. *Cultural Anthropologist, Institute of Ethnology, University of Vienna. Author of Música Tradicional e Aculturada dos !Kung de Angola and other works on African music.*

AFRICAN ARTS (in part)

G.Ka. George Kazantzis. *Professor of Occupational Medicine, London School of Hygiene and Tropical Medicine, University of London. Contributor to*

Handbook on the Toxicology of Metals.
OCCUPATIONAL DISEASES AND
DISORDERS

G.K.E. Geoffrey Kenyon Elliott. *Senior Lecturer in Forestry, University College of North Wales, University of Wales, Bangor.*

ECOSYSTEMS (in part)

G.K.G. G.K. Ghorl. *Former Professor of Geography, University of Mysore, India.*

INDIA (in part)

G.K.Ge. Gerald K. Geerlings. *Architect, etcher, and writer. Author of Wrought Iron in Architecture; Metal Crafts in Architecture.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

G.Kh. George Kish. *Emeritus Professor of Geography, University of Michigan, Ann Arbor.*

ITALY (in part)

G.K.L. George Knowlton Lewis. *Professor of Geography, Boston University. Coauthor of Boston: A Geographical Portrait.*

BOSTON (in part)

G.K.P. George Kerlin Park. *Professor of Anthropology, Memorial University of Newfoundland, St. John's. Author of The Idea of Social Structure; An Afterpiece to Peasantry.*

OCCULTISM (in part)

RELIGIOUS AND SPIRITUAL BELIEF,
SYSTEMS OF (in part)

G.K.S.R. Gotthold K.S. Rhode. *Professor of East European and Russian History; Director, Institute for East European Research, Johannes Gutenberg University of Mainz, West Germany. Author of Kleine Geschichte Polens.*

CASIMIR III (Micropædia)

CASIMIR IV (Micropædia)

JOHN III SOBIESKI (POLAND)
(Micropædia)

WŁADYSŁAW II JAGIEŁŁO (Micropædia)

G.L. George Lang. *International hotel, restaurant, and food consultant. Columnist, Travel & Leisure magazine. Author of The Cuisine of Hungary; consulting editor of Time-Life Foods of the World.*

GASTRONOMY

G.L.C. Gerhard L. Closs. A.A. *Michelson Distinguished Service Professor of Chemistry, University of Chicago. Author of numerous papers on transient intermediates in chemical reactions.*

CARBANION (in part)
(Micropædia)

CARBENE (Micropædia)

G.L.Ca. George Law Cawkwell. *Lecturer in Ancient History, University of Oxford; Fellow of University College, Oxford.*

ISOCRATES (Micropædia)

G.L.D. Gwenda Louise Davis. *Former Associate Professor of Botany, University of New England, Armidale, Australia. Author of Systematic Embryology*

of the Angiosperms.

ANGIOSPERMS (in part)

G.L.G. George L. Gooberman. *Lecturer in Electrical Engineering, National Institute for Higher Education, Limerick, Ireland. Author of Ultrasonics.*

SOUND (in part)

G.L.Go. Gillian Lindt Gollin. *Professor of Sociology of Religion, Columbia University. Author of Moravians in Two Worlds.*

ZINZENDORF, NIKOLAUS LUDWIG, GRAF
VON (Micropædia)

G.Li. Georges Livet. *Professor of Modern History, University of Strasbourg II, France.*

FRANCE (in part)

G.L.K. Sir Geoffrey Langdon Keynes, M.D. (d. 1982). *Honorary Librarian, Royal College of Surgeons of England. Consulting Surgeon, St. Bartholomew's Hospital, London. Author of The Life of William Harvey; A Bibliography of the Writings of Dr. William Harvey.*

HARVEY (in part)

G.L.Ke. George L. Kelling. *Professor of Criminal Justice, Northeastern University, Boston. Research Fellow, John F. Kennedy School of Government, Harvard University. Coauthor of Newark Foot Patrol Experiment.*

POLICE (in part)

G.L.M. George Leslie Miller. *Research Manager, Murex Ltd., Rainham, England, 1934-69.*

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

G.Lu. Georg Hans Luck. *Professor of Classics, Johns Hopkins University, Baltimore. Author of The Latin Love-Elegy and others.*

PROPERTIUS, SEXTUS (Micropædia)

G.L.V. Gilbert L. Voss. *Professor of Marine Science, University of Miami, Florida. Author of Cephalopods of the Philippine Islands.*

MOLLUSKS (in part)

G.M. George Makdisi. *Professor of Arabic and Islamic Studies; Director, Center of Medieval Studies, University of Pennsylvania, Philadelphia. Author of Ibn 'Aqil et la resurgence de l'Islam traditionaliste au XI^e siècle.*

AḤMAD IBN ḤANBAL (Micropædia)

G.Ma. Golo Mann. *Writer. Professor of History and Political Science, Technical University, Stuttgart, West Germany, 1960-64. Author of Friedrich von Gentz and others.*

GENTZ, FRIEDRICH (Micropædia)

G.M.A. Glenda M. Abramson. *Fellow, Oxford Centre for Hebrew Studies; Senior Research Fellow, St. Cross College, University of Oxford. Author of Modern Hebrew Drama.*

HEBREW LITERATURE (in part)

G.M.A.R. Gisela Marie Augusta Richter (d. 1972). *Curator, Greek and Roman Department, Metropolitan Museum of Art, New York City. Author*

of Engraved Gems of the Greeks, Etruscans, and Romans and others.
DRESS AND ADORNMENT (in part)

G.M.B. G. Malcolm Brown. Director, Institute of Geological Sciences, London. Coauthor of Layered Igneous Rocks.
MINERALS AND ROCKS (in part)

G.M.C. Gerald M. Capers. Emeritus Professor of History, Tulane University, New Orleans. Author of John C. Calhoun, Opportunist: A Reappraisal and others.

CALHOUN, JOHN C. (Micropædia)

G.McC.McB. George McCutchen McBride (d. 1971). Professor of Geography, University of California, Los Angeles. Visiting Professor, Carnegie Endowment for International Peace, South America, 1929–30; Central America 1938. Author of Agrarian Indian Communities of Highland Bolivia and others.

BOLIVIA (in part)

G.M.Ce. Gerald M. Clemence (d. 1974). Professor of Astronomy, Yale University, 1966–74. Coauthor of Methods of Celestial Mechanics.
NEWCOMB, SIMON (Micropædia)

G.McK.H. Graham McK. Hughes. Editor, Arts Review magazine. Former Art Director, Worshipful Company of Goldsmiths, London. Head of Design, Royal Mint, London. Author of Modern Silver.

DECORATIVE ARTS AND FURNISHINGS (in part)

G.Me. Gustav Mensching (d. 1978). Professor of Comparative Religion, Rhenish Friedrich Wilhelm University of Bonn, West Germany. Author of Die Religion, Erscheinungsformen, Strukturtypen und Lebensgesetze; Soziologie der Religion; and others.
DOCTRINES AND DOGMAS, RELIGIOUS (in part)

G.Mn. Georges Mongrédien (d. 1980). Historian. Director of the Municipal Council of Paris and General Council of the Seine, 1947–67. Author of Le Grand Condé; Colbert; and many others.

CONDÉ, LOUIS II DE BOURBON, 4^e PRINCE DE (Micropædia)

G.Mo. Gaston Monnerville. Member, Constitutional Council of France, 1974–83. President, Senate of France, 1958–68. Author of Clemenceau and others.
CLEMENCEAU, GEORGES (in part)
(Micropædia)

G.M.S. The Rev. Guthrie Michael Scott (d. 1983). Anglican Clergyman, Diocese of Chichester, England. Coauthor of Attitude to Africa and others.

NYERERE, JULIUS (Micropædia)

G.N. Gerhard Neumann. Emeritus Professor of Earth and Planetary Science, City College, City University of New York. Author of Ocean Currents.
OCEANS (in part)

G.Na. Giuseppe Nangeroni. Emeritus Professor of Geography, Catholic

University of Milan. Author of Geografia e geomorfologia.

ITALY (in part)

G.N.G. George N. Gordon. Professor and Chairman, Communications Department, Fordham University, Bronx, New York. Author of The Languages of Communication; The Communications Revolution; and others.

COMMUNICATION

G.N.H. George N. Halm. Emeritus Professor of Economics, Tufts University, Medford, Massachusetts. Author of Economic Systems: A Comparative Analysis.

ECONOMIC SYSTEMS (in part)

G.N.Ha. George N. Hatsopoulos. President, Thermo Electron Corporation, Waltham, Massachusetts. Coauthor of Principles of General Thermodynamics.
THERMODYNAMICS, PRINCIPLES OF (in part)

G.O. George Ordish. Editor, Tropical Science, London, 1966–72. Author of Untaken Harvest; The Constant Pest and others.

AGRICULTURE, THE HISTORY OF (in part)

G.P. Gerhard Preuschen. Emeritus Director, Max Planck Institute for Agricultural Labour and Scientific Farming, Bad Kreuznach, West Germany. Author of Die Technik im landwirtschaftlichen Betrieb.

AGRICULTURAL SCIENCES (in part)

G.Pa. Günter Passavant. Editor, Journals of the German Institute for the History of Art, Florence. Author of Andrea del Verrocchio: Sculptures, Paintings, and Drawings and others.

VERROCCHIO, ANDREA DEL (Micropædia)

G.Pan. Guido Pannain (d. 1977). Professor of the History of Music, S. Pietro a Maiella Conservatory of Music, Naples. Author of Lineamento di storia della musica and others.

CORELLI, ARCANGELO (Micropædia)

G.Pe. George Pendle (d. 1977). Managing Director, Pendle & Rivett Ltd., London. Author of A History of Latin America and others.
URUGUAY (in part)

G.P.G. Georges Paul Gusdorf. Former Professor of Philosophy, University of Strasbourg, France. Author of Les Sciences humaines et la conscience occidentale; La Découverte de soi; Mémoire et personne.

PHILOSOPHICAL ANTHROPOLOGY (in part)

G.P.Gi. Giovanni Pietro Giorgetti. Lecturer in Italian, Birkbeck College, University of London.

ITALIAN LITERATURE (in part)

G.Pi. Sir George Pickering, M.D. (d. 1980). Master of Pembroke College, Oxford, 1968–74; Regius Professor of Medicine, University of Oxford, 1956–68. Author of High Blood Pressure.

OSLER, SIR WILLIAM, BARONET (Micropædia)

G.P.K. Gertrude Prokosch Kurath. Research Fellow, Wenner-Gren Foundation for Anthropological Research, New York City. Former Co-ordinator, Dance Research Center, Ann Arbor, Michigan. Author of Iroquois Music and Dance and others.

AMERICAN INDIANS (in part)

FOLK ARTS (in part)

G.P.Ka. Gennadi Pavlovitch Kalinin (d. 1975). Professor and Head, Hydrological Department, Geographical Faculty, Moscow M.V. Lomonosov State University. Author of The Problems of Global Hydrology.

HYDROSPHERE, THE (in part)

G.P.L. Gilbert P. Laue. Chief Copy Editor, Richard D. Irwin, Inc., Homewood, Illinois. Former Associate Editor, Sports, Encyclopædia Britannica, Chicago.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

G.P.M. George P. Majeska. Associate Professor of History, University of Maryland, College Park.

BALKANS (in part)

G.P.Ma. The Rev. Germain P. Marchadour. Professor of Philology, Catholic University of the West, Angers, France. Director, Moreana Quarterly. Author of L'Univers de Thomas More and other works on Thomas More.

MORE, SIR THOMAS (in part)
(Micropædia)

G.P.R. Gerald P. Rodnan, M.D. (d. 1983). Professor of Medicine, University of Pittsburgh, 1967–83. Editor of Primer on the Rheumatic Diseases.

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

G.P.Ri. G. Philip Rightmire. Professor of Anthropology, State University of New York at Binghamton.

EVOLUTION, HUMAN (in part)

G.P.T. Sir George Paget Thomson (d. 1975). Professor of Physics, University of London, 1930–52. Co-winner, Nobel Prize for Physics, 1937. Author of J.J. Thomson and the Cavendish Laboratory.
THOMSON, SIR J.J. (Micropædia)

G.R. Graham Reynolds. Keeper, Departments of Prints and Drawings, 1961–74, and of Paintings, 1959–74, Victoria and Albert Museum, London. Author of Constable, the Natural Painter.
CONSTABLE, JOHN (Micropædia)

G.Ra. Graham Ratcliff. Neuropsychologist, Harmorville Rehabilitation Center, Pittsburgh. Clinical Assistant Professor of Psychiatry, Neurology, and Psychology, University of Pittsburgh.

NERVES AND NERVOUS SYSTEMS (in part)

G.R.B. Glenn Richard Bugh. Interim Director, Center for Programs in the Humanities, Virginia Polytechnic Institute and State University, Blacksburg. Author of The Horsemen of

Ancient Athens.

LEBANON (in part)

PALESTINE (in part)

G.R.C. Gerald Roe Crone (d. 1982) Librarian and Map Curator, Royal Geographical Society, London, 1945–66. Author of *Maps and Their Makers and others*.

HAKLUYT, RICHARD (Micropædia)
MACKINDER, SIR HALFORD JOHN (Micropædia)

G.R.Co. George R. Collins. Professor of Art History, Columbia University. Author of *Antonio Gaudí and others*; coauthor of *The Designs and Drawings of Antonio Gaudí*.

GAUDÍ, ANTONIO (Micropædia)

G.Re. George S. Rentz. Emeritus Curator of the Middle East Collection, Hoover Institution on War, Revolution, and Peace, Stanford, California. Emeritus Lecturer in Islamic History, Stanford University. Coauthor and editor of *Oman and the Southern Shore of the Persian Gulf*.

ARABIA (in part)

G.R.E. Sir Geoffrey R. Elton. Regius Professor of Modern History, University of Cambridge. Author of *The Tudor Revolution in Government: Administrative Changes in the Reign of Henry VIII and others*.

CRANMER, THOMAS (in part)
(Micropædia)

CROMWELL, THOMAS, EARL OF ESSEX (Micropædia)

HENRY VIII (ENGLAND) (in part)
(Micropædia)

G.R.F. Gizella Rochelle Fowler. Free-lance writer and consultant.
DRESS AND ADORNMENT (in part)

G.R.G.H. Gavin R.G. Hambly. Professor of History, University of Texas at Dallas. Coauthor and editor of *Central Asia*.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

G.R.H. G.R. Hawting. Lecturer in the History of the Near and Middle East, School of Oriental and African Studies, University of London.

MANŞÜR, AL- (Micropædia)

G.R.M.B. Germain René Michel Bazin. Research Professor Emeritus of Fine Arts, York University, Toronto. Emeritus Curator, the Louvre Museum, Paris. Author of *History of World Sculpture*.

RODIN, AUGUSTE (Micropædia)

G.Ro. Gloria Robinson. Research Affiliate in the History of Medicine, Yale University.

HAECKEL, ERNST (Micropædia)

G.R.P. George Richard Potter (d. 1981). Professor of Medieval History, University of Sheffield, England. Coauthor of *A Short History of Switzerland*.

SWITZERLAND (in part)

G.R.R. George Richard Rumney. Emeritus Professor of Geography, University of Connecticut, Storrs.

Author of *Climatology and the World's Climates*.

KÖPPEN, WLADIMIR (Micropædia)

G.R.S. G. Ralph Strohl. Market Researcher, Journals Division, University of Chicago Press. Author of *"The Ephemeral and the Immortal" in India and Greece: Connections and Parallels*.

JAINISM (in part)

G.R.St. George R. Stibitz. Emeritus Professor of Physiology, Dartmouth College, Hanover, New Hampshire. Author of *Mathematics in Medicine and the Life Sciences*; coauthor of *Mathematics and Computers*.

MATHEMATICS, THE HISTORY OF (in part)

G.R.T. George Raynor Thompson. Historian, U.S. Army Strategic Communications Command, 1964–72. WAR, THE TECHNOLOGY OF (in part)

G.R.W. Gordon R. Willey. Bowditch Professor Emeritus of Mexican and Central American Archaeology, Harvard University. Author of *An Introduction to American Archaeology*.

PRE-COLUMBIAN CIVILIZATIONS (in part)

MEXICO (in part)

NORTH AMERICA (in part)

G.R.Z. George R. Zug. Curator, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

BEHAVIOUR, ANIMAL (in part)

G.S. Geoffrey Sawyer. Emeritus Professor of Law, Australian National University, Canberra. Author of *Law in Society*.

LAW, THE PROFESSION AND PRACTICE OF (in part)

G.Sa. Gudmund Sandvik. Professor of Legal History, University of Oslo. Author of *Det gamle veldet: Norske finansar 1760–79 and others*.

DENMARK (in part)

NORWAY (in part)

SWEDEN (in part)

G.Sc. Georg Schwarzenberger. Emeritus Professor of International Law, University of London. Vice President, London Institute of World Affairs. Author of *A Manual of International Law*.

INTERNATIONAL LAW (in part)

G.Sh. Gordon Shillinglaw. Professor of Accounting, Columbia University. Author of *Managerial Cost Accounting*.

ACCOUNTING

G.S.H. Gerald S. Hawkins. Physicist and Astronomer, U.S. Information Agency, Washington, D.C. Author of *Mindsteps to the Cosmos and others*.

BRADLEY, JAMES (Micropædia)

G.S.Ha. Gordon S. Haight (d. 1985). Professor of English, Yale University 1950–68. Author of *George Eliot: A Biography*; editor of *The George Eliot Letters*.

ELIOT, GEORGE (Micropædia)

G.Si. George Bertrand Silberbauer. Senior Lecturer in Anthropology and Sociology, Monash University, Clayton, Australia. Author of *Hunter and Habitat in the Central Kalahari Desert and others*.

AFRICA (in part)

SOUTHERN AFRICA (in part)

G.S.K. Geoffrey S. Kirk. Regius Professor Emeritus of Greek, University of Cambridge. Author of *The Songs of Homer and others*.

HOMERIC EPICS, THE

G.S.Ke. G. Stuart Keith. Research Associate, Department of Ornithology, American Museum of Natural History, New York City. Author of numerous scientific and popular articles on cranes. BIRDS (in part)

G.S.L. George S. Lane (d. 1981). Kenan Professor of Germanic and Comparative Linguistics, University of North Carolina at Chapel Hill, 1950–72. Author of *Studies in Kuchean Grammar I*.

LANGUAGES OF THE WORLD (in part)

G.S.Lo. George S. Losey. Professor of Zoology; Associate Director, Hawaii Institute of Marine Biology, University of Hawaii, Honolulu.

COLORATION, BIOLOGICAL (in part)

G.S.O. Glenn S. Orton. Member of the Technical Staff, Earth and Space Sciences Division, Jet Propulsion Laboratory, California Institute of Technology, Pasadena.

SOLAR SYSTEM, THE (in part)

G.S.P.F.-G. Greville Stewart Parker Freeman-Grenville. Honorary Fellow, University of York, Heslington, England. Professor of African History, State University of New York College at New Paltz, 1969–74. Author of *The Medieval History of the Coast of Tanganyika and others*.

SA'ID IBN SULṬĀN (Micropædia)

G.St. George Speaight. Former Editorial Director, George Rainbird Ltd. Author of *The History of the English Puppet Theatre; Punch and Judy: A History; and others*.

POPULAR ARTS (in part)

G.T.G. Guy Thompson Griffith (d. 1985). Laurence Reader in Classics, University of Cambridge, 1951–75; Fellow of Gonville and Caius College, Cambridge. Coauthor of *A History of Macedonia*.

PHILIP II (MACEDONIA) (Micropædia)

G.Ts. George Thomas Tsoumis. Professor of Forest Utilization, Aristotelian University of Thessaloniki, Greece. Author of *Wood as Raw Material*.

FORESTRY AND WOOD PRODUCTION (in part)

G.T.S. Glenn T. Seaborg. University Professor of Chemistry; Associate Director, Lawrence Berkeley Laboratory; Director, Lawrence Hall of Science, University of California, Berkeley; Chancellor, 1958–61. Chairman,

Atomic Energy Commission, 1961–71. Cowinner, Nobel Prize for Chemistry, 1951. Author of *Man-Made Transuranium Elements*.

CHEMICAL ELEMENTS (in part)

G.T.Se. Giles Timothy Severin.

Free-lance writer. Author of *Explorers of the Mississippi*.

NORTH AMERICA (in part)

G.Tu. Glenn Tucker (d. 1976).

Free-lance writer and historian. Author of *Tecumseh: Vision of Glory*.

TECUMSEH (Micropædia)

G.U. George Unwin. Reader, editor, and translator, George Allen & Unwin Ltd., London. Translator of *Sign, Symbol and Script* and others.

PUBLISHING (in part)

Gu.B. Guglielmo Barblan (d. 1978).

Professor of Music History, University of Milan. Director of the Library, G. Verdi Conservatory of Music, Milan. Author of *Gaetano Donizetti; La musica in Milano; and others*.

BOCCHERINI, LUIGI (Micropædia)

Gü.P. Günther Patzig. Professor of Philosophy and Director, Philosophical Seminar, Georg August University of Göttingen, West Germany. Author of *Aristotle's Theory of the Syllogism*.

LOGIC, THE HISTORY AND KINDS OF (in part)

Gu.S. Gunnar Schlieder. Instructor in Geology, Lehigh University, Bethlehem, Pennsylvania.

CONTINENTAL LANDFORMS (in part)

Gu.W. Gunther Wolf. Lecturer in History, Rupert Charles University of Heidelberg, West Germany.

Coauthor and editor of *Stupor Mundi: Zur Geschichte Friedrichs II von Hohenstaufen*.

FREDERICK II (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

G.V. Georges Vajda (d. 1981). Director of Studies, École pratique des Hautes études (Institute for Advanced Research), Paris. Author of *Recherches sur la philosophie et la Kabbale dans la pensée juive du Moyen-Âge and others*.

JUDAISM (in part)

G.v.B. Gerhardt von Bonin, M.D. (d. 1979). Consultant in Neuroanatomy,

Neurological Institute, Mt. Zion Hospital, San Francisco. Professor of Anatomy, University of Illinois, Chicago, 1939–58. Author of *Essay on the Cerebral Cortex*.

NERVES AND NERVOUS SYSTEMS (in part)

G.V.G. Gerald V. Gibbs. University Distinguished Professor of Mineralogy, Virginia Polytechnic Institute and State University, Blacksburg.

MINERALS AND ROCKS (in part)

G.V.K. German Viktorovich Kopanev. Head, Central Asian Section, Council for Research on Productive Forces, U.S.S.R. Planning Committee, Moscow. Coauthor of *Central Asian Economic Region*.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

G.V.M. Gerard V. Middleton.

Professor of Geology, McMaster University, Hamilton, Ontario. A leading advocate of quantitative methods in studies of sediments.

OCEANS (in part)

G.V.T.M. Geoffrey Vernon Townsend Matthews. Director of Research, The Wildfowl Trust, Slimbridge, England. Author of *Bird Navigation*.

BIRDS (in part)

G.W. George Woodcock. Free-lance writer. Editor, Canadian Literature (quarterly), University of British Columbia, Vancouver, 1959–77. Author of *Anarchism; The Crystal Spirit: A Study of George Orwell; Pierre-Joseph Proudhon; and others*.

ORWELL, GEORGE (Micropædia)

PROUDHON, PIERRE-JOSEPH

(Micropædia)

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

G.W.A. Gösta W. Ahlström.

Professor of Old Testament and Ancient Palestinian Studies, University of Chicago. Author of *Aspects of Syncretism in the Israelite Religion*.

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

G.W.B. Geoffrey W. Bromiley.

Senior Professor of Church History and Historical Theology, Fuller Theological Seminary, Pasadena, California. Editor and translator of *Zwingli and Bullinger (Library of Christian Classics)*.

ZWINGLI, HULDRYCH (Micropædia)

G.W.Ba. Glen W. Baxter. Senior Lecturer on East Asian Studies, Harvard University, 1956–80; Associate Director, Harvard-Yenching Institute, 1964–80.

Author of *Index to the Imperial Register of Tz'u Prosody*.

PAN KU (Micropædia)

G.W.Bo. G.W. Bowersock. Professor of Ancient History, Institute for Advanced Study, Princeton, New Jersey. Author of *Greek Sophists in the Roman Empire; Augustus and the Greek World*.

AGRIPPA, MARCUS VIPSANIUS

(Micropædia)

GALEN OF PERGAMUM (Micropædia)

HADRIAN (in part) (Micropædia)

G.W.H. Gerard Willem Huygens.

Professor of History and Dutch Literature, Rotterdam Lyceum, The Netherlands. Author of *The Dutch Writer and His Public*.

DUTCH LITERATURE (in part)

G.Win. Gustaf Wingren. Emeritus

Professor of Systematic Theology, University of Lund, Sweden. Author of *Man and the Incarnation: A Study in the Biblical Theology of Irenaeus and others*.

IRENAEUS, SAINT (Micropædia)

G.W.K. George Williams Keeton.

President, London Institute of World Affairs. Emeritus Professor of English Law, University of London. Author of *Trusts*.

PROPERTY LAW (in part)

G.Wn. Geo Widengren. Emeritus Professor of the History of Religions and Psychology of Religion, University of Uppsala, Sweden. Author of several monographs on Iranian culture, history, and religion.

MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

G.W.O. Gerrit Willem Overdijkink. Expert on Southeast Asian affairs.

EAST INDIES, THE (in part)

G.W.P. Giles William Playfair.

Free-lance writer. Professor of Drama, Williams College, Williamstown, Massachusetts, 1956–63. Author of *Kean and others*.

KEAN, EDMUND (Micropædia)

G.Wr. Gordon Wright. William H.

Bonsall Professor Emeritus of History, Stanford University, California. Author of *France in Modern Times and others*.

FRANCE (in part)

G.W.S.B. Geoffrey Wallis Steuart

Barrow. Sir William Fraser Professor of Scottish History and Palaeography, University of Edinburgh. Author of *Feudal Britain and others*.

FRANCE (in part)

RICHARD I (ENGLAND)

(Micropædia)

G.W.W. Goddard Williams

Winterbottom. Director of Publications, The World Bank, Washington, D.C. Associate Editor, Arts, Encyclopædia Britannica, Chicago, 1967–72. Former Director of Theatre, Briarcliff College, Briarcliff Manor, New York.

POPULAR ARTS (in part)

G.W.We. George W. Wetherill.

Director, Department of Terrestrial Magnetism, Carnegie Institution of Washington, D.C.

SOLAR SYSTEM, THE (in part)

H.A. Henri Arvon. Professor, University of Paris X. Author of *Le Bouddhisme and others*.

FA-HSIEN (in part) (Micropædia)

Ha.A. Hans Aurenhammer. Former

Director, Austrian State Gallery, Vienna. Author of *J.B. Fischer von Erlach and others*.

FISCHER VON ERLACH, JOHANN

BERNHARD (Micropædia)

H.A.A. Hamza A. Alavi. Reader

in Sociology, Victoria University of Manchester. Author of numerous articles on Pakistan; coeditor of *Rural Development in Pakistan*.

PAKISTAN (in part)

H.A.B.R. Helen Anne B. Rivlin.

Professor of History, State University of New York at Binghamton. Author of *The Agricultural Policy of Muḥammad 'Alī in Egypt and others*.

MUḤAMMAD 'ALĪ (EGYPT)

(Micropædia)

Ha.D. Harry Davis. President, Systems Review Associates, Arlington, Virginia. Deputy Undersecretary of the Air Force (Systems Review), U.S. Department of Defense, Washington, D.C., 1968–73.

WAR, THE TECHNOLOGY OF
(in part)

H.A.D. Harl Adams Dalstrom.

Professor of History, University of Nebraska at Omaha.

UNITED STATES OF AMERICA (in part)

H.A.Da. Hugh Alistair Davies.

Lecturer in English, University of Sussex, Brighton, England.

ENGLISH LITERATURE (in part)

Ha.G. Harvey S. Gross. *Professor of Comparative Literature, State University of New York at Stony Brook. Author of Sound and Form in Modern Poetry and others.*

LITERATURE, THE ART OF (in part)

H.Ah. Hélène Ahrweiler. *Chancellor,*

University of Paris; Professor of the History of Byzantine Civilization, University of Paris I. Author of Recherches sur l'administration de l'empire byzantin aux IX^e-XI^e siècles.

NICEPHORUS II PHOCAS (Micropædia)

Ha.He. Hans Herzfeld (d. 1982).

Professor of Modern History, Free University of Berlin, 1950-60. Author of Die moderne Welt, 1789-1945.

FREDERICK WILLIAM IV (PRUSSIA)
(Micropædia)

Ha.K. Harold Kurtz (d. 1972). *Author of The Trial of Marshal Ney: His Last Years and Death and others.*

NEY, MICHEL, DUC D'ELCHINGEN
(Micropædia)

Ha.Ko. Sir Hans Kornberg. *Sir William Dunn Professor and Head, Department of Biochemistry, University of Cambridge; Master of Christ's College, Cambridge. Coauthor of Energy Transformations in Living Matter; editor of Essays in Cell Metabolism.*

METABOLISM (in part)

H.A.L. Hubert Arthur Lechevalier.

Professor of Microbiology, Rutgers University, New Brunswick, New Jersey. Coauthor of Three Centuries of Microbiology.

COHN, FERDINAND (Micropædia)

Ha.M. Hans Moldenhauer.

Musicologist. Director, Moldenhauer Archives. President, Spokane Conservatory of Music and Allied Arts, Inc., Washington. Author of Anton von Webern: A Chronicle of His Life and Work and others.

WEBERN, ANTON VON (Micropædia)

H.A.M. Henry A. Millon. *Dean,*

Center for Advanced Study in the Visual Arts, National Gallery of Art, Washington, D.C. Author of Baroque and Rococo Architecture and others.

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

Ha.Ma. Harry Magdoff. *Coeditor, Monthly Review. Author of The Age of Imperialism and others.*

EUROPEAN OVERSEAS EXPLORATION
AND EMPIRES, THE HISTORY OF
(in part)

H.A.Mi. Hassan Ali Mirreh.

Government Civil Servant, Somalia;

Secretary of State for Education, 1969-70.

EASTERN AFRICA (in part)

Ha.P. Hans H. Penner. *Dean of the Faculty; Professor of Religion, Dartmouth College, Hanover, New Hampshire. Author of articles on structuralism, myth, and ritual.*

rites and ceremonies, sacred
(in part)

H.Ar. Hassan Arfa. *Major General, Iranian Army (retired). Author of Under Five Shahs and others.*

REZA SHAH PAHLAVI (Micropædia)

Ha.Ro. Hans Roos (d. 1984). *Professor of East European History, University of the Ruhr, Bochum, West Germany. Author of A History of Modern Poland.*

POLAND (in part)

Ha.S. Hans Saner. *Free-lance writer. Personal Assistant to Professor Karl Jaspers, 1962-69. Author of Karl Jaspers.*

JASPERS, KARL (Micropædia)

H.A.S. H. Arthur Steiner. *Emeritus Professor of Political Science, University of California, Los Angeles. Editor of Report on China; Chinese Communism in Action.*

CHINA (in part)

Ha.Sc. Harold Scarborough (d.

1988). *Professor of Medicine; Provost, College of Medical Sciences, University of Maiduguri, Nigeria, 1979-84. Coauthor of Textbook of Physiology and Biochemistry.*

MEDICINE (in part)

Ha.Se. Hamzah Sendut. *Vice Chancellor, University of Science, Minden, Malaysia, 1969-76.*

EAST INDIES, THE (in part)

H.Au. Hermann Aubin (d. 1969). *Professor of History, University of Hamburg, 1946-54.*

EUROPE (in part)

H.A.W. Herbert A. White (d. 1972). *Editor, Metals and Foundry Practice Section, Engineering Index, New York City.*

INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

Ha.We. Hans Fritz Welzel (deceased). *Professor of Penal Law and of the Philosophy of Law, Rhenish Friedrich Wilhelm University of Bonn, West Germany. Author of Die Naturrechtslehre Samuel Pufendorfs.*

PUFENDORF, SAMUEL, FREIHERR VON
(Micropædia)

H.B. Hans Bobek. *Emeritus Professor of Geography, University of Vienna. Author of Iran: Probleme eines unterentwickelten Landes alter Kultur.*

ELBURZ MOUNTAINS (Micropædia)

H.B.A. Harry Burrows Acton (d. 1974). *Professor of Moral Philosophy, University of Edinburgh, 1964-74.*

CONDORCET, MARIE-JEAN-ANTOINE-
NICOLAS DE CARITAT, MARQUIS DE

(Micropædia)

SPENCER, HERBERT (Micropædia)

H.Bi. Haralds Biezais. *Professor of the History of Comparative Religions, Swedish University of Åbo, Finland. Author of Die Gottesgestalt der lettischen Volksreligion.*

EUROPEAN RELIGIONS, ANCIENT
(in part)

H.B.K. Herbert B. Knechtel (d. 1987). *President, Knechtel Laboratories, Inc. (consultants to the candy industry), Skokie, Illinois.*

FOOD PROCESSING (in part)

H.B.-M. Hubert Beuve-Méry. *Founder of Le Monde. Author of Le Suicide de la IV^e République.*

FRANCE (in part)

H.B.P. Henry Bamford Parkes (d. 1972). *Professor of History, New York University, New York City, 1949-72. Author of A History of Mexico.*

MEXICO (in part)

H.Br. Hugh Brogan. *Lecturer in History, University of Essex, Colchester, England. Author of Longman History of the United States of America.*

GOVERNMENT, THE FORMS OF

H.B.Ro. H.B. Rodgers. *Professor of Geography, Victoria University of Manchester. Coauthor of Lancashire, Cheshire and Isle of Man.*

MANCHESTER

H.B.W. Harry B. Whittington. *Woodwardian Professor Emeritus of Geology, Sedgwick Museum, University of Cambridge. World authority on trilobites and Lower Paleozoic stratigraphy.*

GEOCHRONOLOGY (in part)

H.C. The Rev. Henri Chambre, S.J. *Associate Director of the Laboratory, College of France, Paris. Author of De Karl Marx à Lénine et Mao Tsé-toung.*

MARXISM, MARX AND (in part)

H.C.B. Harold C. Bold (d. 1987). *Professor of Systematic Botany, University of Texas at Austin, 1957-78. Author of Morphology of Plants and others.*

REPRODUCTION AND REPRODUCTIVE
SYSTEMS (in part)

H.C.Br. Harold Chillingworth Brookfield. *Professor of Human Geography, Australian National University, Canberra.*

INDIAN OCEAN ISLANDS (in part)

H.C.C. H.C. Casey, Jr. *Professor and Chairman, Department of Electrical Engineering, Duke University, Durham, North Carolina. Coauthor of Heterostructure Lasers (2 vol.).*

ELECTRONICS (in part)

H.C.G. Howard C. Goldblatt. *Professor of Chinese, San Francisco State University. Author of Hsiao Hung; editor of Chinese Literature for the 1980s.*

CHINESE LITERATURE (in part)

H.Ch. Hoklam Chan. *Professor of Chinese History, University of*

Washington, Seattle. Coeditor of and contributor to *Yüan Thought: Chinese Thought and Religion Under the Mongols*.

CHINA (in part)

H.Cha. The Very Rev. Henry Chadwick. Master of Peterhouse, Cambridge; Regius Professor Emeritus of Divinity, University of Cambridge. Author of *The Early Church*; Origen contra Celsum; and others.

CHRISTIANITY (in part)

JOHN THE APOSTLE, SAINT (Micropædia)
ORIGEN (Micropædia)

H.C.Ho. Harold C. Hodge. Emeritus Professor of Pharmacology and Radiation Biology, University of Rochester, New York. Coauthor of *Clinical Toxicology of Commercial Products*.

POISONS AND POISONING (in part)

H.C.R.L. H.C. Robbins Landon. Free-lance writer and music historian. Author of *Mozart and others*; coeditor of *The Mozart Companion*.

MOZART (in part)

H.D. Hariprasanna Das. Professor of Geography, Gauhati University, Assam, India. Author of *Geography of Assam*.

INDIA (in part)

H.Da. Hugh Davson. Honorary Research Associate and Fellow, Department of Physiology, University College, University of London. Author of *Physiology of the Eye*; editor of *The Eye*.

SENSORY RECEPTION (in part)

H.D.F.K. H.D.F. Kitto (d. 1982). Professor of Greek, University of Bristol, England, 1944–62. Author of *Greek Tragedy*; *Form and Meaning in Drama*.

GREEK DRAMATISTS, THE CLASSICAL

(in part)

H.-D.H.W. Hans-Dietrich H. Weigmann. Associate Director of Research, Textile Research Institute, Princeton, New Jersey.

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

H.Di. Heide Dienst. Assistant, Institute of Austrian History Research, University of Vienna. Author of *Babenberger Studien* and others.

LEOPOLD I (GERMANY/HOLY ROMAN EMPIRE) (in part) (Micropædia)

H.D.I. Hans Dietrich Irmischer. Professor of Modern German Literary Criticism, University of Cologne. Author of *Probleme der Herder-Forschung*.

HERDER, JOHANN GOTTFRIED VON (Micropædia)

H.D.L. Hywel David Lewis. Emeritus Professor of History and Philosophy of Religion, King's College, University of London. Chairman of the Council of the Royal Institute of Philosophy. Author of *Our Experience of God*; *The Elusive Mind*; and others.

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

Hd.M.V. Harold M. Vinacke (d. 1981). Professor of Political Science,

University of Cincinnati, Ohio 1926–64. Author of *History of Far East in Modern Times*.

ASIA (in part)

H.D.S. Helmut Dietmar Starke. Free-lance writer on modern European history.

GERMANY (in part)

LUXEMBURG, ROSA (Micropædia)

H.E. Heinz Eulau. Professor of Political Science, Stanford University, California. Author of *The Politics of Representation* and others.

POLITICAL SYSTEMS (in part)

He.B. Hellmut Brunner. Emeritus Professor of Egyptology, Eberhard Karl University of Tübingen, West Germany. Author of *An Outline of Middle Egyptian Grammar* and others.

WRITING (in part)

He.Ba. Hélène J. Balfet. Teaching assistant, University of Aix-Marseille II, Aix-en-Provence, France. Former staff member for comparative technology, Musée de l'Homme, Paris. Author of *"Basketry: A Proposed Classification"* in *Papers on Californian Archaeology*.

DECORATIVE ARTS AND FURNISHINGS (in part)

He.F. Herbert Friedmann (d. 1987). Director, Los Angeles County Museum of Natural History, 1961–70. Researcher on the evolution and ecology of brood parasites among birds. Author of *The Honey-Guides*; *The Symbolic Goldfinch*.

BIRDS (in part)

He.Gu. Henri Guillemin. Emeritus Professor of History of French Literature, University of Geneva. Author of *Lamartine, l'homme et l'oeuvre*; *Lamartine en 1848*; and others.

LAMARTINE, ALPHONSE DE

(Micropædia)

He.H. Heinz Heinen. Professor of Ancient History, University of Trier, West Germany. Editor, *Historia* (journal of ancient history). Author of *Untersuchungen zur hellenistischen Geschichte des 3. Jahrhunderts vor Chr.*

PTOLEMY II PHILADELPHUS

(Micropædia)

H.E.H. Hans Egon Holthusen. Professor of German, Northwestern University, Evanston, Illinois, 1968–81. Author of *A Portrait of Rilke*.

RILKE, RAINER MARIA (Micropædia)

H.E.K. Harry Edward Korab. Executive Director, Society of Soft Drink Technologists. Former Technical Director, National Soft Drink Association, Washington, D.C.

BEVERAGE PRODUCTION (in part)

H.E.L.-H. Hellmut E. Lehmann-Haupt. Emeritus Professor of Bibliography and Rare Book Consultant, University of Missouri, Columbia. Author of *Gutenberg and the Master of the Playing Cards*.

GUTENBERG, JOHANNES (Micropædia)

He.M. Hershel Markovitz. Professor of Chemistry and Polymer Science,

Carnegie-Mellon University, Pittsburgh. Coauthor of *Viscometric Flows of Non-Newtonian Fluids*.

MECHANICS (in part)

H.E.Mo. Harold E. Moore, Jr. (d. 1980). Professor of Botany, L.H. Bailey Hortorium, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, 1960–80. Author of several articles on the palm order.

ANGIOSPERMS (in part)

H.En. Henrik Enander. Former Lecturer in History, University of Stockholm.

DENMARK (in part)

EUROPE (in part)

NORWAY (in part)

SWEDEN (in part)

He.Ni. Henri Nicolai. Professor of Applied Geography, Free University of Brussels.

CENTRAL AFRICA (in part)

He.P. Hermann Pálsson. Professor of Icelandic, University of Edinburgh. Author of *Art and Ethics in Hrafnkel's Saga*; translator of *Hrafnkel's Saga* and other Icelandic stories.

LITERATURE, THE ART OF (in part)

He.R. Helmuth Rogge. Chief Archivist, National Records Office, Potsdam, Germany, 1921–45. Author of *Friedrich von Holstein, Lebensbekenntnis in Briefen an eine Frau* and several other books on Holstein.

HOLSTEIN, FRIEDRICH VON (Micropædia)

H.E.R. Hugh E. Richardson. Member, Indian Civil Service, 1930–50; Indian Trade Agent, Gyantse, and Officer in Charge, Indian Mission, Lhasa, 1936–40 and 1946–50. Author of *Tibet and Its History* and others.

CHINA (in part)

H.E.R.G. Helmut Erich Robert Gernsheim. Photo-historian and author. Founder of the Gernsheim Collection. Regents Professor of Art, University of California, Riverside, 1984, and Santa Barbara, 1985. Author of *The History of Photography* and many others.

PHOTOGRAPHY (in part)

He.Ri. Helmut Richter. Director, Westphalian Archive Office, Münster, for the District of Westphalia-Lippe, West Germany.

GERMANY (in part)

He.S. Henri Stern. Director of Research, National Centre for Scientific Research, Paris. Author of *Le Calendrier de 354*; *L'Art byzantin*.

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

H.E.T. Harold E. Thomas. Research Hydrologist, Water Resources Division, Geological Survey, U.S. Department of the Interior, 1929–72. Author of *Conservation of Ground Water*.

HYDROSPHERE, THE (in part)

He.Th. Helmuth Thomsen (d. 1978). *Principal Curator, Museum for the History of Hamburg, 1957–71. Author of Liebes altes Hamburg; editor of Hamburg.*

HAMBURG (in part)

He.W. Hellmut Wilhelm. *Emeritus Professor of Chinese History and Literature, University of Washington, Seattle. Author of Change: Eight Lectures on the I Ching and others.*

CHINESE LITERATURE (in part)

H.E.W. Harold E. Wethey (d. 1984). *Professor of the History of Art, University of Michigan, Ann Arbor, 1946–72. Author of Colonial Architecture and Sculpture in Peru; El Greco and His School; The Complete Paintings of Titian.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

GIORGIONE (Micropædia)

GRECO, EL (Micropædia)

TITIAN

H.Ey. Henry Eyring (d. 1981). *Distinguished Professor of Chemistry and Professor of Metallurgy, University of Utah, Salt Lake City, 1967–81. Coauthor of Quantum Chemistry; Theory of Rate Processes.*

CHEMICAL REACTIONS (in part)

H.F. Hermann Friedrich. *Former Director, Overseas Museum, Bremen, West Germany. Author of Marine Biology.*

EUROPE (in part)

H.F.A. Héctor Fernando Avila. *Division Chief, International Monetary Fund Institute, Washington, D.C.*

SOUTH AMERICA (in part)

H.F.C. Howard F. Cline (d. 1971). *Director, Hispanic Foundation, Library of Congress, Washington, D.C., 1952–71. Author of Mexico: Revolution to Evolution, 1940–1960 and others.*

MEXICO (in part)

H.F.D. Hugh F. Denman. *Lecturer in German and Yiddish, Queen's University of Belfast, Northern Ireland.*

YIDDISH LITERATURE

H.Fe. Herbert Feigl (d. 1988). *Professor of Philosophy, University of Minnesota, Minneapolis, 1941–71; Director, Minnesota Center for Philosophy of Science, 1953–71. Original member of the Vienna Circle, which developed the Positivist movement. Author of "The Wiener Kreis in America" in The Intellectual Migration: Europe and America, 1930–1960.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.F.G. Hessle Filmore Garner. *Professor of Geology, Rutgers University, Newark, New Jersey. Author of The Origin of Landscapes.*

CONTINENTAL LANDFORMS (in part)

H.F.J. Herbert Felix Jolowicz (d. 1954). *Regius Professor of Civil Law, University of Oxford, 1948–54. Professor of Roman Law, University of London,*

1931–48; Dean, Faculty of Law, 1937–38. Author of Historical Introduction to the Study of Roman Law.

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

H.F.K. H.F. Koeper. *Professor of Architectural History, California State Polytechnic University, Pomona. Author of American Architecture, 1607–1976 and others.*

AALTO, ALVAR (Micropædia)

GROPIUS, WALTER (Micropædia)

SAAFINEN, EERO (Micropædia)

SULLIVAN, LOUIS (Micropædia)

H.F.L. Harvey F. Lodish. *Professor of Biology, Massachusetts Institute of Technology, Cambridge. Member, Whitehead Institute for Biomedical Research, Cambridge, Massachusetts. Coauthor of Molecular Cell Biology.*

CELLS (in part)

H.F.M. Herman F. Mark. *Emeritus Dean, Polytechnic Institute of New York, Brooklyn. Director, Polymer Research Institute, 1946–64. World authority on polymers and polymerization processes. Editor of Encyclopedia of Polymer Science and Technology.*

CHEMICAL COMPOUNDS (in part)

H.F.P. H.F. Pearson (deceased). *Author of A Popular History of Singapore; This Other India: A Biography of Sir Thomas Stamford Raffles.*

RAFFLES, SIR STAMFORD

(Micropædia)

H.Fr. Herbert Franke. *Emeritus Professor of Far Eastern Studies, Ludwig Maximilian University of Munich. Author of Geld und Wirtschaft in China unter der Mongolen and others.*

CHINA (in part)

H.Fra. Heinrich Fraenkel (d. 1986). *Free-lance writer. Author of The Other Germany; coauthor of Hermann Göring. GÖRING, HERMANN (in part)*

(Micropædia)

H.F.W. Harold F. Walton. *Professor of Chemistry, University of Colorado, Boulder. Coauthor of Ion Exchange in Analytical Chemistry.*

CHEMICAL REACTIONS (in part)

H.F.We. Heinz Fritz Wermuth. *Former Curator of Herpetology, State Museum of Natural History, Ludwigsburg, West Germany. Coauthor of Schildkröten, Krokodile, Brückenechsen.*

REPTILES (in part)

H.G. Herbert V. Guenther. *Emeritus Professor of Far Eastern Studies, University of Saskatchewan, Saskatoon. Author of The Life and Teaching of Nāropa; Tibetan Buddhism Without Mystification; and others.*

BUDDHISM, THE BUDDHA AND (in part)

H.G.D. H. Grady Davis (d. 1975). *Former Professor of Functional Theology, Lutheran School of Theology at Chicago. Coauthor of The Gospels in Study and Preaching.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

H.G.Do. Herndon G. Dowling. *Professor of Biology, New York University, New York City. Research Associate in Herpetology, American Museum of Natural History, New York City. Editor, Yearbook of Herpetology. Curator of Reptiles, New York Zoological Park, 1960–67.*

REPTILES (in part)

H.G.E. Heinrich Gustav Euler. *Professor of Modern History, University of Würzburg, West Germany. Author of Napoleon III. in seiner Zeit, vol. 1.*

NAPOLÉON III (FRANCE)

(Micropædia)

H.G.F. Henry George Forder (d. 1981). *Professor of Mathematics, University of Auckland, New Zealand, 1934–55. Author of The Foundations of Euclidean Geometry and others.*

GEOMETRY (in part)

H.G.G. Hans G. Güterbock. *Tiffany and Margaret Blake Distinguished Service Professor Emeritus of Hittitology, Oriental Institute, University of Chicago. Author of Siegel aus Boğazköy.*

BOĞAZKÖY (Micropædia)

H.G.K. Helmut Georg Koenigsberger. *Emeritus Professor of History, King's College, University of London. Author of The Habsburgs and Europe, 1516–1660; coauthor of Europe in the Sixteenth Century.*

ALBA, FERNANDO ALVAREZ DE

TOLEDO Y PIMENTEL, 3^{er} DUQUE DE (Micropædia)

JIMÉNEZ DE CISNEROS, FRANCISCO, CARDENAL (Micropædia)

PHILIP II (SPAIN) (Micropædia)

SPAIN (in part)

H.G.N. Herbert G. Nicholas. *Rhodes Professor Emeritus of American History and Institutions, University of Oxford. Author of Britain and the U.S.A. and others.*

CHURCHILL

H.Go. Hermann Goetz (d. 1976). *Director, Baroda Museum and Picture Gallery, Baroda, India, 1940–53. Curator, National Gallery of Modern Art, New Delhi, 1953–55. Author of The Art of India and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

H.G.R. Henry Godfrey Roseveare. *Reader in History, King's College, University of London. Author of The Treasury: The Evolution of a British Institution.*

CHARLES II (GREAT BRITAIN)

(Micropædia)

H.Gu. Henri Guittou. *Professor of Economics, University of Paris I. Editor in Chief, La Revue d'Économie Politique.*

ECONOMIC THEORY (in part)

H.G.W. Harris Gaylord Warren. *Emeritus Professor of History, Miami University, Oxford, Ohio. Author of Paraguay and the Triple Alliance: The*

Postwar Decade, 1869–1878.

PARAGUAY (in part)

H.H. Helmut Hölder. Emeritus Professor of Paleontology, Geological-Paleontological Institute, University of Münster, West Germany.

GEOCHRONOLOGY (in part)

H.Ha. Harold Hart. Professor of Chemistry, Michigan State University, East Lansing. Coauthor of Organic Chemistry.

CHEMICAL COMPOUNDS (in part)

MOLECULES (in part)

H.H.A. H. Harvard Arnason (d. 1986). Art historian. Vice President for Art Administration, Solomon R. Guggenheim Foundation, New York City, 1961–69. Author of *History of Modern Art*; coauthor of two books on Alexander Calder; and others.

CALDER, ALEXANDER (Micropædia)

H.H.A.B. Hans H.A. Bielenstein. Professor of Chinese History, Columbia University. Author of "The Restoration of the Han Dynasty" in *Bulletin of the Museum of Far Eastern Antiquities*.

WANG MANG (Micropædia)

H.H.B.-S. Haim Hillel Ben-Sasson (d. 1977). Professor of Jewish Medieval History, Hebrew University of Jerusalem. Editor of *Peraqim be-toldot ha-Yehudim bi-yeme ha-benayim*, 3 vol.; author of vol. 2.

ELIJAH BEN SOLOMON (Micropædia)

H.He. Herbert Hensel (d. 1983). Professor of Physiology; Director, Institute of Physiology, Philipps University of Marburg, West Germany. Coauthor of *Temperatur und Leben*.

SENSORY RECEPTION (in part)

H.Hei. Helmut Heiber. Assistant, Institute for Contemporary History, Munich. Author of *Joseph Goebbels and others*.

GOEBBELS, JOSEPH (Micropædia)

H.-H.He. Hermann-Heino Heine. Taxonomic Botanist, Royal Botanic Gardens, Kew, England.

GERMANY (in part)

H.H.Hu. Herbert Henry Huxley. Emeritus Professor of Classics, University of Victoria, British Columbia. Supervisor in Classics, St. John's College, University of Cambridge. Editor of *Virgil's Georgics (Books I and IV)* and others.

MARTIAL (Micropædia)

H.Hj. Hakon Hjelmqvist. Associate Professor of Botany, University of Lund, Sweden, 1960–71. Author of *Studies on the Floral Morphology and Phylogeny of the Amentiferae*.

ANGIOSPERMS (in part)

H.-H.J. Hans-Heinrich Jescheck. Emeritus Professor of Law, Albert Ludwig University of Freiburg, Freiburg im Breisgau, West Germany. Emeritus Director, Max Planck Institute for Foreign and International Criminal Law, Freiburg. Author of *Lehrbuch des*

Strafrechts.

CRIMINAL LAW

PROCEDURAL LAW (in part)

H.H.K. Howard H. Kendler. Professor of Psychology, University of California, Santa Barbara. Author of *Psychology: A Science in Conflict and others*.

LEARNING AND COGNITION, HUMAN (in part)

H.H.L. Hubert Horace Lamb. Former Director, Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, England.

Investigator of climatic variation from the viewpoint of general atmospheric circulation. Author of *Climate: Present, Past and Future* and others.

CLIMATE AND WEATHER (in part)

H.Hn. Herbert Hoffmann. Former Curator of Ancient Art, Museum of Art and Industry, Hamburg.

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

H.H.R. Harry Howe Ransom. Professor of Political Science, Vanderbilt University, Nashville, Tennessee. Author of *The Intelligence Establishment*.

INTELLIGENCE AND COUNTERINTELLIGENCE

H.H.S. Howard Hayes Scullard (d. 1983). Professor of Ancient History, King's College, University of London, 1959–70. Author of *Roman Politics*, 220–150 B.C. and others.

GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

SCIPIO AEMILIANUS (in part) (Micropædia)

SCIPIO AFRICANUS MAJOR (Micropædia)

SYRIA (in part)

H.I. Halil Inalcik. Professor of History, University of Chicago. Author of "Mehmed the Conqueror (1432–1481) and His Time" in *Speculum* and others.

MEHMED II (Micropædia)

H.-I.M. Henri-Irénée Marrou (d. 1977). Professor of the History of Ancient Christianity, University of Paris, 1945–75. Author of *De la connaissance historique*.

EDUCATION, HISTORY OF (in part)

Hi.Mo. Hiroyuki Momo. Emeritus Professor and former Director, Historiographical Institute, University of Tokyo.

HISTORY, THE STUDY OF (in part)

H.Is. Hildebert Isnard (d. 1983). Professor of Geography, University of Nice, France. Professor of Geography, University of Aix-Marseille II, Aix-en-Provence, France, 1947–70. Author of *Géographie du Maghreb; Afrique tropicale; and others*.

AFRICA (in part)

H.I.S. Harold I. Sharlin. Consultant on science policy. Former Professor of History, Iowa State University, Ames. Author of *The Making of the Electrical Age; Lord Kelvin: Dynamic Victorian*.

KELVIN

H.J.Bi. Harold J. Bissell. Emeritus Professor of Geology, Brigham Young University, Provo, Utah.

MINERALS AND ROCKS (in part)

H.J.Bl. Henry J. Blumenthal. Reader in Greek, University of Liverpool. Coeditor of *Soul and the Structure of Being in Late Neoplatonism*.

PLATONISM, PLATO AND (in part)

H.J.Bn. Henry J. Bruman. Emeritus Professor of Geography, University of California, Los Angeles.

NORTH AMERICA (in part)

H.J.C. Henry J. Cadbury (d. 1974). Hollis Professor of Divinity, Harvard University, 1934–54. Chairman, American Friends Service Committee, 1928–34; 1944–60.

FOX, GEORGE (Micropædia)

H.J.D. Hubert Jules Deschamps (d. 1979). Professor of Modern History of Black Africa, University of Paris, 1962–70. Colonial Administrator, Madagascar, 1926–36. Author of *History of Madagascar* and others.

CENTRAL AFRICA (in part)

WESTERN AFRICA (in part)

H.J.De. Henri J. Delporte. Chief Curator, Museum of National Antiquities, Saint-Germain-en-Laye, France.

EVOLUTION, HUMAN (in part)

H.J. de B. Harm J. de Blij. Professor of Geography, University of Miami, Coral Gables, Florida. Author of *Mozambique* and others.

SOUTHERN AFRICA (in part)

H.J. de V. Herman Jean de Vleeschauwer. Emeritus Professor of Philosophy, University of South Africa, Pretoria. Author of *L'Évolution de la pensée kantienne*; editor of *Kantstudien*.

KANTIANISM, KANT AND (in part)

H.J.Dw. Harvey J. Dworken, M.D. Professor of Medicine, Case Western Reserve University, Cleveland, Ohio. Author of *Gastroenterology: Pathophysiology and Clinical Applications* and others.

DIGESTION AND DIGESTIVE SYSTEMS (in part)

H.J.Er. Hubert Joseph Erb. Berlin Correspondent, Associated Press.

BERLIN (in part)

H.J.H. Herbert James Hunt (d. 1973). Professor of French Language and Literature, Royal Holloway College, University of London, 1944–66. Author of *Honoré de Balzac: A Biography*.

BALZAC, HONORÉ DE (in part) (Micropædia)

H.-J.I. Heinz-Jürgen Ipfling. Professor of Educational Theory, University of Regensburg, West Germany. Author of *Jugend und Illustrierte* and others.

EDUCATION, HISTORY OF (in part)

H.-J.K. Hans-Joachim Kramm. Professor of Economic Geography, College of Education, Potsdam, East Germany. Author of *Ökonomische*

Geographie der DDR.

GERMANY (in part)

H.J.S. Howard James Stains. *Professor of Zoology, Southern Illinois University, Carbondale. Author of "Carnivores and Pinnipeds" in Recent Mammals of the World.*

MAMMALS (in part)

H.J.Sp. Herbert John Spiro. *Professor of Politics, John F. Kennedy Institute for North American Studies, Free University of Berlin. U.S. Ambassador to Cameroon, 1975–77. Author of Government by Constitution and others.*

CONSTITUTION AND CONSTITUTIONAL GOVERNMENT (in part)

H.J.Wi. Howard J. Wiarda. *Professor of Political Science, University of Massachusetts, Amherst. Author of The Dominican Republic: Nation in Transition and others.*

WEST INDIES, THE (in part)

H.K. Hans Kohn (d. 1971). *Professor of History, City College, City University of New York, 1949–62. Author of Political Ideologies of the Twentieth Century.*

ISRAEL (in part)

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

H.Ka. Harry Kalven, Jr. (d. 1974). *Harry A. Bigelow Professor of Law, University of Chicago, 1953–74. Coauthor of The American Jury.*

JUDICIAL AND ARBITRATIONAL SYSTEMS (in part)

H.K.B. Howard Kent Birnbaum. *Professor of Physical Metallurgy, University of Illinois, Urbana. Author of numerous papers on the physics and mechanics of solids.*

MATTER (in part)

H.K.G. Harry K. Girvetz (d. 1974). *Professor of Philosophy, University of California, Santa Barbara, 1951–74. Author of The Evolution of Liberalism.*

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

H.K.M.S. H.K. Manmohan Singh. *Jawaharlal Nehru Professor of Economics, Punjabi University, Patiala, India.*

INDIA (in part)

H.Ko. Horst Koegler. *Music Editor, Stuttgarter Zeitung. Editor, Ballett (annual), 1965–83. Author of Concise Oxford Dictionary of Ballet.*

DANCE, THE HISTORY OF WESTERN (in part)

H.Kü. Hans Kühner. *Historian and free-lance writer. Specialist on the history of the Roman Catholic Church and the Papacy. Author of Encyclopedia of the Papacy and others.*

GREGORY I, SAINT (PAPACY) (Micropædia)

JULIUS II (Micropædia)

H.K.V. Hans K. Vogt. *Emeritus Professor of General Linguistics,*

University of Oslo. Author of Grammaire du géorgien moderne.

LANGUAGES OF THE WORLD (in part)

H.L. Henri Laoust (d. 1983). *Professor of Sociology of Islām, College of France, Paris, 1956–76. Editor and translator of Le Traité de droit public d'Ibn Taimiya. IBN TAYMIYAH (Micropædia)*

H.L.A.H. Herbert Lionel Adolphus Hart. *Principal of Brasenose College, Oxford, 1973–78; Professor of Jurisprudence, University of Oxford, 1952–68. Author of The Concept of Law; Law, Liberty and Morality. AUSTIN, JOHN (Micropædia)*

H.L.B. Henry Lewis Barnett, M.D. *Emeritus Professor of Pediatrics, Albert Einstein College of Medicine, Yeshiva University, Bronx, New York. Medical Director, Children's Aid Society, New York City. Associate Editor of Pediatrics. CHILDHOOD DISEASES AND DISORDERS (in part)*

H.L.C. Hampton L. Carson. *Professor of Genetics, University of Hawaii, Honolulu. Author of Heredity and Human Life.*

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

H.L.C.J. Hans L.C. Jaffé. *Professor of Modern Art History, University of Amsterdam. Author of Piet Mondrian; Picasso.*

MONDRIAN, PIET (in part) (Micropædia)

H.L.E. Herbert Leeson Edlin (d. 1976). *Publications Officer, Forestry Commission of Great Britain, London. Author of Trees, Woods and Man. FORESTRY AND WOOD PRODUCTION (in part)*

H.-L.-É.T. Henri-Louis-Étienne Terrasse (d. 1971). *Curator, Historic Monuments of Morocco, 1935–57. Director, Institute for Advanced Moroccan Studies, Rabat, Morocco, 1941–57. Chairman, Department of Islāmic Archaeology, University of Algiers, 1945–57. Director, Casa de Velázquez, Ciudad University, Madrid, 1957–65. Author of Histoire du Maroc. 'ABD AL-MU'MIN (Micropædia)*

NORTH AFRICA (in part)

H.Li. Heinz Lieberich. *General Director, Bavarian State Archives, Munich. Author of Ludwig der Bayer als Gesetzgeber and others.*

LOUIS IV (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.L.-J. Hugh Lloyd-Jones. *Regius Professor of Greek, University of Oxford. Author of The Justice of Zeus and others.*

SCHOLARSHIP, CLASSICAL

H.L.Ke. Herbert Leon Kessler. *Professor and Chairman, Department of the History of Art, Johns Hopkins University, Baltimore. Author of French and Flemish Illuminated Manuscripts in Chicago Collections and others.*

EYCK, JAN VAN (Micropædia)

WEYDEN, ROGIER VAN DER (Micropædia)

H.L.M. Hanns Leo Mikoletzky (d. 1978). *General Director, Austrian State Archives, Vienna. Professor of History, University of Vienna. Author of Kaiser Heinrich II und die Kirche and others.*

HENRY III (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.L.Ms. Hallam L. Movius, Jr. (d. 1987). *Professor of Anthropology, Harvard University; Curator of Paleolithic Archaeology, Peabody Museum.*

PREHISTORIC PEOPLES AND CULTURES (in part)

H.Ln. Helge Larsen. *Minister of Education, Danish Government, 1968–71.*

ARCTIC, THE (in part)

H.Lz. Hans Liebeschütz (d. 1978). *Reader in Medieval History, University of Liverpool, 1955–59. GERMANY (in part)*

H.M. Hermann Mannheim (d. 1974). *Reader in Criminology, University of London, 1946–55. Author of Comparative Criminology.*

SOCIAL SCIENCES, THE (in part)

H.Ma. Henry Margenau. *Eugene Higgins Professor Emeritus of Physics and Natural Philosophy, Yale University. Author of Nature of Physical Reality; coauthor of Mathematics of Physics and Chemistry and others.*

PHYSICAL PRINCIPLES AND CONCEPTS (in part)

H.M.A. Harold Maurice Abrahams (d. 1978). *Broadcaster and journalist. Chairman, British Amateur Athletic Board. Olympic Gold Medalist (100-metre dash), 1924. Author of The Olympic Games, 1896–1952.*

OLYMPIC GAMES (in part)

H.M.K. Horace M. Kallen (d. 1974). *Professor of Social Philosophy, New School for Social Research, New York City, 1919–52. Author of the introduction to The Philosophy of William James, Drawn from His Own Works. JAMES, WILLIAM (Micropædia)*

H.M.L. Henry M. Leicester. *Emeritus Professor of Biochemistry, University of the Pacific, San Francisco. Coauthor of Source Book in Chemistry 1400–1900.*

LIEBIG, JUSTUS, FREIHERR VON (Micropædia)

WÖHLER, FRIEDRICH (Micropædia)

H.M.La. Hugh Michael Laracy. *Senior Lecturer in History, University of Auckland, New Zealand.*

PACIFIC ISLANDS (in part)

H.M.M. Harold M. Mayer. *Professor of Geography, University of Wisconsin, Milwaukee. Vice President, Milwaukee Harbor Commission. Author of The Port of Chicago and the St. Lawrence Seaway; coauthor of Chicago, Growth of a Metropolis.*

CHICAGO (in part)

H.M.P. Henri M. Peyre. *Distinguished Professor Emeritus, Graduate Center,*

City University of New York. Sterling Professor Emeritus of French, Yale University. Author of *Literature and Sincerity and many others*; contributor to Émile Durkheim, 1858–1917.

DURKHEIM, ÉMILE (Micropædia)
LITERATURE, THE ART OF (in part)

H.M.S. Harold M. Somers. Professor of Economics, University of California, Los Angeles; Dean, Division of Social Sciences, 1967–70. Author of *Capital Gains, Death and Gift Taxation*.

TAXATION (in part)

H.Mu. Hugo Munsterberg. Professor of Oriental Art, Bard College, Annandale-on-Hudson, New York. Author of *The Arts of Japan and others*.

OGATA KÖRIN (Micropædia)

SESSHŪ (Micropædia)

SŌTATSU (Micropædia)

H.M.V.D. Hobart Merritt Van Deusen (d. 1976). Archbold Assistant Curator, Department of Mammalogy, American Museum of Natural History, New York City, 1958–75. Coauthor of "Marsupials" in *Recent Mammals of the World*.

MAMMALS (in part)

H.M.W. Helen Margaret Wallis. Map Librarian, British Library, London. Editor of *Carteret's Voyage Round the World and others*.

TASMAN, ABEL JANSZON (Micropædia)

H.My. Hla Myint. Professor of Economics, London School of Economics and Political Science, University of London. Author of *Economic Theory and the Underdeveloped Countries*.

ECONOMIC GROWTH AND PLANNING (in part)

H.N. Heinrich Nagel. Emeritus Professor of Civil and International Civil Procedure, Georg August University of Göttingen, West Germany. Former Presiding Judge, Hanseatic Court of Appeals, Bremen. Author of *Internationales Zivilprozessrecht and others*.

PROCEDURAL LAW (in part)

H.Na. Hajime Nakamura. Director, Eastern Institute, Inc., Tokyo. Emeritus Professor of Indian and Buddhist Philosophy, University of Tokyo. Author of *Ways of Thinking of Eastern Peoples and others*.

BUDDHISM, THE BUDDHA AND (in part)

H.Ne. Howard Nemerov. Poet and novelist. Edward Mallinckrodt Distinguished Professor of English, Washington University, St. Louis, Missouri. Author of *Poetry and Fiction: Essays; Reflexions on Poetry and Poetics; and others*.

LITERATURE, THE ART OF (in part)

H.N.G. Harry Norwood Ginns (d. 1981). Deputy Chief Engineer, Highways Engineering Division, Ministry of Transport, London, 1963–69.

TRANSPORTATION (in part)

H.O. Harold Oldroyd. Senior Principal Scientific Officer, British Museum (Natural History), London, 1964–73.

Author of *The Natural History of Flies and others*.

INSECTS (in part)

Ho.B. Howard Bay (d. 1986). Stage and film designer. Professor of Theatre Arts, Brandeis University, Waltham, Massachusetts. Author of *Stage Design*.
THEATRICAL PRODUCTION (in part)

Ho.I.P. Hovhanness Israel Pilikian. Theatre director. Founder and Artistic Director of Hano-no Mask-Theatre Company. Author of *The Prince of Darkness and others*.

REINHARDT, MAX (Micropædia)

H.O.Sc. Hans Otto Schmitt. Senior Adviser, International Monetary Fund, Washington, D.C.; Division Chief, 1971–80.

ECONOMIC THEORY (in part)

H.P. Heinrich Potthoff. Contributor, Commission for the History of Parliamentarism and Political Parties, Bonn. Author of *Die deutsche Politik Beusts and others*.

BEUST, FRIEDRICH FERDINAND, GRAF VON (Micropædia)

H.Pa. Hans Patze. Professor of German History; Director, Institute for Historical Research, Georg August University of Göttingen, West Germany. Author of *Die Entstehung der Landesherrschaft in Thüringen and others*.

FREDERICK I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.Pe. Harry Perry. Energy consultant. Senior Specialist, Congressional Research Service, Library of Congress, Washington, D.C., 1970–72.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

H.P.La. Harriet Pratt Lattin. Historian. Author of *The Peasant Boy Who Became Pope*; translator of *The Letters of Gerbert*, with His Papal Privileges as Sylvester II.

SYLVESTER II (Micropædia)

H.Pr. Helmut Preidel. Historian. Author of *Das grossmährische Reich im Spiegel der Bodenfunde; Handel und Handwerk im frühgeschichtlichen Mitteleuropa; and others*.

CHARLES IV (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.P.R. Humphrey P. Rang. Director, Sandoz Institute for Medical Research, University College, University of London. Coauthor of *Pharmacology*.

DRUGS AND DRUG ACTION (in part)

H.P.Tr. Hamilton P. Traub (d. 1983). Editor, *Plant Life*, American Plant Life Society, La Jolla, California. Author of *The Amaryllis Manual and others*.

ANGIOSPERMS (in part)

H.P.V. Homero Pozo Vélez. Professor of History and Geography; Dean, Faculty of Educational Science, National University of Loja, Ecuador.

ECUADOR (in part)

H.R. Helmer Ringgren. Emeritus Professor of Old Testament Exegesis,

University of Uppsala, Sweden. Author of *Israelite Religion; Messiah in the Old Testament; and various articles on theological concepts in the Qur'ān*.

ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

H.Ra. Hassanein Muhammad Rabie. Professor of History, University of Cairo. Author of *The Financial System of Egypt*: A.H. 564–741/A.D. 1169–1341.

BAYBARS I (Micropædia)

H.Re. Hans Reichardt. Emeritus Professor of Mathematics, Humboldt University of Berlin. Editor of C.F. Gauss Gedenkband anlässlich des 100. Todestages am 23. Februar 1855.

GAUSS

H.R.H. Heribert R. Hutter. Director, Gallery of the Academy of Fine Arts, Vienna. Author of *Drawing: History and Technique and others*.

DRAWING (in part)

H.Ro. Herbert H. Rowen. Professor of History, Rutgers University, New Brunswick, New Jersey. Author of *John de Witt, Grand Pensionary of Holland, 1625–1672 and others*.

LOW COUNTRIES, THE (in part)

H.R.O. Horace Russell Ogden. Former Manager, Magnesium Research Center, Battelle Memorial Institute, Columbus, Ohio.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

H.R.T. Hugh Russell Tinker. Emeritus Professor of Politics, University of Lancaster, England. Author of *India and Pakistan: A Political Analysis; Experiment with Freedom, India and Pakistan; and others*.

BANGLADESH (in part)

INDIA (in part)

PAKISTAN (in part)

H.R.W. Henry R. West. Professor of Philosophy, Macalester College, St. Paul, Minnesota. Coeditor of *Moral Philosophy: Classic Texts and Contemporary Problems*.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.S. Helmut Sick. Naturalist, Brazilian Academy of Sciences, Rio de Janeiro. Author of *numerous papers on neotropical birds*.

BIRDS (in part)

H.Sa. Heinrich Satter. Free-lance writer. Author of *Paul Ehrlich, Begründer der Chemotherapie and others*.

EHRLICH, PAUL (Micropædia)

H.Sc. Heinrich Schiffrers. Lecturer in Geography, Preparatory College for Foreign Students, University of Cologne, 1965–70. Lecturer in Geography, secondary schools of Aachen and Cologne, 1930–65. Author of *Die Sahara und die Syrtländer; The Quest for Africa*.

AFRICA (in part)

H.Se. Humphrey Searle (d. 1982). Composer. Professor of Composition,

Royal College of Music, London. Author of The Music of Liszt and others.

LISZT, FRANZ (in part) (Micropædia)

H.S.H. Helen Sawyer Hogg. Emeritus Professor of Astronomy, University of Toronto. Astronomy columnist, Toronto Daily Star, 1951–81.

STARS AND STAR CLUSTERS (in part)

H.S.L. Howard S. Levie. Colonel, U.S. Army (retired). Emeritus Professor of Law, St. Louis University, Missouri.

WAR, THE THEORY AND CONDUCT OF (in part)

H.Sm. Harlan James Smith. Professor of Astronomy; Director, McDonald Observatory, University of Texas at Austin. Coeditor of Planetary Atmospheres.

SOLAR SYSTEM, THE (in part)

H.S.M. H.S. Morris. Former Reader in Anthropology, London School of Economics and Political Science, University of London. Author of Indians in Uganda.

SOCIAL DIFFERENTIATION (in part)

H.S.MacD.C. H.S. MacDonald Coxeter. Emeritus Professor of Mathematics, University of Toronto. Author of Non-Euclidean Geometry.

GEOMETRY (in part)

H.S.N. H.S. Narayana. Former Professor of Botany, University of Rājasthān, Jaipur, India.

ANGIOSPERMS (in part)

Hs.P. Hans Plischke (d. 1972). Professor of Ethnology, Georg August University of Göttingen, West Germany.

GERMANY (in part)

H.Sp. Herbert Spiegelberg. Emeritus Professor of Philosophy, Washington University, St. Louis, Missouri. Author of The Phenomenological Movement.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.S.P. H. Steffen Peiser. Chief, Office of International Relations, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C., 1969–79. Author of X-Ray Diffraction by Polycrystalline Materials.

ATOMIC WEIGHT (in part) (Micropædia)

H.Sr. Hugo Stehkämper. Director, Historical Archives, Cologne.

COLOGNE (in part)

H.S.R. Hans Siegbert Reiss. Professor of German, University of Bristol, England. Author of Goethe's Novels and others.

GERMAN LITERATURE (in part)

H.Ss. Halsey Stevens. Composer. Emeritus Professor of Music, University of Southern California, Los Angeles. Author of The Life and Music of Béla Bartók.

BARTÓK, BÉLA (Micropædia)

H.S.Sc. Herbert S. Schell. Emeritus Dean of the Graduate School, University of South Dakota, Vermillion; former

Professor of History. Author of South Dakota, Its Beginning and Growth; History of South Dakota.

UNITED STATES OF AMERICA (in part)

H.S.-Sm. Sir Hubert Shirley-Smith (d. 1981). Consulting Engineer to W.V. Zinn & Associates, London, 1969–78. President, Institute of Civil Engineers, 1967. Author of The World's Great Bridges.

PUBLIC WORKS (in part)

H.St. Hans Sturmberger. Former Director, Upper Austrian Provincial Archives, Linz. Author of Kaiser Ferdinand II and others.

FERDINAND II (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.S.T. H.S. Thayer. Professor of Philosophy, City College, City University of New York. Author of Meaning and Action: A Critical History of Pragmatism.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.S.Ta. Sir Hugh S. Taylor (d. 1974). Professor of Chemistry, 1922–58; Dean of the Graduate School, 1945–58, Princeton University. Coauthor of Catalysis in Theory and Practice.

CHEMICAL REACTIONS (in part)

H.St.J.B.P. Harry St. John Bridger Philby (d. 1960). Explorer in Arabia. Author of The Heart of Arabia.

ARABIA (in part)

H.S.-W. Hugh Seton-Watson (d. 1984). Professor of Russian History, University of London, 1951–83. Author of The Russian Empire, 1801–1917.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

YUGOSLAVIA (in part)

H.S.Y. Hatten Schuyler Yoder, Jr. Director and Petrologist, Geophysical Laboratory, Carnegie Institution of Washington, D.C. Investigator of mineral and rock properties through experimental studies.

MINERALS AND ROCKS (in part)

H.T. Holger Thesleff. Professor of Greek, University of Helsinki. Author of An Introduction to the Pythagorean Writings of the Hellenistic Period.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.Ta. Hugh Tait. Deputy Keeper, Department of Medieval and Later Antiquities, British Museum, London. Author of Porcelain and others.

DECORATIVE ARTS AND FURNISHINGS (in part)

H.T.C. Hiden T. Cox. Professor of Biology, California State University, Long Beach.

ANGIOSPERMS (in part)

H.T.D. Harry T. Dickinson. Professor of History, University of Edinburgh. Author of Bolingbroke and others.

BOLINGBROKE, HENRY SAINT JOHN, 1ST VISCOUNT (Micropædia)

H.T.F. Harold T. Friermood. Chairman, Education Council, United

States Olympic Committee. Editor of Handball: Official, Unified-Playing Rules; When Volleyball Began.

HANDBALL (Micropædia)
VOLLEYBALL (Micropædia)

H.Th. Helmut Thielicke (d. 1986). Professor of Systematic Theology, University of Hamburg, 1954–74. Author of Theological Ethics and others.

THEOLOGY

H.T.M. Haydn T. Mason. Professor of French Language and Literature, University of Bristol, England. Author of French Writers and their Society 1715–1800 and others.

FRENCH LITERATURE (in part)

H.T.P. Hugh T. Patrick. Professor of Far Eastern Economics, Yale University. Author of Monetary Policy and Central Banking in Contemporary Japan.

MARKETS (in part)

H.U. Homer Ulrich (d. 1987). Professor and Head, Department of Music, University of Maryland, College Park, 1953–72. Editor, American Music Teacher, 1973–87. Author of Chamber Music and others.

MUSICAL FORMS AND GENRES (in part)

H.-U.H. Hanns-Ulrich Haedeke. Director, German Sword Museum, Solingen, West Germany. Author of Metalwork and others.

DECORATIVE ARTS AND FURNISHINGS (in part)

Hu.M. Hugh Sinclair Morrison (d. 1978). Leon E. Williams Professor of Art, Dartmouth College, Hanover, New Hampshire, 1963–69. Author of Early American Architecture; Louis Sullivan.

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

Hu.S. Hudson Strode (d. 1976). Professor of English, University of Alabama, Tuscaloosa, 1924–63. Author of Jefferson Davis and others.

DAVIS, JEFFERSON (Micropædia)

H.U.S. Harald Ulrik Sverdrup (d. 1957). Director, Norwegian Polar Research Institute, Oslo, 1948–57. Director, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1936–48. Author of Oceanography for Meteorologists and others.

NANSEN, FRIDTJOF (Micropædia)
OCEANS (in part)

Hu.Wa. Hugh Wakefield (d. 1984). Keeper, Department of Circulation, Victoria and Albert Museum, London, 1960–75. Author of Nineteenth Century British Glass; Victorian Pottery.

DECORATIVE ARTS AND FURNISHINGS (in part)

H.V. Hans Volkmann (deceased). Professor of Ancient History, University of Cologne.

ANTIGONUS I MONOPHTHALMUS (Micropædia)

ANTIGONUS II GONATAS (Micropædia)
ANTIOCHUS III (Micropædia)

ANTIOCHUS IV EPIPHANES
(Micropædia)

H. van W. H. van Werveke (d. 1974).
*Professor of the History of Belgium,
State University of Ghent.*

ARTEVELDE, JACOB VAN
(Micropædia)

H.v.J. Helmut von Jan. *Former
Director of the Archives and Library,
Hildesheim, West Germany.
Extraordinary Member, Palatinate
Society for the Promotion of Sciences.
Second President, Union for the Church
History of the Palatinate.*
GERMANY (in part)

H.V.L. Harold V. Livermore. *Former
Professor of Spanish and Portuguese,
University of British Columbia,
Vancouver. Author of A History of
Portugal and others.*

ALBUQUERQUE, AFONSO DE, THE GREAT
(Micropædia)

COVILHÃ, PÊRO DA (Micropædia)

DIAS, BARTOLOMEU (Micropædia)

JOHN I (PORTUGAL) (Micropædia)

JOHN II (PORTUGAL) (Micropædia)

MANUEL I (PORTUGAL) (Micropædia)
PORTUGAL (in part)

H.Wa. Hao Wang. *Professor of
Mathematical Logic, The Rockefeller
University, New York City. Author of A
Survey of Mathematical Logic.*
LOGIC, THE HISTORY AND KINDS
OF (in part)

H.W.B. Hendrik W. Bode (d. 1982).
*Gordon McKay Professor of Systems
Engineering, Harvard University, 1967–
74. Author of Network Analysis and
Feedback Amplifier Design.*

INDUSTRIAL ENGINEERING AND
PRODUCTION MANAGEMENT (in part)

H.W.Br. Harold Whitman Bradley.
*Emeritus Professor of History,
Vanderbilt University, Nashville,
Tennessee. Member, Tennessee House of
Representatives, 1964–72. Author of The
United States, 1492–1877 and others.*

JACKSON, ANDREW (in part)
(Micropædia)

UNITED STATES OF AMERICA (in part)

H.We. Herbert Weinstock (d. 1971).
*Consulting Editor, Alfred A. Knopf, Inc.,
New York City, 1963–71; Executive
Editor, 1943–59. Author of The Opera;
Music as an Art; and many biographies
of composers.*

MUSICAL FORMS AND GENRES
(in part)

H.W.F. Hubert William Frings.
*David Ross Boyd Professor Emeritus
of Zoology, University of Oklahoma,
Norman. Coauthor of Animal
Communication.*

SENSORY RECEPTION (in part)

H.W.F.S. Henry W.F. Saggs. *Emeritus
Professor of Semitic Languages,
University College, Cardiff, University
of Wales. Author of The Greatness That
Was Babylon and others.*

BABYLON (Micropædia)

NEBUCHADREZZAR II (Micropædia)

SENNACHERIB (Micropædia)

H.W.G. Herman W. Goult (d. 1977).
*Editor, Cyprus Mail, Nicosia. Cyprus
correspondent, The Times (London).*
CYPRUS (in part)

H.W.H. H.W. Herbert. *Consulting
Economist, Economic Services, Brisbane,
Australia.*

AUSTRALIA (in part)

H.Wi. Hermann Wiesflecker. *Professor
of Austrian History, University of
Graz, Austria. Author of Maximilian I,
Österreich, das Reich und Europa an der
Wende zur Neuzeit (vol. 1–3) and others.*

MAXIMILIAN I (GERMANY/HOLY ROMAN
EMPIRE) (Micropædia)

H.W.J. H.W. Janson (d. 1982).
*Professor of Fine Arts, Washington
Square College of Arts and Science, New
York University, New York City, 1949–
79. Author of The Sculpture
of Donatello; History of Art.*

DONATELLO (in part) (Micropædia)

H.W.L. Herbert W. Levi. *Agassiz
Professor of Zoology; Curator of
Arachnology, Museum of Comparative
Zoology, Harvard University. Coauthor
of A Guide to Spiders and Their Kin;
cotranslator and coeditor of Invertebrate
Zoology by A. Kaestner.*

ARACHNIDS (in part)

H.W.M. Horace Winchell Magoun.
*Emeritus Professor of Anatomy,
University of California, Los Angeles.
Author of The Waking Brain and others.*
NERVES AND NERVOUS SYSTEMS
(in part)

H.W.P. Herbert William Parke (d.
1986). *Professor of Ancient History,
Trinity College, University of Dublin,
1934–73. Author of Greek Mercenary
Soldiers.*

EPAMINONDAS (Micropædia)

H.W.W. Harold W. Wardman.
*Professor of French Studies, University
of Lancaster, England. Author of Ernest
Renan: A Critical Biography; Renan
Historien Philosophe.*

RENAN, ERNEST (Micropædia)

Hy.K. Hyman Kaufman. *Professor
of Mathematics, McGill University,
Montreal, 1952–80. Coauthor of Table of
Laplace Transforms.*

ANALYSIS (IN MATHEMATICS) (in part)

H.Z. Hans Zeisel. *Emeritus Professor
of Law and Sociology, University of
Chicago. Coauthor of The American
Jury.*

JUDICIAL AND ARBITRATIONAL
SYSTEMS (in part)

H.Z.D. Haim Zalman Dimitrovsky.
*Lieberman Professor of Talmudic
Exegesis, Jewish Theological Seminary
of America, New York City. Editor and
translator of Bava metzia.*

JUDAISM (in part)

I.A. Isaac Asimov. *Science writer.
Professor of Biochemistry, Boston
University. Author of Asimov's
Biographical Encyclopedia of Science
and Technology and many others.*
MICHELSON, A.A. (Micropædia)

I.A.A.-L. Ibrahim A. Abu-Lughod.
*Professor of Political Science,
Northwestern University, Evanston,
Illinois. Author of Arab Rediscovery of
Europe: A Study in Cultural Encounters.*
IRAQ (in part)

I.A.Y. Ivan Alekseyevich Yerofeyev.
*Head Geography Editor, Prosveshcheniye
(educational publishers), Moscow. Author
of Southwestern Economic Region;
coauthor of Kiev.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

I.B. Ivan Barnes. *Research Geochemist,
Water Resources Division, Geological
Survey, U.S. Department of the Interior.
An authority on the geochemistry of
freshwaters.*

HYDROSPHERE, THE (in part)

I.Be. Ian D. Bent. *Professor of
Music, University of Nottingham,
England. Author of numerous articles
in musicological journals; Text Editor
of The New Grove Dictionary of Music
and Musicians, 6th ed.*

MUSIC, THE ART OF (in part)

I.Bo. Ira Bornstein. *Nuclear Engineer,
Office of the Director, Argonne National
Laboratory, Illinois.*

ENGINEERING (in part)

I.Bt. Irving Brant (d. 1976). *Member,
Advisory Board, James Madison Papers,
University of Chicago. Council Member,
Institute of Early American History
and Culture, 1959–62. Author of James
Madison (6 vol.) and others.*

MADISON, JAMES (Micropædia)

**I.C.B. The Rev. Ignatius Charles
Brady, O.F.M.** *Former Director of
the theological section, College of St.
Bonaventura, Grottaferrata, Italy.
Coeditor and cotranslator of Francis and
Clare: The Complete Works.*

FRANCIS OF ASSISI, SAINT
(Micropædia)

I.C.C. Ian C. Clingan. *Former Engineer
in Chief, Trinity House Lighthouse
Service, London.*

PUBLIC WORKS (in part)

I.C.Cn. Ivor Cecil Coffin. *Regional
Economist, Economics Department,
Lloyds Bank Group, London.*

URUGUAY (in part)

I.C.L. Iñigo Caverio Lataillade.
*Minister of Culture, Government of
Spain, 1980–81.*
SPAIN (in part)

I.D.E. Ian David Edge. *Lecturer in
Law, School of Oriental and African
Studies, University of London.*
CRIME AND PUNISHMENT (in part)

I.D'O.E. Sir Ivo D'Oyly Elliott (d.
1961). *Indian Civil Service, 1906–32.*
TURENNE, HENRI DE LA TOUR
D'AUVERGNE, VICOMTE DE
(Micropædia)

I.E. Specialists, *Institute of Economics,
University of Havana.*
HAVANA (in part)
WEST INDIES, THE (in part)

I.F.B. Ivor F. Burton. Professor of Social Policy, Bedford College, University of London. Author of *The Captain-General: The Career of John Churchill, Duke of Marlborough, from 1702–1711 and others.*

MARLBOROUGH, JOHN CHURCHILL, 1ST DUKE OF (Micropædia)

PIUS IX (in part) (Micropædia)

PIUS V, SAINT (in part) (Micropædia)

I.F.G.B. Ian F.G. Baxter. Professor of Law, University of Toronto; former Director of Family Law Study.

FAMILY LAW

I.G. Isabella Gordon. Head, Crustacea Section, British Museum (Natural History), London, 1928–66. Coeditor of *Crustaceana*.

CRUSTACEANS (in part)

I.G.S. Irwin G. Sarason. Professor of Psychology, University of Washington, Seattle. Author of *Personality: An Objective Approach*.

PERSONALITY (in part)

I.G.W. Ivor G. Wilks. Melville J. Herskovits Professor of African Studies, Northwestern University, Evanston, Illinois.

NKRUMAH, KWAME (Micropædia)

I.H. Igor Hájek. Lecturer in Czechoslovak Studies, University of Glasgow. Coauthor and coeditor of *Dictionary of Czech Writers, 1948–1979*. *CZECHOSLOVAK LITERATURE* (in part)

I.Hr. Ivan Hrbek. Member, Oriental Institute, Czechoslovak Academy of Sciences, Prague. Author of *"The Chronology of Ibn Battute's Travels"* in *Archiv Orientalni*.

IBN BAṬṬŪṬAH (Micropædia)

I.Hy.B. Isabelle Hyman. Professor of Fine Arts, Washington Square and University College of Arts and Science, New York University, New York City. *BRUNELLESCHI, FILIPPO* (in part) (Micropædia)

I.J. Ivar K. Johansson. Emeritus Professor of Animal Breeding, Agricultural College of Sweden, Uppsala. Author of *Genetic Aspects of Dairy Cattle Breeding*; coauthor of *Genetics and Animal Breeding*.

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

I.J.G. Ignace J. Gelb (d. 1985). Frank P. Hixon Distinguished Service Professor, Oriental Institute and Departments of Linguistics and of Near Eastern Languages and Civilizations, University of Chicago, 1965–79. Author of *A Study of Writing and many others*. *LANGUAGES OF THE WORLD* (in part) *LINGUISTICS* (in part)

I.J.S. Irving J. Stolberg. Speaker of the House of Representatives of Connecticut. Former Assistant Professor of Geography, Southern Connecticut State College, New Haven.

UNITED STATES OF AMERICA (in part)

I.K. Irving Kaplansky. Director, Mathematical Sciences Research

Institute, Berkeley, California. Author of *Commutative Rings*.

GALOIS, ÉVARISTE (Micropædia)

HILBERT, DAVID (Micropædia)

NUMBER THEORY (in part)

I.K.F. Ian Keith Ferguson. Government Botanist and Principal Scientific Officer, Royal Botanic Gardens, Kew, England. Assistant Editor of *Flora Europaea* (vol. 2–3).

ANGIOSPERMS (in part)

I.Ko. Igor Kopytoff. Professor of Anthropology, University of Pennsylvania, Philadelphia. Author of various articles on African anthropology. *CENTRAL AFRICA* (in part)

I.K.P. Ismail K. Poonawala. Professor of Arabic and Islāmic Studies, University of California, Los Angeles.

‘ALĪ (Micropædia)

I.L.W. Ira L. Wiggins. Emeritus Professor of Biology, Stanford University, California. Research Associate, Department of Botany, California Academy of Sciences, San Francisco.

GYMNOSPERMS (in part)

I.M.D. Igor Mikhailovich Diakonoff. Head, Near Eastern Department and Ancient Oriental Languages Group, Institute of Oriental Studies, Academy of Sciences of the U.S.S.R., Leningrad. Author of *Semito-Hamitic Languages*.

LANGUAGES OF THE WORLD (in part)

I.M.G. Ivan M. Goodbody. Professor of Zoology, University of the West Indies, Mona, Kingston, Jamaica.

CHORDATES (in part)

I.M.J. Ingrid Margareta Jonsson. Staff Research Editor, *Encyclopædia Britannica*, Chicago, 1969–73.

OCEANS (in part)

I.M.L. I.M. Lewis. Professor and Chairman, Department of Anthropology, London School of Economics and Political Science, University of London. Author of *A Pastoral Democracy*; *A Modern History of Somalia from Nation to State*.

EASTERN AFRICA (in part)

I.M.P. do A. Ilídio Melo Peres do Amaral. Rector and Professor of Geography, University of Lisbon. Author of numerous publications on the geography of Portugal and its former colonies.

PORTUGAL (in part)

I.N.S. Ian Naismith Sneddon. Simson Professor of Mathematics, University of Glasgow. Author of *Elements of Partial Differential Equations and others*.

ANALYSIS (IN MATHEMATICS) (in part)

I.P. Indra Pal. Professor and Head, Department of Geography, University of Rājasthān, Jaipur, India. Coauthor of *World in Its Natural Regions*.

INDIA (in part)

I.P.G. Innokentii Petrovich Gerasimov (d. 1985). Director, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow. An authority on

geomorphology and soil science.

GEOMORPHIC PROCESSES (in part)

I.P.H. Ian P. Howard. Professor of Psychology, York University, Toronto. Coauthor of *Human Spatial Orientation*. *PERCEPTION, HUMAN* (in part)

I.P.S. Ivan Peter Shaw. Former Fellow and Secretary, King's College, University of London. Author of *Nationality and the Western Church Before the Reformation*.

EDWARD THE BLACK PRINCE (Micropædia)

I.R.C. Ian R. Christie. Astor Professor of British History, University College, University of London. Author of *Wilkes, Wyvill and Reform and others*.

WILKES, JOHN (Micropædia)

I.Re. Irving Rouse. Charles J. MacCurdy Professor Emeritus of Anthropology, Yale University.

WEST INDIES, THE (in part)

Ir.W. Irving Wallace. Novelist and biographer. Author of *The Fabulous Showman: The Life and Times of P.T. Barnum*; *The Man*; and many others.

BARNUM, P.T. (Micropædia)

I.S. Isaac Schapera. Emeritus Professor of Anthropology, London School of Economics and Political Science, University of London. Author of *The Tswana and others*.

SOUTHERN AFRICA (in part)

I.S.C. Ivan Stoddard Coggeshall. Fellow, Institute of Electrical and Electronics Engineers. Assistant Vice President, Western Union Telegraph Company, New York City, 1959; Director of International Communications, 1951–58.

TELECOMMUNICATIONS SYSTEMS (in part)

I.S. de S. Isbelia M. Sequera de Segnini. Director, Institute of Geography; Coordinator of Graduate Studies in Geography, Central University of Venezuela, Caracas. Author of *Dinámica de la agricultura and others*. *VENEZUELA* (in part)

I.S.S. Irvin S. Snyder. Professor and Chairman, Department of Microbiology, West Virginia University, Morgantown. Coauthor of *Bacteria and Human Disease*.

DRUGS AND DRUG ACTION (in part)

I.Su. Ilmari Sundblad. Foreign Editor, Finnish News Agency (STT-FNB), Helsinki.

FINLAND (in part)

I.T. Isadore Twersky. Littauer Professor of Hebrew Literature and Philosophy, Harvard University. Author of *Rabad of Posquières and others*.

RASHI (Micropædia)

I.T.R. The Rt. Rev. Ian Thomas Ramsey (d. 1972). Lord Bishop of Durham, England, 1966–72. Nolloth Professor of the Philosophy of Christian Religion, University of Oxford, 1951–66. Author of *Religious Language*; *Christian Discourse*.

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

I.V.Ko. Innokenty Varfolomeevich Kozlov. Deputy Principal Editor, Geography, Mysl Publishing House, Moscow. Author of Sovetskiye subtropiki.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

I.V.N. Israel Vladimirovich Nestyev. Chief Scientist, Research Institute of History of Arts, Moscow. Author of Prokofiev.

PROKOFIEV, SERGEY (in part)
(Micropædia)

I.V.P. Igor Vladimirovich Popov. Senior Scientist, Leningrad Hydrological Institute. Author of Basic Methods for the Study of Riverbed Processes.

ASIA (in part)

I.W. Immanuel Wallerstein. Distinguished Professor of Sociology, State University of New York at Binghamton. Author of Africa: The Politics of Independence.

LUMUMBA, PATRICE (in part)
(Micropædia)

I.W.H. Inez Whitaker Hunt (d. 1983). Lecturer and free-lance writer. Teacher of creative writing, University of Colorado extension, Colorado Springs, 1963–66. Coauthor of Lightning in His Hand: The Life Story of Nikola Tesla.

TESLA, NIKOLA (Micropædia)

I.Z. Imre Zoltán, M.D. Professor of Gynecology and Obstetrics, Semmelweis Medical University, Budapest, Hungary. Coauthor of Semmelweis élete és munkássága.

SEMMELWEIS, IGNAZ PHILIPP
(Micropædia)

J.A.A. J.A. Andrup. Author of Latvian Literature and others.

LATVIAN LITERATURE
(Micropædia)

J.A.B. James Alan Bassham. Senior Scientist, Chemical Biodynamics Division, Lawrence Berkeley Laboratory, University of California, Berkeley. Coauthor of Photosynthesis of Carbon Compounds; The Path of Carbon in Photosynthesis.

PHOTOSYNTHESIS

J.A.Ba. John A. Bailey. President, Transportation Systems Associates, Philadelphia. Director, Transportation Center, Northwestern University, Evanston, Illinois, 1967–75.

TRANSPORTATION (in part)

Ja.Be. Jane Bergerol. Free-lance journalist based in Angola.

SOUTHERN AFRICA (in part)

J.A.Bo. John Andrew Boyle (d. 1978). Professor of Persian Studies, Victoria University of Manchester, 1966–78. Editor of and contributor to Cambridge History of Iran, vol. 5.

FERDOWSI (Micropædia)

GHĀZĀN, MAHMŪD (Micropædia)

J.A.B.v.B. J.A.B. van Buitenen (d. 1979). Distinguished Service Professor of Sanskrit and Indic Studies, University

of Chicago, 1974–79. Author of Tales of Ancient India.

CALENDAR (in part)

HINDUISM (in part)

RĀMĀNUJA (Micropædia)

SOUTH ASIAN ARTS (in part)

Ja.C. Jan Christensen. Assistant Foreign Editor, Verdens Gang, Oslo. Author of Kort om Stortinget.

NORWAY (in part)

J.A.Ca. Jorge A. Camacho. Free-lance writer. Staff member, British Broadcasting Corporation, 1938–69; Head of Talks and Current Affairs (Radio), 1961–69.

BROADCASTING (in part)

J.A.C.A. John Anthony Charles Ardagh. Free-lance writer and journalist. Author of France in the 1980s.

PARIS (in part)

J.A.C.B. J.A.C. Brown (d. 1984). Professor of Applied Economics, University of Oxford, 1970–84. Coauthor of The Lognormal Distribution.

ECONOMIC THEORY (in part)

J.A.Cr. John Anthony Crook. Professor of Ancient History, University of Cambridge, 1979–84. Author of Law and Life of Rome.

MARCUS AURELIUS (Micropædia)

Ja.D. Janusz Durko. Director, Historical Museum of Warsaw. Editor of Bibliography of Warsaw.

WARSAW (in part)

J.Ad. Jean Adhémar (d. 1987). Curator of Prints, Bibliothèque Nationale, Paris, 1961–87. Editor in Chief, Gazette des Beaux Arts, 1955–87. Author of Honoré Daumier and others.

DAUMIER, HONORÉ (Micropædia)

Ja.F. James E. Fallor. Fellow, Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder.

GRAVITATION (in part)

Ja.F.D. Jane F. Desforges, M.D. Professor of Medicine, Tufts University, Boston.

BLOOD (in part)

Ja.G.M. James Grier Miller, M.D. Adjunct Professor of Psychiatry, University of California, Los Angeles. President, University of Kentucky, Louisville, 1973–80.

PSYCHOLOGY (in part)

J.A.H. John A. Haywood. Reader in Arabic, University of Durham, England, 1967–78. Author of Arabic Lexicography.

FAKHR AD-DĪN AR-RĀZĪ (Micropædia)

JA'FAR IBN MUHAMMAD (Micropædia)

MAS'UDĪ, AL- (Micropædia)

J.A.Ha. John A. Harrison. Emeritus Professor of History, University of Miami, Coral Gables, Florida. Editor, The Journal of Asian Studies, 1969–72. Author of New Light on Early and Medieval Japanese History.

HŌJŌ FAMILY (Micropædia)

Ja.H.B. James H. Bready. Former editorial writer and book columnist, The Sun newspapers, Baltimore. Author of

The Home Team.

UNITED STATES OF AMERICA (in part)

J.A.Ho. James A. Hodges. Professor of History, Wooster College, Wooster, Ohio.

UNITED STATES OF AMERICA (in part)

Ja.H.W. Jack H. Wernick. Manager, Materials Science Division, Central Services Organization for the regional Bell operating companies, Murray Hill, New Jersey.

ENERGY CONVERSION (in part)

Ja.J.P. James J. Parsons. Emeritus Professor of Geography, University of California, Berkeley. Author of Antioqueño Colonization in Western Colombia and others.

COLOMBIA (in part)

Ja.J.S. James Joseph Stilwell. Rear Admiral, U.S. Navy (retired). Labour arbitrator and consulting engineer.

TRANSPORTATION (in part)

Ja.K. Jan Kazimour. President, Federal Statistical Office of Czechoslovakia, Prague, 1969–81.

PRAGUE (in part)

J.A.K. Jerzy A. Kondracki. Emeritus Professor of Physical Geography, University of Warsaw. Author of Geografia fizyczna Polski.

EUROPE (in part)

POLAND (in part)

J.A.Ka. John Anderson Kay. Director, Centre for Business Strategy; Professor of Industrial Policy, London Business School. Coauthor of The British Tax System and others.

GOVERNMENT FINANCE (in part)

J.A.Ke. The Rev. John Arthur Kemp, S.J. (d. 1963). Professor of Medieval History, Loyola University, Chicago, 1959–63. Author of History of Europe to 1500.

ANSELM OF CANTERBURY, SAINT
(Micropædia)

Ja.Kn. Jan Knappert. Lecturer in Bantu, School of Oriental and African Studies, University of London. Author of Myths and Legends of the Congo and many others.

AFRICAN ARTS (in part)

Ja.L. James Laver (d. 1975). Keeper, Departments of Engraving, Illustration and Design, and of Paintings, Victoria and Albert Museum, London, 1938–59. Author of A Concise History of Costume.

DRESS AND ADORNMENT (in part)

J.Al. John Allan (d. 1955). Keeper, Department of Coins and Medals, British Museum, London, 1931–49.

COINS AND COINAGE (in part)

J.A.L. Joseph Albert Lauwerys (d. 1981). Director, Atlantic Institute of Education, Halifax, Nova Scotia, 1970–76. Professor of Comparative Education, University of London, 1947–70. Coeditor, World Year Book of Education, 1947–70.

EDUCATION, HISTORY OF
(in part)

Ja.La. Janko Lavrin (d. 1986).

Professor of Russian Literature, University of Nottingham, England, 1923–53. Author of Gogol; Russian Writers; and others.

GOGOL, NIKOLAY (Micropædia)

J.A.Le. James A. Lee (d. 1981).

Consultant, Brick Institute of America, Atlanta, Georgia. Author of articles in American Ceramic Journal and other journals.

INDUSTRIAL GLASS AND CERAMICS
(in part)

Ja.L.S. Jason Lewis Saunders.

Professor of Philosophy, City College, City University of New York. Author of Early Stoic Philosophy.

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN
(in part)

Ja.M. Jacques Millot (d. 1980).

Professor, National Museum of Natural History, Paris, 1943–67. Researcher on the anatomy of coelacanths and their fossil relatives.

FISHES (in part)

J.A.Ma. J. Alan Mackie. *Free-lance writer.*

ALEXANDRIA (in part)

J.A.McG. Joseph A. McGeough.

Regius Professor of Engineering; Head, Department of Mechanical Engineering, University of Edinburgh. Author of Principles of Electrochemical Machining.

TOOLS (in part)

J.A.M.K.I. Jozef A.M.K. IJsewijn.

Professor of Neo-Latin, Catholic University of Louvain, Belgium. Editor, Humanistica Lovaniensia.

GROTIUS, HUGO (Micropædia)

J.A.Mn. J. Alden Mason (d. 1967).

Curator, American Section, University Museum, University of Pennsylvania, 1926–55.

PERU (in part)

J.A.Mo. John A. Monick (d. 1981).

Research Associate, Colgate-Palmolive Company, Piscataway, New Jersey. Author of Alcohols: Their Chemistry, Properties and Manufacture.

CHEMICAL COMPOUNDS (in part)

J.A.Mu. John A. Munroe. *H. Rodney Sharp Professor Emeritus of History,*

University of Delaware, Newark. Editor, Delaware History. Author of History of Delaware and others.

UNITED STATES OF AMERICA (in part)

J.A.O. Juan A. Oddone. *Professor of History, Autonomous Metropolitan University, Mexico City. Author of La formación del Uruguay moderno.*

URUGUAY (in part)

J.A.P. James A. Peters (d. 1972).

Curator and Supervisor, Division of Reptiles and Amphibians, National Museum of Natural History, Smithsonian Institution, Washington, D.C., 1966–72. Specialist on the taxonomy of snakes. Author of Dictionary of Herpetology.

REPTILES (in part)

J.A.R. James Arthur Ramsay (d.

1988). Professor of Comparative Physiology, University of Cambridge, 1969–76. Joint Editor, Journal of Experimental Biology, 1952–74. Author of Physiological Approach to the Lower Animals.

EXCRETION AND EXCRETORY SYSTEMS
(in part)

Ja.S. Jacques Soustelle. *Professor of*

Social Anthropology, School of Advanced Studies in the Social Sciences, Paris. Author of La Vie quotidienne des Aztèques and others.

PRE-COLUMBIAN CIVILIZATIONS
(in part)

J.A.S. Jorge A. Suárez (d. 1985).

Professor of Amerindian Linguistics and of Contemporary Linguistics, National Autonomous University of Mexico, Mexico City. Coauthor of A Description of Colloquial Guaraní.

LANGUAGES OF THE WORLD (in part)

J.A.S.G. John A.S. Grenville. *Professor of*

Modern History, University of Birmingham, England. Author of Lord Salisbury and Foreign Policy and others.

SALISBURY, ROBERT CECIL, 3RD
MARQUESS OF (Micropædia)

J.A.Sh. Jerome A. Shaffer. *Professor and Head, Department of Philosophy, University of Connecticut, Storrs. Author of Philosophy of Mind.*

MIND, THE PHILOSOPHY OF

J.A.T. John A. Thomas. *Vice President*

for Academic Services; Professor of Pharmacology, University of Texas Health Science Center at San Antonio. Coauthor of Synopsis of Endocrine Pharmacology and others.

DRUGS AND DRUG ACTION (in part)

J.Au. Jeannine Auboyer. *Emeritus*

Curator in Chief, Museum Guimet, Paris. Author of La Vie quotidienne dans l'Inde ancienne.

rites AND CEREMONIES, SACRED
(in part)

Ja.W. Jan Wojnowski. *Senior Editor, Polish Scientific Publishers, Warsaw. Editor, Wielka Encyklopedia Powszechna, Warsaw, 1962–70. Editor of Literatura polska: Przewodnik encyklopedyczny.*

POLISH LITERATURE (in part)

J.A.W. Sir Jack Allan Westrup (d.

1975). Professor of Music, University of Oxford, 1946–71; Fellow of Wadham College, Oxford, 1947–71. Author of Purcell and many others.

MUSICAL INSTRUMENTS (in part)

PURCELL, HENRY (Micropædia)

J.A.Y. Jay A. Young. *Consultant on*

chemical safety and health. Manager, Technical Publications, Manufacturing Chemists Association, Washington, D.C., 1976–80. Hudson Professor of Chemistry, Auburn University, Alabama, 1970–75.

CHEMICAL REACTIONS (in part)

J.B. Jonathan Barnes. *Fellow of Balliol College, University of Oxford. Author of Aristotle; coeditor of Articles on*

Aristotle.

PLATONISM, PLATO AND (in part)

J.Ba. Jacques Barzun. *University*

Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67. Author of Berlioz and the Romantic Century; Darwin, Marx, Wagner; and others.

BERLIOZ, HECTOR (Micropædia)

EUROPE (in part)

FLAUBERT, GUSTAVE (in part)

(Micropædia)

POE, EDGAR ALLAN (in part)

(Micropædia)

J.B.B. John Bernard Beer. *Fellow*

of Peterhouse, Cambridge; Reader in English Literature, University of Cambridge. Author of Coleridge, the Visionary and others.

ENGLISH LITERATURE (in part)

FORSTER, E.M. (Micropædia)

J.-B.Ba. Jean-Bertrand Barrère (d.

1985). Professor of French Literature, University of Cambridge, 1954–82; Fellow of St. John's College, Cambridge. Author of Hugo, l'homme et l'oeuvre and other works on Victor Hugo.

HUGO, VICTOR (in part) (Micropædia)

J.B.Bd. John Brian Bird. *Professor and Chairman, Department of Geography, McGill University, Montreal.*

ARCTIC, THE (in part)

J.B.B.T. John B.B. Trussell. *Chief, Division of History, Pennsylvania Historical and Museum Commission, Harrisburg.*

PHILADELPHIA (in part)

J.B.C. J.B. Condliffe (d. 1981). *Senior Economist, Stanford Research Institute, Menlo Park, California, 1961–67.*

Professor of Economics, University of California, Berkeley, 1940–58. Author of The Commerce of Nations.

UNITED NATIONS (in part)

J.B.Co. Jerome B. Cohen. *Frank*

C. Engelhart Professor of Materials Science and Engineering, Northwestern University, Evanston, Illinois. Author of Diffraction Methods in Materials Science.

MATTER (in part)

J.Be. Jeremy Bernstein. *Professor of*

Physics, Stevens Institute of Technology, Hoboken, New Jersey. Author of Elementary Particles and Their Currents.

SCHRÖDINGER, ERWIN (Micropædia)

YANG, CHEN NING (Micropædia)

J.B.F. John Bailey Fernald (d. 1985).

Theatre director. Principal, Royal Academy of Dramatic Art, London, 1955–65. Professor of Dramatic Art, Oakland University, Rochester, Michigan, 1966–70. Author of Sense of Direction.

THEATRE, THE ART OF THE (in part)

J.B.-G. Jacqueline Beaujeu-Garnier.

Professor of Geography, University of Paris I; Director, Centre for Space Analysis Research. Author of Géographie de la population and others.

FRANCE (in part)

J.B.GI. Sir John Bagot Glubb (d. 1986). Lieutenant General; Chief of General Staff, The Arab Legion, Amman, Jordan, 1939–56. Author of *War in the Desert and others*.

ARABIA (in part)

IBN SA'UD (Micropædia)

MECCA AND MEDINA (in part)

J.B.H. John B. Heywood. Professor of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge. Coauthor of *Open-Cycle MHD Power Generation*.

ENERGY CONVERSION (in part)

J.B.He. James B. Hendrickson. Professor of Chemistry, Brandeis University, Waltham, Massachusetts. Author of *The Molecules of Nature*; coauthor of *Organic Chemistry*. WOODWARD, R.B. (Micropædia)

J.B.Ho. Joseph Bixby Hoyt. Emeritus Professor of Geography, Southern Connecticut State College, New Haven. Author of *The Connecticut Story*.

UNITED STATES OF AMERICA (in part)

J.B.I. John B. Irwin. Former Associate Professor of Astronomy, Kean College of New Jersey, Union.

MEASUREMENT AND OBSERVATION, PRINCIPLES, METHODS, AND INSTRUMENTS OF (in part)

J.B.-J. John Buettner-Janusch. Former Professor and Chairman, Department of Anthropology, New York University, New York City. Author of *Origins of Man*.

CENTRAL AMERICA (in part)

EVOLUTION, HUMAN (in part)

J.B.M. John Barron Mays (d. 1987). Eleanor Rathbone Professor of Sociology, University of Liverpool, 1965–80. Author of *The Young Pretenders: Teenage Culture in Contemporary Society and others*.

SOCIAL DIFFERENTIATION (in part)

J.B.Mi. Jean Brown Mitchell. Fellow, Newnham College, Cambridge, 1934–68; Lecturer in Geography, University of Cambridge, 1945–68. Author of *Historical Geography*.

EUROPEAN OVERSEAS EXPLORATION AND EMPIRES, THE HISTORY OF (in part)

J.B.P. J. Bruce Pluckhahn. Curator, National Bowling Hall of Fame and Museum, St. Louis, Missouri. Coauthor of *Pins and Needlers*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

J.B.Pa. James Bayard Parsons (d. 1985). Professor of Chemistry, University of Chicago, 1958–61. Coauthor of *The Study of the Physical World*.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.B.R. Jean B. Richard. Honorary Dean, Faculty of Letters and Human Sciences, University of Dijon, France. Author of *Histoire de la Bourgogne*. FRANCE (in part)

J.B.Ra. John Bell Rae. Emeritus Professor of the History of Technology,

Harvey Mudd College, Claremont, California. Author of *American Automobile Manufacturers: The First Forty Years and others*.

INDUSTRIES, MANUFACTURING (in part)

J.Bru. Jean Bruhat. Professor, Institute of Political Science of Paris. Instructor, University of Paris VIII. Author of *Les Journées de février 1848 and others*.

BLANQUI, AUGUSTE (Micropædia)

J.B.Sm. J(en)kyn Beverley Smith. Reader in Welsh History, University College of Wales, Aberystwyth, University of Wales.

UNITED KINGDOM (in part)

J.B.Sp. J. Brookes Spencer. Associate Professor of the History of Science, Oregon State University, Corvallis. Editor of *The Collected Works of Niels Bohr*.

PHYSICAL SCIENCES, THE (in part)

J.Bu. Joseph Buttinger. Free-lance writer. Author of *Vietnam: A Dragon Embattled and others*.

SOUTHEAST ASIA, MAINLAND (in part)

J.B.Wi. John Bernard Wilkinson. Former Head, Unilever Research Laboratory, Isleworth, England. Editor of *Harry's Cosmeticsology*.

DRESS AND ADORNMENT (in part)

J.C. Jozef Cohen. Professor of Psychology, University of Illinois, Urbana. Author of *Eyewitness Series in Psychology*.

PSYCHOLOGY (in part)

J.C.A. John C. Ayres (d. 1982). D.W. Brooks Distinguished Professor of Food Science, University of Georgia, Athens. Coeditor of *Chemical and Biological Hazards in Foods and others*.

FOOD PROCESSING (in part)

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MAMMALS (in part)

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NIEBUHR, REINHOLD (Micropædia)

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UNION OF SOVIET SOCIALIST REPUBLICS (in part)

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GAMBETTA, LÉON (Micropædia)

J.C. de G.-J. John Coleman de Graft-Johnson (d. 1977). Editor, *Economic*

Bulletin of Ghana. Research Associate Professor of Economics, University of Ghana. Author of African Glory: The Story of Vanished Negro Civilizations. MUSA (Micropædia)

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'UMAR TALL (Micropædia)

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PROTESTANTISM (in part)

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ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

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MUSIC, THE ART OF (in part)

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JOHN (ENGLAND) (Micropædia)

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MATTER (in part)

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MEDICINE (in part)

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SOUTHERN AFRICA (in part)

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NERO (Micropædia)

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CAMUS, ALBERT (Micropædia)

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VICO, GIAMBATTISTA (Micropædia)

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HOPKINS, GERARD MANLEY (Micropædia)

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WAR, THE TECHNOLOGY OF (in part)

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BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)
DAVID (ISRAEL) (Micropædia)

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PROTESTANTISM (in part)

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FISHES (in part)

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ARABIA (in part)

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BULGARIA (in part)

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UNITED KINGDOM (in part)

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SPERANSKY, MIKHAIL MIKHAYLOVICH, GRAF (Micropædia)

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THOMISM, THOMAS AQUINAS AND (in part)

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CENTRAL AMERICA (in part)

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SOTO, HERNANDO DE (Micropædia)

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rites and ceremonies, sacred (in part)

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EAST INDIES, THE (in part)

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DOCTRINES AND DOGMAS, RELIGIOUS (in part)

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EAKINS, THOMAS (Micropædia)
HOMER, WINSLOW (Micropædia)

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ERASMUS

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LOS ANGELES

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CHRISTIAN IV (DENMARK)
(Micropædia)

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ROTHSCHILD FAMILY (Micropædia)
TURGOT, ANNE-ROBERT-JACQUES,
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POPE, ALEXANDER (in part)
(Micropædia)

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DIOCLETIAN (Micropædia)

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ANGIOSPERMS (in part)

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YÜAN SHIH-K'AI (Micropædia)

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PYM, JOHN (Micropædia)

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WESTERN AFRICA (in part)

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TOUSSAINT-LOUVETURE (Micropædia)

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AFRICA (in part)

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SENSORY RECEPTION (in part)

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(in part)

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PENN, WILLIAM (Micropædia)

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EISENSTEIN, SERGEY (Micropædia)
RAY, SATYAJIT (in part) (Micropædia)

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ECHINODERMS (in part)

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SOUTHEAST ASIAN ARTS (in part)

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GUIANAS, THE (in part)

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BELGIAN LITERATURE (in part)

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MOLLUSKS (in part)

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ARABIA (in part)

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AFRICA (in part)

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BRANCUSI, CONSTANTIN (Micropædia)

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COMENIUS, JOHN AMOS (Micropædia)

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CHINA (in part)

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MEMLING, HANS (Micropædia)

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PLINY THE ELDER (Micropædia)

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DIAGNOSIS AND THERAPEUTICS (in part)

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RUSKIN, JOHN (in part) (Micropædia)

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EAST INDIES, THE (in part)

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EUROPE (in part)

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NUTRITION (in part)

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HSIA KUEI (Micropædia)

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CICERO, MARCUS TULLIUS (in part) (Micropædia)

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INDUSTRIES, EXTRACTION AND PROCESSING (in part)

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AFRICA (in part)

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CONSTANTINE THE GREAT (in part)

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EAST INDIES, THE (in part)

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TAYLOR, FREDERICK W. (Micropædia)

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CZECHOSLOVAKIA (in part)

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AFRICA (in part)

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PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

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WAR, THE THEORY AND CONDUCT OF (in part)

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NAPIER, JOHN (Micropædia)

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MUSCLES AND MUSCLE SYSTEMS (in part)

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PUBLIC WORKS (in part)

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INDUSTRIES, CHEMICAL PROCESS (in part)

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GIBBS, J. WILLARD (Micropædia)

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PARACELSUS (Micropædia)

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JOHANAN BEN ZAKKAI (Micropædia)

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OCEANIC ARTS (in part)

J.G.Th. **John Gareth Thomas** (d. 1987). *Registrar, University of Wales, Cardiff. Coauthor of Wales.*
UNITED KINGDOM (in part)

J.G.W. **J. Garth Watson.** *Secretary, Institution of Civil Engineers, London, 1967-79.*
ENGINEERING (in part)

J.G.W. de V. **Johan G.W. de Vries.** *President, Tropimex International, Inc., Miami. Former Consul General of Suriname, New York City.*
GUIANAS, THE (in part)

J.H. **Jakob Houtgast** (d. 1981). *Associate Professor of Astronomy, Astronomical Institute, Utrecht University, The Netherlands. Coauthor of Photometric Atlas of the Solar Spectrum.*
ECLIPSE, OCCULTATION, AND TRANSIT (in part)

J.Ha. **Jack Halpern.** *Louis Block Distinguished Service Professor of Chemistry, University of Chicago. Author of papers on transition metal ions and complexes.*
CHEMICAL COMPOUNDS (in part)

J.H.A. **John H. Adler** (d. 1980). *Director, Programming and Budgeting Department, International Bank for Reconstruction and Development, Washington, D.C., 1968-76. Coauthor of Public Finance in a Developing Country.*
UNITED NATIONS (in part)

J.-H.B. **Jacques-Henry Bornecque.** *Professor of Modern and Contemporary French Literature, University of Paris XIII. Author of Les Années d'apprentissage d'Alphonse Daudet; Verlaine par lui-même.*
DAUDET, ALPHONSE (Micropædia)

J.H.Be. **John Herbert Beynon.** *Royal Society Research Professor, University College of Swansea, University of Wales. Author of Mass Spectrometry and Its Application to Organic Chemistry.*
ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

J.H.Br. **John H. Bryant, M.D.** *Special Assistant to the Assistant Secretary for Health, U.S. Department of Health and Human Services, Bethesda, Maryland. Author of Health and the Developing World.*
MEDICINE (in part)

J.He. **John Herivel.** *Former Reader in the History and Philosophy of Science, Queen's University of Belfast, Northern Ireland. Author of The Background to Newton's Principia.*
HUYGENS, CHRISTIAAN (Micropædia)

J.H.-H. **John Heslop-Harrison.** *Royal Society Research Professor, Welsh*

Plant-Breeding Station, University College of Wales, Aberystwyth, University of Wales. Author of New Concepts in Flowering Plant Taxonomy and numerous papers on development in plants.

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

J.H.Hi. **John Hugh Hill.** *Emeritus Professor of Medieval History, University of Houston, Texas. Coauthor of Raymond IV, Count of Toulouse and others.*

BOHEMOND I (in part) (Micropædia)

J.H.Hy. **John H. Humphrey, M.D.** (d. 1987). *Professor of Immunology, Royal Postgraduate Medical School, University of London, 1976-81. Coeditor of Advances in Immunology.*
IMMUNITY

J.Hi. **John Hick.** *Danforth Professor of the Philosophy of Religion, Claremont Graduate School, California. Author of Death and Eternal Life and others.*
CHRISTIANITY (in part)

J.H.J. **John Holmes Jellett** (d. 1971). *Civil engineer. Director, Anglo Dutch Dredging Company Ltd., Beaconsfield, England. Docks engineer, Southampton, England, 1946-66.*
PUBLIC WORKS (in part)

J.H.K. **Joseph Henry Keenan** (d. 1977). *Professor of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, 1939-66. Author of Thermodynamics; coauthor of Principles of General Thermodynamics.*
THERMODYNAMICS, PRINCIPLES OF (in part)

J.H.L. **J.H. Larson.** *Senior Sculpture Conservator, Victoria and Albert Museum, London. Author of Guan Yin: A Masterpiece Revealed.*
ART CONSERVATION AND RESTORATION (in part)

J.Hm. **James Holderbaum.** *Professor of Art, Smith College, Northampton, Massachusetts.*
SCULPTURE, THE HISTORY OF WESTERN (in part)

J.H.McM.S. **John Hearsey McMillan Salmon.** *Marjorie Walter Goodhart Professor of History, Bryn Mawr College, Pennsylvania. Author of The French Religious Wars in English Political Thought and others.*
EUROPE (in part)

J.Ho. **James Houston.** *Chancellor, Regent College, Vancouver, British Columbia. Author of The Western Mediterranean World.*
SPAIN (in part)

J.H.Py. **John Horace Parry** (d. 1982). *Gardiner Professor of Oceanic History and Affairs, Harvard University, 1965-82. Author of A Short History of the West Indies and others.*
WEST INDIES, THE (in part)

J.H.R. **John H. Rizley.** *Consulting engineer. Former Manager, Materials Research and Process Engineering,*

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INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.H.Ro. Jonathan H. Robbins, M.D. *Director, Cardiology Section, Leominster Hospital, Massachusetts. DISEASE (in part)*

J.H.Sh. J.H. Shennan. *Professor of European History, University of Lancaster, England. Author of Government and Society in France, 1461-1661 and others. FRANCE (in part)*

J.H.S.L. Brigadier Joseph Harold Spence Lacey. *Former Secretary, Institution of Royal Engineers, Chatham, England; former Editor, Royal Engineers Journal.*

WAR, THE THEORY AND CONDUCT OF (in part)

J.H.Sm. The Rev. James Hutchinson Smylie. *Professor of American Church History, Union Theological Seminary, Richmond, Virginia. Editor, Journal of Presbyterian History.*

ADVENTIST (Micropædia)

J.H.-s.S. The Rev. Joseph Hsing-san Shih. *Professor of Missions and Sinology, Pontifical Gregorian University, Rome, Italy. Contributor to Studia Missionalia.*

RICCI, MATTEO (Micropædia)

J.Hud. Joseph Hudnut (d. 1968). *Professor of Architecture and Dean, Graduate School of Design, Harvard University, 1935-53. Author of Modern Sculpture and others.*

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.H.W. John Humphreys Whitfield. *Serena Professor Emeritus of Italian Language and Literature, University of Birmingham, England. Author of Petrarch and the Renaissance; A Short History of Italian Literature; and others. PETRARCH (in part) (Micropædia) PIRANDELLO, LUIGI (Micropædia)*

J.H.Wa. James Hamilton Ware, Jr. *Professor of Philosophy and Religion; Chairman, Asian Studies Program, Austin College, Sherman, Texas. Author of Chinese Religions. CHUANG-TZU (Micropædia)*

J.H.We. John H. Wellington. *Emeritus Professor of Geography, University of the Witwatersrand, Johannesburg. Author of Southern Africa. AFRICA (in part)*

J.H.Wi. John Hoyt Williams. *Professor of History, Indiana State University, Terre Haute. Author of The Rise and Fall of the Paraguayan Republic, 1800-1870. PARAGUAY (in part)*

J.H.Z. James Herbert Zumberge. *President, University of Southern California, Los Angeles. Author of Elements of Geology and others.*

GEOMORPHIC PROCESSES (in part)

Ji.B. Jillian Becker. *Director, Institute for the Study of Terrorism, London. Author of Hitler's Children: The Story of the Baader-Meinhof Terrorist Gang. CRIME AND PUNISHMENT (in part)*

J.I.D. Jorge I. Domínguez. *Professor of Government; Member, Center for International Affairs, Harvard University. Author of Cuba: Order and Revolution. CASTRO, FIDEL (Micropædia)*

J.I.M.S. John I.M. Stewart. *Reader in English Literature, University of Oxford, 1969-73. Author of Rudyard Kipling. KIPLING, RUDYARD (Micropædia)*

J.I.S. James Irvine Smith. *Advocate. Former Sheriff of Glasgow.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

J.J. Jules Janick. *Professor of Horticulture, Purdue University, West Lafayette, Indiana. Author of Horticultural Science.*

GARDENING AND HORTICULTURE (in part)

J.-J.C. Jean-Jacques Chevallier. *Emeritus Professor of the History of Political Thought, University of Paris. Member of the Institute of France. Author of Mirabeau and others. MIRABEAU, HONORÉ-GABRIEL RIQUETI, COMTE DE (Micropædia)*

J.J.Ca. John J. Cahir. *Associate Dean, College of Earth and Mineral Sciences, Pennsylvania State University, University Park. Coauthor of Principles of Climatology and others.*

CLIMATE AND WEATHER (in part)

J.J.C.S. John Jamieson Carswell Smart. *Professor of Philosophy, Institute of Advanced Studies, Australian National University, Canberra. Emeritus Professor of Philosophy, University of Adelaide, Australia. Author of Philosophy and Scientific Realism and others; editor of Problems of Space and Time.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part) TIME (in part)

J.-J.H. Jean-Jacques Hatt. *Emeritus Professor of National and Rhenish Antiquities, University of Strasbourg, France. Author of Histoire de la Gaule romaine and others. FRANCE (in part)*

J.J.Ha. James J. Haggerty. *Free-lance writer, specializing in aviation and space technology. Editor, Aerospace Yearbook, 1966-70. Author of Apollo: Lunar Landing. INDUSTRIES, MANUFACTURING (in part)*

J.J.Ho. John J. Honigmann (d. 1977). *Professor of Anthropology, University of North Carolina at Chapel Hill, 1955-77. Author of World of Man. AMERICAN INDIANS (in part)*

J.J.J. Joy Juanita Jackson. *Professor of History and Archivist, Southeastern Louisiana University, Hammond; Director, Center for Regional Studies.*

Author of New Orleans in the Gilded Age.

NEW ORLEANS

J.J.Jo. John J. Johnson. *Emeritus Professor of History, Stanford University, California. Author of Political Change in Latin America and others.*

CHILE (in part)

MEXICO (in part)

LATIN AMERICA, THE HISTORY OF (in part)

J.J.L. J.J. Lagowski. *Professor of Chemistry, University of Texas at Austin. Author of The Chemical Bond.*

CHEMICAL ELEMENTS (in part)

J.J.M. James J. Murphy. *Professor and Chairman, Department of Rhetoric, University of California, Davis. Editor of Demosthenes' On the Crown: A Critical Case Study of a Masterpiece of Ancient Oratory.*

DEMOSTHENES (Micropædia)

J.J.M.T. Jan Joseph Marie Timmers. *Former Professor of the History of Art, Jan van Eyck Academy, Maastricht, The Netherlands. Author of Dutch Life and Art; A Handbook of Romanesque Art.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.J.No. J. Jeremy Noble. *Associate Professor of Music, State University of New York at Buffalo.*

BYRD, WILLIAM (Micropædia)

J.J.P. Jan J. Poelhekke. *Emeritus Professor of Modern History, Catholic University of Nijmegen, The Netherlands. Author of De Vrede van Munster and others.*

FREDERICK HENRY, PRINCE OF ORANGE (Micropædia)

OLDENBARNEVELT, JOHAN VAN (Micropædia)

J.J.Pa. J.J. Papike. *Director, Institute for the Study of Mineral Deposits, South Dakota School of Mines and Technology, Rapid City. Editor of Pyroxenes and Amphiboles: Crystal Chemistry and Phase Petrology.*

MINERALS AND ROCKS (in part)

J.J.Pe. Jaroslav Jan Pelikan. *Sterling Professor of History, Yale University. Author of The Christian Tradition: A History of the Development of Doctrine; The Riddle of Roman Catholicism; and others.*

CHRISTIANITY (in part)

JESUS (in part)

MARY (MOTHER OF JESUS) (in part) (Micropædia)

ROMAN CATHOLICISM (in part)

J.J.S. John J. Stoudt. *Professor of Philosophy, Kutztown State College, Pennsylvania, 1965-70. Free-lance writer and researcher. Author of Jacob Boehme: His Life and Thought and others. BÖHME, JAKOB (Micropædia)*

J.J.Se. Jean J. Seznec (d. 1983). *Marshal Foch Professor of French Literature, University of Oxford, 1950-*

72. *Author of Marcel Proust et les dieux and others.*

MICHELET, JULES (Micropædia)

J.J.Sp. Joseph J. Spengler. *James B. Duke Professor Emeritus of Economics, Duke University, Durham, North Carolina. Author of Population Economics and others.*

RICARDO, DAVID (Micropædia)

J.J.Z. J.J. Zuckerman (d. 1987). *Professor of Chemistry, University of Oklahoma, Norman, 1976-87. Coeditor of Determination of Organic Structures by Physical Methods.*

MOLECULES (in part)

J.Ke. James Kerney, Jr. (deceased). *Editor, Trenton Times Newspapers, New Jersey, 1965-74; Publisher, 1962-73.*

UNITED STATES OF AMERICA (in part)

J.K.-G. Joan Kelly-Gadol (d. 1982). *Professor of History, City College, City University of New York, 1972-82. Author of Leon Battista Alberti.*

ALBERTI, LEON BATTISTA (Micropædia)

J.Ki. Jay Kinsbruner. *Professor of History, Queens College, City University of New York. Author of Bernardo O'Higgins and others.*

O'HIGGINS, BERNARDO (Micropædia)

J.K.J. J. Knox Jones, Jr. *Vice President for Research and Graduate Studies, Texas Tech University, Lubbock. Researcher on the biology of a variety of mammals. Coeditor of Orders and Families of Recent Mammals of the World.*

MAMMALS (in part)

J.K.L. John K. Loosli. *Emeritus Professor of Animal Nutrition, Cornell University, Ithaca, New York. Visiting Professor of Animal Science, University of Florida, Gainesville. Coauthor of Animal Nutrition.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

J.K.La. John Kingsley Lattimer, M.D. *Professor and Chairman, Department of Urology, Columbia University. Director, Squier Urological Clinic, Presbyterian Hospital, New York City.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

J.Kr. Julian Krzyżanowski (d. 1976). *Professor of the History of Polish Literature, University of Warsaw, 1934-66. President, Mickiewicz Literary Society. Member, Polish Academy of Sciences, Warsaw. Author of Polish Romantic Literature and others.*

POLISH LITERATURE (in part)

J.K.S. James Kenneth Sutherland. *Professor of Organic Chemistry, Victoria University of Manchester.*

MOLECULES (in part)

J.K.Sh. John K.G. Shearman. *Chairman, Department of Art and Archaeology, Princeton University. Author of Andrea del Sarto.*

ANDREA DEL SARTO (Micropædia)

J.Ku. Job Kuijt. *Professor of Botany, University of Lethbridge, Alberta.*

Author of The Biology of Parasitic Flowering Plants.

ANGIOSPERMS (in part)

J.K.W. James King West. *Professor of Religion and Philosophy, Catawba College, Salisbury, North Carolina. Author of Introduction to the Old Testament.*

SAUL (Micropædia)

J.La. Jean Lacouture. *Former Professor, Institute for Political Studies, University of Paris. Adviser, Éditions du Seuil, Paris. Author of Ho Chi Minh and others.*

HO CHI MINH (Micropædia)

J.L.A.F. Jean L.A. Filiozat (d. 1982). *Professor of Indian Languages and Literatures, College of France, Paris. Member, Institute of France. Author of Inde classique and others.*

HISTORY, THE STUDY OF (in part)

J.L.A.-L. Janet L. Abu-Lughod. *Professor of Sociology, Northwestern University, Evanston, Illinois, and New School for Social Research, New York City. Author of Cairo: 1001 Years of the City Victorious.*

CAIRO

J.L.C. John L. Cornwall. *Professor of Economics, Dalhousie University, Halifax, Nova Scotia. Author of Modern Capitalism: Its Growth and Transformation.*

ECONOMIC GROWTH AND PLANNING (in part)

J.-L.Ca. Jean-Louis Causson. *Former Editor, Opéra (journal), Paris. Author of Rossini.*

ROSSINI, GIOACCHINO (Micropædia)

J.-L.Ch. Jean-Léon Charles. *Professor of Military History, Belgian Royal Military Academy, Brussels. Author of La Ville de Saint-Trond au Moyen-Âge.*

FARNESE, ALESSANDRO, DUCA DI PARMA E PIACENZA (Micropædia)

J.L.Cl. James Lowry Clifford (d. 1978). *Professor of English, Columbia University, 1946-69. Author of Young Sam Johnson and others.*

JOHNSON, SAMUEL (in part)

J.L.D. Jack L. Dull. *Associate Professor of History; Chairman, China Program, School of International Studies, University of Washington, Seattle. Editor of Han Social Structure.*

CHINA (in part)

WU TI (HAN DYNASTY) (Micropædia)

J.Le. Jacques Levron. *Honorary Chief Curator, Archives of France, Paris. Author of Saint-Louis ou l'apogée du moyen-âge and others.*

FRANCE (in part)

LOUIS IX (FRANCE) (Micropædia)

J.L.Fi. John L. Fischer (deceased). *Professor of Anthropology, Tulane University, New Orleans. Coauthor of The Eastern Carolines.*

PACIFIC ISLANDS (in part)

J.L.G. Judson Linsley Gressitt (d. 1982). *Director, Wau Ecology Institute,*

Papua New Guinea. Distinguished Chair of Zoology, Bernice P. Bishop Museum, Honolulu. Coauthor of Chrysomelidae of China; Insects of Campbell Island.

INSECTS (in part)

J.L.Gi. James L. Gibbons, M.D. *Professor of Psychiatry, University of Southampton, England. Editor of Psychiatry.*

MENTAL DISORDERS AND THEIR TREATMENT (in part)

J.L.H. John Lawrance Howard. *Head, Magnetic Division, Admiralty Compass Observatory, Slough, England. Author of several compass manuals.*

NAVIGATION (in part)

J.L.H.K. John L.H. Keep. *Professor of Russian History, University of Toronto. Author of The Russian Revolution: A Study in Mass Mobilization.*

MILYUKOV, PAVEL NIKOLAYEVICH (Micropædia)

NICHOLAS II (RUSSIA) (Micropædia)

J.-L.Hu. Jean-Louis Huot. *Professor of Oriental Archaeology, University of Paris I. Author of Iran.*

XERXES I (PERSIA) (Micropædia)

J.L.I.F. John Lister Illingworth Fennell. *Professor of Russian, University of Oxford. Author of Ivan the Great of Moscow and others.*

IVAN III (in part) (Micropædia)

J.L.K. James L. Kaplan. *Staff Writer, Sports Illustrated, New York City.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

J.L.Ki. John Louis King, Jr. *Former Assistant Professor of History, University of the District of Columbia, Washington, D.C.*

CARVER, GEORGE WASHINGTON (Micropædia)

J.L.M. John Lawrence Mero. *President, Ocean Resources, Inc., La Jolla, California. Author of The Mineral Resources of the Sea.*

OCEANS (in part)

J.L.McK. The Rev. John L. McKenzie, S.J. *Emeritus Professor of Theology, DePaul University, Chicago. Author of The World of the Judges; Dictionary of the Bible; and others.*

ROMAN CATHOLICISM (in part)

SAMUEL (Micropædia)

J.L.Me. Julian Louis Meltzer. *Executive Vice Chairman, Yad Chaim Weizmann National Memorial, and Director, Weizmann Archives, Rehovot, Israel, 1966-75. Managing editor of Weizmann Letters and Papers.*

WEIZMANN, CHAIM (Micropædia)

J.L.Ra. John Lang Rawlinson. *Professor of History, Hofstra University, Hempstead, New York. Author of China's Struggle for Naval Development, 1839-1895.*

LI HUNG-CHANG (Micropædia)

J.L.Ro. J. Lewis Robinson. *Emeritus Professor of Geography, University of*

British Columbia, Vancouver. Author of Concepts and Themes in the Regional Geography of Canada and others.

NORTH AMERICA (in part)

J.L.S. J.L. Styan. *Franklyn Bliss Snyder Professor of English Literature, Northwestern University, Evanston, Illinois. Author of The Elements of Drama; Shakespeare's Stagecraft; Chekhov in Performance; and others.*
LITERATURE, THE ART OF (in part)

J.L.Sa. Jeffrey L. Sammons. *Professor of German, Yale University. Author of Heinrich Heine: A Modern Biography.*
HEINE, HEINRICH (Micropædia)

J.L.Sp. Jay L. Spaulding. *Former Visiting Professor of African History, Michigan State University, East Lansing. Coauthor of Kingdoms of the Sudan.*
SUDAN (in part)

J.L.T. John L. Thomas. *Professor of History, Brown University, Providence, Rhode Island. Author of The Liberator: William Lloyd Garrison.*
GARRISON, WILLIAM LLOYD (Micropædia)

J.L.Te. John L. Teall (d. 1979). *Professor of History, Mount Holyoke College, South Hadley, Massachusetts, 1968–79. Coauthor of Atlas of World History.*
BYZANTINE EMPIRE, THE HISTORY OF THE (in part)

J.Ly. John Lyman (d. 1977). *Professor of Oceanography; Marine Sciences Coordinator, University of North Carolina at Chapel Hill, 1968–73. Coauthor of Ocean Sciences.*
MAPPING AND SURVEYING (in part)

J.Lyo. Sir John Lyons. *Master of Trinity Hall, University of Cambridge. Professor of Linguistics, University of Sussex, Brighton, England, 1976–84. Author of Structural Semantics; Introduction to Theoretical Linguistics.*
LINGUISTICS (in part)

J.M. The Rev. John Meyendorff. *Dean, St. Vladimir's Orthodox Theological Seminary, Tuckahoe, New York; Professor of Church History and Patristics, 1959–84. Professor of Byzantine and East European History, Fordham University, New York City. Author of The Orthodox Church, Its Past and Its Role in the World Today.*
EASTERN ORTHODOXY

J.Ma. Joseph Machlis. *Emeritus Professor of Music, Queens College, City University of New York. Author of The Enjoyment of Music and others.*
COPLAND, AARON (Micropædia)

J.MacG. Janet MacGaffey. *Visiting Lecturer in Anthropology, Bryn Mawr College, Pennsylvania.*
KINSHASA (in part)

J.M.B. John Mayston Béchervaise. *Free-lance writer. Director of Studies, Geelong Grammar School, Corio, Victoria, Australia, 1962–72. Leader, Australian National Antarctic Research*

Wintering Expeditions, Heard Island, 1953–54; Mawson, 1955–56 and 1959–60. Author of Australia: World of Difference and others.
AUSTRALIA (in part)

J.M.-Br. Josef Müller-Brockmann. *Graphic designer, lecturer, and writer. IBM European Design Consultant. Author of The Graphic Artist and His Design Problems and others.*
MARKETING AND MERCHANDISING (in part)

J.M.Bu. Julian Medforth Budden. *Former External Services Music Organizer, British Broadcasting Corporation, London. Author of The Operas of Verdi.*
BEETHOVEN

J.M.Ca. Janet M. Cartwright. *Chairman, Board of Trustees, Black Hawk College, Moline, Illinois.*
UNITED STATES OF AMERICA (in part)

J.McL. John McLaughlin. *Former Political Writer, Trenton Times Newspapers, New Jersey.*
UNITED STATES OF AMERICA (in part)

J.M.C.T. Jocelyn M.C. Toynbee (d. 1985). *Laurence Professor of Classical Archaeology, University of Cambridge, 1951–62. Author of The Art of the Romans.*
PAINTING, THE HISTORY OF WESTERN (in part)
SCULPTURE, THE HISTORY OF WESTERN (in part)

J.M.-D. Jean Martin-Demézil. *Archivist, Département of Loir-et-Cher, France, 1941–78.*
FRANCE (in part)

J.M.F.P. José M.F. Pastor. *Town and regional planning expert. President, Town Planning Council, Buenos Aires. Author of Urbanismo con planeamiento.*
BUENOS AIRES (in part)

J.M.H. Joan Mervyn Hussey. *Emeritus Professor of History, Royal Holloway College, University of London. Author of The Byzantine World and others; editor of Cambridge Medieval History, vol. 4, parts 1 and 2.*
ALEXANDER I COMNENUS (Micropædia)
BASIL I (BYZANTINE EMPIRE) (Micropædia)
BASIL II (BYZANTINE EMPIRE) (Micropædia)
GREECE (in part)
JUSTINIAN I (in part) (Micropædia)

J.M.Ha. J.M. Hayes. *Professor of Biogeochemistry, Indiana University, Bloomington. Coauthor of Chemical Separations and Measurements.*
ATMOSPHERE (in part)

J.M.Hi. John M. Hills. *Emeritus Professor of Geological Sciences, University of Texas at El Paso. Author of numerous articles on the petroleum and saline deposits of the Permian basin of Texas and New Mexico.*
FOOD PROCESSING (in part)

J.Mi. Jacques Miège. *Professor of Systematic Botany, University of Geneva.*

Former Director, Conservatory and Botanical Garden, Geneva. Editor of Candollea and Boissiera.
ANGIOSPERMS (in part)

J.Mir. Jeannette Mirsky (d. 1987). *Visiting Fellow, Department of East Asian Studies, Princeton University, 1970–74. Coauthor of The World of Eli Whitney.*
WHITNEY, ELI (Micropædia)

J.M.J.v.H. Baron Jean M.J. van Houtte. *Minister of State, Government of Belgium; Minister of Finance, 1950–52, 1958–61; Prime Minister, 1952–54. Emeritus Professor of Fiscal Law, State University of Ghent. Emeritus Professor of Penal Law, State University of Liège.*
TAXATION (in part)

J.M.K. Joseph M. Kitagawa. *Emeritus Professor of the History of Religions and of Far Eastern Languages and Civilizations, University of Chicago; Dean, Divinity School, 1970–80. Author of Religions of the East and others.*
BUDDHISM, THE BUDDHA AND (in part)

J.M.K.S. J.M.K. Spalding, M.D. *Former Consultant Neurologist, Radcliffe Infirmary, Oxford. Former Senior Research Fellow, St. Peter's College, University of Oxford. Coauthor of Disorders of the Autonomic Nervous System; Neurocardiology.*
NERVES AND NERVOUS SYSTEMS (in part)

J.M.L. Jacob M. Landau. *Professor of Political Sciences, Hebrew University of Jerusalem. Author of Studies in the Arab Theatre and Cinema and others.*
ISLAMIC ARTS (in part)

J.M.Lu. Joseph M. Lucker (d. 1980). *Editor in Chief, De Tijd, Amsterdam. Editorial Chairman of The Netherlands Newsreel, Polygoon. The Netherlands Delegate to Unesco.*
LOW COUNTRIES, THE (in part)

J.M.M.-R. J.M. Munn-Rankin (d. 1981). *Lecturer in Near Eastern History, University of Cambridge, 1949–81. Contributor to The Cambridge Ancient History.*
DARIUS I (Micropædia)

J.M.N.-D. John M. Newsom-Davis. *Professor of Clinical Neurology, University of Oxford. Coauthor of Respiratory Muscles: Mechanics and Neural Control.*
MUSCLES AND MUSCLE SYSTEMS (in part)

J.Mo. The Rev. Jacques Monet, S.J. *President, Regis College, Toronto School of Theology, University of Toronto. Author of The Last Cannon Shot: A Study of French-Canadian Nationalism.*
LAURIER, SIR WILFRID (Micropædia)

J.M.O. Jane M. Oppenheimer. *Emeritus Professor of the History of Science, Bryn Mawr College, Pennsylvania. Author of Essays in the History of Embryology and Biology.*
BAER, KARL ERNST, RITTER VON, ELDER VON HUTHORN (Micropædia)
DRIESCH, HANS ADOLF EDUARD (Micropædia)

J.M.P. John M. Prausnitz. *Professor of Chemical Engineering, University of California, Berkeley. Author of Molecular Thermodynamics of Fluid-Phase Equilibria.*
MATTER (in part)

J.M.Po. James M. Powell. *Professor of Medieval History, Syracuse University, New York. Editor of Innocent III: Vicar of Christ or Lord of the World?*

ALEXANDER III (PAPACY) (Micropædia)
GREGORY IX (PAPACY) (Micropædia)

J.M.R. Johannes M. Renger. *Professor of Assyriology, Free University of Berlin, West Berlin.*

HAMMURABI (Micropædia)

J.-M.-R.N. Jacques-M.-R. Nicolle (d. 1972). *Director, Laboratory of Isomeric Biochemistry, Collège de France, Paris. Author of Louis Pasteur, a Master of Scientific Inquiry.*

PASTEUR (in part)

J.Ms. Joseph Margolis. *Professor of Philosophy, Temple University, Philadelphia. Author of Art and Philosophy and others.*

ARTS, CRITICISM OF THE

J.M.S. John M. Simpson. *Senior Lecturer in Scottish History, University of Edinburgh.*

UNITED KINGDOM (in part)

J.M.T. James M. Tanner, M.D. *Professor of Child Health and Growth, Institute of Child Health, University of London. Author of A History of the Study of Human Growth.*

GROWTH AND DEVELOPMENT,
BIOLOGICAL (in part)

J.Mu. Joachim Müller. *Professor of German Literature, Friedrich Schiller University of Jena, East Germany.*

LESSING, GOTTHOLD EPHRAIM (in part)
(Micropædia)

J.M.W. J. Marvin Weller (d. 1976). *Professor of Invertebrate Paleontology, University of Chicago, 1945-65. One of the first to describe and analyze rhythmic deposits of the central U.S. Author of Stratigraphic Principles and Practice.*
GEOCHRONOLOGY (in part)

J.M.W.-H. John Michael Wallace-Hadrill (d. 1985). *Chichele Professor of Modern History, University of Oxford, 1974-83; Fellow of All Souls College, Oxford. Author of The Long-Haired Kings and others.*
CLOVIS I (Micropædia)
GERMANY (in part)

J.M.Ws. James M. Wells. *Former Vice President and Emeritus Custodian, John M. Wing Foundation on the History of Printing, Newberry Library, Chicago. Author of The Scholar Printers; "Book Typography in the U.S.A." in Book Typography in Europe and the U.S.*

PRINTING, TYPOGRAPHY, AND
PHOTOENGRAVING (in part)

J.M.W.S. Jonathan M.W. Slack. *Senior Research Scientist, Imperial Cancer Research Fund Developmental*

Biology Unit, University of Oxford. Author of From Egg to Embryo.

CELLS (in part)

J.M.Yi. J. Milton Yinger. *Professor of Sociology and Anthropology, Oberlin College, Ohio. Author of The Scientific Study of Religion and others.*

RELIGION, SOCIAL ASPECTS OF

J.Na. Jerome Namias. *Research Meteorologist, Scripps Institution of Oceanography, University of California at San Diego, La Jolla. Chief, Extended Forecast Division, National Weather Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C., 1941-71. Author of "30-Day Forecasting," American Meteorological Society Monograph.*

OCEANS (in part)

J.N.B. John N. Burrus. *Distinguished University Professor of Sociology, University of Southern Mississippi, Hattiesburg. Author of Life Opportunities: An Analysis of Differential Mortality in Mississippi and others.*

UNITED STATES OF AMERICA
(in part)

J.N.D. James Norman Davidson (d. 1972). *Gardiner Professor of Biochemistry, University of Glasgow, 1957-72. Author of Biochemistry of the Nucleic Acids.*

BIOCHEMICAL COMPONENTS OF
ORGANISMS (in part)

J.N.D.K. The Rev. John N.D. Kelly. *Principal of St. Edmund Hall, Oxford, 1951-79; Lecturer in Patristic Studies, University of Oxford, 1948-76. Author of Early Christian Creeds; Early Christian Doctrines; and others.*

CHRISTIANITY (in part)

J.N.H. John N. Hazard. *Nash Professor Emeritus of Law, Columbia University. Author of Communists and Their Law; Managing Change in the U.S.S.R.; and others.*

LEGAL SYSTEMS, THE EVOLUTION OF
MODERN WESTERN (in part)

J.N.M. Jitendra N. Mohanty. *George Lynn Cross Research Professor of Philosophy, University of Oklahoma, Norman. Author of Gangesa's Theory of Truth and others.*

INDIAN PHILOSOPHY

Jn.S. Jean Stengers. *Professor of History, Free University of Brussels.*
CENTRAL AFRICA (in part)

J.N.S. Johannes Nicolaas Scheepers. *Professor and Chairman, Department of Geography, Rand Afrikaans University, Johannesburg. Author of A Cartographic Analysis of the Man-Land Ratio: An Adventure into the Population Geography of the Transvaal.*
SOUTH AFRICA (in part)

J.O. The Rev. Joseph Owens, C.S.S.R. *Professor of Philosophy, Pontifical Institute of Mediaeval Studies, University of Toronto. Author of The Doctrine of Being in the Aristotelian Metaphysics.*

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN (in part)

J.O.A. James Oladipo Adejuwon. *Professor of Geography, University of Ife, Ile-Ife, Nigeria.*

KINSHASA (in part)

Jo.A.W. John A. Wilson (d. 1976). *Andrew MacLeish Distinguished Service Professor of Egyptology, University of Chicago, 1953-68. Author of The Burden of Egypt and others.*
AKHENATON (Micropædia)

Jo.B. José Bonilla. *Town and regional planning expert. Codirector, Regional and Urban Planning Institute, Buenos Aires, 1952-82.*

BUENOS AIRES (in part)

Jo.Be. John Beresford Bentley. *Managing Editor, Air-Cushion Vehicles (bimonthly); Editor, Hoverfoil News.*
TRANSPORTATION (in part)

Jo.B.M. John Burnett Mitchell. *Lecturer in the History of Art, University of East Anglia, Norwich, England. Coeditor of San Vincenzo al Volturno: The Archaeology, Art and Territory of an Early Medieval Monastery.*
PAINTING, THE HISTORY OF WESTERN
(in part)

Jo.Bo. John Boardman. *Lincoln Professor of Classical Art and Archaeology, University of Oxford. Fellow of the British Academy. Author of Greek Art; The Greeks Overseas; and others.*

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

GRECO-ROMAN CIVILIZATION, CLASSICAL
(in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

Jo.Br. John Bright. *Emeritus Professor of Hebrew and the Interpretation of the Old Testament, Union Theological Seminary, Richmond, Virginia. Author of A History of Israel and others.*
EZRA (Micropædia)

J.O'B.R. John O'Beirne Ranelagh. *Commissioning Editor, Channel Four Television, London. Author of A Short History of Ireland and others.*
IRELAND (in part)

Jo.Bu. The Rev. John Burnaby (d. 1978). *Regius Professor of Divinity, University of Cambridge, 1952-58. Author of Amor Dei: A Study in the Religion of St. Augustine and others.*
AUGUSTINE (in part)

Jo.C. John Cogley (d. 1976). *Senior Fellow, Center for the Study of Democratic Institutions, Santa Barbara, California, 1967-76; Editor, The Center Magazine, 1967-74. Author of The Layman and the Council and others.*
JOHN XXIII (PAPACY) (Micropædia)

Jo.Ch. Joan Chissell. *Assistant Music Critic, The Times, London, 1947-79. Author of Chopin; Schumann; and others.*

CHOPIN, FRÉDÉRIC (*in part*)
(Micropædia)

Jo.E.C. John Edwards Caswell. *Emeritus Professor of History, California State College, Stanislaus, Turlock, California. Author of Arctic Frontiers: U.S. Explorations in the Far North.*
HUDSON, HENRY (Micropædia)

Jo.E.S. Joseph E. Spencer (d. 1984). *Emeritus Professor of Geography, University of California, Los Angeles. Coauthor of Asia, East by South.*
ASIA (*in part*)

J.O.Fl. Joseph O. Fletcher. *Deputy Director, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Boulder, Colorado.*

OCEANS (*in part*)

Jo.H. Josef Haeckel (deceased). *Professor of Ethnology; Director, Institute for Ethnology, University of Vienna. Author of Zum Individual- und Geschlechtstotemismus in Australien.*
RELIGIONS AND SPIRITUAL BELIEF,
SYSTEMS OF (*in part*)

Jo.Ha. Joseph Hashisaki. *Professor of Mathematics, Western Washington University, Bellingham. Coauthor of Theory of Arithmetic.*
SET THEORY (*in part*)

Jo.Hac. John Hackett. *Director for Financial, Fiscal, and Enterprise Affairs, Organization for Economic Cooperation and Development, Paris. Author of Economic Planning in France.*
ECONOMIC GROWTH AND PLANNING
(*in part*)

Jo.Ho. John Hospers. *Professor of Philosophy, University of Southern California, Los Angeles. Author of Understanding the Arts and others.*
PHILOSOPHIES OF THE BRANCHES OF
KNOWLEDGE (*in part*)

Jo.L. Joan Lawson. *Specialist Teacher of History of Ballet, Classical and National Dance, Royal Ballet School, London. Contributor to The Dancing Times, London. Author of European Folk Dance and others.*
POPULAR ARTS (*in part*)

Jo.La. Jorgen Laessoe. *Professor of Assyriology, University of Copenhagen. Author of People of Ancient Assyria and others.*
SARGON II (ASSYRIA) (Micropædia)

Jo.Ly. John Lynch. *Professor of Latin-American History; Director, Institute of Latin-American Studies, University of London. Author of Spain Under the Habsburgs and others.*
CHARLES III (SPAIN) (Micropædia)

Jo.M. John Mitchell. *Free-lance writer and translator.*
ITALIAN LITERATURE (*in part*)

Jo.Ma. John Marlowe. *Free-lance writer. Author of Anglo-Egyptian Relations, 1800-1953; Cromer in Egypt.*
ZAGHLÛL, SA'D (Micropædia)

J.O'M.B. John O'M. Bockris. *Distinguished Professor of Chemistry, Texas A & M University, College Station. Coauthor of Fuel Cells: Their Electrochemistry; Modern Electrochemistry.*

CHEMICAL REACTIONS (*in part*)

J.O.M.Br. Jan O.M. Broek (d. 1974). *Professor of Geography, University of Minnesota, Minneapolis, 1948-70.*
EAST INDIES, THE (*in part*)

Jo.N. John Naisbitt. *Chairman of the Board, Center for Policy Process, Washington, D.C. Coauthor of Right On!: A Documentary of Student Protest in America.*

UNITED STATES OF AMERICA (*in part*)

Jo.Pl. Sir John Plumb. *Professor of Modern English History, University of Cambridge, 1966-74; Master of Christ's College, Cambridge, 1978-82. Fellow of the British Academy. Author of England in the Eighteenth Century; Sir Robert Walpole; and others.*

WALPOLE, ROBERT, 1ST EARL OF
ORFORD (Micropædia)

Jo.Pr. Joshua Praver. *Professor of History, Hebrew University of Jerusalem. Editor in Chief, Encyclopaedia Hebraica. Author of The Latin Kingdom of Jerusalem.*
JERUSALEM (*in part*)

Jo.R. John A. Rowe. *Associate Professor of African History, Northwestern University, Evanston, Illinois.*

KENYATTA, JOMO (Micropædia)

J.Or. Jean Orcibal. *Director of Studies, Religious Sciences Division, Institute for Advanced Research, Paris.*
PASCAL (*in part*)

J.O.R. John O. Rasmussen, Jr. *Professor of Chemistry, University of California, Berkeley. Author of "Alpha Decay" in Alpha-, Beta-, and Gamma-Ray Spectroscopy and others.*
ATOMS (*in part*)

Jo.S. The Rev. John Stacey. *Secretary, Local Preachers' Office, British Methodist Church, London; Editor, Epworth Press. Author of John Wyclif and Reform and others.*
WYCLIFFE, JOHN (Micropædia)

J.O.S. John Oliver Stoner, Jr. *Professor of Physics, University of Arizona, Tucson.*

ANALYSIS AND MEASUREMENT,
PHYSICAL AND CHEMICAL
(*in part*)

Jo.Si. Joseph Silverman. *Professor of Chemistry and Nuclear Engineering; Director, Laboratory for Radiation and Polymer Science, University of Maryland, College Park. Coeditor of Radiation Processing: Transactions of the First International Meeting on Radiation Processing.*
RADIATION (*in part*)

Jo.S.R. John Shipley Rowlinson. *Dr. Lee's Professor of Chemistry, University of Oxford. Author of Liquids and Liquid*

Mixtures.

MATTER (*in part*)

Jo.St. John Strugnell. *Professor of Christian Origins, Harvard University.*
JOHN THE BAPTIST, SAINT (Micropædia)

J.O'T. James Joseph O'Toole. *University Associates' Professor of Management and Organization, University of Southern California, Los Angeles. Author of Making America Work.*

FUTUROLOGY (*in part*) (Micropædia)

Jo.W. John H. Wickstead. *Senior Principal Scientific Officer, Marine Biological Association of the United Kingdom, Plymouth, England. Author of An Introduction to the Study of Tropical Plankton and others.*

CHORDATES (*in part*)

Jö.We. Jörgen Weibull. *Professor of History, Göteborg University, Sweden. Author of Carl Johan och Norge 1810-1814 and others.*

DENMARK (*in part*)

FINLAND (*in part*)

ICELAND (*in part*)

NORWAY (*in part*)

SWEDEN (*in part*)

Jo.W.H. Sir John Wardle Houlton (d. 1973). *President of the Swaziland Senate, 1968-73.*

SOUTHERN AFRICA (*in part*)

Jo.W.P. John Whitney Pickersgill. *President, Canadian Transport Commission, Ottawa, 1967-72. Member, House of Commons, Parliament of Canada, 1953-67. Coauthor of The Mackenzie King Record.*

KING, W.L. MACKENZIE
(Micropædia)

J.P. Jan Pen. *Professor of Economics, State University of Groningen, The Netherlands. Author of Income Distribution and others.*

ECONOMIC THEORY (*in part*)

J.Pa. Juan Papadakis. *Member, Academy of Athens. Former Professor, University of Buenos Aires. Author of Soils of the World.*
SOILS

J.P.A.G. Johannes P.A. Gruijters. *Mayor of Lelystad, The Netherlands. Minister of Housing and Physical Planning, Government of The Netherlands, 1973-77.*

LOW COUNTRIES, THE (*in part*)

J.P.D. Jean P. Dorst. *Professor, National Museum of Natural History, Paris. Author of The Migration of Birds and others.*

BEHAVIOUR, ANIMAL (*in part*)

SOUTH AMERICA (*in part*)

J.P.Do. Jean P. Dorese. *Research Master, National Centre for Scientific Research, Paris. Author of Ethiopia and others.*

EASTERN AFRICA (*in part*)

J.-P.E. Jean-Pierre Erpelding (d. 1977). *President, Section of Arts and Literature, Grand-Ducal Institute, Luxembourg, 1962-68. Author of*

Luxemburg 1000 Jahre.

LOW COUNTRIES, THE (in part)

J.P.-H. Sir John Pope-Hennessy. Professor of Fine Arts, New York University. Consultative Chairman, Department of European Paintings, Metropolitan Museum of Art, New York City, 1977-86. Author of *Italian Renaissance Sculpture; Cellini; and others.*

CELLINI, BENVENUTO (Micropædia)

J.P.Hy. J. Philip Hyatt (d. 1972). Professor of Old Testament, Vanderbilt University, Nashville, Tennessee, 1944-72. Author of *Jeremiah: Prophet of Courage and Hope and others.*

JEREMIAH (Micropædia)

J.Pi. John Picton. Lecturer in African Art, School of Oriental and African Studies, University of London. Coauthor of *African Textiles.*

AFRICAN ARTS (in part)

J.Piv. Jean Piveteau. Professor of Palaeontology, University of Paris. Editor of *Oeuvres philosophiques de Buffon.*

BUFFON, GEORGES-LOUIS LECLERC, COMTE DE (Micropædia)

J.P.K. John P. Kenyon. Professor of Modern History, University of St. Andrews, Scotland. Author of *The Stuarts.*

JAMES II (GREAT BRITAIN) (Micropædia)

J.-p.L. Jung-pang Lo (d. 1981). Professor of History, University of California, Davis, 1969-76. Author of *K'ang Yu-wei: A Biography and a Symposium.*

CHENG HO (Micropædia)

K'ANG YU-WEI (Micropædia)

J.Pl. Jaan Puhvel. Professor of Classics and Indo-European Studies, University of California, Los Angeles.

HISTORY, THE STUDY OF (in part)

WRITING (in part)

J.P.M. John Preston Moore. Emeritus Professor of History, Louisiana State University, Baton Rouge. Author of *The Cabillo in Peru Under the Bourbons and others.*

PERU (in part)

J.P.Mo. J. Philip Mosley. Lecturer in Humanities, Glasgow College of Technology.

BELGIAN LITERATURE (in part)

J.P.M.S. J. Patricia Morgan Swenson. Free-lance writer and editor. Author of *Hawaii: A Book to Begin On and others.*

UNITED STATES OF AMERICA (in part)

J.P.P. Justo Pastor Prieto (d. 1982). Former Minister of Foreign Affairs, Paraguay, 1939; Minister of Justice and Public Education, 1931-36. Rector, National University of Asunción, 1929-31. Author of *Paraguay, la provincia gigante de las Indias and others.*

PARAGUAY (in part)

J.P.Pl. John P. Plamenatz (d. 1975). Chichele Professor of Social and Political Theory, University of Oxford, 1967-75; Fellow of All Souls College, Oxford.

Author of *The English Utilitarians.*

BENTHAM, JEREMY (Micropædia)

J.Pr. Jean Prevost. Professor, Laboratory of Ecology and General Biology, University of Limoges, France. Researcher on the biology of Antarctic seabirds, especially penguins. Author of *Le Manchot empereur; coeditor of Biologie antarctique.*

BIRDS (in part)

J.P.R. Jean Pierre Rouch. Director of Research, National Centre for Scientific Research, Paris. Author of *Les Songhay.*

MUHAMMAD I ASKIA (Micropædia)

J.P.Ri. Joseph P. Riva, Jr. Specialist in Earth Sciences (geologist), Congressional Research Service, Library of Congress, Washington, D.C. Author of *World Petroleum Resources and Reserves.*

FUELS, FOSSIL (in part)

J.Pro. James Alan Proudlove. Emeritus Professor of Transport Studies, University of Liverpool. Author of *Roads.*

UNITED KINGDOM (in part)

J.P.S. James Patrick Saville. Former Manager, Information Services, The Metals Society, London.

BESSEMER, SIR HENRY (Micropædia)

J.P.-V. Javier Pulgar-Vidal. Emeritus Professor of Geography, National University of San Marcos, Lima. Author of *Geografía del Perú: Las ocho regiones naturales and others.*

PERU (in part)

J.P.V.D.B. John P.V. Dacre Balsdon (d. 1977). Fellow of Exeter College, University of Oxford, 1928-69. Author of *Life and Leisure in Ancient Rome.*

CICERO, MARCUS TULLIUS (in part)

(Micropædia)

GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

MARIUS, GAIUS (Micropædia)

J.R.Al. John Richard Alden. James B. Duke Professor Emeritus of History, Duke University, Durham, North Carolina. Author of *A History of the American Revolution.*

ADAMS, SAMUEL (Micropædia)

J.R.B. James R. Brandon. Professor of Drama and Theatre, University of Hawaii, Honolulu. Author of *Kabuki: Five Classic Plays; Theatre in Southeast Asia; and others.*

EAST ASIAN ARTS (in part)

SOUTHEAST ASIAN ARTS (in part)

J.R.Ba. John R. Baines. Professor of Egyptology, University of Oxford. Coauthor of *Atlas of Ancient Egypt.*

EGYPT (in part)

J.R.Br. John Russell Brown. Professor of English, University of Sussex, Brighton, England. Author of *Shakespeare's Dramatic Style; and others.*

SHAKESPEARE (in part)

J.R.C. John R. Campbell. Dean, College of Agriculture, University of Illinois, Urbana. Coauthor of *The Science of Animals that Serve*

Humanity.

AGRICULTURAL SCIENCES (in part)

J.R.G. James R. Giles. Professor of English, Northern Illinois University, De Kalb. Author of *Irwin Shaw and others.*

AMERICAN LITERATURE (in part)

J.R.Go. John Ross Goodner. Senior Editor, *Golf Digest.* Author of *Golf's Greatest and others.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

J.R.H. J.R. Heirtzler. Senior Scientist, Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Massachusetts.

MINERALS AND ROCKS (in part)

J.R.Ha. John R. Hagely. Projects Manager, Battelle-Columbus Laboratories, Columbus, Ohio.

BUILDING CONSTRUCTION (in part)

J.R.K. John Robert Kell (d. 1983). Consulting engineer. Author of *Heating and Air-Conditioning of Buildings.*

BUILDING CONSTRUCTION (in part)

J.R.Kr. John Richard Krueger. Former Professor of Uralic and Altaic Studies, Indiana University, Bloomington. Coauthor of *Introduction to Classical Mongolian.*

CENTRAL ASIAN ARTS (in part)

J.R.L.H. J.R.L. Highfield. Fellow of Merton College, Oxford; Lecturer in Modern History, University of Oxford. Editor of *Spain in the Fifteenth Century; coeditor of Europe in the Middle Ages.*

EDWARD III (ENGLAND AND GREAT

BRITAIN) (in part) (Micropædia)

ISABELLA I (SPAIN) (Micropædia)

J.R.M. John Richard Meyer. Associate Professor of Education, University of Windsor, Ontario.

BERNARD OF CLAIRVAUX, SAINT (Micropædia)

J.R.Ma. Judith R. Mackrell. Dance critic, *The Independent*, London. Author of *British Dance Since 1945.*

DANCE, THE ART OF

J.R.Me. José Ramón Medina. Poet and writer. Professor, Faculty of Law, Central University of Venezuela, Caracas. Former Attorney General of Venezuela. Author of *Ochenta años de literatura venezolana and others.*

CARACAS (in part)

J.R.Mn. J. Ronald Munson. Professor of Philosophy, University of Missouri, St. Louis. Editor of *Man and Nature: Philosophical Issues in Biology.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

J.R.M.R. J. Roberto Moncada R. President, MONDAI Engineers (engineering and architectural consultants), Tegucigalpa, Honduras. Director General of the National Geographic Institute, Tegucigalpa, 1969-71.

CENTRAL AMERICA (in part)

J.R.N. J.R. Napier. *Director, Unit of Primate Biology, Birkbeck College, University of London. Researcher on locomotion of primates. Coauthor of A Handbook of Living Primates.*

MAMMALS (in part)

J.Ro. Joan Violet Robinson (d. 1983). *Professor of Economics, University of Cambridge, 1965–71. Author of Theory of Imperfect Competition and others.*

MARKETS (in part)

J.R.P. John R. Pierce. *Emeritus Professor of Engineering, California Institute of Technology, Pasadena. Author of The Beginnings of Satellite Communications and others.*

TELECOMMUNICATIONS SYSTEMS (in part)

J.R.-S. John Graham Royde-Smith (d. 1986). *Associate Editor, History, Encyclopædia Britannica, London.*

BOURBON, THE HOUSE OF (in part)

HABSBURG, THE HOUSE OF

WORLD WARS, THE (in part)

J.R.Sp. John R. Spencer. *Professor of Art, Duke University, Durham, North Carolina. Editor of L.B. Alberti's On Painting.*

CIMABUE (Micropædia)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.R.Su. James R. Sutherland. *Emeritus Professor of Modern English Literature, University of London. Author of Defoe; English Literature of the Late Seventeenth Century.*

DRYDEN, JOHN (in part) (Micropædia)

J.R.T. John Russell Taylor. *Art Critic, The Times (London); Film Critic, 1962–73. Professor of Cinema, University of Southern California, Los Angeles, 1972–78. Author of Cinema Eye, Cinema Ear: Some Key Film-Makers of the Sixties and others.*

ANTONIONI, MICHELANGELO (Micropædia)

BERGMAN, INGMAR (Micropædia)

J.R.T.P. John Richard Thornhill Pollard. *Former Senior Lecturer in Classics, University College of North Wales, University of Wales, Bangor. Author of Birds in Greek Life and Myth; Helen of Troy; and others.*

EUROPEAN RELIGIONS, ANCIENT (in part)

J.R.V.P. J.R.V. Prescott. *Professor of Geography, University of Melbourne. Author of Frontiers and Boundaries and others.*

AUSTRALIA (in part)

MELBOURNE

J.S. John Scarne (d. 1985). *President, John Scarne Games, Inc., North Bergen, New Jersey. Authority on gambling. Author of Scarne's Complete Guide to Gambling; Scarne on Dice; and others.*

ROULETTE (Micropædia)

J.S.A. James Stephen Atherton (deceased). *Lecturer in English Literature, Wigan and District Mining*

and Technical College, England. Author of The Books at the Wake.

JOYCE, JAMES (in part) (Micropædia)

J.S.Ac. James S. Ackerman. *Arthur Kingsley Porter Professor of Fine Arts, Harvard University. Author of The Architecture of Michelangelo; Palladio.*

ARCHITECTURE, THE ART OF (in part)

J.S.B. Joe S. Bain. *Emeritus Professor of Economics, University of California, Berkeley. Author of Industrial Organization; Barriers to New Competition.*

ECONOMIC THEORY (in part)

J.S.Bo. John S. Bowman. *Free-lance writer and editor. Editor, "Monuments of Civilization" Series. Author of Traveler's Guide to Crete.*

GREECE (in part)

J.S.Br. The Rev. Joseph Stanislaus Brushser, S.J. (d. 1972). *Professor of History, University of San Francisco, 1968–72. Author of Popes Through the Ages.*

GREGORY VII, SAINT (PAPACY) (Micropædia)

J.Sc. Jefim H. Schirmann (d. 1981). *Professor of Hebrew Literature, Hebrew University of Jerusalem. Member, Israel National Academy of Sciences. Author of The Hebrew Poetry in Spain and Provence.*

JUDAH HA-LEVI (Micropædia)

J.Sch. Johannes Schregle. *Secretary-General, International Society for Labour Law and Social Security. Honorary Professor of Comparative Labour Law, University of Salzburg, Austria. Former Director of Industrial Relations, International Labour Organisation, Geneva. Author of Negotiating Development: Labour Relations in Southern Asia.*

BUSINESS LAW (in part)

J.S.D. John S. Driscoll. *Executive Editor, Boston Globe.*

UNITED STATES OF AMERICA (in part)

J.Se. Jakob Seibert. *Professor of Ancient History, Ludwig Maximilian University of Munich. Author of Historische Beiträge zu den dynastischen Verbindungen in hellenistischer Zeit and others.*

SELEUCUS I NICATOR (Micropædia)

J.S.E. John S. Ezell. *David Ross Boyd Professor Emeritus of History, University of Oklahoma, Norman. Author of The South Since 1865.*

UNITED STATES OF AMERICA (in part)

J.S.F. Jeffrey S. Fedan. *Research Pharmacologist, National Institute for Occupational Safety and Health, Morgantown, West Virginia. Adjunct Associate Professor of Pharmacology and Toxicology, West Virginia University, Morgantown.*

DRUGS AND DRUG ACTION (in part)

J.S.G.W. John Stuart Gladstone Wilson. *Emeritus Professor of Economics*

and Commerce, University of Hull, England. Author of Banking Policy and Structure.

BANKS AND BANKING

J.Sh. Jose Shercliff. *Lisbon Correspondent of The Times, (London), and the British Broadcasting Corporation.*

PORTUGAL (in part)

J.Shi. James Shiel. *Former Reader in the History of Hellenic Thought, University of Sussex, Brighton, England. Author of Greek Thought and the Rise of Christianity.*

BOETHIUS, ANICIUS MANLIUS SEVERINUS (Micropædia)

J.Si. Josef Silverstein. *Professor of Political Science, Rutgers University, New Brunswick, New Jersey. Author of Burma: Military Rule and the Politics of Stagnation and others.*

SOUTHEAST ASIA, MAINLAND (in part)

J.S.K. James S. Kus. *Professor and Chairman, Department of Geography, California State University, Fresno.*

PERU (in part)

J.S.M. John S. Mathis. *Professor of Astronomy, University of Wisconsin, Madison.*

NEBULA

J.S.Ma. John S. Marshall (d. 1979). *Professor of Philosophy, University of the South, Sewanee, Tennessee, 1946–68. Author of Hooker's Polity in Modern English; Hooker and the Anglican Tradition.*

HOOKE, RICHARD (Micropædia)

J.S.McE. The Rev. James Stevenson McEwen. *Professor of Church History, University of Aberdeen, Scotland, 1958–77. Author of The Faith of John Knox.*

KNOX, JOHN (in part) (Micropædia)

J.Sn. Joshua Stern. *Lecturer in Physics, University of Maryland, College Park. Associate Editor, Review of Scientific Instruments.*

MEASUREMENT AND OBSERVATION, PRINCIPLES, METHODS, AND INSTRUMENTS OF (in part)

J.So. Jacob Solinger. *Management consultant. Author of Apparel Manufacturing Analysis; Apparel Manufacturing Handbook.*

INDUSTRIES, MANUFACTURING (in part)

J.S.O. Jerry S. Olson. *Senior Ecologist, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee. Professor of Botany, University of Tennessee, Knoxville. Editor of Ecological Studies.*

ECOSYSTEMS (in part)

J.S.R. John S. Ryland. *Professor of Zoology, University College of Swansea, University of Wales. Author of Bryozoans.*

MOSS ANIMALS

J.S.Ro. James Scott Robson, M.D. *Emeritus Professor of Medicine, University of Edinburgh; Consultant Physician, Edinburgh Royal Infirmary.*

Author of numerous articles on acid-base and electrolyte metabolism and renal disorders.

EXCRETION AND EXCRETORY SYSTEMS
(in part)

TISSUES AND FLUIDS (in part)

J.St. James Stevenson. Emeritus Fellow of Downing College, Cambridge; formerly University Lecturer in Divinity, University of Cambridge. Editor of *A New Eusebius*; *Creeds, Councils, and Controversies*.

EUSEBIUS OF CAESAREA (Micropædia)

J.S.T. Joseph S. Tulchin. Professor of History, University of North Carolina at Chapel Hill. Coeditor of *Latin America in World Politics*.

BUENOS AIRES (in part)

J.Ste. Johannes Steudel (d. 1973). Professor of the History of Medicine, Rhenish Friedrich Wilhelm University of Bonn.

MÜLLER, JOHANNES PETER
(Micropædia)

J.Su. John Sutton. Emeritus Professor of Geology, Royal School of Mines, Imperial College of Science and Technology, University of London.

GEOCHRONOLOGY (in part)

J. Sum. Sir John Summerson. Curator, Sir John Soane's House and Museum, London. Author of *Inigo Jones*; *Sir Christopher Wren*; *Architecture in Britain, 1530–1830*; and others.

JONES, INIGO (Micropædia)

WREN, SIR CHRISTOPHER (in part)
(Micropædia)

J.S.W. John Steven Watson. Principal and Vice Chancellor, University of St. Andrews, Scotland. Author of *The Reign of George III*.

GEORGE III (GREAT BRITAIN)
(Micropædia)

J.T.B. Joseph T. Butler. Curator, Sleepy Hollow Restorations, Tarrytown, New York. Adjunct Associate Professor of Architecture, Columbia University. Author of *American Antiques 1800–1900* and others.

DECORATIVE ARTS AND FURNISHINGS
(in part)

J.T.Bo. John Tyler Bonner. George M. Moffett Professor of Biology, Princeton University. Author of *Size and Cycle* and others.

REPRODUCTION AND REPRODUCTIVE
SYSTEMS (in part)

J.T.C. J. Terry Copp. Professor of History, Wilfrid Laurier University, Waterloo, Ontario. Coauthor of *Confederation: 1867* and others.

BORDEN, SIR ROBERT (Micropædia)

J.T.C.L. James T.C. Liu. Professor of History and of East Asian Studies, Princeton University. Author of *Reform in Sung China* and others.

CHINA (in part)

J.T.G.O. Jan Theodoor Gerard Overbeek. Emeritus Professor of Physical Chemistry, Utrecht University, The Netherlands. Coauthor of *Theory of the*

Stability of Lyophobic Colloids.

MATTER (in part)

J.Th. John Patrick Thomas. Singer and composer. Former Assistant Professor of Music, State University of New York at Buffalo.

MUSIC, THE ART OF (in part)

J.T.H. James T. Harris. Former Regional Representative for West Africa (Lagos, Nigeria) for the African-American Institute, New York City.

UNITED STATES OF AMERICA (in part)

J.T.M. Joe T. Marshall. Zoologist, National Fish and Wildlife Laboratory, National Museum of Natural History, Washington, D.C. Coauthor of *Birds of Arizona*.

BIRDS (in part)

J.Tn. John Thompson. Professor of Geography, University of Illinois, Urbana.

CENTRAL AMERICA (in part)

J.T.Pa. John T. Paoletti. Professor of Art History, Wesleyan University, Middletown, Connecticut.

UCCELLO, PAOLO (Micropædia)

J.T.Sc. Jacob T. Schwartz. Chairman, Department of Computer Science, Courant Institute of Mathematical Sciences, New York University, New York City. Author of *Mathematical Methods in Analytical Economics*; coauthor of *Linear Operators*.

ANALYSIS (IN MATHEMATICS) (in part)

J.T.W. J. Tuzo Wilson. Director General, Ontario Science Centre, Don Mills, 1974–85. A leading advocate of continental drift and sea floor spreading.

OCEANS (in part)

J.U. Jürgen Untermann. Professor of Comparative Philology, University of Cologne. Author of *Die venetischen Personennamen*.

LANGUAGES OF THE WORLD (in part)

Ju.H. Julius S. Held. Emeritus Professor of Art History, Barnard College, Columbia University. Author of *Flemish Painting* and others.

VAN DYCK, SIR ANTHONY
(Micropædia)

Ju.S. Julius Stone (d. 1985). Professor of Law, University of New South Wales, Kensington, Australia. Distinguished Professor of Jurisprudence and International Law, University of California Hastings College of Law, San Francisco. Challis Professor of Jurisprudence and International Law, University of Sydney, Australia, 1942–72. Author of *The Province and Function of Law* and others.

PHILOSOPHIES OF THE BRANCHES OF
KNOWLEDGE (in part)

Ju.S.B. Julia S. Berrall. Free-lance lecturer and writer. Author of *Flowers and Table Settings*; *The Garden: An Illustrated History*; *A History of Flower Arrangement*.

DECORATIVE ARTS AND FURNISHINGS
(in part)

J.V. John Vaizey, Baron Vaizey (d. 1984). Professor of Economics, Brunel University, Uxbridge, England, 1966–82. Author of *The Economics of Education* and others.

EDUCATION, SOCIAL AND ECONOMIC
ASPECTS OF (in part)

J.v.D. Jacques van Doorn. Professor of Sociology, University of Rotterdam. Editor of *Armed Forces and Society*.

WAR, THE THEORY AND CONDUCT
OF (in part)

J.v.E. Josef van Ess. Professor of Islamic Studies and Semitic Languages, Eberhard Karl University of Tübingen, West Germany. Author of *Die Erkenntnislehre des 'Aḡadaddīn al-Īcī. MUḤĀSIBĪ, AL-* (Micropædia)

J.V.F. J. Valerie Fifer. Honorary Research Fellow, Institute of Latin American Studies, University of London. Author of *Bolivia: Land, Location, and Politics since 1825*.

BOLIVIA (in part)

J.V.G. Juan Vernet Ginés. Professor of Arabic, University of Barcelona. Author of *Los Musulmanes españoles* and others.

SPAIN (in part)

J.v.H. Jan S.F. van Hoogstraten. Chief of Mission, Intergovernmental Committee for Migration, Bonn. Former Church World Service Director, Africa Department, National Council of the Churches of Christ in the U.S.A.

CENTRAL AFRICA (in part)

J.Vi. Jean Vidalenc. Former Professor of Contemporary History, University of Rouen, France. Author of *Louis Blanc*; *La Restauration (1814–1830)*; and others.

BLANC, LOUIS (Micropædia)

MARAT, JEAN-PAUL (Micropædia)

THIERS, ADOLPHE (Micropædia)

J.V.K. John V. Killheffer. Associate Editor, *Science*, Encyclopædia Britannica, Chicago, 1971–88.

CHEMICAL COMPOUNDS (in part)
INDUSTRIES, CHEMICAL PROCESS
(in part)

J.V.M. John V. Murra. President, Institute of Andean Research, New York City. Emeritus Professor of Anthropology, Cornell University, Ithaca, New York. Author of *The Economic Organization of the Inka State* and others.

AMERICAN INDIANS (in part)

PRE-COLUMBIAN CIVILIZATIONS (in part)

J.V.N. Joseph Veach Noble. Director, Museum of the City of New York, New York City. Author of *The Techniques of Painted Attic Pottery*; coauthor of *An Inquiry into the Forgery of the Etruscan Terracotta Warriors in the Metropolitan Museum of Art*.

ARTS, PRACTICE AND PROFESSION OF
THE (in part)

J.Vo. Jack Vowles. Lecturer in Political Studies, University of Auckland, New Zealand.

NEW ZEALAND (in part)

J.V.R. Jan L.R. Van Roey. *Honorary Archivist, City Archives, Antwerp.*
ANTWERP

J.V.S. Joseph V. Smith. *Louis Block Professor of Physical Sciences, University of Chicago. An authority on phase equilibria in mineral systems and on crystal structure.*

MINERALS AND ROCKS
(in part)

J.V.W. James V. Warren, M.D. *Professor of Medicine, Ohio State University, Columbus. Contributor to Textbook of Medicine; The Heart.*
CIRCULATION AND CIRCULATORY SYSTEMS (in part)

J.W.B. Jesse W. Beams (d. 1977). *Professor of Physics, University of Virginia, Charlottesville, 1930–69. Coauthor of Tests of the Theory of Isotope Separation by Centrifuging.*
GRAVITATION (in part)

J.W.Ba. John Walton Barker, Jr. *Professor of History, University of Wisconsin, Madison. Author of Justinian and the Later Roman Empire and others.*

BELISARIUS (Micropædia)

J.W.C. John W. Caughey. *Emeritus Professor of American History, University of California, Los Angeles. Author of McGillivray of the Creeks.*

MCGILLIVRAY, ALEXANDER
(Micropædia)

J.W.Du. J. Wyatt Durham. *Emeritus Professor of Paleontology; Curator of Mesozoic and Cenozoic Invertebrates, University of California, Berkeley.*
GEOCHRONOLOGY (in part)

J.We. Jac Weller. *Weapons engineer, military historian, and free-lance writer. Author of Weapons and Tactics; coauthor of Firearms Investigation, Identification, and Evidence.*
WAR, THE TECHNOLOGY OF
(in part)

J.W.F. J.W. Fiegenbaum. *Professor of Religion, Mount Holyoke College, South Hadley, Massachusetts.*

ḤALLĀJ, AL- (Micropædia)
IBN ḤAZM (Micropædia)

J.W.Ha. John W. Harbaugh. *Professor of Geology, Stanford University, California. Coauthor of Computer Simulation in Geology.*
EARTH SCIENCES, THE
(in part)

J.W.Hu. John W. Huffman, M.D. *Emeritus Professor of Obstetrics and Gynecology, Medical School, Northwestern University, Chicago. Author of Gynecology and Obstetrics.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

J.Wi. J. Williams. *Director of Nuclear Research, Atomic Energy Research Establishment, Harwell, England.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.W.K. John W. Kendrick. *Emeritus Professor of Economics, George Washington University, Washington, D.C. Former Chief Economist, U.S. Department of Commerce. Author of Productivity Trends in the United States.*
ECONOMIC GROWTH AND PLANNING
(in part)

J.W.L. Justin W. Leonard (d. 1975). *Professor of Natural Resources and of Zoology; Research Associate, Museum of Zoology, University of Michigan, Ann Arbor, 1964–75. Coauthor of Mayflies of Michigan Trout Streams.*
INSECTS (in part)

J.W.Le. John Wilson Lewis. *William Haas Professor of Chinese Politics, Stanford University, California. Author of Leadership in Communist China and others.*

CHINA (in part)
TAIWAN (in part)

J.W.McF. James Walter McFarlane. *Professorial Fellow in European Literature, University of East Anglia, Norwich, England. Author of Ibsen and the Temper of Norwegian Literature; editor and translator of The Oxford Ibsen.*

IBSEN, HENRIK (Micropædia)
SCANDINAVIAN LITERATURE
(in part)

J.Wo. John Woodward (d. 1988). *Keeper, Birmingham City Museum and Art Gallery, Birmingham, England. Author of A Picture History of British Painting.*

REYNOLDS, SIR JOSHUA (Micropædia)

J.W.O. John W. Osborne. *Professor of History, Rutgers University, New Brunswick, New Jersey. Author of William Cobbett: His Thoughts and His Times and others.*

COBBETT, WILLIAM (Micropædia)

J.W.R. James Wilmot Rowe. *Executive Director, New Zealand Employers' Federation, Wellington. Coauthor of New Zealand.*

NEW ZEALAND (in part)

J.W.R.T. John W.R. Taylor. *Editor, Jane's All the World's Aircraft. Author of Combat Aircraft of the World; History of Aerial Warfare; and others.*

WAR, THE TECHNOLOGY OF (in part)

J.W.T. John Walford Todd, M.D. *Former Consultant Physician, Frimley Park and Farnham Hospitals, Farnham, England. Author of Health and Humanity.*

MEDICINE (in part)

J.W.Th. John W. Thieret. *Professor of Botany, Northern Kentucky University, Highland Heights.*

ANGIOSPERMS (in part)
GYMNOSPERMS (in part)

J.W.W. James Wreford Watson. *Emeritus Professor of Geography, University of Edinburgh. Author of North America: Its Countries and Regions and others.*

NORTH AMERICA (in part)

J.W.Wr. John Wilfrid Wright. *Land surveyor; free-lance writer and lecturer. Author of Ground and Air Survey for Field Scientists.*

MAPPING AND SURVEYING (in part)

J.Y.S. John Y. Simon. *Professor of History, Southern Illinois University, Carbondale. Executive Director, Ulysses S. Grant Association. Editor of The Papers of Ulysses S. Grant.*

GRANT, ULYSSES S. (Micropædia)

J.Z.S. Jonathan Zittel Smith. *Robert O. Anderson Distinguished Service Professor of the Humanities, University of Chicago.*

EUROPEAN RELIGIONS, ANCIENT (in part)
MYTH AND MYTHOLOGY (in part)

J.Z.V. Josefina Zoraida Vázquez. *Professor of History, College of Mexico, Mexico City. Author of Nacionalismo y educación en México.*

EDUCATION, HISTORY OF (in part)

K.A.B. Kenneth A. Ballhatchet. *Professor of the History of South Asia, School of Oriental and African Studies, University of London. Author of Race, Sex and Class under the Raj.*

AKBAR (Micropædia)

DALHOUSIE, JAMES ANDREW BROWN
RAMSAY, MARQUESS AND 10TH
EARL OF (Micropædia)

K.A.H. Keith Arnold Hitchins. *Professor of History, University of Illinois, Urbana.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

K.A.J.W. Keith Arthur John Wise. *Entomologist, Auckland Institute and Museum, New Zealand.*

INSECTS (in part)

Ka,La. Karl Lavrencic. *Journalist.*
YUGOSLAVIA (in part)

K.A.M. Kazimieras Antano Meškauskas. *Member and Chief Learned Secretary of the Presidium, Lithuanian S.S.R. Academy of Sciences. Author of Soviet Lithuania: An Economic Survey and others.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

K.A.R.K. Kenneth A.R. Kennedy. *Professor of Ecology, Anthropology, and Asian Studies, Cornell University, Ithaca, New York. Field researcher on the physical anthropology of early man in South Asia. Author of Neanderthal Man.*
ASIA (in part)

K.A.S. Kaj Aa. Strand. *Scientific Director, U.S. Naval Observatory, Washington, D.C., 1963–77. Editor of Basic Astronomical Data; Vistas in Astronomy.*

PARALLAX (in part) (Micropædia)

K.A.St. Kaydon Al Stanzione. *Senior Engineer, Advanced Vehicle Aerodynamics, Boeing Vertol Company, Philadelphia.*

ENGINEERING (in part)

K.A.W.C. Keith A.W. Crook. *Reader in Geology, Australian National*

University, Canberra. Coauthor of Geological Evolution of Australia and New Zealand.

MINERALS AND ROCKS (in part)

K.B. Knut Bergsland. Emeritus Professor of Finno-Ugric Languages, University of Oslo. Scholar who proved the connection between the Eskimo and Aleut languages. Author of "Aleut Dialects of Atka and Attu" in Transactions of the American Philosophical Society.

LANGUAGES OF THE WORLD (in part)

K.Ba. Kurt Badt (deceased). Art historian. Author of Die Kunst des Nicolas Poussin; John Constable's Clouds; The Art of Cézanne; and others.

POUSSIN, NICOLAS (Micropædia)

K.B.D. Kwamina Busumafi Dickson. Vice-Chancellor, University of Cape Coast, Ghana. Author of A Historical Geography of Ghana.

AFRICA (in part)

K.Be. Karl Beckson. Professor of English, Brooklyn College, City University of New York. Editor of Aesthetes and Decadents of the 1890's; Oscar Wilde: The Critical Heritage.

WILDE, OSCAR (Micropædia)

K.-b.L. Ki-baik Lee. Professor of History, Sogang University, Seoul, Korea. Author of Hankuksa sillon.

KOREA (in part)

K.B.M. Kathleen Berton Murrell. Researcher on the history of Moscow. Author of Moscow: An Architectural History.

MOSCOW (in part)

K.Br. Sir Kenneth Bradley (d. 1977). Director, Commonwealth Institute, London, 1953-69.

SOUTHERN AFRICA (in part)

K.C.B. Kevin Charles Beck. Associate Professor of Geophysical Sciences, Georgia Institute of Technology, Atlanta. Coauthor of Clay Water Diagenesis During Burial: How Mud Becomes Gneiss.

MINERALS AND ROCKS (in part)

K.C.E. Kenneth Charles Edwards (d. 1982). Professor of Geography, University of Nottingham, England, 1948-70.

LOW COUNTRIES, THE (in part)

K.-c.H. Kung-chuan Hsiao (d. 1981). Professor of the History of Chinese Thought, University of Washington, Seattle, 1959-68. Author of Rural China: Imperial Control in the 19th Century.

HAN-FEI-TZU (Micropædia)

K.C.P. Kenneth C. Parkes. Curator of Birds, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania. Author of numerous articles on the biology and systematics of birds.

BIRDS (in part)

K.-D.G. Karl-Dietrich Gundermann. Professor of Organic Chemistry, Technical University of Clausthal, West Germany. Author of Chemilumineszenz

organischer Verbindungen.

LIGHT (in part)

K.E.Bo. Kenneth E. Boulding. Distinguished Professor Emeritus of Economics, University of Colorado, Boulder. Author of Economics as a Science; Ecodynamics: A New Theory of Societal Evolution.

ECONOMIC THEORY (in part)

K.E.H. Kenneth E. Hofer, Jr. Vice President, L. J. Broutman and Associates, Ltd., Chicago. Former Senior Research Engineer, Materials Engineering, Illinois Institute of Technology Research Institute, Chicago.

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

K.E.N. Kai E. Nielsen. Professor of Philosophy, University of Calgary, Alberta. Author of Scepticism.

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

K.E.P. Kenyon Edwards Poole. Emeritus Professor of Economics, Northwestern University, Evanston, Illinois. Author of Public Finance and Economic Welfare.

GOVERNMENT FINANCE (in part)

Ke.S. Keith Sinclair. Professor of History, University of Auckland, New Zealand. Author of A History of New Zealand.

NEW ZEALAND (in part)

K.G. Karl Geiringer. Emeritus Professor of Music, University of California, Santa Barbara. Coauthor of Brahms: His Life and Work; Haydn: A Creative Life in Music.

HAYDN, JOSEPH (in part) (Micropædia)

K.Ga. Kenneth Garrad. Professor of Spanish, Flinders University of South Australia, Bedford Park (Adelaide).

SPAIN (in part)

K.G.J. Kingsley Garland Jayne. Former Scholar of Wadham College, University of Oxford. Author of Vasco da Gama and His Successors.

EAST INDIES, THE (in part)

K.G.L. Kenneth G. Lieberthal. Professor of Political Science; Research Associate, Center for Chinese Studies, University of Michigan, Ann Arbor. Author of Central Documents and Politburo Politics in China and others.

CHINA (in part)

CULTURAL REVOLUTION (Micropædia)

K.G.R. Kenneth Grahame Rea. Lecturer and Tutor in Drama, Guildhall School of Music and Drama, London. Theatre Critic and writer, The Guardian.

THEATRE, THE HISTORY OF WESTERN

K.G.T. Kennedy G. Tregonning. Headmaster, Hale School, Wembley Downs, Western Australia. Raffles Professor of History, University of Singapore, 1958-66. Author of A History of Modern Malaysia and Singapore.

SOUTHEAST ASIA, MAINLAND (in part)

K.Hä. Karl H. Häuser. Professor of Political Economy, Johann Wolfgang

Goethe University of Frankfurt, Frankfurt am Main, West Germany. Coauthor of The German Economy, 1870 to the Present.

TAXATION (in part)

K.H.C. Kenneth H. Cooper. President and Founder, The Aerobics Center, Dallas, Texas. Author of The Aerobics Program for Total Well-being.

EXERCISE AND PHYSICAL CONDITIONING (in part)

K.H.D.H. K.H.D. Haley. Emeritus Professor of Modern History, University of Sheffield, England. Author of The First Earl of Shaftesbury.

SHAFTESBURY, ANTHONY ASHLEY COOPER, 1ST EARL OF (Micropædia)

K.H.L. Karl Heinz Lüling. Former Chairman, Department of Ichthyology, Zoological Research Institute and Alexander Koenig Museum, Bonn, West Germany. Researcher on the physiology and behaviour of lungfishes.

FISHES (in part)

Kh.Mo. Khosrow Mostofi. Professor of Political Science, University of Utah, Salt Lake City; former Director, Middle East Languages and Area Center. Author of Aspects of Nationalism: A Sociology of Colonial Revolt.

IRAN (in part)

K.Ho. Keigo Hogetsu. Honorary Professor of Literature, University of Tokyo. Author of Nihon shi gairon and others.

TAIRA FAMILY (Micropædia)

K.H.V. Karel Hendrik Voous. Emeritus Professor of Systematic Zoology and Zoogeography, Free University, Amsterdam, The Netherlands. Author of Atlas of European Birds and others.

BIOSPHERE, THE (in part)

K.I. Keith Irvine. President, Reference Publications, Inc., Algonac, Michigan. Principal Editor, Geography, Encyclopædia Britannica, Chicago, 1969-72. Research Officer, Permanent Mission of Ghana to the United Nations, New York City, 1958-69. Author of The Rise of the Colored Races.

LEE KUAN YEW (Micropædia)

K.In. Kenneth Ingham. Professor of History, University of Bristol, England. Author of East Africa and others.

AFRICA (in part)

EASTERN AFRICA (in part)

SOUTHERN AFRICA (in part)

K.Iw. Kenkichi Iwasawa. H.B. Fine Professor of Mathematics, Princeton University. Author of Lectures on p-adic L-functions.

ANALYSIS (IN MATHEMATICS) (in part)

K.J. Karl H.E. Jordan. Emeritus Professor of Medieval and Modern History, Christian Albrecht University of Kiel, West Germany. Editor of Die Urkunden Heinrichs des Löwen.

HENRY III (Saxony) (Micropædia)

K.J.B. Keith J. Beven. Lecturer in Engineering Hydrology, University of

Lancaster, England.

EARTH SCIENCES, THE (in part)

K.J.DeW. Kenneth J. DeWoskin. Associate Professor of Chinese; Associate Director, Center for Chinese Studies, University of Michigan, Ann Arbor. Author of *A Song for One or Two: Music and the Concept of Art in Early China and others.*

CHINA (in part)

K.J.H. Keith J. Hancock. Vice-Chancellor, Flinders University of South Australia, Bedford Park.

AUSTRALIA (in part)

K.J.Hi. K. Jaakko J. Hintikka. Professor of Philosophy, Florida State University, Tallahassee. Author of *Logic, Language-Games and Information.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

K.J.L. K.J. Leyser. Chichele Professor of Medieval History, University of Oxford, 1984–88. Author of *Medieval Germany and Its Neighbours, 900–1250.*

GERMANY (in part)

K.J.N. Karl J. Narr. Professor and Director, Seminary for Prehistory and Protohistory; Director, Institute for Early Medieval Studies, University of Münster, West Germany.

PREHISTORIC PEOPLES AND CULTURES (in part)

K.J.R. Kenneth John Rea. Professor of Economics, University of Toronto. Author of *The Political Economy of the Canadian North.*

CANADA (in part)

K.K. Kumar Krishna. Research Associate, Department of Entomology, American Museum of Natural History, New York City. Professor of Biology, City College, City University of New York. Coeditor of *Biology of Termites.*

INSECTS (in part)

K.Ku. Karthigesapillai Kularatnam (deceased). Professor and Head, Department of Geography, University of Sri Lanka, Colombo. Author of *"Ceylon" in Developing Countries of the World.*

SRI LANKA (in part)

K.La. Kenneth Lamott (d. 1979). Novelist and journalist. Author of *Anti-California and numerous other books and magazine articles.*

SAN FRANCISCO (in part)

K.L.K.L. Kai L.K. Laitinen. Associate Professor of Finnish Literature, University of Helsinki. Author of *Suomen kirjallisuus 1917–1967; editor of Suomen kirjallisuuden antologia.*

FINNISH LITERATURE (Micropædia)

K.L.N. Kenneth L. Nordtvedt, Jr. Professor of Physics, Montana State University, Bozeman.

GRAVITATION (in part)

K.Lo. Dame Kathleen Lonsdale (d. 1971). Professor of Chemistry, University of London, 1949–68. Editor and part author of *Vols. I, II, III, International Tables for X-Ray Crystallography.*

BRAGG, SIR LAWRENCE (Micropædia)

BRAGG, SIR WILLIAM (Micropædia)

K.M. Kathy Mezei. Associate Professor of English, Simon Fraser University, Burnaby, British Columbia. Coeditor of *The Prose of Life; Sketches from Victorian Canada.*

CANADIAN LITERATURE (in part)

K.Ma. Kitajima Masamoto. Former Professor of Japanese History, Tokyo Metropolitan University. Author of *Structure of Power in the Edo Shogunate.*

JAPAN (in part)

K.M.A.G. Kurt Moritz Artur Goldammer. Professor of Comparative History of Religions and of the History of Religious Art, Philipps University of Marburg, West Germany. Author of *Kultsymbolik des Protestantismus.*

RELIGIOUS SYMBOLISM AND ICONOGRAPHY

K.Me. Kenneth Mellanby Consultant and Editor, Environmental Pollution. Director, Monks Wood Experimental Station, Huntingdon, England, 1961–74. Author of *Farming and Wildlife and others.*

AGRICULTURE, THE HISTORY OF (in part)

K.M.G.P. Kings Mbazwa G. Phiri. Senior Lecturer in History, University of Malawi, Zomba.

SOUTHERN AFRICA (in part)

K.M.K. Dame Kathleen Mary Kenyon (d. 1978). Principal, St. Hugh's College, University of Oxford, 1962–73. Director, British School of Archaeology in Jerusalem, 1951–66. Author of *Archaeology in the Holy Land; Digging Up Jericho; and others.*

PALESTINE (in part)

K.M.L. Kathleen Marguerite Lea. Emeritus Fellow of Lady Margaret Hall, University of Oxford; Vice Principal of Lady Margaret Hall, Oxford, 1947–71.

BACON, FRANCIS (in part)

K.M.S. Kazimierz Maciej Smogorzewski. Free-lance writer on contemporary history. London Correspondent, *Kurier Polski* (Warsaw), 1957–81. Founder and Editor, *Free Europe*, 1939–45. Author of *Joseph Pilsudski, soldat de la Pologne restaurée; Poland's Access to the Sea; and others.*

GERMANY (in part)

PILSUDSKI, JÓZEF (Micropædia)

POLAND (in part)

ROMANIA (in part)

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

YUGOSLAVIA (in part)

K.M.W. Karl M. Waage. Professor of Geology; Curator of Invertebrate Paleontology, Peabody Museum of Natural History, Yale University. Coauthor of *Historical Geology.*

DANA, JAMES D. (Micropædia)

K.N. Keiji Nagahara. Professor of History, Hitotsubashi University, Tokyo. Author of *Minamoto no Yoritomo.*

MINAMOTO YORITOMO (Micropædia)

K.Na. Kusum Nair. Visiting Professor, Department of Economics, University of Maryland, College Park. Author of *The Lonely Furrow: Farming in the United States, Japan, and India and others.*

AGRICULTURE, THE HISTORY OF (in part)

K.N.L. Karl Nickerson Llewellyn (d. 1962). Professor of Law, University of Chicago, 1951–62.

MANSFIELD OF CAEN WOOD, WILLIAM MURRAY, 1ST EARL OF (Micropædia)

K.Ob. Kalervo Oberg (d. 1973). Professor of Anthropology, Oregon State University, Corvallis. Author of *Indian Tribes of Northern Mato Grosso, Brazil.*

AMERICAN INDIANS (in part)

K.O.v.A. Karl Otmar, Baron von Aretin. Professor of Contemporary History, Technical University of Darmstadt, West Germany. Director, Institute for European History, Mainz, West Germany.

FRANCIS JOSEPH (Micropædia)

METTERNICH, KLEMENS, FURST VON (in part) (Micropædia)

K.P.S. Karl Patterson Schmidt (d. 1957). Chief Curator of Zoology, Field Museum of Natural History, Chicago, 1941–55.

CHINA (in part)

UNITED STATES OF AMERICA (in part)

K.Re. Kenneth Rexroth (d. 1982). Poet, writer, and painter. Special Lecturer, University of California, Santa Barbara. Author of *Classics Revisited and others.*

LITERATURE, THE ART OF (in part)

K.-r.L. Kwang-rin Lee. Professor of History, Sogang University, Seoul, Korea. Author of *History of Enlightenment in Korea.*

KOREA (in part)

K.R.S. Kenneth Reginald Sturley, Professor of Telecommunications, Ahmadu Bello University, Zaria, Nigeria, 1968–71. Chief Engineer, External Broadcasting, British Broadcasting Corporation, London, 1963–68. Author of *Radio Receiver Design and others.*

BROADCASTING (in part)

K.R.St. Karl R. Stadler. Professor and Head, Institute of Modern and Contemporary History, Johannes Kepler University of Linz, Austria. Author of *The Birth of the Austrian Republic.*

AUSTRIA (in part)

K.R.V.H. Kent R. Van Horn, Vice President, Research and Development, Aluminum Company of America, Pittsburgh, 1962–70; Director of Research, 1952–62; Research Metallurgist, 1929–62. Coauthor of *Aluminum in Iron and Steel; editor of Aluminum.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

K.S. Khushwant Singh. Free-lance journalist. Member, Rajya Sabha (upper house of the Indian Parliament). Author of *A History of the Sikhs and others.*

SIKHISM

K.S.A.J. Kamel S. Abu Jaber. Professor of Political Science, University of Jordan, Amman. Author of *The Jordanians and the People of Jordan*. JORDAN (in part)

K.S.D. Keith S. Donnellan. Professor of Philosophy, University of California, Los Angeles. Author of articles in various philosophical journals, particularly on the theory of reference.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

K.S.G. Karl S. Guthke. Professor of German Literature, Harvard University. Author of *Das Leid im Werke Gerhart Hauptmanns*; *Gerhart Hauptmann: Weltbild im Werk*.

HAUPTMANN, GERHART (Micropædia)

K.Si. Kate Silber (deceased). Senior Lecturer in German, University of Edinburgh, 1963–73. Author of *Pestalozzi: The Man and His Work*. PESTALOZZI, JOHANN HEINRICH (in part) (Micropædia)

K.S.L. Kenneth S. Lane. Editorial Board Member, *Underground Space*. Consulting Engineer for dams and tunnels, and soils and rock engineering. Editor of *Proceedings of the North American Rapid Excavating and Tunneling Conference, 1972*; *Proceedings of the ASCE symposium on Underground Rock Chambers, 1971*.

PUBLIC WORKS (in part)

K.S.N. Kenneth Stafford Norris. Professor of Natural History, University of California, Santa Cruz. Director, *Oceanic Institute*, Waimanalo, Hawaii, 1968–71. Editor of *Whales, Dolphins and Porpoises*.

MAMMALS (in part)

K.S.S. Kamal Suleiman Salibi. Professor of History, American University of Beirut. Author of *The Modern History of Lebanon and others*. BEIRUT (in part)
ISRAEL (in part)
SYRIA (in part)

K.St. The Rev. Krister Stendahl. Bishop of Stockholm. Andrew W. Mellon Professor of Divinity, Harvard University, 1981–84; Dean, Divinity School, 1968–79. Author of *Paul Among Jews and Gentiles and others*.

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

K.St.P. Kosta Stevan Pavlowitch. Librarian, Department of Slavonic Studies, University of Cambridge. Yugoslav diplomat, 1928–45. Author of *The Struggle of the Serbs and others*. YUGOSLAVIA (in part)

K.S.W. Kathrine Sorley Walker. Free-lance writer, editor, and dance critic. Author of *Dance and Its Creators and others*.

BALANCHINE, GEORGE (Micropædia)
FOKINE, MICHEL (Micropædia)
PAVLOVA, ANNA (Micropædia)

K.U.K. Khalil Ullah Kureshy. Professor of Geography; Director, Institute of Education and Research, University of

the Punjab, Lahore, Pakistan. Editor of *Pakistan Geographical Review*.

PAKISTAN (in part)

Ku.N. Kurt Nassau. Research Scientist, AT&T Bell Laboratories, Murray Hill, New Jersey. Author of *The Physics and Chemistry of Color*.

COLOUR

Ku.R. Kurt Reindel. Professor of History, University of Regensburg, West Germany.

OTTO I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

K.v.Fr. Kurt von Fritz (d. 1985). Professor of Classical Philosophy, Ludwig Maximilian University of Munich. Author of *Die griechische Geschichtsschreibung*, vol. I, and numerous others.

PHILOSOPHY, THE HISTORY OF WESTERN (in part)

K.V.J.v.F. Kai V.J. von Fieandt. Emeritus Professor of Psychology, University of Helsinki. Author of *The World of Perception*.

PERCEPTION, HUMAN (in part)

K.V.Su. K.V. Sundaram. Joint Director, Planning Commission, Government of India, New Delhi.

DELHI (in part)

K.V.Z. Kamil V. Zvelebil. Professor of Dravidology, Utrecht University, The Netherlands. Author of *Comparative Dravidian Phonology*.

LANGUAGES OF THE WORLD (in part)

K.W.B. Karl W. Butzer. Dickson Centennial Professor of Liberal Arts, University of Texas at Austin. Specialist on the interrelationships among environment, prehistoric cultures, and human evolution. Author of *Environment and Archeology*; coauthor of *Desert and River in Nubia*.

CLIMATE AND WEATHER (in part)

K.W.Bo. Kees W. Bolle. Professor of History, University of California, Los Angeles. Author of *The Freedom of Man in Myth*.

MYTH AND MYTHOLOGY (in part)

K.W.Br. Kenneth W. Britt. Senior Research Associate, Empire State Paper Research Institute, State University of New York College of Environmental Science and Forestry, Syracuse. Editor of *Handbook of Pulp and Paper Technology*.

INDUSTRIES, CHEMICAL PROCESS (in part)

K.W.C. Kenneth Walter Cameron. Emeritus Associate Professor of English, Trinity College, Hartford, Connecticut. Author of *Emerson the Essayist*; *Young Emerson's Transcendental Vision*. EMERSON, RALPH WALDO (in part) (Micropædia)

K.W.K. Kathryn Weichert Kranbuhl, M.D. Assistant Professor of Radiation Oncology, University of Cincinnati, Ohio. ORGANS AND ORGAN SYSTEMS, PLANT AND ANIMAL (in part)

K.W.P. Ken W. Purdy (d. 1972). Free-lance writer. Author of *Kings of the Road*; *Motorcars of the Golden Past*. TRANSPORTATION (in part)

La.B. Larissa Bonfante. Professor of Classics, New York University, New York City. Author of *Etruscan Dress*. DRESS AND ADORNMENT (in part)

La.B.S. Lacey Baldwin Smith. Peter B. Ritzma Professor of Humanities, Northwestern University, Evanston, Illinois. Author of *Tudor Prelates and Politics and others*.

UNITED KINGDOM (in part)

L.A.C. Lewis A. Coser. Distinguished Professor of Sociology, State University of New York at Stony Brook. Author of *The Functions of Social Conflict*.

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

L.A.Cr. Lawrence A. Cremin. Frederick A.P. Barnard Professor of Education, Teachers College, Columbia University. Author of *American Education: The Colonial Experience and others*. MANN, HORACE (Micropædia)

La.G. Sir Lawrence Gowing. Slade Professor of Fine Art, University College, University of London. Author of *Vermeer*; *Turner*; *Imagination and Reality*.

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

La.L. Laurence Elliot Libin. Curator of Musical Instruments, Metropolitan Museum of Art, New York City. MUSICAL FORMS AND GENRES (in part)

L.-A.L. Luce-Andrée Langevin. Honorary Professor; former teacher of physical science, Lycée Fénélon, Paris. Author of *Lomonosov*.

LOMONOSOV, MIKHAIL VASILYEVICH (Micropædia)

L.A.M. Leslie A. Marchand. Emeritus Professor of English, Rutgers University, New Brunswick, New Jersey. Author of *Byron: A Biography and others*; editor of *Byron's Letters and Journals*.

BYRON, GEORGE GORDON BYRON, 6TH BARON (in part) (Micropædia)

L.A.Ma. L. Andrew Mannheim. Technical editor, writer, and consultant. Author of *Leica Way and others*; editor of *Focal Encyclopedia of Photography*. PHOTOGRAPHY (in part)

L.A.N. Leonid Alekseyevich Nikiforov. Senior Scientific Associate, Institute of History of the U.S.S.R., Academy of Sciences of the U.S.S.R., Moscow. Author of *Anglo-Russian Relations in the Reign of Peter I*.

PETER I THE GREAT, OF RUSSIA (in part)

L.A.P.G. L.A. Peter Gosling. Professor of Geography, University of Michigan; Director, Center for South and Southeast Asian Studies, 1962–66.

EAST INDIES, THE (in part)

SOUTHEAST ASIA, MAINLAND (in part)

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MUSICAL FORMS AND GENRES (in part)

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BANGKOK

L.A.S. Lionel Astor Sheridan. *Professor of Law, University College, University of Wales, Cardiff. Coauthor of Equity.*

LAW, THE PROFESSION AND PRACTICE OF (in part)

L.A.Si. Larry A. Silver. *Professor of Art History, Northwestern University, Evanston, Illinois. Author of The Paintings of Quinten Massys.*

REMBRANDT

L.A.St. L. Andrew Staehelin. *Professor of Cell Biology, University of Colorado, Boulder. Coeditor of Encyclopedia of Plant Physiology, vol. 19.*

CELLS (in part)

L.A.W. Leslie A. White (d. 1975). *Professor of Anthropology, University of Michigan, Ann Arbor. Author of The Science of Culture; The Evolution of Culture.*

CULTURE, THE CONCEPT AND COMPONENTS OF (in part)

L.A.Wa. Lionel A. Walford (d. 1979). *Director, Sandy Hook Marine Laboratory, Highlands, New Jersey, 1960–71; Senior Scientist, 1971–74. Author of Living Resources of the Sea.*

FISHES (in part)

L.B. Liliana Brisby. *Editor, The World Today. Author of Les Relations russo-bulgares, 1878–1886.*

BULGARIAN LITERATURE (in part)
(Micropædia)

L.Ba. Lawrence Badash. *Professor of the History of Science, University of California, Santa Barbara. Author of several papers on Becquerel's work.*

BEQUEREL, HENRI
(Micropædia)

L.B.A. Leslie B. Arey (d. 1988). *Robert L. Rea Professor and Chairman, Department of Anatomy, Medical School, Northwestern University, Chicago, 1925–56. Author of Developmental Anatomy.*

GROWTH AND DEVELOPMENT,
BIOLOGICAL (in part)

L.B.As. Larned B. Asprey. *Staff Member, Los Alamos National Laboratory, New Mexico. Author of numerous papers on the actinide, rare-earth, transuranium, and halogen elements.*

CHEMICAL ELEMENTS (in part)

L.Be. Lyman Benson. *Emeritus Professor of Botany, Pomona College, Claremont, California. Author of The Cacti of the United States and Canada and others.*

ANGIOSPERMS (in part)

L.B.S. Leonard Bertram Schapiro (d. 1983). *Professor of Political Science (Russian Studies), London School of Economics and Political Science, University of London, 1963–75. Author of The Communist Party of the Soviet Union and others.*

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

L.B.Sm. Lyman B. Smith. *Emeritus Botanist, Smithsonian Institution, Washington, D.C. Author of Bromeliaceae—North American Flora; Flora Neotropica.*

ANGIOSPERMS (in part)

L.C. Leonard W. Conversi. *Lecturer in English, Yale University.*

LITERATURE, THE ART OF (in part)

L.Ca. Luigi Carluccio. *Member of the arts editorial staff, La Gazzetta del popolo, Turin, Italy. Author of Giacometti: A Sketchbook of Interpretative Drawings.*

CARAVAGGIO (Micropædia)

L.C.B. Lawrence C. Bliss. *Professor and Chairman, Department of Botany, University of Washington, Seattle. Author of Alpine Zone of the Presidential Range.*

ECOSYSTEMS (in part)

L.C.Br. L. Carl Brown. *Garrett Professor of Foreign Affairs; Director, Program in Near Eastern Studies, Princeton University. Author of The Tunisia of Ahmad Bey.*

NORTH AFRICA (in part)
WESTERN AFRICA (in part)

L.C.D. L.C. Dunn (d. 1974). *Professor of Zoology, 1928–62; Senior Research Associate in Biological Sciences, 1962–74, Columbia University, New York City. Author of Heredity and Evolution in Human Populations and others.*

GROWTH AND DEVELOPMENT,
BIOLOGICAL (in part)

MENDEL, GREGOR (in part)
(Micropædia)

L.C.F. Louis C. Faron. *Professor of Anthropology, State University of New York at Stony Brook. Author of Hawks of the Sun and others.*

AMERICAN INDIANS (in part)

L.Ch. Luciano Chiappini. *Teacher. President, Ferrarese Delegation for the History of Italy. Committeeman, Antonio Frizzi Institute for the History of Ferrara. Author of Eleonora d'Aragona, prima duchessa di Ferrara and others.*

ESTE, HOUSE OF (Micropædia)

L.C.H. Lois Chapman Houghton. *Staff member, Middle East Institute, Washington, D.C.*

DAMASCUS (in part)

L.C.O. Leonard C. Overton. *Country Representative, Asia Foundation, Phnom Penh, Cambodia, 1955–59, 1961–64; Saigon, South Vietnam, 1965–67.*

SOUTHEAST ASIA, MAINLAND (in part)

L.C.P. Linus C. Pauling. *Research Professor, Linus Pauling Institute*

of Science and Medicine, Palo Alto, California. Professor of Chemistry, Stanford University, California, 1969–74. Nobel Prize for Chemistry, 1954; Nobel Prize for Peace, 1962. Author of The Nature of the Chemical Bond and others.

CHEMICAL ELEMENTS (in part)

L.D. Lovat Dickson (d. 1987). *Writer. Director, Macmillan & Company Ltd., London, 1941–64. Author of H.G. Wells.*

WELLS, H.G. (Micropædia)

L.De. Ludwig Denecke. *Director, Murhard Library of the City of Kassel and State Library; Head of the Brothers Grimm Museum, Kassel, West Germany, 1959–68. Author of Jacob Grimm und sein Bruder Wilhelm; editor of Brüder Grimm Gedenken.*

GRIMM, JACOB LUDWIG CARL AND WILHELM CARL (Micropædia)

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BEHAVIOUR, ANIMAL (in part)

L. de S.R. Luís de Sousa Rebelo. *Reader in Portuguese Studies, King's College, University of London. Author of A tradição clássica na Literatura portuguesa and others.*

LISBON (in part)

PORTUGUESE LITERATURE (in part)

L.D.F. Larry D. Faller. *Associate Professor, Department of Medicine, University of California, Los Angeles. Author of papers on the application of relaxation techniques to rapid chemical processes.*

CHEMICAL REACTIONS (in part)

L.D.S. Sir Laurence Dudley Stamp (d. 1966). *Professor of Social Geography, University of London, 1948–58. Author of Asia, a Regional and Economic Geography and others.*

EAST INDIES, THE (in part)

L.Du. Louis Dupree. *Visiting Professor of Public Policy Studies; Senior Research Associate, Islamic and Arabian Studies, Duke University, Durham, North Carolina. Field researcher in Afghanistan, India, Pakistan, and Bangladesh. Author of Afghanistan.*

AFGHANISTAN (in part)

L.Ed. Leon Edel. *Henry James Professor Emeritus of English and American Letters, New York University, New York City. Citizens, Professor Emeritus of English Literature, University of Hawaii at Manoa. Author of The Life of Henry James and others; editor of The Complete Tales of Henry James and others.*

JAMES, HENRY (in part) (Micropædia)

L.-E.H. Louis-Edmond Hamelin. *Geographer, University of Quebec at Trois-Rivières; Rector, 1978–83. Author of Canada.*

NORTH AMERICA (in part)

L.El. Lajos Elekes. *Professor of the Medieval History of Hungary, Eötvös Loránd University, Budapest. Member*

of the Hungarian Academy of Sciences. Author of Hunyadi; Mátyás és kora; and others.

HUNYADI, JÁNOS (Micropædia)
MATTHIAS I (HUNGARY) (Micropædia)

Le.M. Leonard Mosley. Author of Curzon: The End of an Epoch and others.

CURZON OF KEDLESTON, GEORGE
NATHANIEL CURZON, MARQUESS (Micropædia)

L.E.M. Leonard E. Mason. Consultant in Pacific Islands affairs. Emeritus Professor of Anthropology, University of Hawaii, Honolulu. Author of Relocation of the Bikini Marshallers.

PACIFIC ISLANDS (in part)

L.E.R. Leo E. Rose. Professor of Political Science, University of California, Berkeley. Author of Nepal: Strategy for Survival and others. NEPAL (in part)

Le.S. Lee Strasberg (d. 1982). Artistic Director, Actors Studio, 1948–82. Head, Lee Strasberg Theatre Institute, New York City. Author of Strasberg at the Actors Studio.

THEATRE, THE ART OF THE (in part)

L.E.S. Lawrence E. Sullivan. Associate Professor of the History of Religions, University of Chicago. Author of Icanchu's Drum: South American Religions, an Orientation to Meaning. CHRISTIANITY (in part)

L.F. Linwood Fredericksen. Undersecretary and Manager, Program Development Division, Rotary International. Associate Editor, Religion, Encyclopædia Britannica, Chicago, 1969–73. Author of A Christian Witness in a Non-Christian Culture According to Clement of Alexandria.

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

CHRISTIANITY (in part)

CLEMENT OF ALEXANDRIA, SAINT (in part) (Micropædia)

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

rites and ceremonies, sacred (in part)

L.F. de B. Lieven Ferdinand de Beaufort (d. 1968). Professor of Zoogeography, University of Amsterdam, 1929–49. Director, Zoological Museum, Amsterdam, 1922–49. Author of Zoogeography of the Land and Inland Waters.

ASIA (in part)

L.F.K.W. Lothar F.K. Wickert. Emeritus Professor of Ancient History, University of Cologne. Author of Theodor Mommsen: Eine Biographie; Drei Vorträge über Theodor Mommsen. MOMMSEN, THEODOR (Micropædia)

L.Fo. Lukas Foss. Composer and pianist. Music Director and Conductor, Brooklyn (New York) Philharmonic. Music Director, 1982–86, and Conductor Laureate, Milwaukee Symphony Orchestra. Composer of Time Cycle and many other works.

MUSIC, THE ART OF (in part)

L.F.S. Leo F. Solt. Dean, Graduate School; Professor of History, Indiana University, Bloomington. Author of Saints in Arms: Puritanism and Democracy in Cromwell's Army. UNITED KINGDOM (in part)

L.G.J.B. Ludwig G.J. Bieler (d. 1981). Professor of Paleography and Late Latin, University College, Dublin, National University of Ireland. Author of Boethii Philosophiae Consolatio and others.

IGNATIUS OF ANTIOCH, SAINT (Micropædia)

L.Go. Ludwig Goldscheider. Art historian. Former director and designer of books for Phaidon Press Ltd., London. Author of Kokoschka; Michelangelo; and numerous other classic works on the art of antiquity, the Italian Renaissance, the Baroque, and the late 19th and early 20th centuries.

KOKOSCHKA, OSKAR (Micropædia)

L.G.P. Leslie Gilbert Pine (d. 1987). Writer and lecturer. Editor, Burke's Peerage. Author of The Genealogist's Encyclopedia; The Story of Heraldry; and many others.

HERALDRY

HISTORY, THE STUDY OF (in part)

L.G.S. Lloyd Grenfell Stevenson, M.D. William H. Welch Professor of the History of Medicine; Director, Institute of the History of Medicine, Johns Hopkins University, Baltimore. Author of Sir Frederick Banting.

KOCH, ROBERT (Micropædia)

L.H. Leslie Harris. President and Vice-Chancellor, Memorial University of Newfoundland, St. John's. Author of A Short History of Newfoundland and Labrador.

CANADA (in part)

L.H.A. Lawrence Hugh Aller. Emeritus Professor of Astronomy, University of California, Los Angeles. Author of Atoms, Stars, and Nebulae. STARS AND STAR CLUSTERS (in part)

L.H.B. Leslie Hilton Brown (d. 1980). Ornithologist, naturalist, and consultant on range management, land use, and planning. Specialist on the ecology of birds and mammals of East Africa. Author of Africa: A Natural History; African Birds of Prey; Eagles; coauthor of Eagles, Hawks and Falcons of the World. AFRICA (in part)
BIRDS (in part)

L.H.Bu. Lyman H. Butterfield (d. 1982). Editor in Chief, The Adams Papers, Massachusetts Historical Society, Boston, 1954–75. Editor of Letters of Benjamin Rush.

RUSH, BENJAMIN (Micropædia)

L.H.E. Luther Harris Evans (d. 1981). Director, International Collections, Columbia University, 1962–71. Director General, UNESCO, 1953–58. Librarian of Congress, 1945–53. Author of The Virgin Islands from Naval Base to New Deal. WEST INDIES, THE (in part)

L.H.F. Louis H. Feldman. Professor of Classics, Yeshiva University, New York City. Author of Scholarship on Philo and Josephus, 1937–1962; editor and translator of Josephus, vol. 9, Jewish Antiquities.

JUDAISM (in part)

L.H.H. Ludwig Heinrich Heydenreich (d. 1978). Director, Central Institute for the History of Art, Munich, 1947–70. Author of Leonardo da Vinci; Leonardo architetto.

LEONARDO DA VINCI (in part)

L.Hi. Lejaren Hiller. Birge-Cary Professor of Composition, State University of New York at Buffalo. Author of Informationstheorie und Computermusik; coauthor of Experimental Music.

MUSICAL FORMS AND GENRES (in part)

L.H.S. Lou Hackett Silberman. Hillel Professor Emeritus of Jewish Literature and Thought, Vanderbilt University, Nashville, Tennessee. Author of American Impact; editor of Rabbinic Essays. JUDAISM (in part)

L.H.St. Lawrence H. Starkey. Lecturer in Philosophy, University of Missouri, Rolla. Associate Editor, Philosophy, Encyclopædia Britannica, Chicago, 1968–72.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

Li.L. Libero Lenti. Professor of Statistics, University of Milan. Author of Inventario dell'economia italiana. ITALY (in part)

L.J. Lucien Jerphagnon. Professor of Philosophy, University of Caen, France. Author of Le Caractère de Pascal. PASCAL (in part)

L.J.A. Leonard James Arrington. Former Lemuel H. Redd Professor of Western American History, Brigham Young University, Provo, Utah. Author of Great Basin Kingdom: An Economic History of the Latter-day Saints and others.

UNITED STATES OF AMERICA (in part)

L.J.B. Louis J. Battan (d. 1986). Professor of Atmospheric Sciences, University of Arizona, Tucson, 1958–86. World authority on radar meteorology and its applications. Author of Radar Meteorology; The Nature of Violent Storms; and others.

CLIMATE AND WEATHER (in part)

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MEASUREMENT AND OBSERVATION, PRINCIPLES, METHODS, AND INSTRUMENTS OF (in part)

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Sydney. Editor of The Oxford History of Australian Literature.

AUSTRALIA AND NEW ZEALAND,
LITERATURES OF (in part)

L.J.S. Lewis Judson Stannard, Jr. *Emeritus Taxonomist, Illinois Natural History Survey, Urbana. Author of The Phylogeny and Classification of the North American Genera of the Suborder Tubulifera (Thysanoptera).*

INSECTS (in part)

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BUCER, MARTIN (Micropædia)

L.J.W. Louis Jolyon West, M.D. *Professor and Chairman, Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles; Director, Neuropsychiatric Institute; Psychiatrist in Chief, U.C.L.A. Hospital and Clinics. Author of Hallucinations.*

PERCEPTION, HUMAN (in part)

L.K. Lawrence Kaplan. *Professor of Biology, University of Massachusetts, Boston.*

GROWTH AND DEVELOPMENT,
BIOLOGICAL (in part)

L.Kl. Larry Klein. *Contributing Editor, Stereo Review magazine; former Technical Director. Coauthor of Electronic Test Equipment.*

SOUND (in part)

L.K.L. Lawrence K. Lustig. *Former Vice President and Editor in Chief, Arête Publishing Company, Princeton, New Jersey. Senior Editor, Earth Sciences, Encyclopædia Britannica, Chicago, 1968-73; Managing Editor, Yearbooks, 1974-77. An authority on fluvial processes in arid regions.*

ECOSYSTEMS (in part)

MINERALS AND ROCKS (in part)

RIVERS (in part)

L.K.M. Liliya Konstantinovna Malik. *Senior Scientist, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow. Author of The Characteristic of the Snow Cover as One of the Factors of the Formation of High Waters in the Basin of the Ob River.*

ASIA (in part)

L.Ko. Lionel Kochan. *Bearsted Reader in Jewish History, University of Warwick, England. Author of Russia in Revolution, 1890-1918 and others.*

WITTE, SERGEY YULYEVICH, GRAF
(Micropædia)

L.Kr. Lawrence Krader. *Director, Ethnological Institute, Free University of Berlin. Author of Peoples of Central Asia; Social Organization of Mongol-Turkic Pastoral Nomads.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

L.Le. Lewis Leary. *William Rand Kenan, Jr., Professor Emeritus of English, University of North Carolina at Chapel Hill. Author of Mark Twain;*

editor of A Casebook of Mark Twain's Wound and others.

Twain, Mark (Micropædia)

L.L.H. Laurita L. Hill (deceased). *Writer and editor. Instructor in History, University of Texas at Austin, 1963-68. Coauthor of Raymond IV, Count of Toulouse and others.*

BOHEMOND I (in part) (Micropædia)

L.Lk. Leonhard Lenk. *Research Historian, Institute of Bavarian History, University of Munich.*

GERMANY (in part)

L.L.S. Lester L. Short. *Chairman and Curator, Department of Ornithology, American Museum of Natural History, New York City.*

BIRDS (in part)

L.L.Sl. L.L. Sloss. *Emeritus Professor of Geology, Northwestern University, Evanston, Illinois. Coauthor of Stratigraphy and Sedimentation.*

GEOCHRONOLOGY (in part)

L.M. Luis Michelena. *Professor of Indo-European and Basque Linguistics, University of the Basque Country, Vitoria, Spain. Author of Fonética histórica vasca; editor of Textos arcaicos vascos.*

LANGUAGES OF THE WORLD (in part)

L.Ma. Leopold Marquard (deceased). *Publisher. President, South African Institute of Race Relations, 1957-58, 1968. Author of The Story of South Africa and others.*

SMUTS, JAN CHRISTIAN (Micropædia)

L.M.A. Lewis M. Alexander. *Professor of Geography, University of Rhode Island, Kingston. Author of Offshore Geography of Northwestern Europe.*

EUROPE (in part)

L.M.At. Lewis Malcolm Atherden (d. 1973). *Lecturer in Pharmaceutical Chemistry, University of Bath, England. Editor of Bentley and Driver's Textbook of Pharmaceutical Chemistry.*

INDUSTRIES, CHEMICAL PROCESS
(in part)

L.M.B. Laurie M. Brown. *Professor of Physics and Astronomy, Northwestern University, Evanston, Illinois. Coeditor of The Birth of Particle Physics.*

PHYSICAL PRINCIPLES AND CONCEPTS
(in part)

PHYSICAL SCIENCES, THE (in part)

L.M.F. Luch Mikhaylovich Fomin. *Head, Laboratory of Sea Currents, Southern Division, Institute of Oceanography, Academy of Sciences of the U.S.S.R., Gelendzhik.*

EUROPE (in part)

L.M.G. Leland Matthew Goodrich. *James T. Shotwell Professor Emeritus of International Relations, Columbia University. Author of The United Nations; coauthor of Charter of the United Nations: Commentary and Documents.*

UNITED NATIONS (in part)

L.M.K. Lewis M. Killian. *Professor of Sociology, University of Massachusetts,*

Amherst. Author of The Impossible Revolution; coauthor of Collective Behavior.

COLLECTIVE BEHAVIOUR (in part)

L.M.L. Ludwig M. Landgrebe. *Professor of Philosophy, University of Cologne. Director of the Husserl Archives, Cologne. Member of the International Institute of Philosophy, Paris. Author of Phaenomenologie und Geschichte and others.*

HUSSERL, EDMUND (Micropædia)

L.M.M. Leonard M. Marcus. *Editor in Chief, High Fidelity magazine and Musical America, 1968-80.*

MUSIC, THE ART OF (in part)

L.Mo. Lynn Montross (d. 1961). *Historian, United States Marine Corps, 1950-61. Author of War Through the Ages and others.*

WAR, THE THEORY AND CONDUCT OF
(in part)

L.M.Ö. The Rev. Ladislav M. Örsy, S.J. *Professor of Canon Law, Catholic University of America, Washington, D.C. Author of Marriage in Canon Law and others.*

CHRISTIANITY (in part)

L.M.-P. Lorenzo Minio-Paluello. *Emeritus Reader in Mediaeval Philosophy, University of Oxford; Fellow of Oriel College, Oxford, 1962-75. Director of Aristoteles Latinus, 1959-72. Editor of numerous works of Aristotle.*

ARISTOTELIANISM, ARISTOTLE AND
(in part)

L.Ms. Luciano Martins. *Assistant Professor, Federal University of Rio de Janeiro. Research Assistant, National Centre of Scientific Research, Paris. Author of Industrialização, Burguesia Nacional e Desenvolvimento.*

BRAZIL (in part)

L.M.T. Leonard Monteath Thompson. *Professor of History, Yale University; Director, Yale-Wesleyan Southern African Research Program. Author of The Political Mythology of Apartheid.*

SOUTH AFRICA (in part)

L.M.W. Lillian M. Weber. *Chief Horticulture Assistant to the Senior Horticulture Specialist, New York Botanical Garden, Bronx. Collaborating Editor of New Illustrated Encyclopedia of Gardening.*

TREES (in part)

L.N.F. Lee Nathan Feigon. *Associate Professor of History and Asian Studies, Colby College, Waterville, Maine. Staff Writer, East Asian Affairs, Encyclopædia Britannica, Chicago, 1970-73.*

HUNG HSIU-CH'UAN (Micropædia)

L.O.H. Lauri O. Honko. *Professor of Folkloristics and Comparative Religion, University of Turku, Finland. Author of Geisterglaube in Ingermanland.*

EUROPEAN RELIGIONS, ANCIENT
(in part)

Lo.J.B. Lowell John Bean. *Professor of Anthropology, California State University, Hayward. Author of*

Temalpah: An Ethnobotany of the Cahuilla Indians of Southern California; **Mukat's People:** An Ecological Study of the Cahuilla Indians of Southern California.

AMERICAN INDIANS (in part)

L.P. László Péter. Lecturer in Hungarian History, School of Slavonic and East European Studies, University of London.

BUDAPEST

L.P.L. Lawrence P. Lessing. Member, Board of Editors, Fortune magazine, New York City, 1941-52; 1965-74. Author of *Man of High Fidelity*: Edwin Howard Armstrong.

ARMSTRONG, EDWIN H. (Micropædia)

L.P.Lé. Lucile P. Leone. Chief Nurse Officer, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C., 1949-66. Associate Dean, College of Nursing, Texas Women's University, 1968-71. Author of *Statewide Planning for Nursing Education*.

MEDICINE (in part)

L.P.S. L.P. Smith. Former President, Commission for Agricultural Meteorology, World Meteorological Organization, Geneva. Author of *Seasonable Weather*.

CLIMATE AND WEATHER (in part)

L.P.V. Lalita P. Vidyarthi (d. 1985). Professor and Head, Department of Anthropology, University of Ranchi, India, 1968-85. Author of *Socio-Cultural Implication of Industrialization in India and others*.

ASIA (in part)

L.P.W. L. Pearce Williams. John Stambaugh Professor of the History of Science; Codirector, Program in the History and Philosophy of Science and Technology, Cornell University, Ithaca, New York. Author of *Michael Faraday*.

FARADAY

HELMHOLTZ

SCIENCE, THE HISTORY OF

L.P.Wi. Lancelot Patrick Wilkinson (d. 1985). *Brereton Reader in Classics*, University of Cambridge, 1969-74; Fellow of King's College, Cambridge. Author of *Ovid Recalled and others*.

LATIN LITERATURE (in part)

L.R.C. L. Russell Cook (d. 1978). President, Chocolate and Confectionery Division, W.R. Grace & Company, New York City, 1965-73. Author of *Chocolate Production and Use*.

FARMING AND AGRICULTURE

TECHNOLOGY (in part)

FOOD PROCESSING (in part)

L.R.L. Lorna R. Levi. Coauthor of *A Guide to Spiders and Their Kin*; cotranslator and coeditor of *Invertebrate Zoology* by A. Kaestner.

ARACHNIDS (in part)

L.R.M. Laurence Reginald (Bob) Mernagh (d. 1980). Director, Institution of the Rubber Industry, London, 1966-70. Formerly Chief Chemist and Manager of Product Engineering,

Firestone Tyre and Rubber Company Ltd. Editor of *Engineering Design—Rubber*.

INDUSTRIES, CHEMICAL PROCESS (in part)

L.R.R. Leonard R. Rogers. Sculptor and writer. Former Head, Faculty of Three-Dimensional Design, College of Art and Design, Loughborough, England. Author of *Sculpture: Appreciation of the Arts*; *Relief Sculpture*.

SCULPTURE, THE ART OF

L.S. Leon Sokoloff, M.D. Professor of Pathology, State University of New York at Stony Brook. Author of *The Biology of Degenerative Joint Disease*.

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

L.S.B. Louis Stanley Berenson. Owner and President, Berensons' Hartford Jai-Alai, Connecticut.

JAI ALAI (Micropædia)

L.S.El H. Laila Shukry El Hamamsy. Former Director, Social Research Center, American University in Cairo.

EGYPT (in part)

L.S.F. Lewis S. Feuer. University Professor Emeritus of Sociology and Government, University of Virginia, Charlottesville. Author of *Marx and the Intellectuals and others*.

MARXISM, MARX AND (in part)

L.S.Fe. Luis Suárez Fernández. Former Professor of History, University of Valladolid, Spain.

SPAIN (in part)

L.S.K. Lester S. King, M.D. Professorial Lecturer in the History of Medicine, University of Chicago. Author of *The Growth of Medical Thought*.

JENNER, EDWARD (Micropædia)

L.St. Leif Størmer (deceased). Professor of Historical Geology, University of Oslo.

GEOCHRONOLOGY (in part)

L.Sur. Leo Suryadinata. Former Research Associate, Centre for Southeast Asian Studies, Kyōto University, Japan. Author of *The Pre-World War II Peranakan Chinese Press of Java: A Preliminary Survey*.

GAJAH MADA (Micropædia)

KERTANAGARA (Micropædia)

L.S.V. Lalgudi Sivasubramanian Venkataramanan. Director, Institute for Social and Economic Change, Bangalore, India. Author of *The Theory of Futures Trading*.

MARKETS (in part)

L.T. Lewis Thorpe (d. 1977). Professor of French, University of Nottingham, England, 1958-77. Editor and translator of *Two Lives of Charlemagne*.

LOUIS I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

L.T.C.R. L.T.C. Rolt (d. 1974). Member, Executive Committee, American Society for the History of Technology. Chairman, Talyllyn Railway Company, England, 1963-68. Author of *Great Engineers and many others*.

TREVITHICK, RICHARD (Micropædia)

L.Th. Laura Thompson. Consultant in applied anthropology. Field researcher on Hopi, Pagogo, Zuni, Navaho, and Sioux reservations. Author of *Culture in Crisis: A Study of the Hopi Indians*.

AMERICAN INDIANS (in part)

L.T.N. Lennart T. Norman. Archivist and historian.

MARGARET I (DENMARK/NORWAY/SWEDEN) (Micropædia)

SWEDEN (in part)

L.V. Leo Vroman. Physiologist, Medical Research Department, Veterans Administration Hospital, Brooklyn, New York. Author of *Blood*.

TISSUES AND FLUIDS (in part)

L.V.A. Lloyd Van Horn Armstrong (d. 1977). Chief Engineer, Diesel Engine Department, Ingersoll Rand Company. Coauthor of *The Diesel Engine*.

ENERGY CONVERSION (in part)

L.Ve. Louis Verniers. Honorary Secretary, General Ministry of Education, Belgium. Author of *Un millénaire d'histoire de Bruxelles, des origines à 1830 and others*.

BRUSSELS (in part)

L.v.G. Ludwig von Gogolák. Author of *Csehszlovákia; "T.G. Masaryks slowakische und ungarländische Politik: Ein Beitrag zur Vorgeschichte des Zerfalls Ungarns im Jahre 1918" in Bohemia, Jahrbuch des Collegium Carolinum; and others*.

MASARYK, TOMÁŠ (Micropædia)

L.Vi. Luigi Villari (deceased). Official in the Italian Foreign Office. Author of *Italian Life in Town and Country*.

ITALY (in part)

L.W.B. Lewis W. Bealer. Former Assistant Professor of History, University of Oklahoma, Norman.

BRAZIL (in part)

L.W.D. Larry W. Donald. Editor and Publisher, Basketball Times.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

L.We. Leo Weaver. Executive Director and Chief Engineer, Ohio River Valley Water Sanitation Commission, Cincinnati. Technical editor of *Municipal Refuse Disposal; Refuse Collection Practice*.

PUBLIC WORKS (in part)

L.W.M. Laurence Woodward Martin. Vice Chancellor, University of Newcastle upon Tyne, England. Professor of War Studies, King's College, University of London, 1968-77. Author of *Arms and Strategy and others*.

WAR, THE THEORY AND CONDUCT OF (in part)

L.Wy. Sir Leonard Woolley (d. 1960). Archaeologist; excavated at Ur, 1922-34, and many other sites. Major contributor to knowledge of the Sumerians. Author of *Digging Up the Past; Excavations at Ur; and others*.

UR (in part) (Micropædia)

L.Y.B. Louay Y. Bahry. *Adjunct Professor of Political Science, University of Tennessee, Knoxville. Author of Die Bagdad-Bahn: A Study in the Development and Diplomacy of the Baghdad Railway Question.*
BAGHDAD (in part)

L.Z. Lev Zetlin. *President, Zetlin-Argo Structural Investigations, Inc., New York City. Author of structural and civil engineering handbooks on concrete and suspension structures.*
STADIUM (Micropædia)

L.Zg. Ladislav Zgusta. *Professor of Linguistics and of Classics; Member, Center for Advanced Studies, University of Illinois, Urbana. Author of Kleinasiatische Personennamen; Personennamen griechischer Staedte; and others.*
NAMES

M.A. Marcelle Auclair (d. 1983). *Writer. Author of Enfances et mort de Garcia Lorca; La Vie de Sainte Thérèse d'Avila; Le Livre du bonheur; and others.*
GARCÍA LORCA, FEDERICO (Micropædia)

Ma.A. Maurice Allais. *Professor of Economic Analysis, National College of Mines of Paris. Professor of Monetary Analysis, University of Paris. Author of Traité d'économie pure.*
INTERNATIONAL TRADE (in part)

M.A.A. Maynard A. Amerine. *Emeritus Professor of Enology, University of California, Davis; Emeritus Enologist at the Agricultural Experiment Station. Author of The Technology of Wine Making.*
BEVERAGE PRODUCTION (in part)

Ma.A.C. Margret A. Carey. *Former Assistant Keeper, Department of Ethnography, British Museum, London. Author of Myths and Legends of Africa.*
AFRICAN ARTS (in part)

M.A.Al. The Rev. Michel Adrien Allard, S.J. (d. 1976). *Director, Institute of Oriental Studies, St. Joseph University, Beirut, Lebanon. Author of Le problème des attributs divins en théologie musulmane and others.*
ASH'ARĪ, ABU AL-ḤASAN AL- (Micropædia)

Ma.B. Marino Berengo. *Professor of Modern History, University of Venice. Author of La società veneta alla fine del 700 and others.*
ITALY (in part)

Ma.Br. Martin Brett. *Fellow of Robinson College, University of Cambridge. Lecturer and Senior Lecturer in Medieval History, University of Auckland, New Zealand, 1964–71. Author of English Church under Henry I.*
EUROPE (in part)

Ma.Bu. Martin Butlin. *Keeper of the British Collection, Tate Gallery, London. Author of Turner Watercolours; coauthor of The Paintings of J.M.W. Turner.*
TURNER, J.M.W. (in part) (Micropædia)

Ma.C. Malcolm Cowley. *Literary Adviser, The Viking Press. President, National Institute of Arts and Letters, New York City, 1956–59, 1961–64. Author of The Faulkner-Cowley File; editor of The Portable Faulkner.*
FAULKNER, WILLIAM (Micropædia)

M.A.Ca. Marcello A. Carmagnani. *Professor of Latin American History, University of Turin, Italy. Author of El salariado minero en Chile colonial.*
CHILE (in part)

M.A.E. M. Albert Evans. *Mining consultant. Coauthor of Demonstration Mine Using Longwall Mining Techniques; Technical Manual on Longwall Mining Systems.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

Ma.E.O. Mario E. Occhialino. *Professor of Law, University of New Mexico, Albuquerque.*
PROCEDURAL LAW (in part)

Ma.F. Marvin Frankel. *Professor of Economics, University of Illinois, Urbana. Author of British and American Manufacturing Productivity: A Comparison and Interpretation.*
ECONOMIC GROWTH AND PLANNING (in part)

Ma.Fu. Masutani Fumio. *Professor of the History of Religion, Taisho University, Tokyo.*
HÖNEN (Micropædia)

M.Ag. Margarita Aguirre. *Writer. Author of Las vidas de Pablo Neruda.*
NERUDA, PABLO (Micropædia)

M.A.G. Mahmud Ali Ghul. *Former Professor of Arabic and Semitic Languages, American University of Beirut.*
ARABIA (in part)

M.A.Gl. Mary Ann Glendon. *Professor of Law, Harvard University. Author of The New Family and the New Property.*
INHERITANCE AND SUCCESSION (in part)
LAW, THE PRACTICE AND PROFESSION OF (in part)
LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

Ma.H. Marshall Hall, Jr. *IBM Professor Emeritus of Mathematics, California Institute of Technology, Pasadena. Author of The Theory of Groups; Combinatorial Theory.*
ALGEBRA (in part)

M.A.H. Michael Anthony Hoskin. *Lecturer in History of Science, University of Cambridge. Author of William Herschel and the Construction of the Heavens.*
HERSCHEL, SIR JOHN, 1ST BARONET (Micropædia)
LOVELL, SIR BERNARD (in part) (Micropædia)

Ma.Ha. Mamie Harmon. *Contributor to Dictionary of Folklore, Mythology and Legend; contributor and advisory editor to Encyclopedia of World Art.*
FOLK ARTS (in part)

Ma.J. Marsden Jones. *Professor of Arabic Studies, American University in Cairo. Editor of Kitāb al-maghāzī lil-Wāgidi.*
EGYPT (in part)

Ma.J.M. Matthew James Moulton. *Chief Editorial Writer, The Scotsman, Edinburgh.*
UNITED KINGDOM (in part)

Ma.K. Max Kaltenmark. *Director of Studies, École Pratique des Hautes Études (Institute for Advanced Research), Paris, 1957–78. Author of Lao Tzu and Taoism.*
LAO-TZU (Micropædia)

M.Ak. Mustafa Akdağ (d. 1973). *Professor of Modern History, University of Ankara. Author of Turkiyenin iktisadi ve ictimai tarihi.*
ATATÜRK

Ma.Ko. Margaret Kohl. *Free-lance writer and translator. Staff member, English Department, University of Munich, 1962–68; 1978–80.*
COLOGNE (in part)
GERMANY (in part)

M.Al. Mohammad Ali (deceased). *Professor and Head, Department of History, Kābul University, Afghanistan. Author of A Cultural History of Afghanistan; Afghanistan: Land of Glorious Past; and many other works on Afghan history, culture, and economy.*
AFGHANISTAN (in part)
MAḤMŪD (GHAZNA) (Micropædia)

Ma.M. Maurice Matloff. *Adjunct Professor of History, Georgetown University, Washington, D.C. Chief Historian, Center of Military History, U.S. Department of the Army, Washington, D.C., 1973–81. Author of Strategic Planning for Coalition Warfare, 1943–1944; editor of American Military History.*
WAR, THE THEORY AND CONDUCT OF (in part)

M.A.M. Maurice Alfred Millner. *Former Professor of Law, University College, University of London. Author of Negligence in Modern Law.*
LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

M.A.MacC. Michael A. MacConaill. *Emeritus Professor of Anatomy, University College, Cork, National University of Ireland. Coauthor of Synovial Joints; Muscles and Movements.*
SUPPORTIVE AND CONNECTIVE TISSUES (in part)

Ma.N. Manning Nash. *Professor of Anthropology, University of Chicago. Specialist on economic development and cultural change. Author of Machine-Age Maya.*
AMERICAN INDIANS (in part)

M.A.P. Miodrag Al. Purković. *Secretary, Serbian Orthodox Church of St. Sava, London.*
YUGOSLAVIA (in part)

Ma.R. Mary Rowlett (d. 1983).
Free-lance writer on Egypt. Author of
Founders of Modern Egypt.
ALEXANDRIA (in part)

M.Ar. Michael Argyle. Reader in
Social Psychology, University of Oxford;
Fellow of Wolfson College, Oxford.
Author of Social Interaction; The
Psychology of Interpersonal Behaviour.
SOCIAL SCIENCES, THE (in part)

M.A.R. Margaret Ann Richardson.
Deputy Curator, Drawings Collection,
Royal Institute of British Architects,
London.

PALLADIO, ANDREA (Micropædia)

M.A.Ro. Margaret Ann Rowe. Lecturer
in English, Palmerston North Teachers'
College, New Zealand. Coauthor of New
Zealand.
NEW ZEALAND (in part)

M.As. Maurice Ashley. Research
Fellow, Loughborough University of
Technology, England, 1967–70. Editor,
The Listener, 1958–67. Author of The
Greatness of Oliver Cromwell.
CHARLES I (GREAT BRITAIN)

(Micropædia)

CROMWELL, OLIVER (in part)

M.A.S. M.A. Screech. Fielden
Professor of French Language and
Literature, University College,
University of London. Author of Rabelais
and others.

RABELAIS, FRANÇOIS (in part)
(Micropædia)

M.A.Sa. Michael Anthony Samuels.
Deputy U.S. Trade Representative
and Ambassador, General Agreements
on Tariffs and Trade, Geneva. U.S.
Ambassador to Sierra Leone, 1974–
77. Coeditor of Portuguese Africa: A
Handbook.

SOUTHERN AFRICA (in part)

M.A.Su. Margaret Ann Sumner.
Lecturer in Physiology, University of
Melbourne, Australia, and University
College, University of London. Author of
Thought for Food.

DRUGS AND DRUG ACTION (in part)

M.A.v.M. M.A. van Meerhaeghe.
Professor of Economics, State
University of Ghent, Belgium. Author
of International Economic Institutions;
International Economics.

INTERNATIONAL TRADE (in part)

M.B. Minodhar Barthakur. Professor
of Geography, Gauhati University,
India. Author of numerous articles on
geography.
INDIA (in part)

M.Ba. Michael Bar-Zohar. Free-lance
writer. Member of the Knesset. Former
Lecturer in Political Science, Haifa
University, Israel. Author of Ben-Gurion:
The Armed Prophet and others.
BEN-GURION, DAVID (Micropædia)

M.B.C. Malcolm Breckenridge
Carpenter, M.D. Professor and
Chairman, Department of Anatomy,
Uniformed Services University of the
Health Sciences, Bethesda,

Maryland. Coauthor of Human
Neuroanatomy.

NERVES AND NERVOUS SYSTEMS
(in part)

M.Be. Manfred Bensing. Professor of
History, Karl Marx University, Leipzig.
Author of Thomas Müntzer.
MÜNTZER, THOMAS (Micropædia)

M.B.F. Manuel Basas Fernández.
Former Professor, Faculty of Economic
Sciences, University of Valladolid, Spain.
Author of Breve Historia de la ría y
noble Villa de Bilbao.

SPAIN (in part)

M.Bg. Mark Blaug. Professor of the
Economics of Education, Institute of
Education, University of London. Author
of Economic Theory in Retrospect.
SOCIAL SCIENCES, THE (in part)

M.B.G. Manuel Ballesteros Gaibrois.
Professor and Head, Section of American
History, University of Madrid. Author of
Francisco Pizarro and others.

PIZARRO, FRANCISCO (Micropædia)

M.Bi. Margarete Bieber (d. 1978).
Associate Professor of Art History and
Archaeology, Columbia University,
1937–48; Special Lecturer, School
of General Studies, 1949–54. Author
of The History of the Greek and
Roman Theater; The Sculpture of the
Hellenistic Age.

DRESS AND ADORNMENT (in part)

M.B.J. Marius B. Jansen. Professor
of History, Princeton University. Author
of Sakamoto Ryōma and the Meiji
Restoration and others.

JAPAN (in part)

M.Bl. Miroslav Blažek. Professor of
Human Geography and of Regional
Economy, School of Economics, Prague.
Author of Economic Geography of
Czechoslovakia.

CZECHOSLOVAKIA (in part)

M.B.McE. Michael B. McElroy.
Abbott Lawrence Rotch Professor of
Atmospheric Sciences; Chairman,
Department of Earth and Planetary
Sciences, Harvard University.

ATMOSPHERE (in part)

M.Bn. Maurice Burton. Deputy Keeper
of Zoology, British Museum, London,
1925–58. Author of Encyclopaedia of
Animals and others.

GERMANY (in part)

M.Bo. Marc Bouloiseau. Former
Secretary, Commission for the
Economic and Social History of the
French Revolution. Emeritus Teaching
Assistant in History of the French
Revolution, University of Paris. Author of
Robespierre and others.

ROBESPIERRE, MAXIMILIEN-FRANÇOIS-
MARIE-ISADORE DE (Micropædia)

M.B.P. Michel B. Pelletier. Political
Affairs Officer, Department of Political
Affairs, Trusteeship and Decolonization,
United Nations, New York City.
EASTERN AFRICA (in part)

M.B.R. Michael B. Rowton (d. 1986).
Professor of Near Eastern Languages

and Civilizations, Oriental Institute,
University of Chicago.

HISTORY, THE STUDY OF (in part)

M.Bu. Milton Burton (d. 1985).
Professor of Chemistry, University
of Notre Dame, Indiana, 1945–71;
Director, Radiation Laboratory, 1946–
71. Coeditor of Advances in Radiation
Chemistry.

RADIATION (in part)

M.C. Maurice Cranston. Emeritus
Professor of Political Science, London
School of Economics and Political
Science, University of London.
Biographer of Locke and Rousseau.

GENEVA (in part)

HUME (in part)

IDEOLOGY

ROUSSEAU, JEAN-JACQUES

M.Car. Max Cary (d. 1958). Reader,
then Professor of Ancient History,
University of London, 1908–46. Author
of The Geographic Background of Greek
and Roman History.

GRECO-ROMAN CIVILIZATION, CLASSICAL
(in part)

M.C.G. M. Charles Gilbert. Professor
of Petrology and Head, Department
of Geology, Texas A&M University,
College Station.

MINERALS AND ROCKS (in part)

M.Ch. Mary Chamot. Assistant
Keeper, Tate Gallery, London, 1950–65.
Author of Modern Painting in England.

TURNER, J.M.W. (in part)
(Micropædia)

M.C.J. Marshall C. Johnston.
Professor of Botany; Associate Director,
Plant Resources Center, University of
Texas at Austin. Coauthor of Manual of
the Vascular Plants of Texas.

ANGIOSPERMS (in part)

Mc.M. McKim Marriott. Professor,
Department of Anthropology and Social
Sciences, Collegiate Division, University
of Chicago. Author of Caste Ranking and
Community Structure in Five Regions of
India and Pakistan and others.

SOCIAL DIFFERENTIATION (in part)

M.C.M. Michael C. Meyer. Professor
of History; Director, Latin American
Area Center, University of Arizona,
Tucson. Coauthor of The Course of
Mexican History.

MEXICO (in part)

M.C.Ma. Michael C. Malin. Professor
of Geology, Arizona State University,
Tempe. Coauthor of Earthlike Planets.
SOLAR SYSTEM, THE (in part)

M.Co. Michael Cordner. Lecturer
in English and Related Literature,
University of York, England. Editor of
The Plays of Sir George Etherege.
ENGLISH LITERATURE (in part)

M.C.R. Marvin Chauncey Ross (d.
1977). Curator, Hillwood (art collections
of Mrs. Merriweather Post), Washington,
D.C. Chief Curator, Los Angeles County
Museum of Art, 1952–55.

DECORATIVE ARTS AND FURNISHINGS
(in part)

M.C.S. Malcolm C. Shurtleff. *Professor of Plant Pathology; Extension Plant Pathologist, University of Illinois, Urbana. Author of How to Control Plant Diseases in Home and Garden.*
DISEASE (in part)

M.Cu. Michael Cuffee. *Student of Biology, Massachusetts Institute of Technology, Cambridge.*
CELLS (in part)

M.C.U. Melvyn C. Usselman. *Associate Professor of Chemistry, University of Western Ontario, London.*
PHYSICAL SCIENCES, THE (in part)

M.D. Myles Dillon (d. 1972). *Senior Professor of Celtic Studies, Dublin Institute for Advanced Studies, 1949–72. Author of Early Irish Society.*

EUROPEAN RELIGIONS, ANCIENT (in part)

M.D.C. Michael Douglas Coe. *Professor of Anthropology, Yale University. Author of The Maya.*
PRE-COLUMBIAN CIVILIZATIONS (in part)

M.-D.Ch. The Rev. Marie-Dominique Chenu, O.P. *Professor of Theology, University of Paris. Author of Toward Understanding St. Thomas.*
THOMISM, THOMAS AQUINAS AND (in part)

M.D.D. Morton D. Davis. *Professor of Mathematics, City College, City University of New York. Author of Game Theory: A Nontechnical Introduction.*
GAME THEORY

M.De. Mary Delane. *Free-lance writer. Women's Editor, The Times (London), 1954–64. Author of Sardinia: The Undeclared Island.*
ITALY (in part)

M. de F. Michael de Ferdinandy. *Emeritus Professor of Humanities, University of Puerto Rico, Río Piedras. Author of El emperador Carlos V: semblanza de un hombre and others.*
CHARLES V (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

M. Del V. Mario Del Viscovo. *Professor of Economics and Politics of Transport, University of Rome. Director, Centre for Studies of Transportation Systems, Rome. Author of Il conto nazionale dei trasporti.*
ITALY (in part)

M.D.H.M. Mark D.H. Miller. *Research Associate, Syracuse University, New York.*
SOUTH AMERICA (in part)

M.D.K. The Rev. Michael David Knowles, O.S.B. (d. 1974). *Regius Professor of Modern History, University of Cambridge, 1954–63. Author of The Benedictines: A Digest for Moderns; The Evolution of Medieval Thought; Thomas Becket; and others.*
BECKET, SAINT THOMAS (Micropædia)
BENEDICT OF NURSIA, SAINT (Micropædia)
HENRY II (ENGLAND) (Micropædia)
MACAULAY OF ROTHLEY, THOMAS

BABINGTON MACAULAY, BARON (Micropædia)

ROMAN CATHOLICISM (in part)

M.Do. Martin Domke (d. 1980). *Adjunct Professor of Law, New York University, New York City. Consultant on commercial and international arbitration. Author of The Law and Practice of Commercial Arbitration.*

JUDICIAL AND ARBITRATIONAL SYSTEMS (in part)

M.Dr. Moira Dunbar. *Acting Director, Division of Earth Sciences, Defence Research Board, Ottawa, Canada, 1975–77.*

ARCTIC, THE (in part)

M.Du. Maurice Duverger. *Professor of Comparative Political Systems, University of Paris I. Author of Les Partis politiques.*

POLITICAL PARTIES AND INTEREST GROUPS (in part)

M. Du P.C. Martin Du Pré Cooper (d. 1986). *Music Editor, Daily Telegraph, London, 1954–76. Author of French Music, 1869–1924; Georges Bizet; and others.*

BIZET, GEORGES (Micropædia)
FRANCK, CÉSAR (Micropædia)

M.E. Marcel Emerit. *Emeritus Professor of History; Member, Academy of Ethics and Politics, Institute of France. Author of L'Algérie à l'époque d' Abd-el-Kader.*

ABDELKADER (Micropædia)

M.E.Bl. Milton E. Bliss. *Farmer and Agricultural communications specialist. Author of A Handbook on Farm Broadcasting for the Developing Countries.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

M.E.D. M. Edward Davis, M.D. (d. 1978). *Joseph Bolivar De Lee Professor of Obstetrics and Gynecology, University of Chicago, 1947–66. Coauthor of De Lee's Obstetrics for Nurses.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

M.E.DeB. Michael E. DeBakey, M.D. *Chancellor, Baylor College of Medicine; Professor and Chairman, Department of Surgery. Director, National Heart and Blood Vessel Research and Demonstration Center, Methodist Hospital, Houston, Texas. Coauthor of Blood Transfusion and others.*

CIRCULATION AND CIRCULATORY SYSTEMS (in part)

M.e.D.S. Mohy el Din Sabr. *Director-General, Arab League Educational, Cultural and Scientific Organization, Cairo. Minister of Education, Republic of The Sudan, 1969–72. Author of Cultural Change and Community Development.*
SUDAN (in part)

M.Ee. Mircea Eliade (d. 1986). *Sewell L. Avery Distinguished Service Professor, Divinity School; Professor, Committee on*

Social Thought, University of Chicago.
SACRED OFFICES AND ORDERS (in part)

Me.F.G. Mercedes Fermín Gómez. *Professor of Geography, Central University of Venezuela, Caracas. Author of The Orinoco Basin.*
SOUTH AMERICA (in part)

M.E.H. Melvin E. Hecht (deceased). *Professor of Geography and Regional Development, University of Arizona, Tucson.*

UNITED STATES OF AMERICA (in part)

M.E.J. Martin Evan Jay. *Professor of History, University of California, Berkeley. Author of The Dialectical Imagination and others.*
FREUD

M.E.M. Martin E. Marty. *Fairfax M. Cone Distinguished Service Professor, Divinity School, University of Chicago. Associate Editor, The Christian Century. Author of Religion & Republic: The American Circumstance.*
CHRISTIANITY (in part)
PROTESTANTISM (in part)
ROMAN CATHOLICISM (in part)

M.E.Ma. Martin E. Malia. *Professor of History, University of California, Berkeley. Author of Alexander Herzen and the Birth of Russian Socialism, 1812–1855.*
HERZEN, ALEKSANDR (Micropædia)

M.E.Mu. Marvin E. Mundel. *President, M.E. Mundel and Associates, Consulting Industrial Engineers, Silver Spring, Maryland.*
ENGINEERING (in part)

M.E.O. Milton Edgeworth Osborne. *Head, Southeast Asia—Pacific Branch, Office of National Assessments, Canberra, Australia. Author of Southeast Asia: An Introductory History.*
SOUTHEAST ASIA, MAINLAND (in part)

M.E.P. Maynard E. Pirsig. *Emeritus Professor of Law, University of Minnesota, Minneapolis. Professor of Law, William Mitchell College of Law, St. Paul, Minnesota. Coauthor of Cases and Materials on Professional Responsibility.*

LAW, THE PROFESSION AND PRACTICE OF (in part)

M.E.R. Marjorie E. Reeves. *Honorary Fellow and former Vice-Principal, St. Anne's College, Oxford; former Lecturer in Modern History, University of Oxford. Author of The Influence of Prophecy in the Later Middle Ages: A Study in Joachimism.*
JOACHIM OF FIORE (Micropædia)

M.E.Ro. M. Elizabeth Rogers. *Lecturer in Zoology, University of Edinburgh. Author of Looking at Vertebrates.*

CIRCULATION AND CIRCULATORY SYSTEMS (in part)

M.E.T. Mary Elizabeth Tiles. *Secretary, Royal Institute of Philosophy, London. Author of Bachelard: Science*

and Objectivity.

PHILOSOPHICAL ANTHROPOLOGY (*in part*)

M.E.Y. Malcolm Edward Yapp. *Senior Lecturer in the History of the Near and Middle East, School of Oriental and African Studies, University of London.*

TURKEY AND ANCIENT ANATOLIA
(*in part*)

M.F. Merle Fainsod (d. 1972). *Carl H. Pforzheimer Professor of Government; Director of the Library, Harvard University, 1965–72; Director, Russian Research Center, 1959–64. Author of How Russia Is Ruled and others.*

UNION OF SOVIET SOCIALIST REPUBLICS
(*in part*)

M.F.A. Sir Michael Francis Atiyah. *Royal Society Research Professor, Mathematical Institute, University of Oxford. Author of K-Theory; coauthor of Introduction to Commutative Algebra.*

GEOMETRY (*in part*)

M.F.G. Martin F. Glaessner. *Emeritus Professor of Geology and Honorary Research Associate, University of Adelaide, Australia. Coeditor of Geology of South Australia.*

AUSTRALIA (*in part*)

M.F.Go. Morris F. Goodman. *Associate Professor of Linguistics, Northwestern University, Evanston, Illinois. Author of several articles on African languages and A Comparative Study of Creole French Dialects.*

LANGUAGES OF THE WORLD (*in part*)

M.Fl. Marcel Florin, M.D. (d. 1979). *Professor of Biochemistry, State University of Liège, Belgium. Author of L'Évolution biochimique.*

VESALIUS, ANDREAS (Micropædia)

M.F.M. Mark F. Meier. *Director, Institute of Arctic and Alpine Research; Professor of Geological Sciences, University of Colorado, Boulder.*

ICE AND ICE FORMATIONS (*in part*)

M.F.Mo. Maynard F. Moseley, Jr. *Professor of Botany, University of California, Santa Barbara. Author of a series of morphological studies on the family Nymphaeaceae.*

ANGIOSPERMS (*in part*)

M.Fo. Murray Fowler. *Emeritus Professor of Linguistics, University of Wisconsin, Madison. Coeditor of Materials for the Study of the Etruscan Language.*

LANGUAGES OF THE WORLD
(*in part*)

M.F.O. Michael Francis Oliver, M.D. *Duke of Edinburgh Professor of Cardiology, University of Edinburgh. Editor of Coronary Heart Disease in Young Women and others.*

CIRCULATION AND CIRCULATORY
SYSTEMS (*in part*)

M.Fr. Milton Friedman. *Paul Snowden Russell Distinguished Service Professor Emeritus of Economics, University of Chicago. Senior Research Fellow, Hoover Institution, Stanford University, California. Nobel Prize for Economics,*

1976. Author of Dollars and Deficits.
MONEY

M.Fre. Michael Freund (d. 1973). *Professor of Political Theory and History, Christian Albrecht University of Kiel, West Germany. Author of Deutsche Geschichte; "Friedrich Ebert" in Die grossen Deutschen; and others.*

EBERT, FRIEDRICH (Micropædia)

M.F.R.S. Maurice Francis Richard Shadbolt. *Short-story and travel writer; novelist. Author of The New Zealanders and others.*

AUSTRALIA AND NEW ZEALAND,
LITERATURES OF (*in part*)

M.F.S. Mark F. Schwartz. *Research and Clinical Associate; Director of Educational Programs, Masters and Johnson Institute, St. Louis, Missouri.*

SEX AND SEXUALITY (*in part*)

M.G. Marija Gimbutas. *Professor of European Archaeology, University of California, Los Angeles. Author of The Bronze Age Cultures of Central and Eastern Europe and others.*

BALKANS (*in part*)

PREHISTORIC PEOPLES AND CULTURES
(*in part*)

UNION OF SOVIET SOCIALIST REPUBLICS
(*in part*)

M.Ga. Mikael Gam. *Minister for Greenland, 1960–64. Author of Den grønlandske kvinde.*

ARCTIC, THE (*in part*)

M.G.A.V. Malcolm G.A. Vale. *Fellow and Tutor in History, St. John's College, Oxford; Lecturer in Modern History, University of Oxford. Author of War and Chivalry and others.*

JOAN OF ARC (*in part*)

M.G.B. Michael Graham Balfour. *Emeritus Professor of European History, University of East Anglia, Norwich, England. Author of The Kaiser and His Times.*

WILLIAM II (GERMAN EMPIRE)
(Micropædia)

M.G.G. M. Grant Gross. *Director, Ocean Sciences Division, National Science Foundation, Washington, D.C. Author of Oceanography.*

OCEANS (*in part*)

M.Gi. Martin Gimm. *Professor of Sinology, University of Cologne.*

DORGON (Micropædia)

M.G.L. Mikhail Grigoriyevich Lozinsky (d. 1976). *Head, Laboratory of High-Temperature Metallography, Institute for the Study of Machines, Moscow. Author of Industrial Applications of Induction Heating.*

ENERGY CONVERSION (*in part*)

M.G.Ma. Maxwell Gay Marwick. *Reader in Humanities (Anthropology and Sociology), Griffith University, Brisbane, Australia, 1976–81. Author of Sorcery in Its Social Setting: A Study of the Northern Rhodesian Cewa; editor of Witchcraft and Sorcery: Selected Readings.*

OCCULTISM (*in part*)

M.Gr. Michael Grant. *President and Vice Chancellor, Queen's University of Belfast, Northern Ireland, 1959–66. Author of History of Rome; Myths of the Greeks and Romans; and others; editor of Latin Literature and others.*

ANTONY, MARK (Micropædia)

AUGUSTUS

EUROPEAN RELIGIONS, ANCIENT (*in part*)
HORACE (Micropædia)

M.Gre. Morris Greenspan. *Writer on international law. Author of The Modern Law of Land Warfare; The Soldier's Guide to the Laws of War.*

WAR, THE THEORY AND CONDUCT OF
(*in part*)

M.G.W. M. Gordon Wolman. *Professor and Chairman, Department of Geography and Environmental Engineering, Johns Hopkins University, Baltimore, Maryland. An authority on fluvial processes and ecological problems concerning rivers. Coauthor of Fluvial Processes in Geomorphology.*

GEOMORPHIC PROCESSES (*in part*)

M.H. Maureen Heneghan Tripp. *Costume Designer, Stratford-on-Avon Shakespeare Company, BBC-TV, and Stratford Festival, Ontario. Associate Professor of Costume Design, Brandeis University, Waltham, Massachusetts.*

THEATRICAL PRODUCTION (*in part*)

M.Ha. Mason Hammond. *Pope Professor Emeritus of Latin Language and Literature; former Professor of Roman History, Harvard University. Author of The Antonine Monarchy.*

TRAJAN (Micropædia)

M.Has. Margaret Hastings (d. 1979). *Professor of History, Douglass College, Rutgers University, New Brunswick, New Jersey, 1960–75. Author of The Court of Common Pleas in Fifteenth Century England and others.*

UNITED KINGDOM (*in part*)

M.H.Au. Maung Htin Aung (d. 1978). *Associate Fellow, St. Antony's College, University of Oxford. Burmese Ambassador to Ceylon, 1959–63. Rector and Vice Chancellor, University of Rangoon, 1946–59. Author of Burmese Drama; A History of Burma; and others.*

BURMA (*in part*)

SOUTHEAST ASIAN ARTS (*in part*)

M.H.B. M.H. Butler. *Lecturer in English, University of Leeds, England. Author of Theatre and Crisis, 1632–1642.*

ENGLISH LITERATURE (*in part*)

M.H.Bo. Marc H. Bornstein. *Professor of Psychology and Human Development, New York University, New York City. Author of Development in Infancy: An Introduction and others.*

BEHAVIOR, THE DEVELOPMENT OF
HUMAN (*in part*)

M.H.C. Mary Heimerdinger Clench. *Adjunct Curator of Birds, Florida State Museum, University of Florida, Gainesville. Author and coauthor of numerous articles on birds.*

BIRDS (*in part*)

M.H.D. Michael H. Day. *Professor of Anatomy, St. Thomas's Hospital Medical School, University of London. Author of Guide to Fossil Man.*

EVOLUTION, HUMAN (in part)

M.H.K. Malcolm H. Kerr (d. 1984). *President, American University of Beirut, 1982-84. Professor of Political Science, University of California, Los Angeles, 1967-82. Author of Islamic Reform: The Political and Legal Theories of Muhammad 'Abduh and Rashid Rida.*

'ABDUH, MUHAMMAD (Micropædia)

M.H.S. The Rev. Massey H. Shepherd, Jr. *Hodges Professor Emeritus of Liturgics, Church Divinity School of the Pacific, Berkeley, California. Author of The Worship of the Church and others.*

CHRISTIANITY (in part)

M.Hu. Mahmud Husain (d. 1975). *Vice Chancellor, University of Karachi, Pakistan. Editor of History of the Freedom Movement.*

JINNAH, MOHAMMED ALI (Micropædia)

M.H.W. Michael Henry Woodford. *Secretary, British Falconers' Club, London, 1956-60. Author of A Manual of Falconry.*

FALCONRY (in part) (Micropædia)

M.H.Z. Martin Huldrych Zimmermann (d. 1984). *Charles Bullard Professor of Forestry, Harvard University; Director, Harvard Forest, Petersham, 1970-84. Coauthor of Trees: Structure and Function.*

TISSUES AND FLUIDS (in part)

Mi.B. Michel Burdeau. *Director General, Regional Council of Bourgogne, Dijon, France. Author of numerous reports on transportation.*

FRANCE (in part)

M.I.B. Michael I. Bruce. *Angas Professor of Chemistry, University of Adelaide, Australia. Coeditor of Progress in Organometallic Chemistry.*

CHEMICAL COMPOUNDS (in part)

M.I.C. Dame Margaret I. Cole (d. 1980). *Honorary President, Fabian Society, England. Author of Beatrice Webb and others; editor of The Webbs and Their Work.*

WEBB, SIDNEY AND BEATRICE (Micropædia)

Mi.D. Michael A.E. Dummett. *Wykeham Professor of Logic, University of Oxford; Fellow of New College, Oxford. Author of Frege: Philosophy of Language and others.*

FREGE, GOTTLÖB (Micropædia)

M.I.H. Marvin Irving Herzog. *Professor of Linguistics and Yiddish Studies; Chairman, Department of Linguistics, Columbia University. Author of The Yiddish Language in Northern Poland; coeditor of The Field of Yiddish, Third and Fourth Collections.*

LANGUAGES OF THE WORLD (in part)

M.I.He. Markku Ilmari Henriksson. *Co-Director, North American Studies Program; Assistant for Non-European History, Institute for Historical Research and Documentation, University of Helsinki.*

FINLAND (in part)

Mi.L. Michael Levi. *Lecturer in Criminology, University College, Cardiff, University of Wales. Author of Controlling Crime in the Upperworld and others.*

CRIME AND PUNISHMENT (in part)

Mi.Ma. Michael Edward Mallett. *Professor of History, University of Warwick, England. Author of The Borgias and others.*

BORGIA, CESARE, DUC DE VALENTINOIS (Micropædia)

M.I.N. Marion I. Newbigin (d. 1934). *Editor, Scottish Geographical Magazine. Author of Geographical Aspects of Balkan Problems and others.*

BALKANS (in part)

M.I.R. Mikhail Ivanovich Rostovtsev. *Senior Research Associate, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow. Coauthor of Belorussian S.S.R.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

Mi.Ro. Michel Rouzé. *Former producer in French broadcasting. Author of Robert Oppenheimer and the Atomic Bomb; Robert Oppenheimer: The Man and His Theories.*

OPPENHEIMER, J. ROBERT (Micropædia)

Mi.V. Michele Vishny. *Art historian and critic. Author of Mordcai Ardon; contributor to Arts Magazine.*

PISSARRO, CAMILLE (Micropædia)

M.I.V. Milton I. Vanger. *Professor of History, Brandeis University, Waltham, Massachusetts; Chairman of Latin American Studies, 1971-81. Author of José Batlle y Ordoñez of Uruguay.*

URUGUAY (in part)

M.I.W. Matthew Immanuel Wiencke. *Professor of Classics, Dartmouth College, Hanover, New Hampshire.*

WINCKELMANN, JOHANN (Micropædia)

M.J. Madeleine Jarry. *Principal Inspector, Mobilier National (state furniture collection); National Factories of Gobelins and Beauvais (tapestry); and of the Savonnerie (carpet factory), Ministry of Cultural Affairs, France. Author of World Tapestry and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

M.J.B. Margaret J. Baigent. *Associate Professor of Nutrition, University of Toronto.*

BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

M.J.D. Mário José Domingues. *Author of O Marquês de Pombal and others.*

POMBAL, SEBASTIÃO DE CARBALHO, MARQUÊS DE (Micropædia)

M.J.Dr. Mark J. Dresden. *Emeritus Professor of Iranian Studies, University*

of Pennsylvania, Philadelphia. Editor of Modern Persian Reader and others.

IRAN (in part)

M.J.Du. Maxwell John Dunbar. *Emeritus Professor of Zoology, McGill University, Montreal; Chairman, Marine Sciences Center, 1963-77.*

ARCTIC, THE (in part)

M.J.E. Martin J. Esslin. *Professor of Drama, Stanford University, California. Head of Radio Drama, British Broadcasting Corporation, London, 1963-77. Author of Brecht: The Man and His Work; The Theatre of the Absurd.*

BECKETT, SAMUEL (Micropædia)

M.J.E.B. Maurice J.E. Brown (d. 1975). *Author of Schubert: A Critical Biography; Essays on Schubert.*

SCHUBERT, FRANZ (in part) (Micropædia)

M.J.G. Michael James Godman. *Senior Lecturer in Child Life and Health, University of Edinburgh. Consultant Paediatric Cardiologist, Royal Hospital for Sick Children, Edinburgh. Coeditor of Heart Disease in the Newborn.*

CIRCULATION AND CIRCULATORY SYSTEMS (in part)

M.J.K. Martin J. Klein. *Eugene Higgins Professor of the History of Physics, Yale University.*

BOHR

M.J.Ke. Martin J. Kemp. *Professor of Fine Arts, University of St. Andrews, Scotland.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

M.J.L. Margaret Jean Legum. *Free-lance journalist. Editor, X-Ray on Current Affairs in Southern Africa. Coauthor of South Africa: Crisis for the West.*

SOUTH AFRICA (in part)

M.J.Lo. M. John Loeffler. *Emeritus Professor of Geography, University of Colorado, Boulder. Author of several articles on Colorado.*

UNITED STATES OF AMERICA (in part)

M.J.MacL. Murdo J. MacLeod. *Professor of History, University of Arizona, Tucson. Author of Spanish Central America.*

ECUADOR (in part)

WEST INDIES, THE (in part)

M.J.Mo. Michel J. Mollat. *Emeritus Professor of History, University of Paris. Author of Genèse médiévale de la France moderne; Les Affaires de Jacques Coeur.*

CHARLES (BURGUNDY) (Micropædia)

COEUR, JACQUES (Micropædia)

FRANCE (in part)

LOUIS XI (FRANCE) (Micropædia)

M.Jo. Matthew Josephson (d. 1978). *Author of Edison: A Biography.*

EDISON (in part)

M.J.O. Margaret J. Osler. Associate Professor of History, University of Calgary, Alberta.

PHYSICAL SCIENCES, THE (in part)

M.J.P. Michael J. Pelczar, Jr. Emeritus Vice President for Graduate Studies and Research; Emeritus Professor of Microbiology, University of Maryland, College Park. President, Council of Graduate Schools in the United States. Coauthor of *Microbiology: Elements of Microbiology*.

BACTERIA (in part)

M.J.Pi. Mark Jeffrey Pietka. Technical Director, Cadbury Beverages Latin America, Inc., Fort Lauderdale, Florida.

BEVERAGE PRODUCTION (in part)

M.J.S.B. Michael J.S. Belton. Astronomer, Kitt Peak National Observatory, Tucson, Arizona.

SOLAR SYSTEM, THE (in part)

M.Ke. Mark Keller. Emeritus Professor, Rutgers University, New Brunswick, New Jersey; Emeritus Editor, *Journal of Studies on Alcohol*. Editor of *International Bibliography of Studies on Alcohol*.

ALCOHOL AND DRUG CONSUMPTION (in part)

M.Kh. Majid Khadduri. Emeritus Professor of Middle East Studies, School of Advanced International Studies, Johns Hopkins University, Baltimore. Author of *Independent Iraq; Republican Iraq; Socialist Iraq*.

IRAQ (in part)

M.Ki. Martin Kilson. Professor of Government, Harvard University; Research Associate, Harvard Center for International Affairs. Author of *Political Change in a West African State*.

KAUNDA, KENNETH (Micropædia)

M.K.L. Mildred K. Lehman. Associate Administrator, Alcohol, Drug Abuse, and Mental Health Administration, U.S. Department of Health and Human Services, Rockville, Maryland.

GODDARD, ROBERT HUTCHINGS (in part) (Micropædia)

M.K.N. Mehdi K. Nakosteen (d. 1982). Professor of the History and Philosophy of Education, University of Colorado, Boulder. Author of *The History and Philosophy of Education*.

EDUCATION, HISTORY OF (in part)

M.Ko. Mieczyslaw Kolinski (d. 1981). Composer, ethnomusicologist, and author of many musicological and ethnomusicological articles.

MUSIC, THE ART OF (in part)

M.K.P. Macaire K. Pedanou. Director, Office of the Commissioner for Namibia, United Nations, New York City.

WESTERN AFRICA (in part)

M.Kr. Melvin Kranzberg. Callaway Professor of the History of Science and Technology, Georgia Institute of Technology, Atlanta. Editor in Chief, *Technology and Culture* (quarterly), 1958–81. Coauthor of *By the Sweat of*

Thy Brow: Work in the Western World. WORK AND EMPLOYMENT (in part)

M.Ks. Manfred Krebs. Former Director, Baden State Archives, Karlsruhe, West Germany.

GERMANY (in part)

M.K.Sp. Monroe K. Spears. Moody Professor of English, Rice University, Houston, Texas. Author of *The Poetry of W.H. Auden; Dionysus and the City*; editor of *W.H. Auden: A Collection of Critical Essays*.

AUDEN, W.H. (Micropædia)

M.K.W. Marcus K. Williams. Senior member of sports staff, *The Times* (London). Editor of *Double Century: 200 Years of Cricket in The Times*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

M.L. Maurits Lindström. Professor of Geology, Geological–Paleontological Institute, Philipps University of Marburg, West Germany. Author of *Conodonts*.

GEOCHRONOLOGY (in part)

M.L.-B. Massimo Livi-Bacci. Professor of Demography, University of Florence. Author of *The Demographic and Social Pattern of Emigration from the Southern European Countries*.

ITALY (in part)

M.L.C. Martin Lowther Clarke. Former Professor of Latin, University College of North Wales, Bangor, University of Wales. Author of *Rhetoric at Rome; Higher Education in the Ancient World*.

QUINTILIAN (Micropædia)

M.L.D. Mikhail Leonidovich Djibladze. Journalist.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

M.Le. Michel Lejeune. Director of Research, National Center for Scientific Research, Paris. Author of *Phonétique historique du mycénien et du grec ancien and others*.

LANGUAGES OF THE WORLD (in part)

M.L.Go. Marie Louise Goodnight. Free-lance writer and researcher. Instructor in Biological Sciences, Purdue University, West Lafayette, Indiana, 1946–65. Coauthor of *General Zoology*.

ARACHNIDS (in part)

M.Li. Martin Lindauer. Professor of Zoology and Comparative Physiology; Director, Zoological Institute, University of Würzburg, West Germany. Author of *Communication Among Social Bees*.

INSECTS (in part)

ML.J. Michael Jaffé. Professor of the History of Western Art; Director, Fitzwilliam Museum, University of Cambridge; Fellow of King's College, Cambridge. Author of *Rubens and Italy*.

RUBENS, PETER PAUL (in part) (Micropædia)

M.Ln. Milton Lehman (d. 1966). Free-lance writer. Author of *This High Man: The Life of Robert H. Goddard*.

GODDARD, ROBERT HUTCHINGS (in part) (Micropædia)

ML.R. Michael Roe. Professor of History, University of Tasmania, Hobart, Australia. Author of *Quest for Authority in Eastern Australia, 1835–1851*.

AUSTRALIA (in part)

M.L.R. The Hon. Miriam Louisa Rothschild. Coauthor of *An Illustrated Catalogue of the Rothschild Collection of Fleas (Siphonaptera)* in the British Museum (Natural History) and author of several articles on fleas.

INSECTS (in part)

M.Lu. Myron Luntz. Professor of Physics, State University of New York College at Fredonia.

RADIATION (in part)

M.McA. Mary McAuley. Fellow and Tutor in Politics, St. Hilda's College, University of Oxford. Author of *Politics and the Soviet Union and others*.

LENINGRAD (in part)

M.McC. Malcolm McChesney. Senior Lecturer in Mechanical Engineering, University of Liverpool. Coauthor of *The Dynamics of Relaxing Gases*.

MATTER (in part)

M.McCu. Marilyn McCully. Free-lance writer. Coauthor of *Der Junge Picasso*; editor of *A Picasso Anthology*.

PICASSO

M.Me. Manuel Medina. Professor of International Law and International Relations, University of Madrid.

SPAIN (in part)

M.M.E. Marc Marie Escholier (d. 1972). Judge, Supreme Court of Appeal, Paris. Author of *Port-Royal and others*.

JANSEN, CORNELIUS OTTO (Micropædia)

M.M.El-K. Magdi M. El-Kammash. Former Associate Professor of Economics, North Carolina State University at Raleigh. Author of *Economic Development and Planning in Egypt*.

AFRICA (in part)

M.Mi. Mairin Mitchell. Free-lance writer. Author of *The Odyssey of Acurio Who Sailed with Magellan and others*.

MAGELLAN, FERDINAND (Micropædia)

M.MI. Michel Michel. Assistant Master of Geography, University of Paris I.

BRAZIL (in part)

M.M.M. Maynard Malcolm Miller. Professor of Geology; Dean, College of Mines and Earth Resources; Chief, Idaho Bureau of Mines and Geology, University of Idaho, Moscow. Director, Foundation for Glacier and Environmental Research, Pacific Science Center, Seattle, Washington. Author of numerous monographs and journal articles.

UNITED STATES OF AMERICA (in part)

M.Mn. Sir Max Mallowan (d. 1978). Professor of Western Asiatic Archaeology, University of London, 1947–62. President, British School

of Archaeology in Iraq, 1970–78. Archaeologist on staff of the British Museum Expedition to Nineveh, 1931–32; later leader of many other archaeological expeditions. Author of *Nimrud and Its Remains and others*.

NINEVEH (Micropædia)

M.M.S. Madan Mohan Singh. President, Engineers International, Inc., Westmont, Illinois. Manager, Soil and Rock Mechanics Section, Illinois Institute of Technology Research Institute, Chicago, 1968–74.

BUILDING CONSTRUCTION (in part)

M.M.Sa. Mostafa Moh. Salah. Former Director, Institute of Oceanography and Fisheries, Kayed Bey, Alexandria, Egypt. Author of numerous articles on oceanography.

MEDITERRANEAN SEA (in part)

M.M.W. Maxwell M. Wintrobe, M.D. (d. 1986). Professor of Internal Medicine, University of Utah, Salt Lake City, 1943–70. Author of *Clinical Hematology*.

BLOOD (in part)

M.M.Wr. Michael M. Wertheimer. Professor of Psychology, University of Colorado, Boulder. Consultant, Veterans Administration Hospital, Denver.

PSYCHOLOGY (in part)

M.Na. Maurice Nadeau. Editor, *Lettres Nouvelles* and *La Quinzaine Littéraire*, Paris. Author of *Histoire du surréalisme: editor of the Marquis de Sade's Oeuvres; and others*.

SADE, MARQUIS DE (Micropædia)

M.N.B. Marjorie Nice Boyer. Professor of History, York College, City University of New York, Jamaica. Author of "Medieval Suspended Carriages" in *Speculum*; "Medieval Pivoted Axles" in *Technology and Culture*.

TRANSPORTATION (in part)

M.N.D. Manmath Nath Das. Professor and Head, Department of History, Utkal University, Bhubaneswar, Orissa, India.

INDIA (in part)

M.N.v.L. Maurits N. van Loon. Professor of Prehistory and Archaeology of Western Asia, University of Amsterdam. Research Associate in Archaeology, Oriental Institute, University of Chicago. Author of *Urartian Art*.

DRESS AND ADORNMENT (in part)

Mo.Gr. Moshe Greenberg. Professor of Bible, Hebrew University of Jerusalem. Author of *The Hab/piru and others; editor and translator of The Religion of Israel by Yehezkel Kaufmann*.

JUDAISM (in part)

M.P. Malcolm Potts. President, Family Health International, Research Triangle Park, North Carolina. Coauthor of *The Textbook of Contraceptive Practice and others*.

BIRTH CONTROL

M.Pa. Marcel Pacaut. Professor of the History of the Middle Ages; Emeritus Director, Institute of Political Studies,

University of Lyon. Author of *Louis VII et son royaume and others*.

FRANCE (in part)

PHILIP II (FRANCE) (Micropædia)

M.P.B. Michael Parker Banton. Professor of Sociology, University of Bristol, England. Author of *The Policeman in the Community*.

POLICE (in part)

M.P.G. Mikell P. Groover. Professor of Industrial Engineering, Lehigh University, Bethlehem, Pennsylvania. Author of *Automation, Production Systems, and Computer-Aided Manufacturing*.

AUTOMATION (in part)

M.Ph. Melba Phillips. Emerita Professor of Physics, University of Chicago. Coauthor of *Classical Electricity and Magnetism*.

ELECTROMAGNETIC RADIATION (in part)

M.Pl. Maurice Platnauer (d. 1974). Principal of Brasenose College, University of Oxford, 1956–60. Author of *Latin Elegiac Verse and others; editor of Aristophanes' Peace*.

GREEK DRAMATISTS, THE CLASSICAL (in part)

M.Pm. Dame Margery Perham (d. 1982). Fellow of Nuffield College, Oxford, 1939–63; Reader in Colonial Administration, University of Oxford, 1939–48. Author of *Lugard; coeditor of The Diaries of Lord Lugard*.

LUGARD OF ABINGER, FREDERICK JOHN
DEALTRY LUGARD, BARON
(Micropædia)

M.P.Pe. Mikhail Platonovich Petrov (d. 1978). Professor of Physical Geography, Leningrad A.A. Zhdanov State University. Member of the Turkmen S.S.R. Academy of Sciences. Author of *Pustyni Tsentralnoy Azi ("Deserts of Central Asia")*.

ASIA (in part)

M.Py. E. Michael Pye. Professor of Comparative Religion, University of Marburg, West Germany. Author of *The Study of Kanji*.

rites and CEREMONIES, SACRED (in part)

M.R. Mario Rossi. Professor of the History of Philosophy, University of Siena, Italy. Author of *Marx e la dialettica hegeliana*.

HEGELIANISM, HEGEL AND (in part)

M.Ra. Marc Raeff. Professor of History, Columbia University. Author of *Origins of the Russian Intelligentsia*.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

M.R.B. Merton R. Bernfield, M.D. Josephine Knott Knowles Professor of Human Biology and Professor of Pediatrics, Stanford University, California. Chairman, Ciba Foundation Symposium: Basement Membranes and Cell Movement.

CELLS (in part)

M.R.D. Mary R. Dawson. Curator, Vertebrate Fossils, Carnegie Museum

of Natural History, Pittsburgh. Active in research on the biology and paleontology of rabbits.

MAMMALS (in part)

M.R.Da. Milton Rockwood Daniels (deceased). Commodore, U.S. Coast Guard.

NAVIGATION (in part)

M.R.D.F. Michael Richard Daniell Foot. Professor of History, Victoria University of Manchester, 1967–73. Editor of *The Gladstone Diaries*.

GLADSTONE, WILLIAM EWART (in part)
(Micropædia)

M.Re. Marcel Reinhard (d. 1973). Professor of History, University of Paris. Author of *Le Grand Carnot; Paris pendant la révolution française; and others*.

SAINT-JUST, LOUIS DE (Micropædia)

M.R.G. Mark Richard Greene. Distinguished Professor of Insurance, University of Georgia, Athens. Author of *Risk and Insurance*.

INSURANCE

M.Rh. Max Rheinstein (d. 1977). Max Pam Professor of Comparative Law, University of Chicago, 1942–68. Coauthor of *Law of Decedents' Estates*.

INHERITANCE AND SUCCESSION (in part)

LEGAL SYSTEMS, THE EVOLUTION OF

MODERN WESTERN (in part)

PROCEDURAL LAW (in part)

M.R.H. Michael R. House. Professor of Geology, University of Hull, England. Author of *Continental Drift and the Devonian System and others*.

GEOCHRONOLGY (in part)

M.-R.Ho. Michel-Rostislav Hofmann. Musicologist. Author of *Moussorgski; Histoire de la musique en Russie*.

MUSSORGSKY, MODEST (Micropædia)

M.Ro. Michael Roberts. Professor of Modern History, Queen's University of Belfast, Northern Ireland, 1954–73. Author of *Gustavus Adolphus: A History of Sweden, 1611–1632; The Early Vasas: A History of Sweden, 1523–1611*.

GUSTAV II ADOLF (Micropædia)

OXENSTIERNA (AF SODERMORE), AXEL,
GREVE (Micropædia)

M.R.W. Marilyn R. Waldman. Associate Professor of History; Director, Center for Comparative Studies, Ohio State University, Columbus. Author of *Toward a Theory of Historical Narrative: A Case Study in Perso-Islamicate Historiography*.

ISLAMIC WORLD, THE

M.Sa. Michele Sarà. Professor of Zoology; Director, Institute of Zoology, University of Genoa. Author of *Zoologia; Biologia generale*.

SPONGES (in part)

M.S.A. Mikhail S. Arlazorov. Staff member, Union of Cinematographers, Moscow. Author of *Tsiolkovsky*.

TSIOLKOVSKY, KONSTANTIN

EDUARDOVICH (Micropædia)

M.Sal. Mario Salmi (d. 1980). Professor of the History of Medieval

and Modern Art, University of Rome. Author of *Il Beato Angelico* and many monographs on Italian Renaissance artists.

ANGELICO, FRA (Micropædia)

M.S.C. Maria S. Cox. Former Assistant Professor of Economics, University of Wisconsin, Madison.

TAXATION (in part)

M.Sch. Mischa Schwartz. Professor of Electrical Engineering, Columbia University. Author of *Information Transmission, Modulation, and Noise*; coauthor of *Communication Systems and Techniques*.

TELECOMMUNICATIONS SYSTEMS (in part)

M.S.D. Margaret Stafana Drower. Honorary Research Fellow; former Reader in Ancient History, University College, University of London. Author of *Egypt in Colour*; *Nubia: A Drowning Land*.

THUTMOSE III (Micropædia)

M.S.F.H. M. Sinclair F. Hood. Archaeologist. Director, British School at Athens, 1954–62. Author of *The Minoans: Crete in the Bronze Age and others*.

GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

M.Sh. Minoru Shinoda. Professor of History, University of Hawaii, Honolulu. Author of *The Founding of the Kamakura Shogunate 1180–1185*.

DAIGO, GO- (Micropædia)

FUJIWARA FAMILY (Micropædia)

M.S.H. Muhammad Shamsul Huq. President, Foundation for Research on Educational Planning and Development. Foreign Minister, Bangladesh, 1978–82. Minister for Education and Scientific Research, Pakistan, 1969–71. Author of *Education and Manpower Development in South and Southeast Asia and others*.

EDUCATION, HISTORY OF (in part)

M.S.K. Michael Scott Kranbuhl, M.D. Staff Physician, Children's Hospital Medical Center, Cincinnati, Ohio.

ORGANS AND ORGAN SYSTEMS, PLANT AND ANIMAL (in part)

M.S.Ki. M. Semakula M. Kiwanuka. Former Professor and Head, Department of History, Makerere University, Kampala, Uganda. Author of *A History of Buganda*.

EASTERN AFRICA (in part)

M.S.M. Muhsin S. Mahdi. James Richard Jewett Professor of Arabic, Harvard University. Author of *Ibn Khaldun's Philosophy of History and others*.

ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

M.S.Ma. Matthew S. Magda. Associate Historian, Division of History, Pennsylvania Historical and Museum Commission, Harrisburg.

PHILADELPHIA (in part)

M.S.M.F. Michael S.M. Fordham. Analytical psychologist. Coeditor of *The*

Collected Works of C.G. Jung.

JUNG, CARL (in part) (Micropædia)

M.Sp. Matthew Spinka (d. 1972). Professor of Church History, Hartford Seminary Foundation, Connecticut, 1943–58. Author of *John Hus: A Biography and others*.

HUS, JOHN (Micropædia)

M.S.S. Mark S. Slobin. Associate Professor of Music, Wesleyan University, Middletown, Connecticut. Author of *Music in the Culture of Northern Afghanistan and others*.

CENTRAL ASIAN ARTS (in part)

M.St. Michel Strickmann. Associate Professor of Oriental Languages, University of California, Berkeley. Author of *Le Taoïsme du Mao Chan and others*.

TAOISM (in part)

M.S.T. Michael S. Teitelbaum. Program Officer, Alfred P. Sloan Foundation, New York City. Author of *The British Fertility Decline: Demographic Transition in the Crucible of the Industrial Revolution*.

POPULATION

M.Su. Michael Sullivan. Christensen Professor Emeritus of Oriental Art, Stanford University, California. Author of *The Birth of Landscape Painting in China; The Arts of China*.

MA YUAN (Micropædia)

EAST ASIAN ARTS (in part)

M.T. Morris Tanenbaum. Executive Vice President, American Telephone and Telegraph Company, New York City. Coeditor of *Superconductors*.

AUTOMATION (in part)

INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)

M.Ta. Mohamed Talbi. Professor, Faculty of Letters and Human Sciences, University of Tunis. Author of *L'Emirat aghlabide, histoire politique 800–909*.

NORTH AFRICA (in part)

M.T.F. Michael T. Florinsky (d. 1981). Professor of Economics, Columbia University, 1956–63. Author of *Russia: A History and an Interpretation and others*.

ALEXANDER III (RUSSIA) (Micropædia)

M.T.O. Martin T. Orne, M.D. Professor of Psychiatry, University of Pennsylvania, Philadelphia; Director, Unit for Experimental Psychiatry, Institute of Pennsylvania Hospital.

HYPNOSIS (in part) (Micropædia)

M.Tu. Martin Turnell (d. 1979). Writer. Head, Programme Contracts Department, BBC, London, 1959–69. Author of *The Art of French Fiction*.

MAUPASSANT, GUY DE (Micropædia)

ZOLA, ÉMILE (Micropædia)

M.T.V. M. Tulio Velásquez. Director, Institute of Andean Biology, National University of San Marcos, Lima. Coauthor of *Physiological Effects of High Altitude*.

SOUTH AMERICA (in part)

M.U. Michitaka Uda. Emeritus Professor, Tokyo University of Fisheries. Author of *Umi* and numerous articles on oceanography.

ASIA (in part)

Mu.B. Mukhtar Mustafa Buru. Professor of Geography, Al-Fatah University, Tripoli, Libya. Author of *Atlas of Libyan Arab Republic*.

NORTH AFRICA (in part)

Mu.S. Murray Schumach. Former Reporter, The New York Times. Author of *The Face on the Cutting Room Floor*.

NEW YORK CITY

M.V.F. Marion Valerie Friedmann. Editor and translator. Author of *The Slap*; editor of *I Will Still Be Moved: Reports from South Africa*.

SOUTH AFRICAN LITERATURE (in part) (Micropædia)

M.Vi. Marcelle Vioux. Free-lance writer. Author of *Francois I; Henri IV. FRANCIS I (FRANCE)* (Micropædia)

M.V.O. Maynard V. Olson. Assistant Professor of Genetics, Washington University, St. Louis. Author of papers on mechanisms of reactions of transition-metal compounds.

CHEMICAL REACTIONS (in part)

M.W.B. Marshall W. Baldwin (d. 1975). Professor of History, New York University, New York City, 1954–72. Co-editor of *A History of the Crusades*.

CRUSADES, THE (in part)

M.W.F. Marvin W. Formo. Manager, Oil and Protein Research, Cargill Inc., Minneapolis, Minnesota. Contributor to *Industrial Fatty Acids*.

FOOD PROCESSING (in part)

M.W.Fr. Michael Wulf Friedlander. Professor of Physics, Washington University, St. Louis, Missouri. Author of *Astronomy: From Stonehenge to Quasars and others*.

PHYSICAL SCIENCES, THE (in part)

M.W.F.T. Michael Willmer Forbes Tweedie. Director, Raffles Museum, Singapore, 1946–57.

EAST INDIES, THE (in part)

M.W.G. Malcolm W. Greaves. Professor of Dermatology, Institute of Dermatology, St. Thomas's Hospital, University of London. Editor of *The Urticarias*.

INTEGUMENTARY SYSTEMS (in part)

M.Wi. Mitchell Wilson (d. 1973). Science writer and novelist. Author of *American Science and Invention*.

MCCORMICK, CYRUS HALL (Micropædia)

M.W.L. Maung Wai Lin. Research Editor, Biology, Encyclopædia Britannica, Chicago, 1970–72.

FISHES (in part)

M.W.L.K. Michael William Lely Kitson. Professor of the History of Art; Deputy Director, Courtauld Institute of Art, University of London. Author of *The Art of Claude Lorrain and others*.

CLAUDE LORRAIN (Micropædia)

M.Wo. Mary Woodall (d. 1988). *Director, City Museum and Art Gallery, Birmingham, England, 1956-64. Author of Gainsborough's Landscape Drawings; editor of The Letters of Thomas Gainsborough.*

GAINSBOROUGH, THOMAS (Micropædia)

M.W.R. Matilda White Riley. *Associate Director, Social and Behavioral Sciences Research, National Institute on Aging, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, Maryland. Coauthor of Aging and Society (vol. I-III).*

SOCIAL DIFFERENTIATION (in part)

M.W.Ri. Michael William Richey. *Former Director, Royal Institute of Navigation, London. Coauthor of The Geometrical Seaman.*

NAVIGATION (in part)

M.W.W. Manfred W. Wenner. *Associate Professor of Political Science, Northern Illinois University, DeKalb. Author of Modern Yemen, 1918-1966.*

ARABIA (in part)

Mx.M. Max Miller (d. 1973). *Director of State Archives, Stuttgart, West Germany, 1951-66. Chairman of the Historical Commission of Baden-Württemberg.*

GERMANY (in part)

M.Y.S. Margaret Yvonne Stant. *Principal Scientific Officer in Plant Anatomy, Jodrell Laboratory, Royal Botanic Gardens, Kew, England. Author of Anatomy of the Butomaceae.*

ANGIOSPERMS (in part)

M.Z. Moses Zucker (d. 1987). *Professor of Biblical Exegesis, Jewish Theological Seminary of America, New York City. Author of Rav Saadya Gaon's Translation of the Torah.*

SA'ADIA BEN JOSEPH (Micropædia)

M.Zu. Matinuzzaman Zuberi. *Senior Fellow and Head, Centre for International Politics and Organization, Jawaharlal Nehru University, New Delhi.*

NEPAL (in part)

N. John Julius Cooper, 2nd Viscount Norwich. *Writer and broadcaster. Author of The Normans in the South; The Kingdom in the Sun.*

ROGER II (SICILY) (Micropædia)

N.A. Nafis Ahmad (deceased). *Professor of Geography, University of Dacca, Bangladesh. Author of Economic Geography of East Pakistan; editor of Oriental Geographer.*

ASIA (in part)

N.Ab. Nicola Abbagnano. *Emeritus Professor of History of Philosophy, University of Turin, Italy. Foremost Italian Existentialist philosopher. Author of Critical Existentialism and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

N.A.B. N.A. Baloch. *Former Vice Chancellor, Islamic University, Islamabad, Pakistan; former Director, Institute of Historical and Cultural*

Research. Author of Musical Instruments of the Lower Indus Valley of Sind.

PAKISTAN (in part)

N.A.C. Nancy A. Curtin. *Lecturer in Physiology, Charing Cross Hospital Medical School, University of London.*

MUSCLES AND MUSCLE SYSTEMS (in part)

N.A.Ct. Nathan Altshiller Court (d. 1968). *Professor of Mathematics, University of Oklahoma, Norman, 1935-51. Author of College Geometry; Mathematics in Fun and in Earnest.*

GEOMETRY (in part)

N.A.F. Nabih Amin Faris (d. 1968). *Professor of Arab History and Director, Arab Studies Programme, American University of Beirut.*

PALESTINE (in part)

N.A.G. Nikolay Andreyevich Gvozdetzky. *Professor of Geography, Moscow M.V. Lomonosov State University. Author of Kavkaz.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

N.A.J. Nazir Ali Jairazbhoy. *Professor of Music, University of California, Los Angeles. Author of The Rāgs of North Indian Music: Their Structure and Evolution.*

SOUTH ASIAN ARTS (in part)

Na.M. Nancy Mitford (d. 1973). *Writer. Author of Madame de Pompadour and others.*

POMPADOUR, JEANNE-ANTOINETTE
POISSON, MARQUISE DE
(Micropædia)

N.A.M. Norman A. Malcolm. *Susan Linn Sage Professor Emeritus of Philosophy, Cornell University, Ithaca, New York. Author of Ludwig Wittgenstein: A Memoir.*

WITTGENSTEIN, LUDWIG (in part)
(Micropædia)

Na.Mo. Naoaki Maeno. *Emeritus Professor of Chinese Literature, University of Tokyo. Author of Poets in the T'ang Dynasty.*

LITERATURE, THE ART OF (in part)

N.An. Nikolay Andreyev (d. 1982). *Reader in Russian Studies, University of Cambridge; Fellow of Clare Hall, Cambridge. Author of Studies in Muscovy and others.*

IVAN IV (Micropædia)

N.A.O. Ned Allen Ostenso. *Director, Office of Sea Grant and Extramural Programs, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Rockville, Maryland. Leader or participant in several polar expeditions. Author of Geophysical Investigations of the Arctic Ocean Basin.*

ARCTIC, THE (in part)

N.A.R. Nesca A. Robb (d. 1976). *Free-lance writer and lecturer. Author of William of Orange: A Personal Portrait.*

WILLIAM III (ENGLAND AND GREAT BRITAIN) (Micropædia)

N.A.Ro. Nicholas A. Romas, M.D. *Director of Urology, St. Luke's-Roosevelt*

Hospital Center, New York City.

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

N.A.W. Nixon A. Wilson. *Professor of Biology, University of Northern Iowa, Cedar Falls. Author of numerous papers on mites and ticks.*

ARACHNIDS (in part)

N.A.Z. Nicola Abdo Ziadeh. *Emeritus Professor of Arab History, American University of Beirut. Author of Origins of Nationalism—Tunisia and others.*

BOURGUIBA, HABIB (Micropædia)

CALENDAR (in part)

HISTORY, THE STUDY OF (in part)

N.B. Nevill Barbour (d. 1972). *Assistant Head, Eastern Services, British Broadcasting Corporation, 1944-56. Author of Morocco; editor of A Survey of North West Africa.*

NORTH AFRICA (in part)

WESTERN AFRICA (in part)

N.B.P. Nicholas B. Penny. *Keeper of Western Art, Ashmolean Museum of Art and Archaeology, University of Oxford. Author of Church Monuments in Romantic England.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

N.C. Norman Crossland. *Former Bonn correspondent, The Economist, London. Author of The German Electoral System.*

BERLIN (in part)

N.C.G. Neil C. Gustafson. *President, Anticipatory Management, Inc., Minneapolis. Coauthor and editor of Report of the Commission on Minnesota's Future.*

UNITED STATES OF AMERICA

(in part)

N.Ch. Ned Chaillet. *Editor, Radio 3 Plays, British Broadcasting Corporation, London.*

THEATRE, THE ART OF THE (in part)

N.C.H. Nicholas Carr Hightower, M.D. *Senior Consultant, Department of Gastroenterology, Scott and White Clinic and Scott and White Memorial Hospital, Temple, Texas. Contributor of "Digestion" in Best and Taylor, The Physiological Basis of Medical Practice (8th ed.).*

DIGESTION AND DIGESTIVE SYSTEMS (in part)

N.C.N. N. Chandrasekharan Nair. *Joint Director, Botanical Survey of India, Coimbatore. Author of Flora of the Punjab Plains and others.*

ANGIOSPERMS (in part)

N.Co. Nigel Collins. *Editor in Chief, The Ring. Editor, Boxing Illustrated, 1984.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

N.C.P. Norman C. Polmar. *Consultant. Editor, U.S. section, Jane's Fighting Ships, 1967-77. Author of Atomic Submarines; The Ships and Aircraft of the U.S. Fleet; and others.*

WAR, THE TECHNOLOGY OF
(in part)

N.D. Norman Davies. *Professor of History, School of Slavonic and East European Studies, University of London. Author of God's Playground: A History of Poland.*

POLAND (in part)

WARSAW (in part)

N.E.S. Neil E. Salisbury. *Professor of Geography, University of Oklahoma, Norman. Coauthor of "Growth and Decline of Iowa Villages" and "The Valleys of Iowa," Iowa Studies in Geography.*

UNITED STATES OF AMERICA (in part)

N.E.W. Neil E. Wiseman. *Lecturer in Computer Science, University of Cambridge. Coauthor of Creative Computer Graphics.*

COMPUTERS (in part)

N.F.C. Norman F. Childers. *Adjunct Professor, Department of Fruit Crops, University of Florida, Gainesville. M.A. Blake Professor Emeritus of Horticulture, Rutgers University, New Brunswick, New Jersey. Author of Modern Fruit Science.*

FARMING AND AGRICULTURAL
TECHNOLOGY (in part)

N.G. Norman Gash. *Emeritus Professor of History, University of St. Andrews, Scotland. Author of Sir Robert Peel and others.*

CASTLEREAGH, ROBERT STEWART,
VISCOUNT (Micropædia)

GREY, CHARLES GREY, 2ND EARL
(Micropædia)

PEEL, SIR ROBERT, 2ND BARONET
(Micropædia)

N.G.J. Norman Gardner Johnson (d. 1973). *Industry Manager, Explosives Department, Du Pont de Nemours and Company, Wilmington, Delaware, 1960-67; Technical Specialist, Technical Service Section, 1943-60. Author of Safety in the Transportation, Storage, Handling and Use of Explosives.*

INDUSTRIES, CHEMICAL PROCESS
(in part)

N.G.L.H. Nicholas G.L. Hammond. *Henry Overton Wills Professor Emeritus of Greek, University of Bristol, England. Author of A History of Greece to 322 B.C.; editor of Cambridge Ancient History, 3rd edition.*

GRECO-ROMAN CIVILIZATION, CLASSICAL
(in part)

GREECE (in part)

XENOPHON (Micropædia)

N.Go. Noël Goodwin. *Associate Editor, Dance and Dancers, London. Music and Dance Critic, London Daily Express, 1956-78. Area Editor, The New Grove Dictionary of Music and Musicians. Coauthor of London Symphony: Portrait of an Orchestra.*

MUSICAL FORMS AND GENRES
(in part)

N.G.S. Neal Griffith Smith. *Biologist, Smithsonian Tropical Research Institute, Balboa, Panama.*

BEHAVIOUR, ANIMAL (in part)

N.H. Naofusa Hirai. *Professor of Shintō Studies, Kokugakuin University, Tokyo. Author of Japanese Shinto.*

SHINTŌ

N.H.D. Nancy Hatch Dupree. *Program Associate, Islamic and Arabian Development Studies, Duke University, Durham, North Carolina. Author of An Historical Guide to Afghanistan.*

AFGHANISTAN (in part)

N.H.R. Norman H. Russell. *Professor of Biology, Central State University, Edmond, Oklahoma. Author of An Introduction to the Plant Kingdom.*

ANGIOSPERMS (in part)

N.I. Nobutaka Ike. *Professor of Political Science, Stanford University, California. Author of The Beginnings of Political Democracy in Japan and others.*

II NAOSUKE (Micropædia)

N.I.M. Nikolay Ivanovich Mikhaylov. *Professor of Geography, Moscow M.V. Lomonosov State University. Author of Gory Yuzhnoy Sibiri.*

ASIA (in part)

N.J.B. N.J. Berrill. *Strathcona Professor of Zoology, McGill University, Montreal, 1946-65. Author of Sex and the Nature of Things and others.*

SEX AND SEXUALITY (in part)

N.J.C. Noel James Coulson (d. 1986). *Professor of Oriental Laws, University of London, 1967-86. Author of A History of Islamic Law.*

ISLĀM, MUHAMMAD AND THE RELIGION
OF (in part)

N.J.H. Nicholas Joseph Healy. *Adjunct Professor of Law, New York University. Attorney, Healy & Baillie, New York City. Editor, Journal of Maritime Law and Commerce. Coauthor of Healy & Sharpe's Cases and Materials on Admiralty.*

TRANSPORTATION LAW (in part)

N.J.L. Norman Jones Lamb. *Former Senior Lecturer in Portuguese and Spanish, University of Liverpool.*

PORTUGUESE LITERATURE (in part)

N.J.M. Nicholas John Mackintosh. *Professor of Experimental Psychology, University of Cambridge. Author of Psychology of Animal Learning.*

LEARNING, ANIMAL

N.J.P. Norman J. Padelford (d. 1982). *Professor of Political Science, Massachusetts Institute of Technology, Cambridge, 1945-71. Author of The Panama Canal in Peace and War.*

CENTRAL AMERICA (in part)

N.J.S. Neil J. Smelser. *University Professor of Sociology, University of California, Berkeley. Author of Theory of Collective Behavior and others.*

COLLECTIVE BEHAVIOUR

(in part)

N.Ka. Nobuo Kanda. *Professor of East Asian History, Meiji University, Tokyo. Coauthor of Glory of the Forbidden City in Peking.*

K'ANG-HSI (Micropædia)

N.K.G. Nikolai Kallinikovitch Gudzi (d. 1965). *Professor of Old Russian Language and Literature, Moscow M.V. Lomonosov State University. Member, Academy of Sciences of the U.S.S.R. Author of History of Early Russian Literature and others.*

RUSSIAN LITERATURE (in part)

N.K.S. N.K. Sinha (d. 1974). *Professor and Head, Department of History, University of Calcutta, 1955-68. Author of Rise of the Sikh Power.*

BOSE, SUBHAS CHANDRA (Micropædia)

CALCUTTA (in part)

N.L.G. Nancie L. González. *Professor of Anthropology, University of Maryland, College Park. Author of Santiago: Ethnography of a Dominican City.*

WEST INDIES, THE (in part)

N.L.N. Norman L. Nicholson. *Senior Professor of Geography, University of Western Ontario, London. Author of The Boundaries of the Canadian Confederation and others.*

CANADA (in part)

N.M. Nobuhiro Matsumoto. *Emeritus Professor of Oriental History, Keio University, Tokyo. Author of Essai sur la mythologie japonaise.*

JAPANESE LITERATURE (in part)

N.M.C. Nydia Maria Cardoze. *Professor of Geography, University of Panama, Panama City. Author of Notas de geografía.*

CENTRAL AMERICA (in part)

N.Mo. Neil Morgan. *Editor, The Tribune (San Diego, California). Author of The California Syndrome; Westward Tilt.*

UNITED STATES OF AMERICA (in part)

N.M.S. Nicholas M. Short. *Research Scientist, Geophysics Branch, Laboratory for Earth Sciences, Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md. Author of Planetary Geology.*

CONTINENTAL LANDFORMS (in part)

N.M.Sa. Nahum M. Sarna. *Golding Professor of Biblical Studies, Brandeis University, Waltham, Massachusetts. Author of Understanding Genesis.*

BIBLICAL LITERATURE AND ITS CRITICAL
INTERPRETATION (in part)

N.M.Su. N.M. Sutherland. *Reader in Early Modern History, Royal Holloway College, University of London. Author of The Massacre of St. Bartholomew and the European Conflict, 1559-1572.*

CATHERINE DE MÉDICIS (Micropædia)

N.N.G. Nahum N. Glatzer. *Samuel Lane Professor Emeritus of Jewish History and Social Ethics, Brandeis University, Waltham, Massachusetts. University Professor, Boston University. Author of Franz Rosenzweig: His Life and Thought and others.*

AKIBA BEN JOSEPH (Micropædia)

ROSENZWEIG, FRANZ (Micropædia)

N.O.S. Norman Obed Smith. *Professor of Chemistry, Fordham University, New York City. Coauthor of The Phase Rule*

and Its Applications.

MATTER (in part)

N.P. Norman Perrin (d. 1976). *Professor of New Testament, University of Chicago, 1969–76. Author of The Promise of Bultmann.*

BULTMANN, RUDOLF (Micropædia)

N.Pa. Ntsomo Payanzo. *Former Assistant Professor of Sociology, National University of Zaire, Lubumbashi.*

CENTRAL AFRICA (in part)

N.P.A. Nagarajan Panchapagesan Ayyar (d. 1979). *Professor of Geography, Shivaji University, Kolhāpur, India, 1977–79.*

INDIA (in part)

N.P.As. N. Philip Ashmole. *Senior Lecturer in Zoology, University of Edinburgh. Author of numerous papers on the ecology of seabirds.*

BIRDS (in part)

N.Po. Nicholas Polunin. *Secretary General and Editor, International Conferences on Environmental Future. Founder and Editor, Environmental Conservation. President, Foundation for Environmental Conservation. Author of Circumpolar Arctic Flora.*

ECOSYSTEMS (in part)

N.R. Nicholas Rescher. *University Professor of Philosophy, University of Pittsburgh. Author of Topics in Philosophical Logic.*

LOGIC, THE HISTORY AND KINDS OF (in part)

N.R.A. Norman R. Alpert. *Professor and Chairman, Department of Physiology and Biophysics, University of Vermont, Burlington.*

MUSCLES AND MUSCLE SYSTEMS (in part)

N.Ru. Nicolai Rubinstein. *Emeritus Professor of History, Westfield College, University of London. Author of The Government of Florence Under the Medici, 1434–1494, and others.*

GUICCIARDINI, FRANCESCO (Micropædia)

ITALY (in part)

N.R.W. Nelson Raymond Williams. *Principal Technical Adviser to Assistant Director, U.S. Air Force Technical Applications Center, Virginia, 1961–63. Meteorologist, U.S. Weather Bureau, 1940–46. Contributor to The Encyclopedia of Atmospheric Sciences and Astrogeology.*

CLIMATE AND WEATHER (in part)

N.S. Nobuo Shimahara. *Professor of the Anthropology of Education and Associate Dean, Graduate School of Education, Rutgers University, New Brunswick, New Jersey. Author of Adaptation and Education in Japan and others.*

EDUCATION, HISTORY OF (in part)

N.S.B. Norman Spencer Brommelle. *Secretary-General, International Institute for Conservation of Historic and Artistic Works. Director, Hamilton Kerr Institute, Fitzwilliam Museum,*

University of Cambridge, 1978–83. Keeper, Department of Conservation, Victoria and Albert Museum, London, 1960–77.

ART CONSERVATION AND RESTORATION (in part)

N.S.C. Neil S. Cherniack, M.D. *Professor of Medicine and Physiology; Associate Dean for Academic Programs, Case Western Reserve University, Cleveland, Ohio. Coeditor of Handbook of Physiology, sect. 3, The Respiratory System, vol. II, Control of Breathing.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

N.S.G. Norton S. Ginsburg. *Director, Environment and Policy Institute, East-West Center, Honolulu. Author of An Atlas of Economic Development; editor of The Pattern of Asia.*

TAIWAN (in part)

N.Sh. Nicholas Shrimpton. *Fellow and Tutor in English Literature, Lady Margaret Hall, University of Oxford.*

ENGLISH LITERATURE (in part)

N.SI. Nicolas Slonimsky. *Conductor, composer, writer, and editor. Lecturer in Music, University of California, Los Angeles, 1964–67. Author of Music Since 1900; Music of Latin America; editor of Baker's Biographical Dictionary of Musicians.*

RIMSKY-KORSAKOV, NIKOLAY (Micropædia)

N.Sm. Ninian Smart. *Professor of Religious Studies, University of Lancaster, England, and University of California, Santa Barbara. Author of The Religious Experience of Mankind; Philosophers and Religious Truth.*

RELIGIONS, THE STUDY AND CLASSIFICATION OF (in part)

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

N.St. Noel Stock. *Professor of English, University of Toledo, Ohio. Author of The Life of Ezra Pound; Reading the Cantos.*

POUND, EZRA (Micropædia)

N.T. Nicholas Temperley. *Professor of Musicology, University of Illinois, Urbana. Editor of Berlioz' Symphonie fantastique.*

MUSIC, THE ART OF (in part)

N.V.He. Norman V. Henfrey. *Lecturer in English, University of Bristol, England. Editor of Selected Critical Writings of George Santayana.*

SANTAYANA, GEORGE (Micropædia)

N.V.R. Nicholas V. Riasanovsky. *Sidney Hellman Ehrman Professor of European History, University of California, Berkeley. Author of Nicholas I and Official Nationality in Russia, 1825–1855, and others.*

NICHOLAS I (RUSSIA) (Micropædia)

N.W. Norman Ward. *Britnell Professor of Political Science, University of Saskatchewan, Saskatoon. Author of The Public Purse: A Study in Canadian Democracy.*

CANADA (in part)

N.W.D. Norman Wilfred Desrosier. *Director of Research, National Biscuit Company, New York City. Author of The Technology of Food Preservation.*

FOOD PROCESSING (in part)

N.Wi. Nico Wilterdink. *Lecturer in Sociology, University of Amsterdam. Author of Vermogensverhoudingen in Nederland.*

SOCIAL STRUCTURE AND CHANGE

N.W.S. Nathan Wetherill Shock. *Emeritus Scientist, Gerontology Research Center, National Institute of Aging, U.S. Department of Health and Human Services, Baltimore City Hospitals. Author of Trends in Gerontology; editor of Perspectives in Experimental Gerontology.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

N.Z. Nicolas M. Zernov (d. 1980). *Spalding Lecturer in Eastern Orthodox Culture, University of Oxford, 1947–66. Author of The Russian Religious Renaissance of the Twentieth Century and others.*

KHOMYAKOV, ALEKSEY STEPANOVICH (Micropædia)

O.A. Oskar Anweiler. *Professor of Education, University of the Ruhr, Bochum, West Germany. Author of Geschichte der Schule und Pädagogik in Russland, vom Ende des Zarenreiches bis zum Beginn der Stalin-Ära.*

EDUCATION, HISTORY OF (in part)

O.A.B. Otto Allen Bird. *Emeritus Professor of Arts and Letters, University of Notre Dame, Indiana. Author of Cultures in Conflict: An Essay in the Philosophy of the Humanities.*

KANTIANISM, KANT AND (in part)

LEŚNIEWSKI, STANISŁAW (Micropædia)

O.A.O. Oscar A. Ornati. *Professor of Manpower Management, New York University, New York City. Author of Transportation Needs of the Poor: A Case Study of New York City.*

WORK AND EMPLOYMENT (in part)

O.B.G. O. Benjamin Gerig (d. 1976). *Director, Office of Dependent Area Affairs, U.S. Department of State, 1945–62.*

UNITED NATIONS (in part)

O.C. Otis Cary. *Professor of American History, Doshisha University, Kyōto; Representative of Amherst College. Coauthor, and editor of War-Wasted Asia.*

KYŌTO

O.C.C. Orville C. Cromer (d. 1980). *Professor of Mechanical Engineering, Purdue University, West Lafayette, Indiana, 1954–63. Coauthor of Elementary Heat Power.*

ENERGY CONVERSION (in part)

TRANSPORTATION (in part)

O.C.K. Otto C. Kopp. *Professor of Geological Sciences, University of Tennessee, Knoxville. Coauthor of Laboratory Exercises in Physical*

Geology.

FUELS, FOSSIL (in part)

O.D. Oliver Davies. Associate Professor of Archaeology, University of Ghana, 1952–66.

WESTERN AFRICA (in part)

O.E.Z. Oleksa Eliseyovich Zasenkov. Head, Department of the History of Ukrainian Prerevolutionary Literature, Institute of Literature, Ukrainian S.S.R. Academy of Sciences, Kiev. Coauthor of History of Ukrainian Literature, vol. 8.

UKRAINIAN LITERATURE (in part)
(Micropædia)

O.F.B. Otto Friedrich Bollnow. Emeritus Professor of Philosophy and Education, Eberhard Karl University of Tübingen, West Germany. Author of *Dilthey: Eine Einführung in seine Philosophie*.

DILTHEY, WILHELM (Micropædia)

O.G. Owen Gingerich. Professor of Astronomy and of the History of Science, Harvard University. Astrophysicist, Smithsonian Astrophysical Observatory, Cambridge, Massachusetts. Coauthor of *Solar and Planetary Longitudes for Years –2500 to +2000*.

STARS AND STAR CLUSTERS
(in part)

O.Gr. Oleg Grabar. Aga Khan Professor of Islamic Art, Harvard University. Author of *The Formation of Islamic Art*; coauthor of *Islamic Architecture and Its Decoration*.

ISLĀMIC ARTS (in part)

O.J. Oswald Jacoby (d. 1984). Author of *Oswald Jacoby on Poker and many other works on card playing*.

POKER (Micropædia)

O.J.B. Ooi Jin Bee. Professor of Geography, National University of Singapore. Editor, *Singapore Journal of Tropical Geography*. Author of *Peninsular Malaysia and others*.

SOUTHEAST ASIA, MAINLAND (in part)

O.J.E. Olin Jeuck Eggen. Senior Astronomer, Cerro Tololo Interamerican Observatory, La Serena, Chile.

BRAHE, TYCHO (Micropædia)

HALLEY, EDMOND (Micropædia)

O.J.H. Oscar J. Hammen. Emeritus Professor of History, University of Montana, Missoula. Author of *The Red '48ers: Karl Marx and Friedrich Engels*.

ENGELS, FRIEDRICH (Micropædia)

O.K. Olin Kalmbach (d. 1979). President, Tipton and Kalmbach, Inc., Consulting Engineers, Denver.

PUBLIC WORKS (in part)

O.K.-J. Ole Klindt-Jensen (d. 1980). Professor of Prehistory, University of Århus, Denmark, 1961–80. Author of *Foreign Influences in Denmark's Early Iron Age*; *Denmark Before the Vikings*.

PAINTING, THE HISTORY OF WESTERN
(in part)

O.K.L. Oleg Konstantinovich Leontiev. Professor and Head, Department of Geomorphology, Moscow M.V.

Lomonosov State University.

ASIA (in part)

O.L. Otto Leichter (d. 1973). Correspondent for United Nations and U.S. Affairs, *Arbeiter-Zeitung*, Vienna; and *Neue Ruhr-Zeitung*, Essen, West Germany. Author of *Zwischen zwei Diktaturen*.

AUSTRIA (in part)

O.La. Owen Lattimore. Emeritus Professor of Chinese Studies, University of Leeds, England. Foreign Member, Academy of Sciences of the Mongolian People's Republic. Author of *Mongols of Manchuria*; *Inner Asian Frontiers of China*; and *others*.

MONGOLIA (in part)

O.L.A. Oliver L. Austin, Jr. Emeritus Curator in Ornithology, Florida State Museum, University of Florida, Gainesville. Author of *Birds of the World and of numerous papers*.

BIRDS (in part)

O.Li. Otto Liess. Former Editor, *Erdöl-Dienst*, Vienna. Author of *Albanien zwischen Ost und West and others*.

ALBANIA (in part)

O.L.Z. Oliver Louis Zangwill (d. 1987). Professor of Experimental Psychology, University of Cambridge, 1952–81. Author of *An Introduction to Modern Psychology*; coeditor of *Amnesia*.

MEMORY (in part)

O.O. Otakar Odložilík (d. 1973). Professor of European History, University of Pennsylvania, Philadelphia, 1955–70. Author of *Bohemia in European Affairs, 1440–1471*.

CZECHOSLOVAKIA (in part)

O.Or. Oystein Ore (d. 1968). Sterling Professor of Mathematics, Yale University, 1931–68. Author of *Cardano: The Gambling Scholar and others*.

MATHEMATICS, THE HISTORY OF
(in part)

O.O.W. Oscar O. Winther (d. 1970). University Professor of History, Indiana University, Bloomington, 1965–70. Author of *The Great Northwest and others*.

UNITED STATES OF AMERICA (in part)

O.P.S. Otis P. Starkey (d. 1986). Professor of Geography, Indiana University, Bloomington, 1946–70.

UNITED STATES OF AMERICA (in part)

O.R.A.K. Oswin R.A. Köhler. Emeritus Professor of African Studies; former Director, Institute for African Studies, University of Cologne, West Germany. Author of *“Les Langues Khoisan” in Les Langues dans le monde ancien et moderne and others*.

LANGUAGES OF THE WORLD (in part)

O.R.G. Oliver Robert Gurney. Professor of Assyriology, University of Oxford, 1965–78. Author of *The Hittites and others*.

MIDDLE EASTERN RELIGIONS, ANCIENT
(in part)

O.Sh. O. Shagdarsuren. Director, Institute of General and Experimental Biology, Academy of Sciences of the Mongolian People's Republic, Ulaanbaatar.

MONGOLIA (in part)

O.T. Oliver Taplin. Fellow and Tutor of Magdalen College, Oxford; Lecturer in Classical Languages and Literature, University of Oxford. Author of *Greek Tragedy in Action*.

GREEK DRAMATISTS, THE CLASSICAL
(in part)

O.W. Owen Williams. Emeritus Professor of Geography, University of Natal, Pietermaritzburg, South Africa. Coauthor of *The Economic Framework of South Africa*.

SOUTH AFRICA (in part)

O.W.W. O.W. Wolters. Goldwin Smith Professor of Southeast Asian History, Cornell University, Ithaca, New York. Author of *Early Indonesian Commerce and others*.

EAST INDIES, THE (in part)

P.A. Paul Avrich. Distinguished Professor of History, Queens College, City University of New York, Flushing. Author of *The Russian Anarchists*.

KROPOTKIN, PETER (Micropædia)

P.A.C. Paul A. Crow, Jr. President, Council on Christian Unity of the Christian Church (Disciples of Christ), Indianapolis, Indiana. Author of *Christian Unity: Matrix for Mission*.

CHRISTIANITY (in part)

P.Ad. Preston Adams. Professor of Botany, DePauw University, Greencastle, Indiana. Coauthor of *The Study of Botany*.

ORGANS AND ORGAN SYSTEMS, PLANT
AND ANIMAL (in part)

Pa.H. Pauline Heaton. Former Acting Archivist, Bermuda.

WEST INDIES, THE (in part)

P.A.H. Patrick Aidan Heelan. Professor of Philosophy, State University of New York at Stony Brook. Author of *Quantum Mechanics and Objectivity*.

HEISENBERG

Pa.M. Paul Mercier (d. 1976). Professor of Ethnology, University of Paris V. Director of Studies, Institute for Advanced Research, Paris. Author of *Historie de l'anthropologie*.

SOCIAL SCIENCES, THE (in part)

P.A.M. Peter A. Mackridge. Lecturer in Modern Greek, University of Oxford. Author of *The Modern Greek Language*.

GREEK LITERATURE (in part)

P.A.Ma. Phebe A. Marr. Senior Fellow, National Defense University, Washington, D.C. Former Associate Professor of History, University of Tennessee, Knoxville. Author of *The Modern History of Iraq*.

BAGHDAD (in part)

Pa.N. Paul Nash. Professor of Philosophy and Education, Boston University. Author of *Authority and*

Freedom in Education.

PHILOSOPHIES OF THE BRANCHES OF
KNOWLEDGE (in part)

Pa.S. Pauline Simmons. Associate
Curator of Far Eastern Art, Metropolitan
Museum of Art, New York City, 1928–
58. Author of *Chinese Patterned Silks*.
DRESS AND ADORNMENT (in part)

P.A.S. Paul A. Schwartz. Research
Associate, Rancho Grande Biological
Research Station, Ministry of the
Environment and Renewable Natural
Resources, Venezuela.
BIRDS (in part)

P.A.S.S. Peter A.S. Smith. Professor
of Chemistry, University of Michigan,
Ann Arbor. Author of *Chemistry
of Open-Chain Organic Nitrogen
Compounds*.

CHEMICAL COMPOUNDS (in part)

P.Ay. Phyllis Auty. Reader in South
Slavonic History, School of Slavonic and
East European Studies, University of
London, 1947–74. Author of *Yugoslavia*.
YUGOSLAVIA (in part)

P.B.Ca. Philip B. Calkins. Former
Assistant Professor of History, Duke
University, Durham, North Carolina.
INDIA (in part)

P.B.C.M. Peter B.C. Matthews, M.D.
Professor of Sensorimotor Physiology,
University of Oxford. Author of
*Mammalian Muscle Receptors and Their
Central Actions*.

NERVES AND NERVOUS SYSTEMS (in part)

**P.B.D. de la M. Peter B.D. de la
Mare.** Emeritus Professor of Chemistry,
University of Auckland, New Zealand.
Author of *Electrophilic Halogenation*.
CHEMICAL REACTIONS (in part)

P.-B.L. Pierre-Bernard Lafont. Director
of Studies, Division of Historical and
Philological Sciences, École Pratique des
Hautes Études (Institute for Advanced
Research), Paris. Author of *Bibliographie
du Laos and others*.

SOUTHEAST ASIA, MAINLAND
(in part)

P.Ca. Pedro Calmon. President,
Brazilian Historical and Geographical
Institute, Rio de Janeiro. Author of
História do Brasil.

CABRAL, PEDRO ÁLVARES (Micropædia)

P.C.-B. Peter Cannon-Brookes. Keeper,
Department of Art, National Museum of
Wales, Cardiff. Coauthor of *European
Sculpture; Baroque Churches*.

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

P.Ch. Pramod Chandra. George
P. Bickford Professor of Indian Art,
Harvard University. Author of *Stone
Sculpture in the Allahabad Museum;
Bundi Painting*.

SOUTH ASIAN ARTS (in part)

P.C.-H. Peter Crossley-Holland.
Emeritus Professor of Music, University

of California, Los Angeles. Author of
Pelican History of Music, Vol. I, part I.
MUSIC, THE ART OF
(in part)

P.-c.K. Ping-chia Kuo. Emeritus
Professor of History, Southern Illinois
University, Carbondale. Senior Fellow,
National Endowment for the Humanities,
1973–74. Author of *China; China: New
Age and New Outlook*.

CANTON (in part)

CHINA (in part)

CHUNGKING (in part)

NANKING (in part)

P.Cla. Peter Classen (deceased).
Professor of Medieval and Modern
History, Rupert Charles University of
Heidelberg. Author of *Karl der Grosse,
das Papsttum und Byzanz*.

CHARLEMAGNE

P.-C.N. Pierre-Claver Nuwinkware.
Former Administrative Director, Official
University of Bujumbura, Burundi.
Author of *Prince Louis Rwagasore*.
CENTRAL AFRICA (in part)

P.Co. Pierre Courthion. Vice President,
Syndicate of the French Artistic Press.
Author of *Klee; Manet; Seurat; and
many other monographs on modern
European artists*.

KLEE, PAUL (Micropædia)

MANET, ÉDOUARD (in part)

(Micropædia)

SEURAT, GEORGES (Micropædia)

P.C.R. Philip C. Ritterbush. Historian
of science. Program Director, Institute
for Cultural Progress, Washington, D.C.
Author of *Overtures to Biology; The
Speculations of Eighteenth-Century
Naturalists; and others*.

LAMARCK, JEAN-BAPTISTE DE MONTE,
CHEVALIER DE (Micropædia)

P.D. P. Dayal. Visiting Professor
of Geography, North-Eastern Hill
University, Shillong, India. Author of
Bihar in Maps.
INDIA (in part)

P.De. Pierre Descargues. Art historian
and critic. Author of *Frans Hals; Jan
Vermeer; and other monographs*.

HALS, FRANS (Micropædia)

VERMEER, JAN (Micropædia)

P.De A.C. Philip De Armond Curtin.
Professor of History, Johns Hopkins
University, Baltimore. Author of *Africa
Remembered and others*.
AFRICA (in part)

P.de L. Pierre de Latil. Scientific
Editor, *Le Figaro*, Paris. Coauthor of *Le
Professeur Auguste Piccard; Man and
the Underwater World; and others*.
PICCARD, AUGUSTE (in part)
(Micropædia)

P.D.O. Peter D. Owen. Painter and
printmaker. Former Senior Lecturer,
Croydon College of Design and
Technology, England. Author of *Painting:
Appreciation of the Arts*.

PAINTING, THE ART OF

P.Dr. Philip Drucker (d. 1982).
Professor of Anthropology, University of

Kentucky, Lexington, 1968–78. Author
of *The Native Brotherhoods: Modern
Inter-Tribal Organizations of the
Northwest Coast*.

AMERICAN INDIANS (in part)

P.Du V. Patrick Du Val. Former
Professor of Geometry, University of
Istanbul. Author of *Homographies,
Quaternions, and Rotations; Elliptic
Functions and Elliptic Curves*.
GEOMETRY (in part)

P.D.V. Paul D. Vignaux (d. 1987).
President, Section of Religious Sciences,
École Pratique des Hautes Études
(Institute for Advanced Research), Paris,
1961–72. Author of *Philosophy in the
Middle Ages: An Introduction*.
OCKHAM, WILLIAM OF (Micropædia)

P.E. Peter Ellis. Consultant. Former
Senior Lecturer in Textiles, University
of Bradford, England. Author of *The
Geometry of the Plain-Square Weave*.
INDUSTRIES, MANUFACTURING (in part)

Pe.C. Peter Collins (d. 1981). Professor
of Architecture, McGill University,
Montreal. Author of *Changing Ideals
in Modern Architecture; Concrete:
The Vision of a New Architecture;
and others*.

ARCHITECTURE, THE ART OF (in part)

Pe.G. Peter Gray (deceased). Andrey
Avinoff Professor of Biology, University
of Pittsburgh, Pennsylvania, 1964–
78. Author of *Microtome's Formulary
and Guide; editor of Encyclopedia of
Biological Sciences*.

TISSUES AND FLUIDS (in part)

P.E.H. Peter E. Herzog. Crandall
Melvin Professor of Law, Syracuse
University, New York. Author of *Civil
Procedure in France*.

PROCEDURAL LAW (in part)

Pe.He. Peter Herde. Professor of
History; Director of the Historical
Institute, University of Würzburg, West
Germany. Author of *Beiträge zum
päpstlichen Kanzlei und Urkundenwesen
im Dreizehnten Jahrhundert and others*.
HISTORY, THE STUDY OF (in part)

P.E.J. Preston E. James (d. 1986).
Maxwell Professor of Geography,
Syracuse University, New York, 1964–
70. Author of *All Possible Worlds: A
History of Geographical Ideas; Latin
America*.

BRAZIL (in part)

URUGUAY (in part)

P.E.K. Paul E. Klopsteg. Emeritus
Professor of Applied Science,
Northwestern University, Evanston,
Illinois. Author of *Turkish Archery and
the Composite Bow*.

ARCHERY (in part) (Micropædia)

P.E.L. Peter Erik Lasko. Professor of
the History of Art, Courtauld Institute,
University of London. Author of *Ars
Sacra, 800–1200*.

DECORATIVE ARTS AND FURNISHINGS
(in part)

P.E.P. Phillip E. Pope. Professor
of Forestry, Purdue University, West

Lafayette, Indiana. Coauthor of *Environmental Impacts of Harvesting Wood for Energy*.

FORESTRY AND WOOD PRODUCTION
(in part)

P.E.P.D. Paul E. Pieris Deraniyagala (d. 1973). *Director, National Museums of Ceylon, 1939-63. Dean, Faculty of Arts, Vidyodaya University of Ceylon, 1961-64. Specialist on fossil and recent animals of the Indian subcontinent, including extinct human populations. Author of Some Extinct Elephants, Their Relatives and the Two Living Species.*
MAMMALS (in part)

P.Er. Philippe Erlanger (d. 1987). *Head, Artistic Exchange Department, Ministry of Foreign Affairs, Paris, 1946-68. Author of Louis XIV and others.*
LOUIS XIV (FRANCE)
(Micropædia)

P.E.R. Peter Edward Russell. *King Alfonso XIII Professor Emeritus of Spanish Studies, University of Oxford; Fellow of Exeter College, Oxford. Author of The English Intervention in Spain and Portugal in the Time of Edward III and Richard II and others.*
CID, THE (Micropædia)
SPAIN (in part)

Pe.S.G. Peter Spence Gilchrist, Jr. (d. 1985). *President, Gilchem Corporation, Charlotte, North Carolina.*
UNITED STATES OF AMERICA (in part)

Pe.V. Peter Viereck. *William R. Kenan, Jr. Professor of History, Mount Holyoke College, South Hadley, Massachusetts. Author of Conservatism Revisited and others.*
SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN
(in part)

P.E.W. Paul Edward Waggoner. *Director and former Chief Climatologist, Connecticut Agricultural Experiment Station, New Haven. Author of Agricultural Meteorology.*
CLIMATE AND WEATHER (in part)

P.F. Paul Fraisse. *Emeritus Professor of Experimental Psychology, University of Paris. Author of Psychologie du temps.*
PERCEPTION, HUMAN (in part)

P.F.B. Paul F. Borth. *Technical Director, International Association of Photoplasmakers, South Holland, Illinois. Author of numerous articles on engraving processes.*
PRINTING, TYPOGRAPHY, AND PHOTOENGRAVING (in part)

P.F.L. Peirce F. Lewis. *Professor of Geography, Pennsylvania State University, University Park. Author of New Orleans: The Making of an Urban Landscape.*
UNITED STATES OF AMERICA (in part)

P.F.P. Philip F. Purrington. *Curator, Whaling Museum, New Bedford, Massachusetts. Editor of Returns of Whaling Vessels Sailing from American Ports, 1876-1928.*
FISHING, COMMERCIAL (in part)

P.F.V. Paul F. Vincent. *Senior Lecturer in Dutch, University College, University of London. Coeditor of European Context: Studies in the History and Literature of the Netherlands.*
AMSTERDAM (in part)
DUTCH LITERATURE (in part)

P.F.W. Paul F. Watson. *Associate Professor of the History of Art, University of Pennsylvania, Philadelphia. Author of The Garden of Love in Tuscan Art.*
PIERO DELLA FRANCESCA
(Micropædia)

P.G. Paul Guichonnet. *Professor of Human Geography, University of Geneva. Author of Genève, Reflexions sur un destin urbain; general editor of Histoire de Genève.*
GENEVA (in part)

P.Ga. Philippe Garigue. *Principal, Glendon College, York University, Toronto. Professor of Political Science, University of Montreal, 1957-80. Author of La Vie familiale des Canadiens français and others.*
CANADA (in part)

P.G.B. Peter G. Bietenholz. *Professor of History, University of Saskatchewan, Saskatoon. Author of History and Biography in the Work of Erasmus of Rotterdam and others.*
BURCKHARDT, JACOB (Micropædia)

P.G.Be. Peter G. Bergmann. *Professor of Physics, Syracuse University, New York, and New York University, New York City. Author of Introduction to the Theory of Relativity.*
RELATIVITY

P.G.C. Pablo González Casanova. *Professor, Institute of Social Research, National Autonomous University of Mexico, Mexico City. Author of La democracia en México.*
MEXICO (in part)

P.Gd. Pierre Grenand. *Research Assistant, Overseas Office of Scientific and Technical Research, Centre at Cayenne, French Guiana.*
GUIANAS, THE (in part)

P.G. Peter Godman. *Fellow and Tutor, Pembroke College, University of Oxford. Author of Poetry and the Carolingian Renaissance and others.*
LATIN LITERATURE (in part)

P.G.P. Peter Georgiev Penčev. *Professor of Hydrology, University of Sofia, Bulgaria. Chairman, National Committee for the International Hydrologic Program. Author of Hydrologic Regionalization of Bulgaria.*
EUROPE (in part)

P.Gr. Pier Groen. *Former Professor of Meteorology and Physical Oceanography, Free University, Amsterdam. Author of The Waters of the Sea.*
OCEANS (in part)

P.G.S. Peter G. Stein. *Regius Professor of Civil Law, University of Cambridge; Fellow of Queens' College, Cambridge. Author of Regulæ Iuris: From Juristic Rules to Legal Maxims and others.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

P.Gu. Pierre Gourou. *Honorary Professor, College of France, Paris. Emeritus Professor of Geography, Free University of Brussels. Author of L'Asie.*
ASIA (in part)

P.G.W. Patrick Chrestien Gordon Walker, Baron Gordon-Walker (d. 1980). *Member of Parliament (Labour) for Leyton, 1966-74. Author of The Cabinet; The Commonwealth; and others.*
UNITED KINGDOM (in part)

P.H. Peggy Harper. *Former Senior Research Fellow in Dance, Institute of African Studies, University of Ife, Nigeria. Author of numerous articles on African dance.*
AFRICAN ARTS (in part)

P.H.B. Peter H. Burri. *Professor of Anatomy, Histology, and Embryology; Head, Section of Developmental Biology, Institute of Anatomy, University of Bern.*
RESPIRATION AND RESPIRATORY SYSTEMS (in part)

Ph.C. Philip Collins. *Emeritus Professor of English, University of Leicester, England. Author of Dickens and Crime; Dickens and Education.*
DICKENS (in part)

P.H.D. P.H. Davison. *Professor of English, University of Kent at Canterbury, England. Editor, The Library (Journal of the Bibliographical Society), 1971-82. Author of Popular Appeal in English Drama to 1850.*
POPULAR ARTS (in part)

P.He. Sir Philip Hendy (d. 1980). *Adviser to the Israel Museum, Jerusalem, 1968-71. Director, National Gallery, London, 1946-67. Author of Giovanni Bellini; Piero della Francesca and the Early Renaissance.*
BELLINI, GIOVANNI (Micropædia)

P.H.G. Peter Humphry Greenwood. *Senior Principal Scientific Officer (Curator of Fishes), Department of Zoology, British Museum (Natural History), London. Author of The Fishes of Uganda; coauthor of the major modern classification of the bony fishes.*
FISHES (in part)

P.H.Ge. Paul Henry Gebhard. *Professor of Anthropology, Indiana University, Bloomington; former Director, Institute for Sex Research. Coauthor of Pregnancy, Birth and Abortion; Sex Offenders.*
SEX AND SEXUALITY (in part)

P.H.Gu. Pierre H. Guigumde. *Director of Public Relations for the Parliament of Upper Volta.*
WESTERN AFRICA (in part)

P.H.Gul. P.H. Gulliver. *Professor of Anthropology, York University, Downsview, Ontario. Editor of Tradition and Transition in East Africa.*
EASTERN AFRICA (in part)

P.H.H. Perry H. Howard. *Professor of Sociology, Louisiana State University,*

Baton Rouge. Author of Political Tendencies in Louisiana.

UNITED STATES OF AMERICA
(in part)

Ph.H. J.H.t.C. Philo H.J. Houwink ten Cate. *Professor of Ancient Near Eastern History and Languages, University of Amsterdam. Author of The Luwian Population Groups of Lycia and Cilicia Aspera during the Hellenistic Period; The Records of the Early Hittite Empire (c. 1450–1380 BC).*

LANGUAGES OF THE WORLD (in part)
TURKEY AND ANCIENT ANATOLIA
(in part)

P.Hi. Patrice Louis-René Higonnet. *Professor of History, Harvard University. Author of Class, Ideology, and the Rights of Nobles During the French Revolution and others.*

FRANCE (in part)

P.H.J.C. Peter Henry John Castle. *Reader in Zoology, Victoria University of Wellington, New Zealand. Author of numerous papers on eels.*

FISHES (in part)

P.H.K. Philip H. Kuenen (d. 1976). *Professor of Geology, State University of Groningen, The Netherlands, 1943–72. Authority on density currents and marine sedimentation. Author of Marine Geology.*

OCEANS (in part)

P.H.L. Peter H. Lee. *Professor and Chairman, Department of East Asian Languages and Literatures, University of Hawaii at Manoa, Honolulu. Author of Songs of Flying Dragons: A Critical Reading.*

KOREAN LITERATURE (in part)

P.H.M. Peter H. Molnar. *Senior Research Associate, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge.*

CONTINENTAL LANDFORMS (in part)

P.H.O. Paul H. Oehser. *Editor of Scientific Publications, National Geographic Society, 1966–78. Chief, Editorial and Publications Division, Smithsonian Institution, Washington, D.C., 1950–66.*

UNITED STATES OF AMERICA (in part)

P.H.S. Peter H. Solomon, Jr. *Professor of Political Science, University of Toronto. Author of Soviet Criminologists and Criminal Policy and others.*

CRIME AND PUNISHMENT (in part)

P.Hu. Peter J. Huizinga. *Professor of Canon Law and History of Canon Law, Catholic University of Nijmegen, The Netherlands. Author of The Sacraments in Theology and Canon Law.*

CHRISTIANITY (in part)

P.I. Pavle Ivić. *Former Professor of Serbo-Croatian Language, History, and Dialectology, University of Belgrade. Author of Die serbokroatischen Dialekte; coauthor of Accent in Serbocroatian.*

LANGUAGE (in part)

LINGUISTICS (in part)

P.J.C. Peter John Callaghan. *Assistant Lecturer in Classics, University of Cambridge.*

PAINTING, THE HISTORY OF WESTERN
(in part)

P.J.F. Pasquale J. Federico (d. 1982). *Attorney and consultant in patent law. Professorial Lecturer in Law, George Washington University, Washington, D.C., 1950–73. Examiner in Chief, Board of Patent Appeals, Patent Office, U.S. Department of Commerce, Washington, D.C., 1947–70. Author of Commentary on the New Patent Act and others.*

PROPERTY LAW (in part)

P.J.H. Peter John Hilton. *Fellow of Battelle Research Center, Seattle, Washington. Distinguished Professor of Mathematics, State University of New York at Binghamton. Coauthor of Homology Theory; A Course in Homological Algebra; and others.*

ALGEBRA (in part)

P.J.M. P.J. Marshall. *Rhodes Professor of Imperial History, King's College, University of London. Author of The Impeachment of Warren Hastings and others.*

HASTINGS, WARREN (Micropædia)

P.J.Mu. Peter J. Murray. *Emeritus Professor of the History of Art, Birkbeck College, University of London. Author of Architecture of the Italian Renaissance; coauthor of A Dictionary of Art and Artists.*

GHIRLANDAJO, DOMENICO (Micropædia)

GIOTTO DI BONDONE (Micropædia)

PERUGINO (Micropædia)

P.J.N. Per Jonas Nordhagen. *Lecturer in Art History, University of Oslo. Coauthor of Mosaics.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

P.J.P. Peter J. Pollack (d. 1978). *Photographer and lecturer. Author of The Picture History of Photography and others.*

STEICHEN, EDWARD (Micropædia)

P.J.S. Phillip J. Smith. *Professor of Atmospheric Science, Purdue University, West Lafayette, Indiana.*

CLIMATE AND WEATHER (in part)

P.J.S.L. Philip James Stopford Law. *Senior Lecturer in Marketing, London Business School. Editor of Product Management Readings.*

MARKETING AND MERCHANDISING
(in part)

P.J.W. Peter John Wyllie. *Professor of Geology and Chairman, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena. Author of The Dynamic Earth.*

MINERALS AND ROCKS (in part)

P.K. Philip Kissam (d. 1978). *Professor of Civil Engineering, Princeton University, 1948–65. Author of Surveying Practice.*

MEASUREMENT AND OBSERVATION,
PRINCIPLES, METHODS, AND

INSTRUMENTS OF
(in part)

P.K.E. Peter K. Endress. *Professor of Systematic Botany, Institute for Systematic Botany, University of Zürich.*

ANGIOSPERMS (in part)

P.K.K. Peter K. King. *Director, Institute of Modern Dutch Studies, University of Hull, England. Author of Dawn Poetry in the Netherlands.*

DUTCH LITERATURE (in part)

P.L. Philip Longworth. *Associate Professor of History, McGill University, Montreal. Author of The Art of Victory: The Life and Achievements of Generalissimo Suvorov and others.*

SUVOROV, ALEKSANDR VASILYEVICH,
GRAF (Micropædia)

P.Le. Pierre Leprohon. *Writer and journalist. Author of Jean Renoir; Charles Chaplin; Antonioni; and others.*

RENOIR, JEAN (Micropædia)

P.L.G. Patrick Lancaster Gardiner. *Fellow and Tutor in Philosophy, Magdalen College, University of Oxford. Author of The Nature of Historical Explanation and others.*

PHILOSOPHIES OF THE BRANCHES OF
KNOWLEDGE (in part)

P.L.Kl. Paul Lincoln Kleinsorge. *Emeritus Professor of Economics, University of Oregon, Eugene.*

ECONOMIC THEORY (in part)

P.L.v.d.B. Pierre Louis van den Berghe. *Professor of Sociology, University of Washington, Seattle. Author of Race and Racism.*

SOCIAL DIFFERENTIATION (in part)

P.Ma. Philip Mason. *Writer. Director, Institute of Race Relations, London, 1958–69. Indian Civil Service, 1928–47. Author of The Founders; The Guardians; The Birth of a Dilemma; The Men Who Ruled India; and many others.*

BENTINCK, LORD WILLIAM (Micropædia)

P.M.C. Paul M. Cohn. *Professor of Mathematics, University College, University of London. Author of Universal Algebra; Free Rings.*

ALGEBRA (in part)

P.McC. Patrick McCarthy. *Associate Professor of French, Haverford College, Pennsylvania. Author of Céline; Camus.*

FRENCH LITERATURE (in part)

P.McG.R. Peter McGregor Ross (d. 1974). *Professor of Engineering, University of Cambridge, 1970–74.*

ENGINEERING (in part)

P.McL. Peter McLintock. *Former Editor, Winnipeg Free Press, Manitoba.*

CANADA (in part)

P.Me. Pierre Mertz (d. 1982). *Chairman, Board of Editors, Journal of the Society of Motion Picture and Television Engineers, 1954–77. Coauthor of Communication System Engineering Handbook.*

MOTION PICTURES (in part)

P.M.F. Peter Marshall Fraser. *Fellow of All Souls College, Oxford; Reader in*

Hellenistic History, University of Oxford.
PALESTINE (in part)

P.M.H. Philip M. Hauser. *Lucy Flower Professor Emeritus of Urban Sociology; Emeritus Director, Population Research Center, University of Chicago. Co-editor of The Study of Urbanization.*

MODERNIZATION AND URBANIZATION (in part)

P.M.Ho. Peter M. Holt. *Emeritus Professor of the History of the Near and Middle East, University of London. Author of Egypt and the Fertile Crescent, 1516–1922 and others.*

EGYPT (in part)

P.Mi. Peter Michelmores. *Roving Editor, Reader's Digest. Author of Einstein: Profile of the Man.*

EINSTEIN

TELLER, EDWARD (in part) (Micropædia)

P.M.K. Paul Murray Kendall (d. 1973). *Professor of English, University of Kansas, Lawrence. Author of The Art of Biography; Richard the Third; and others.*

LITERATURE, THE ART OF (in part)

P.Mo. Patrick Moore. *President, British Astronomical Association. Author of The Unfolding Universe and many others.*

SOLAR SYSTEM, THE (in part)

P.M.R. Pierre M. Rosenberg. *Curator, Department of Paintings, Louvre Museum, Paris. Author of Chardin: Étude biographique et critique; Dessins français du 17ème siècle.*

CHARDIN, JEAN-BAPTISTE-SIMÉON (Micropædia)

P.M.Sy. Patrick Millington Syngé (d. 1982). *Editor, Publications of the Royal Horticultural Society, London, 1945–70. Author of Collins Guide to Bulbs; coauthor of The Dictionary of Garden Plants in Colour.*

GARDENING AND HORTICULTURE (in part)

P.Mu. Peter Munz. *Professor of History, Victoria University of Wellington, New Zealand. Author of The Origin of the Carolingian Empire.*

CONRAD II (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

HENRY II (SAXONY) (Micropædia)

P.M.U. Peter Michael Urbach. *Lecturer in Philosophy, London School of Economics and Political Science, University of London. Author of Francis Bacon's Philosophy of Science: An Account and a Reappraisal.*

BACON, FRANCIS (in part)

P.M.Y. Percy Marshall Young. *Composer. Director of Music, Wolverhampton College of Technology, England, 1944–66. Author of A History of British Music; Handel.*
HANDEL, GEORGE FRIDERIC (in part) (Micropædia)

P.N.K. Pyotr Nikolayevich Kropotkin. *Head, Laboratory of Structural*

Geophysics, Institute of Geology, Academy of Sciences of the U.S.S.R., Moscow.

ASIA (in part)

P.N.L. Peter N. Ladefoged. *Professor of Phonetics, University of California, Los Angeles. Author of A Course in Phonetics and others.*

SPEECH (in part)

P.N.P. Philip N. Powers (d. 1988). *Professor of Nuclear Engineering, Purdue University, West Lafayette, Indiana, 1960–78.*

ENERGY CONVERSION (in part)

P.O. Paul Oliver. *Associate Head, Department of Architecture, Oxford Polytechnic, England. Editor of Shelter in Africa and others.*

AFRICAN ARTS (in part)

P.P. Paul Petit (d. 1981). *Professor of Ancient History, University of Grenoble II, France. Author of Histoire générale de l'Empire romaine and others.*

GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

P.P.A. Phoon Phon Asanachinta. *Colonel, Royal Thai Army. Emeritus Professor of Geography, Chiang Mai University, Chiang Mai, Thailand.*

SOUTHEAST ASIA, MAINLAND (in part)

P.P.B. Patrick Paul Billingsley. *Professor of Mathematics and of Statistics, University of Chicago. Author of Convergence of Probability Measures and others.*

NUMBER THEORY (in part)

P.P. del C. Pier Paolo del Campana. *Professor of Comparative Religion, Sophia University, Tokyo. Author of Shinran and Nichiren.*

NICHIREN (Micropædia)

P.P.E. Paul P. Ewald (d. 1985). *Professor of Physics, Polytechnic Institute of Brooklyn, New York, 1949–59.*

BETHE, HANS ALBRECHT (Micropædia)

P.P.G. Pedro P. Geiger. *Professor of Geography, Pontifical Catholic University of Rio de Janeiro. Author of Evolução da Rede Urbana do Brasil.*

RIO DE JANEIRO (in part)

P.P.H. Philip Prichard Henderson (d. 1977). *Free-lance writer and editor. Author of William Morris: His Life, Work and Friends; editor of The Letters of William Morris and others.*

MORRIS, WILLIAM (Micropædia)

P.P.K. Pradyuma P. Karan. *Distinguished Professor of Geography, University of Kentucky, Lexington. Author of Nepal: A Physical and Cultural Geography and others.*

NEPAL (in part)

Pp.M. Philip Merlan (d. 1968). *Professor of German Philosophy and Literature, Scripps College, Claremont, California, 1942–68. Author of From Platonism to Neoplatonism and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

P.P.R. Peter P. Rohde. *Free-lance writer. Editor, Kierkegaard's Collected Works (in progress). Author of Søren Kierkegaard.*

KIERKEGAARD, SØREN (in part) (Micropædia)

P.R. Pierre Riché. *Professor of Medieval History, University of Paris X. Author of Education and Culture in the Barbarian West and others.*

EDUCATION, HISTORY OF (in part)

P.R.A. Pierre Robert Angel. *Professor and Head, Department of Classical and Modern Languages, Literature and Civilizations, University of Tours, France. Author of Eduard Bernstein et l'évolution du socialisme allemand and others.*

BERNSTEIN, EDUARD (Micropædia)

P.R.C. Peter Raymond Creevey. *Free-lance writer and journalist. Managing Editor, The Samoa Times, Pago Pago, American Samoa, 1963–70.*

PACIFIC ISLANDS (in part)

P.R.Cd. Paul R. Clifford. *Department Head, Environmental Chemistry and Biology, Metrek Division, Mitre Corporation, McLean, Virginia. Coauthor of Fundamentals of Organic Chemistry.*

CARBONIUM ION (in part) (Micropædia)

P.R.G. Peter R. Grant. *Professor of Biology, University of Michigan, Ann Arbor.*

BIOSPHERE, THE (in part)

P.R.Go. Peter R. Goethals. *Writer, consultant, and research specialist on Southeast Asia. Author of Aspects of Local Government in a Sumbawan Village.*

ASIA (in part)

P.Rh. Philip Rhodes. *Regional Postgraduate Dean of Medical Studies; Professor of Postgraduate Medical Education, University of Southampton, England. Author of An Outline History of Medicine and others.*

MEDICINE (in part)

P.R.L.B. Peter R.L. Brown. *Professor of History and Classics, University of California, Berkeley. Author of Religion and Society in the Age of Saint Augustine.*

AMBROSE, SAINT (Micropædia)

P.Ru. Peter Rudge. *Consultant Neurologist, National Hospital for Nervous Diseases, London. Author of Clinical Neuro-otology.*

NERVES AND NERVOUS SYSTEMS (in part)

P.S. Pierre Samuel. *Professor of Mathematics, University of Paris XI. Author of Théorie algébrique des nombres.*

ALGEBRA (in part)

P.S.Ba. Peter S. Baker. *Assistant Professor of English, Emory University, Atlanta, Georgia. Coeditor of The Correspondence of James Boswell with David Garrick, Edmund Burke, and Edmond Malone.*

ENGLISH LITERATURE (in part)

P.Sc. **Peter Scott.** *Emeritus Professor of Geography, University of Tasmania, Hobart.*

AUSTRALIA (in part)

P.S.C. **Philip S. Corbet.** *Professor of Zoology, University of Dundee, Scotland. Author of A Biology of Dragonflies.*

INSECTS (in part)

P.S.F. **Philip S. Foner.** *Independence Foundation Professor Emeritus of History, Lincoln University, Pennsylvania. Editor of The Complete Writings of Thomas Paine.*

PAINE, THOMAS (Micropædia)

P.S.G. **Peter S. Green.** *Honorary Research Associate, Royal Botanic Gardens, Kew, England; former Deputy Chief Scientific Officer. Coeditor of Wild Flowers of the World.*

ANGIOSPERMS (in part)

P.Si. **Peter Singer.** *Professor of Philosophy; Director, Centre for Human Bioethics, Monash University, Victoria, Australia. Author of Practical Ethics.*

ETHICS

P.S.K. **Pavel Sergeyevich Kuzin.** *Senior Scientist, Leningrad Hydrological Institute. Author of Volga Zavtra.*

EUROPE (in part)

P.S.M. **P.S. Messenger** (d. 1976). *Professor of Entomology, University of California, Berkeley, 1965–76. Author of many research papers on entomology.*

BIOSPHERE, THE (in part)

P.S.R. **Philip S. Rawson.** *Former Dean, School of Art and Design, Goldsmiths' College, London. Curator, Gulbenkian Museum of Oriental Art and Archaeology, University of Durham, England, 1960–79. Author of The Arts of Southeast Asia and others.*

PAGAN (Micropædia)

SOUTHEAST ASIAN ARTS (in part)

P.Su. **Patrick Suppes.** *Lucie Stern Professor of Philosophy; Director, Institute for Mathematical Studies in the Social Sciences, Stanford University, California. Coauthor of Foundations of Measurement.*

MEASUREMENT THEORY (in part)

P.S.W. **Paul S. Wingert** (d. 1974). *Professor of Art History and Archaeology, Columbia University. Author of Primitive Art, Its Traditions and Styles and others.*

MASKS

P.T. **Piero Treves.** *Professor of Ancient History, University of Venice, Italy. Author of biography of Miltiades in Oxford Classical Dictionary.*

MILTIADES THE YOUNGER (Micropædia)

P.U. **Philip Soundy Unwin** (d. 1981). *Free-lance editor. Senior Director, George Allen & Unwin Ltd., London. Author of Book Publishing as a Career.*

PUBLISHING (in part)

P.V. **Paul Veyret.** *Emeritus Professor of Mountain Geography, Institute of Alpine Geography, University of Grenoble I, France. Coauthor of Au*

cœur de l'Europe: Les Alpes and others.

EUROPE (in part)

P.V.G. **Pyotr Vatslavovich Gulyan.** *Assistant Director, Institute of Economics, Latvian S.S.R. Academy of Sciences, Riga. Author of Latvia in the System of the U.S.S.R. National Economy.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

P.Vi. **Paul Viallaneix.** *Professor of French Literature; Director, Centre for Romantic Research, University of Clermont-Ferrand, France. Author of Vigny par lui-même; editor of Vigny's Oeuvres complètes.*

VIGNY, ALFRED-VICTOR, COMTE DE (Micropædia)

P.V.T. **Phillip Vallentine Tobias.** *Professor and Head, Department of Anatomy, University of the Witwatersrand, Johannesburg. Author of Olduvai Gorge: Cranium of Zinjanthropus.*

EVOLUTION, HUMAN (in part)

P.W. **Paul E. Walker.** *Executive Director, American Research Center in Egypt, Columbia University.*

SALADIN (Micropædia)

P.Wa. **Peggy Wagner.** *Staff member, Houghton Mifflin Company, Boston. Editorial Assistant, Arts, Encyclopædia Britannica, Chicago, 1971–73.*

AFRICAN ARTS (in part)

P.W.A. **Peter William Avery.** *Lecturer in Persian; Director, Middle East Centre, University of Cambridge. Author of Modern Iran.*

IRAN (in part)

P.W.D. **Paul W. Drake.** *Professor of Political Science, University of California, San Diego, at La Jolla. Author of Socialism and Populism in Chile, 1932–52.*

CHILE (in part)

P.W.F. **Peter W. Frank.** *Professor of Biology, University of Oregon, Eugene.*

GROWTH AND DEVELOPMENT,

BIOLOGICAL (in part)

P.W.H. **Paul W. Hodge.** *Professor of Astronomy, University of Washington, Seattle. Author of Galaxies and others.*

GALAXIES

P.W.J. **Pascual W. Jordon** (d. 1980). *Professor of Theoretical Physics, University of Hamburg, 1953–70. Author of Verdrängung und Komplementarität: Eine philosophische Untersuchung.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

P.W.K. **Peter W. Kingsford.** *Tutor, Extra Mural Department, University of London. Author of Engineers, Inventors, and Workers; Victorian Railwaymen; and others.*

WATT, JAMES (Micropædia)

P.W.N. **Peter W. Nathan.** *Former External Scientific Worker of Medical Research Council, National Hospital for Nervous Diseases, London. Author of*

The Nervous System.

NERVES AND NERVOUS SYSTEMS (in part)

P.Wo. **Paul Wonnacott.** *Professor of Economics, University of Maryland, College Park. Author of The United States and Canada: The Quest for Free Trade and others.*

INTERNATIONAL TRADE (in part)

P.W.R. **Paul Westmacott Richards.** *Emeritus Professor of Botany, University College of North Wales, University of Wales, Bangor. Author of The Life of the Jungle and others.*

ECOSYSTEMS (in part)

P.Y. **Philip Young.** *Evan Pugh Professor of English, Pennsylvania State University, University Park. Author of Ernest Hemingway; coauthor of The Hemingway Manuscripts.*

HEMINGWAY, ERNEST (Micropædia)

P.Y.K. **Pekka Yrjö Korkala.** *Former Lecturer in Psychometrics, Institute of Psychology, University of Helsinki. Coauthor of Introduction to Psychometrics; coeditor of Contemporary Research in the Psychology of Perception.*

PERCEPTION, HUMAN (in part)

Q.W. **Quincy Wright** (d. 1970). *Professor of International Law, University of Chicago, 1931–56. Author of Study of International Relations.*

UNITED NATIONS (in part)

Q.Z. **Quido Záruba.** *Professor, Geological Institute, Czech Technical University in Prague. Member of the Czechoslovak Academy of Sciences. Coauthor of Landslides and Their Control and others.*

GEOMORPHIC PROCESSES (in part)

R.A. **Rosendo Arguello.** *Former President, Academy of the Geography and History of Nicaragua, Managua. Author of Nueva Nicaragua.*

CENTRAL AMERICA (in part)

R.Aa. **Richard I. Aaron** (d. 1987). *Emeritus Professor of Philosophy, University College of Wales, Aberystwyth, University of Wales, 1932–69. Author of John Locke; Knowing and the Function of Reason.*

EPISTEMOLOGY

LOCKE (in part)

R.A.A. **Ralph A. Austen.** *Associate Professor of History, University of Chicago; Chairman, Committee on African Studies, 1974–79. Author of Northwest Tanzania Under German and British Rule.*

EASTERN AFRICA (in part)

R.A.B. **Roland A. Budenholzer.** *John T. Rettaliata Professor Emeritus of Mechanical Engineering; Chairman, American Power Conference, Illinois Institute of Technology, Chicago.*

ENERGY CONVERSION (in part)

R.A.Bu. **Robert Angus Buchanan.** *Reader in the History of Technology; Director, Centre for the History of Technology, Science, and Society, University of Bath, England. Author of*

Technology and Social Progress.
TECHNOLOGY, THE HISTORY OF

R.A.-C. René Albrecht-Carrié (d.1978). *Professor of History, Barnard College, 1945-69, and Columbia University, 1953-69. Author of A Diplomatic History of Europe Since the Congress of Vienna.*

EUROPE (in part)

R.A.Co. Ralph A. Connor, D.D.S. *Professor of Pediatric and Community Dentistry, Dalhousie University, Halifax, Nova Scotia, 1971-72. Chief, Dental Health Division, Canadian Department of National Health and Welfare, Ottawa, 1963-71.*

MEDICINE (in part)

R.Ad. Ron Adams. *Lecturer in Sociology, Western Institute, Melbourne. Author of In the Land of Strangers: A Century of European Contact with Tanna, 1774-1874.*

PACIFIC ISLANDS (in part)

R.A.D. Richard A Davis, Jr. *Professor of Geology, University of South Florida, Tampa. Author of Depositional Systems and others.*

CONTINENTAL LANDFORMS (in part)

R.A.E. Robert A. East. *Emeritus Professor of History, Brooklyn College, City University of New York. Author of John Quincy Adams.*

ADAMS, JOHN (Micropædia)

R.A.F. Richard Antony French. *Senior Lecturer in the Geography of the U.S.S.R., University College and School of Slavonic and East European Studies, University of London. Author of The U.S.S.R. and Eastern Europe.*

KIEV (in part)

LENINGRAD (in part)

MOSCOW (in part)

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

R.A.G. Richard A. Geyer. *Professor of Oceanography, Texas A&M University, College Station.*

NORTH AMERICA (in part)

R.A.Gi. Robert Andrew Gilbert. *Author of The Golden Dawn: Twilight of the Magicians; coeditor of The Oxford Book of English Ghost Stories.*

OCCULTISM (in part)

R.A.H. Robert A. Hall, Jr. *Emeritus Professor of Linguistics and Italian, Cornell University, Ithaca, New York. Author of Pidgin and Creole Languages.*

LANGUAGES OF THE WORLD (in part)

R.A.He. Ronald A. Henson, M.D. *Physician and Neurologist, London Hospital, 1949-81. Physician, National Hospital for Nervous Diseases, 1952-81.*

MUSCLES AND MUSCLE SYSTEMS (in part)

R.A.Hi. Reynold Alleyne Higgins. *Deputy Keeper of Greek and Roman Antiquities, British Museum, London, 1965-77. Author of Minoan and Mycenaean Art and others.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

Ra.Ho. Ralph Holmes. *Stage lighting designer. Senior Lighting Director, Columbia Broadcasting System, New York City.*

THEATRICAL PRODUCTION (in part)

R.A.Ho. R.A. Horne. *Senior Scientist, Energy and Environmental Engineers, Inc., Cambridge, Massachusetts. President, Free Speech Foundation, Inc., Boston. Author of Marine Chemistry; editor of Water and Aqueous Solutions.*

CHEMICAL COMPOUNDS (in part)

R.A.K. Raymond A. Kliphardt. *Professor and Chairman, Department of Engineering Sciences and Applied Mathematics, Northwestern University, Evanston, Illinois. Author of Program Design in Fortran IV.*

DRAFTING

R.A.Ka. Robert A. Kann (d. 1981). *Professor of History, Rutgers University, New Brunswick, New Jersey, 1956-76. Author of The Habsburg Empire.*

AUSTRIA (in part)

R.A.Kl. Robert A. Klocke, M.D. *Professor of Medicine and Physiology; Chief, Pulmonary Division, State University of New York at Buffalo. Coauthor of Normal and Abnormal Lung Function.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

R.Al. Rex Alston. *Broadcaster and journalist. Staff Sports Commentator and Reporter, British Broadcasting Corporation, 1942-61. Cricket Reporter, Daily and Sunday Telegraph (London), 1961-83. Author of Watching Cricket.*

SPORTS, MAJOR TEAM AND INDIVIDUAL CELLS (in part)

R.A.L. Robert A. Laudise. *Director, Physical and Inorganic Chemical Research Laboratory, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey. Author of The Growth of Single Crystals.*

MATTER (in part)

R.A.La. Ronald A. Laskey. *Charles Darwin Professor of Animal Embryology, University of Cambridge. Editor of Higher Order Structure in the Nucleus.*

CELLS (in part)

Ra.N. Ray Nash (d. 1982). *Professor of Art, Dartmouth College, Hanover, New Hampshire, 1949-70. Author of American Penmanship, 1800-1850; editor and translator of Calligraphy and Printing in the Sixteenth Century.*

WRITING (in part)

R.A.N. Robert A. Nisbet. *Albert Schweitzer Professor Emeritus of History, Columbia University. Noted for contributions to social theory and organization. Author of Social Change and History and others.*

SOCIAL SCIENCES, THE (in part)

R.A.P. Robert A. Pinker. *Professor of Social Work Studies, London School of Economics and Political Science,*

University of London. Author of The Idea of Welfare and others.

SOCIAL WELFARE (in part)

R.A.Pi. Roger Alvin Pielke. *Professor of Atmospheric Science, Colorado State University, Ft. Collins. Author of Mesoscale Meteorological Modeling.*

EARTH SCIENCES, THE (in part)

R.A.Pr. Ralph Anthony Palmer. *Assistant Secretary, American Society of Agricultural Engineers, 1927-69.*

AGRICULTURAL SCIENCES (in part)

R.A.R.T. Ronald A.R. Tricker. *Staff Inspector for Science, Ministry of Education, U.K., 1946-62. Author of Bores, Breakers, Waves and Wakes; The Contributions of Faraday and Maxwell to Electrical Science; and others.*

MECHANICS (in part)

OCEANS (in part)

R.A.S. Richard A. Sheppard. *Geologist, Branch of Energy Minerals, Geological Survey, U.S. Department of the Interior, Denver, Colorado.*

MINERALS AND ROCKS (in part)

R.Au. Robert Austerlitz. *Professor of Linguistics Uralic Studies, Columbia University. Coeditor of Readings in Linguistics II; compiler of Finnish Reader and Glossary, 2nd ed.*

LANGUAGES OF THE WORLD (in part)

Ra.W. Raymond Wolfe. *Supervisor, Materials Research Laboratory, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey. Coauthor of Thermoelectricity.*

ENERGY CONVERSION (in part)

R.A.W. Richard A. Watson. *Professor of Philosophy, Washington University, St. Louis, Missouri. Author of The Breakdown of Cartesian Metaphysics and others.*

CARTESIANISM, DESCARTES AND

R.A.Wa. Robert Austin Warner (d. 1986). *Professor of Music History and Musicology; Director, Stearns Collection of Musical Instruments, University of Michigan, Ann Arbor.*

MUSICAL INSTRUMENTS (in part)

R.A.We. Richard A. Webster. *Professor of History, University of California, Berkeley. Author of Industrial Imperialism in Italy, 1908-1915.*

EUROPEAN OVERSEAS EXPLORATION AND EMPIRES, THE HISTORY OF (in part)

R.B. Robert Browning. *Emeritus Professor of Classics and Ancient History, Birkbeck College, University of London. Author of Medieval and Modern Greek and others.*

GREEK LITERATURE (in part)

R.Ba. Ruth Barbour. *Lecturer in Greek Palaeography, University of Oxford, 1960-67.*

WRITING (in part)

R.B.A. Robert Brown Asprey. *Free-lance writer. Author of The First Battle of the Marne; War in the Shadows; and others.*

WAR, THE THEORY AND CONDUCT OF
(in part)

R.B.Ba. Ronald B. Ballinger (d. 1981).
Professor of History, Rhode Island College, Providence. Author of South West Africa: The Case Against the Union and others.

SOUTH AFRICA (in part)

SOUTHERN AFRICA (in part)

R.B.C. Raymond Brazenor Clayton.
Professor of Biochemistry in Psychiatry, Stanford University, California. Editor of Steroids and Terpenoids.

CHEMICAL COMPOUNDS (in part)

R.B.D. Robert Bruce Davidson.
Curator of History, Provincial Museum of Alberta, Edmonton.

CANADA (in part)

R.B.G. Richard B. Goode. *Director, Fiscal Affairs Department, International Monetary Fund, Washington, D.C., 1965–81. Author of The Corporation Income Tax.*

TAXATION (in part)

R.B.I. Ronald B. Inden. *Associate Professor of History, University of Chicago. Author of Marriage and Rank in Bengali Culture: A History of Caste and Clan in Middle Period Bengal.*

SOCIAL DIFFERENTIATION (in part)

R.Bi. Raymond Bloch. *Professor, École Pratique des Hautes Études (Institute for Advanced Research), Paris. Author of The Etruscans; The Origins of Rome.*

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

GRECO-ROMAN CIVILIZATION, CLASSICAL
(in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

R.B.L. R. Bruce Lindsay (d. 1985).
Hazard Professor of Physics, Brown University, Providence, Rhode Island, 1936–71. Editor in Chief, Acoustical Society of America. Author of Lord Rayleigh: The Man and His Work.

MECHANICS (in part)

RAYLEIGH, JOHN WILLIAM STRUTT, 3RD
BARON (Micropædia)

SOUND (in part)

R.B.M. Raymond B. Manning.
Curator, Division of Crustacea, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Author of Stomatopod Crustacea of the Western Atlantic.

CRUSTACEANS (in part)

R.B.N. Robert Bradford Newman (d. 1983). *Senior Vice President, Bolt Beranek and Newman Inc., Cambridge, Massachusetts. Adjunct Professor of Architecture, Massachusetts Institute of Technology, 1976–83. Professor of Architectural Technology, Harvard University, 1971–83.*

SOUND (in part)

R.B.Ni. Robert Brayton Nichols.
Landscape architect.

PARK (Micropædia)

R.Br. Reginald Brill. *Free-lance writer and historian. Author of Terror of the French: John, Lord Talbot, c. 1388–1453 and several articles on the period of the Hundred Years' War.*

RICHEMONT, ARTHUR, CONSTABLE DE
(Micropædia)

R.B.S. Richard B. Sewall. *Professor of English, Yale University. Author of The Vision of Tragedy; coeditor of Tragedy: Modern Essays in Criticism.*

LITERATURE, THE ART OF
(in part)

R.B.Se. Robert Bertram Serjeant. *Sir Thomas Adams's Professor Emeritus of Arabic, University of Cambridge; Director, Middle East Centre, 1965–82. Author of The Portuguese off the South Arabian Coast and others.*

ARABIA (in part)

R.C. René Coste. *President, French Institute of Coffee and Cocoa, Paris; General Director, 1958–78. Author of Les Cafèiers et les cafés dans le monde.*

BEVERAGE PRODUCTION (in part)

FARMING AND AGRICULTURAL
TECHNOLOGY (in part)

R.Ca. Raymond Carr. *Warden of St. Antony's College, University of Oxford. Author of Spain, 1808–1939*

SPAIN (in part)

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GEOMETRY (in part)

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MAMMALS (in part)

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COMBINATORICS AND COMBINATORIAL
GEOMETRY (in part)

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CHEMICAL ELEMENTS (in part)

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FRENCH LITERATURE (in part)
MARSEILLE (in part)

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CHENG CH'ENG-KUNG (Micropædia)

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ITALY (in part)

VENICE (in part)

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LITERATURE, THE ART OF
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ARGENTINA (in part)

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INSECTS (in part)

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RACINE, JEAN (Micropædia)

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PACIFIC ISLANDS (in part)

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POLO (in part) (Micropædia)

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LIU SHAO-CH'Ō (Micropædia)

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INDIAN OCEAN ISLANDS (in part)

WEST INDIES, THE (in part)

WESTERN AFRICA (in part)

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RENOIR, PIERRE-AUGUSTE
(Micropædia)

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ANGIOSPERMS (in part)

UNITED STATES OF AMERICA (in part)

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DECORATIVE ARTS AND FURNISHINGS
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PACIFIC ISLANDS (in part)

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LOW COUNTRIES, THE (in part)

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RUSSELL, BERTRAND (Micropædia)

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PHILOSOPHIES OF THE BRANCHES OF
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ECONOMIC THEORY (in part)

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SOCIAL SCIENCES, THE (in part)

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LEBANON (in part)

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ARTHROPODS

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SLEEP AND DREAMS (in part)

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VALÉRY, PAUL (Micropædia)

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NORTH AFRICA (in part)

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INFECTIOUS DISEASES (in part)

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AMERICAN INDIANS (in part)

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LOTTERY (Micropædia)

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MEASUREMENT THEORY (in part)

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HENRY, PATRICK (Micropædia)

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ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

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WEST INDIES, THE (in part)

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GODARD, JEAN-LUC (Micropædia)

RESNAIS, ALAIN (in part) (Micropædia)
TRUFFAUT, FRANÇOIS (in part)
(Micropædia)

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FLAUBERT, GUSTAVE (in part)
(Micropædia)

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VIRGIL (in part)

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MEASUREMENT AND OBSERVATION,
PRINCIPLES, METHODS, AND

INSTRUMENTS OF
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FRANCE (in part)

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EDISON (in part)

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HAVANA (in part)

SOUTH AMERICA (in part)

VENEZUELA (in part)

WEST INDIES, THE (in part)

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PROTESTANTISM (in part)

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MUSCLES AND MUSCLE SYSTEMS (in part)

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GERMANY (in part)

R.E.E. Ronald Eric Emmerick. *Professor and Director, Department of Iranian Studies, University of Hamburg. Author of Saka Grammatical Studies; editor and translator of several Khotanese works.*

LANGUAGES OF THE WORLD
(in part)

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PUBLIC WORKS (in part)

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DE FOREST, LEE (Micropædia)

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INFECTIOUS DISEASES (in part)

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MINERALS AND ROCKS (in part)

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NAVIGATION (in part)

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GIACOMETTI, ALBERTO (Micropædia)

R.E.H. Richard E. Holtum. *Honorary Research Associate, Royal Botanic Gardens, Kew, England. Director, Botanic Gardens, Singapore, 1925-49. Professor of Botany, University of Malaya, Singapore, 1949-54. Author of A Revised Flora of Malaya.*
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GERMANY (in part)

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OPTIMIZATION, THE MATHEMATICAL THEORY OF (in part)

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SOCIAL SCIENCES, THE (in part)

R.E.O. The Rev. Ronald E. Osborn. *Emeritus Professor of American Church History, School of Theology at Claremont, California. Author of The Faith We Affirm and others.*
PROTESTANTISM (in part)

R.E.Or. Richard Edmonds Orville. *Professor and Chairman, Department of Atmospheric Science, State University of New York at Albany. Investigator of electrical phenomena in the atmosphere through photographs and their interpretation.*

CLIMATE AND WEATHER (in part)

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LANGUAGES OF THE WORLD (in part)

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BRAZIL (in part)
VARGAS, GETÚLIO (Micropædia)

R.E.Pi. Richard E. Pipes. *Frank B. Baird, Jr., Professor of History, Harvard University.*

NIKON (Micropædia)

R.Es. Robert Escarpit. *Professor of Information and Communication Sciences, University of Bordeaux III, France. Author of L'Angleterre dans l'oeuvre de Madame de Staël and others.*

STAËL-HOLSTEIN, ANNE-LOUISE-GERMAINE NECKER,
BARONNE DE (Micropædia)

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FARMING AND AGRICULTURAL TECHNOLOGY (in part)

R.E.Sh. Robert E. Sheriff. *Professor of Geophysics, University of Houston, Texas. Author of Encyclopedic Dictionary of Exploration Geophysics and others.*

EXPLORATION (in part)

R.F. Robert L. Faherty. *Managing Editor, Congressional Budget Office. Staff editor, Religion, Encyclopædia Britannica, 1969-72.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

RITES AND CEREMONIES, SACRED (in part)

R.F.B. Robert F. Byrnes. *Distinguished Professor of History, Indiana University, Bloomington. Author of Pobedonostsev: His Life and Thought.*

POBEDONOSTSEV, KONSTANTIN PETROVICH (Micropædia)

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CONSERVATION OF NATURAL RESOURCES

R.F.F. Richard Foster Flint (d. 1976). *Henry Barnard Davis Professor of Geology, Yale University, 1957-70. Author of Glacial and Quaternary Geology.*

GEOCHRONOLOGY (in part)

R.F.G.A. R.F.G. Alford. *Cassel Reader in Economics, London School of Economics and Political Science, University of London.*

MARKETS (in part)

R.F.H. Sir Roy Forbes Harrod (d. 1978). *Nuffield Reader in Economics, University of Oxford, 1952-67. Author of International Economics and others.*
INTERNATIONAL TRADE (in part)

R.F.-He. Regina Flannery-Hertzfeld. *Emeritus Professor of Anthropology, Catholic University of America, Washington, D.C. Author of The Gros Ventre of Montana, Part I, Social Life.*
AMERICAN INDIANS (in part)

R.F.Hi. Ronald Francis Hingley. *Fellow of St. Antony's College, Oxford; Lecturer in Russian, University of Oxford. Author of Chekhov: A Biographical and Critical Study; Russian*

Writers and Society; Nihilists; and others; editor and translator of The Oxford Chekhov.

CHEKHOV, ANTON (in part) (Micropædia)
GORKY, MAKSIM (in part) (Micropædia)
STALIN (in part)

R.FI. Ronald Fletcher. *Emeritus Professor of Sociology, University of Reading, England. Author of Auguste Comte and the Making of Sociology and others.*

COMTE, AUGUSTE (in part) (Micropædia)

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EDUCATION, HISTORY OF (in part)

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BELGIAN LITERATURE (in part)

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AFRICA (in part)

R.-F.-M.A. Roger-François-Marie Aubert. *Professor of Church History, Catholic University of Louvain, Belgium. Author of Le Pontificat de Pie IX and others.*

LEO XIII (PAPACY) (Micropædia)

R.F.Pe. Ronald Francis Peel (d. 1985). *Professor of Geography, University of Bristol, England, 1957-77. Chairman, Commission on Arid Lands, International Geographical Union. Author of Physical Geography.*
AFRICA (in part)

R.F.S. Robert F. Spencer. *Professor of Anthropology, University of Minnesota, Minneapolis. Author of The North Alaskan Eskimo.*

ARCTIC, THE (in part)

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GEOMETRY (in part)

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ANGIOSPERMS (in part)

R.F.Tr. Reginald Francis Trehearne (d. 1967). *Professor of History, University College of Wales, Aberystwyth, University of Wales, 1930-67. Author of The Baronial Plan of Reform, 1258-1263 and others.*

EDWARD I (ENGLAND AND GREAT BRITAIN) (Micropædia)

MONTFORT, SIMON DE, EARL OF LEICESTER (Micropædia)

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POLITICAL SYSTEMS (in part)

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NUMBER THEORY (in part)

R.G.A.B. Richard G.A. Buxton. Lecturer in Classics, University of Bristol, England. Author of *Persuasion in Greek Tragedy: A Study of Peitho and others*.

MYTH AND MYTHOLOGY (in part)

R.G.D.L. Robert George Dalrymple Laffan (d. 1972). University Lecturer, University of Cambridge, 1927–53; Fellow of Queen's College, Cambridge. Author of *The Serbs, Guardians of the Gate and others*.

YUGOSLAVIA (in part)

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CULTURE, THE CONCEPTS AND COMPONENTS OF (in part)

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INFORMATION THEORY

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IRAN (in part)

R.G.H. Ralph G. Hopkinson. Haden-Pilkington Professor Emeritus of Environmental Design and Engineering, University College, University of London. Author of *Lighting and others*.

LIGHTING AND LIGHTING DEVICES

R.Gi. Robert W.V. Gittings. Poet, biographer, and playwright. Author of *John Keats and other works on Keats*.

KEATS, JOHN (Micropædia)

R.G.Lo. Robert G. Logan. Sportswriter, Chicago Tribune. Author of *The Bulls and Chicago: A Stormy Affair*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

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ALEMBERT, JEAN LE ROND D' (Micropædia)

R.G.R. Robert G. Richardson. Consultant medical editor. Former Editor, *Abbottempo* (international medical journal). Author of *Surgery: Old and New Frontiers and others*.

MEDICINE (in part)

R.G.S. Ralph G. Sanger (d. 1968). Professor of Mathematics, Kansas State

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GEOMETRY (in part)

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LATIN LITERATURE (in part)

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GEOMETRY (in part)

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MUSCLES AND MUSCLE SYSTEMS (in part)

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ALEXANDER NEVSKY, SAINT (Micropædia)

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CHEMICAL COMPOUNDS (in part)

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CENTRAL AMERICA (in part)

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OCEANS (in part)

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TURGENEV, IVAN (in part) (Micropædia)

RUSSIAN LITERATURE (in part)

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UNITED STATES OF AMERICA (in part)

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AUSTRALIA (in part)

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UNITED STATES OF AMERICA (in part)

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ANALYSIS AND MEASUREMENTS,

PHYSICAL AND CHEMICAL (in part)

SOLAR SYSTEM, THE (in part)

R.H.I. Ralph Hammond Innes. Novelist and writer on history and travel. Author of *The Conquistadors*.

CORTÉS, HERNÁN, MARQUES DEL VALLE DE OAXACA (Micropædia)

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MINERALS AND ROCKS (in part)

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CHEMICAL COMPOUNDS (in part)

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CZECHOSLOVAKIA (in part)

PRAGUE (in part)

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MITHRADATES VI EUPATOR (PONTUS) (Micropædia)

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COLLECTIVE BEHAVIOUR (in part)

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MUSCLES AND MUSCLE SYSTEMS (in part)

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CÉZANNE, PAUL (Micropædia)

DELACROIX, EUGÈNE (Micropædia)

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BIOSPHERE, THE (in part)

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ENGLISH LITERATURE (in part)

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MENELIK II (in part) (Micropædia)

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HIROSHIGE (Micropædia)

HOKUSAI (Micropædia)

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BEHAVIOUR, THE DEVELOPMENT OF HUMAN (in part)

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EARTH, THE (in part)

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BEHAVIOUR, ANIMAL (in part)

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CÁRDENAS, LÁZARO (Micropædia)

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FISHES (in part)

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PREHISTORIC PEOPLES AND CULTURES (in part)

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DECORATIVE ARTS AND FURNISHINGS (in part)

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SOUTH AFRICA (in part)

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COURBET, GUSTAVE

(Micropædia)

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GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

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NERVES AND NERVOUS SYSTEMS (in part)

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TEACHING (in part)

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REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

R.J.H.-C. Ronald James Harrison-Church. *Emeritus Professor of Geography, London School of Economics and Political Science, University of London. Author of West Africa.*

AFRICA (in part)

WESTERN AFRICA (in part)

R.J.J. Roland John Jackson. *Professor of Music, Claremont Graduate School, California. Editor of Neapolitan Keyboard Composers c. 1600.*

MUSIC, THE ART OF (in part)

R.J.M. Ronald James Morley. *Former Technical Director, Coal Products Division, National Coal Board, Harrow, England.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

R.J.M. De W. Roger J.M. De Wiest. *Former Professor and Chairman, Water Resources Program, Princeton University, New Jersey. Author of Geohydrology.*

HYDROSPHERE, THE (in part)

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NORTH AMERICA (in part)

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CORNEILLE, PIERRE (Micropædia)

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AUTOMATA THEORY (in part)

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DANTE

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NAVIGATION (in part)

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ENGINEERING (in part)

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INTELLIGENCE, HUMAN

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CHEMICAL ELEMENTS (in part)

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EASTERN AFRICA (in part)

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UNITED STATES OF AMERICA (in part)

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DOCTRINES AND DOGMAS, RELIGIOUS (in part)

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OPTICS, PRINCIPLES OF (in part)

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AFRICA (in part)

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SCARLATTI, DOMENICO (Micropædia)

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LAKES (in part)

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BIRDS (in part)

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FICHTE, JOHANN GOTTLIEB (Micropædia)

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WESTERN AFRICA (in part)

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KEYNES, JOHN MAYNARD (in part) (Micropædia)

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INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)

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SIBELIUS, JEAN (Micropædia)

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XAVIER, SAINT FRANCIS (Micropædia)

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ENCYCLOPAEDIAS AND DICTIONARIES (in part)

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AFRICA (in part)

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ARCTIC, THE (in part)

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INDIA (in part)

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DUCHAMP, MARCEL (Micropædia)

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MINERALS AND ROCKS (in part)

R.L.Fr. Richard L. Frey. *Editor in Chief, Official Encyclopedia of Bridge. Associate Editor, Bridge World magazine; Emeritus Editor, The Contract Bridge Bulletin; Chief of Editorial Board, Charles H. Goren publications. President Emeritus and Chairman, International Bridge Press*

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CRIBBAGE (Micropædia)

R.L.G. Roger Lancelyn Green (d. 1987). *Author of The Story of Lewis Carroll and others; editor of The Diaries of Lewis Carroll.*

CARROLL, LEWIS (Micropædia)

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COLOMBIA (in part)

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WESTERN AFRICA (in part)

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SMITH, ADAM (in part)

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MAHDI, AL- (Micropædia)

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EARTH, THE (in part)

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SOLAR SYSTEM, THE (in part)

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ANGIOSPERMS (in part)

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CIRCUS (in part)

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ARCHITECTURE, THE HISTORY OF WESTERN (in part)

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WAR, THE TECHNOLOGY OF (in part)

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ENERGY, THE CONCEPT OF (in part)

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BIOLOGICAL SCIENCES, THE (in part)

R.L.S.-R. Reginald Leslie Smith-Rose (d. 1980). Secretary General, Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science, 1961-73. Director, Radio Research, Department of Scientific and Industrial Research, London, 1948-60.

MARCONI, GUGLIELMO (Micropædia)
POPOV, ALEKSANDR STEPANOVICH (Micropædia)

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CHINA (in part)

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EDUCATION, HISTORY OF (in part)

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BIRDS (in part)

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BROADCASTING (in part)

GÖRING, HERMANN (in part)
(Micropædia)

MOTION PICTURES (in part)

TERRY, ELLEN (Micropædia)

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FARMING AND AGRICULTURAL TECHNOLOGY (in part)

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PREHISTORIC PEOPLES AND CULTURES (in part)

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AUSTRALIA (in part)

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WEBSTER, NOAH (Micropædia)

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INDUSTRIES, EXTRACTION AND PROCESSING (in part)

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ARTS, STYLE IN THE

BRAQUE, GEORGES (Micropædia)

CHAGALL, MARC (Micropædia)

DAVID, JACQUES-LOUIS (Micropædia)

FOLK ARTS (in part)

KANDINSKY, WASSILY (in part)

(Micropædia)

LÉGER, FERNAND (Micropædia)

MATISSE, HENRI (in part) (Micropædia)

POPULAR ARTS (in part)

ROUAULT, GEORGES (Micropædia)

R.McN.A. Robert McNeill Alexander. Professor of Zoology, University of Leeds, England. Author of *Animal Mechanics*; *The Chordates*.

MUSCLES AND MUSCLE SYSTEMS (in part)

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FOLK ARTS (in part)

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MYSTERY RELIGIONS

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BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

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CHARLES XII (SWEDEN) (Micropædia)

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GRIFFITH, D.W. (Micropædia)

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UNITED STATES OF AMERICA (in part)

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AUSTRALIA (in part)

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CALVINISM, CALVIN AND (in part)

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PACIFIC ISLANDS (in part)

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BIRDS (in part)

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WAR, THE THEORY AND CONDUCT OF (in part)

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CHAUCE (in part)

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STRESEMANN, GUSTAV (Micropædia)

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WAR, THE TECHNOLOGY OF (in part)

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Commentary on Livy, Books 1-5.
LIVY (Micropædia)

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ANGIOSPERMS (in part)

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ENERGY CONVERSION (in part)

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'ABBĀS I (PERSIA) (Micropædia)

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RAVEL, MAURICE (Micropædia)

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ANALYSIS (IN MATHEMATICS) (in part)

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PERU (in part)

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LINCOLN
WEBSTER, DANIEL (Micropædia)

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TISSUES AND FLUIDS (in part)

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CYRUS II (Micropædia)
KHOSROW I (Micropædia)

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NIJINSKY, VASLAV (Micropædia)

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PERSEPOLIS (Micropædia)

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SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

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VESPUCCI, AMERIGO (Micropædia)

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ANALYSIS AND MEASUREMENT,
PHYSICAL AND CHEMICAL (in part)

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CZECHOSLOVAK LITERATURE (in part)

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SUDAN (in part)

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CHEMICAL COMPOUNDS (in part)

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CLIMATE AND WEATHER (in part)

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RAMSES II (Micropædia)

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HUMANISM

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CANADA (in part)

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LANGUAGE (in part)

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PRINTING, TYPOGRAPHY, AND PHOTOENGRAVING (in part)

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BEN BELLA, AHMED (Micropædia)

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BACH (in part)

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DIDEROT, DENIS (Micropædia)

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GARDENING AND HORTICULTURE (in part)

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MANN, THOMAS (Micropædia)

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SPAIN (in part)

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CH'IENT-LUNG (Micropædia)

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MACHIAVELLI, NICCOLÒ (in part) (Micropædia)

SAVONAROLA, GIROLAMO (Micropædia)

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FISHES (in part)

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AESTHETICS (in part)

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DECORATIVE ARTS AND FURNISHINGS (in part)

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TERTULLIAN (Micropædia)

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ATOMS (*in part*)

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UNITED STATES OF AMERICA (*in part*)

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AFRICA (*in part*)

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WESTERN AFRICA (*in part*)

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NUTRITION (*in part*)

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TIEPOLO, GIOVANNI BATTISTA (Micropædia)

TINTORETTO (*in part*) (Micropædia)

VERONESE, PAOLO (Micropædia)

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MILL, JOHN STUART (*in part*)

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CHEMICAL REACTIONS (*in part*)

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ARCTIC, THE (*in part*)

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DEFOE, DANIEL (Micropædia)

ENGLISH LITERATURE (*in part*)

STEELE, SIR RICHARD (Micropædia)

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ELEANOR OF AQUITAINE (Micropædia)

VILLON, FRANÇOIS (Micropædia)

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PROTOZOA

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SUPPORTIVE AND CONNECTIVE TISSUES (*in part*)

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MARIA THERESA (Micropædia)

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OCCULTISM (*in part*)

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BRAZIL (*in part*)

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LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (*in part*)

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EUROPE (*in part*)

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PROTESTANTISM (*in part*)

SCHLEIERMACHER, FRIEDRICH (Micropædia)

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GEOMORPHIC PROCESSES (*in part*)

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ŌSAKA-KÔBE METROPOLITAN AREA (*in part*)

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SWIFT, JONATHAN (*in part*) (Micropædia)

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INTERNATIONAL TRADE (*in part*)

R.R.B. Richard R. Beeman. *Professor of History, University of Pennsylvania, Philadelphia. Author of The Old Dominion and the New Nation, 1788–1801 and others.*

UNITED STATES OF AMERICA (*in part*)

R.R.D. Ranjit Ramchandra Desai. *Agriculturist and writer. Author of Śrīmāna Yogi: the Life of Śivaji in Marathi and others.*

ŚIVAJI (Micropædia)

R.Ri. Raymond Ritter (d. 1974). *Attorney. Editor in Chief of the review Pyrénées. Author of Henry IV lui-même; editor of Lettres du cardinal de Florence sur Henri IV et sur la France (1596–1598).*

HENRY IV (FRANCE) (Micropædia)

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INDUSTRIES, CHEMICAL PROCESS (*in part*)

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NEPAL (*in part*)

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ROME (*in part*)

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SET THEORY (*in part*)

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VIRUSES

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BUNYAN, JOHN (Micropædia)

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BRIDGMAN, P.W. (Micropædia)

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CHEMICAL REACTIONS (in part)

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NORTH AMERICA (in part)

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ANGIOSPERMS (in part)

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ECKEHART, MEISTER
(Micropædia)

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PAINTING, THE HISTORY OF WESTERN
(in part)

R.S.D. Robert Sinclair Dietz. Professor of Geology, Arizona State University, Tempe. Coauthor of *Seven Miles Down; The Story of the Bathyscaph Trieste*.

OCEANS (in part)

R.S.De. The Most Rev. Ralph Stanley Dean. (d. 1987). Executive Officer, Anglican Communion, 1964–69. Archbishop of Cariboo and Metropolitan of the Anglican Province of British Columbia, 1971–73. Rector, Church of the Redeemer; Greenville, South Carolina, 1979–87. Author of *In the Light of the Cross*.

PROTESTANTISM (in part)

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WINTHROP, JOHN (Micropædia)

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ALBANIA (in part)

R.Sh. Robert Shackleton. (d. 1986). Marshal Foch Professor of French Literature, University of Oxford, 1979–86; Bodley's Librarian, 1966–79. Author of *Montesquieu: A Critical Biography*.

MONTESQUIEU, CHARLES-LOUIS DE
SECONDAT, BARON DE LA BREDE
ET DE (in part) (Micropædia)

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FULTON, ROBERT (Micropædia)
TOOLS (in part)

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EUROPE (in part)

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MINERALS AND ROCKS (in part)

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UNITED STATES OF AMERICA
(in part)

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CONSTANTINE VII PORPHYROGENITUS
(BYZANTINE EMPIRE) (Micropædia)

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RELIGIOUS EDUCATION (in part)

R.So. Robert W. Sowers. Stained-glass artist. Author of *The Language of Stained Glass* and others.

DECORATIVE ARTS AND FURNISHINGS
(in part)

R.Sp. Robert Spence. (d. 1976). Master of Keynes College; Professor of Applied Chemistry, University of Kent at Canterbury, England, 1968–73. Director, Atomic Energy Research Establishment, Harwell, England, 1964–68. Author of the obituary memoir on *Otto Hahn* for the Royal Society.

HAHN, OTTO (Micropædia)

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VAUBAN, SÉBASTIEN LE PRESTRE DE
(Micropædia)

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BLOOD (in part)

R.St. Ralph Stephenson. Former Director, Paris Pullman Cinema, London. Author of *The Animated Film*; coauthor of *The Cinema as Art*.

MOTION PICTURES (in part)

R.St.J. Robert St. John. Journalist, lecturer, and foreign affairs radio commentator. Author of *The Boss* and others.

NASSER, GAMAL ABDEL (Micropædia)

R.S.-U. Rivka Schatz-Uffenheimer. Edmonton Professor of Jewish Mysticism, Hebrew University of Jerusalem. Author of *ha-Hasidut ke-misṭiqa ("Hasidism as Mysticism")*.

BA'AL SHEM ȚOV (in part) (Micropædia)
LURIA, ISAAC BEN SOLOMON (in part)
(Micropædia)

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CENTRAL AMERICA (in part)

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NEWTON (in part)

RAY, JOHN (Micropædia)

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INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

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INSECTS (in part)

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CENTRAL AFRICA (in part)

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ECOSYSTEMS (in part)

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MUSIC, THE HISTORY OF WESTERN

Rt.H. Robert Ho. (d. 1972). Senior Fellow, Department of Human Geography, Australian National University, Canberra. Author of *Farmers of Central Malaya*; editor of *Studies in the Geography of Southeast Asia*.

SOUTHEAST ASIA, MAINLAND (in part)

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INDIA (in part)

R.T.H. Robert Thomas Harms. Professor of Linguistics, University of Texas at Austin. Author of *Estonian Grammar*; *Finnish Structural Sketch*; and others.

LANGUAGES OF THE WORLD (in part)

R.T.J. Richard T. Jackson. Professor of Geography, University of Papua New Guinea, Port Moresby. Editor of *Introduction to the Urban Geography of Papua New Guinea*.

EAST INDIES, THE (in part)

R.T.L. Richard T. Lockhart. President, Social Engineering Associates, Inc., Chicago; Publisher and Editor, Illinois Political Reporter, 1961–86.

UNITED STATES OF AMERICA
(in part)

R.T.La. Robert Terence Lange. *Reader in Botany, University of Adelaide, Australia. Coauthor of Symbiosis. AUSTRALIA (in part)*

R.To. Richard Tolson. *The Times (London) Correspondent, Leeward Islands, 1954–56.*

WEST INDIES, THE (in part)

R.T.S. R. Thomas Sanderson. *Emeritus Professor of Chemistry, Arizona State University, Tempe. Author of Chemical Bonds and Bond Energy and others. CHEMICAL ELEMENTS (in part)*

R.T.V. Richard T. Vann. *Professor of History and Letters, Wesleyan University, Middletown, Connecticut. Author of The Social Development of English Quakerism, 1655–1755 and others.*

PROTESTANTISM (in part)

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Ru.M. Russell Meiggs. *Emeritus Fellow of Balliol College, Oxford; Lecturer in Ancient History, University of Oxford, 1939–70. Author of Ostia; editor of J.M. Bury's History of Greece.*

ALCIBIADES (Micropædia)

CLEISTHENES OF ATHENS (Micropædia)
GRECO-ROMAN CIVILIZATION, CLASSICAL (in part)

Ru.S. Ruth Stephan (d. 1974). *Writer. Author of My Crown, My Love and others.*

CHRISTINA (Micropædia)

Ru.V. Rudolf Vierhaus. *Professor and Director, Max Planck Institute for History, Göttingen, West Germany. Author of Ranke und die soziale Welt and others.*

RANKE, LEOPOLD VON (Micropædia)

R.V. Randolph Vigne. *Director, Stillit Books Ltd., London. Author of The Transkei: A South African Tragedy. SOUTH AFRICA (in part)*

R.Va. Richard Vaughan. *Former Professor of History, University of Hull, England. Author of Philip the Good; John the Fearless.*

JOHN (BURGUNDY) (Micropædia)

PHILIP III (BURGUNDY) (Micropædia)

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TROTSKY, LEON (in part)

(Micropædia)

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

R.Vi. Reino Virtanen (d. 1987). *Professor of Modern Languages, University of Nebraska, Lincoln, 1957–78. Author of Claude Bernard and His Place in the History of Ideas.*

BERNARD, CLAUDE (Micropædia)

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MARKETS (in part)

R.V.R.C.R. R.V.R. Chandrasekhara Rao. *Professor and Head, Department of Political Science; Dean, School of Social Sciences, University of Hyderabad, India. Author of From Innocence to Strength: India Through Cold War, Detente and Entente.*

INDIA (in part)

R.W. Rex Wailes (d. 1986). *Consultant, U.K. Department of the Environment and National Trust on Industrial Monuments. Author of The English Windmill and others.*

ENERGY CONVERSION (in part)

R.W.A. R.W. Allard. *Professor of Genetics, University of California, Davis. Author of Principles of Plant Breeding.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

R.W.B. Roger William Benedict. *Managing Editor, Petroleum Intelligence Weekly, London.*

NORTH AMERICA (in part)

R.W.Bd. Raymond Walter Barnard (d. 1962). *Associate Professor of Mathematics, University of Chicago, 1932–62.*

TRIGONOMETRY (in part)

R.W.C. Robert W. Cahn. *Former Professor of Materials Science, University of Sussex, Brighton, England. Editor of Physical Metallurgy.*

AGRICOLA, GEORGIUS (Micropædia)

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OPTIMIZATION, THE MATHEMATICAL THEORY OF (in part)

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MATTER (in part)

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VOLCANISM (in part)

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IRELAND (in part)

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LIGHT (in part)

R.We. Robert Werner. *Professor of Ancient History, Friedrich Alexander University of Erlangen-Nürnberg, West Germany. Author of Der Beginn der*

römischen Republik.

PTOLEMY I SOTER (Micropædia)

R.W.E. Richard W. Everett. *Vice President, Economic Research Division, Chase Manhattan Bank, New York City, 1967–87.*

ECONOMIC GROWTH AND PLANNING (in part)

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GEOCHRONOLOGY (in part)

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MALINOWSKI, BRONISLAW (in part)
(Micropædia)

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R.W.L. Robert Warden Lee (d. 1958). *Rhodes Professor of Roman-Dutch Law, University of Oxford, 1921–56. Author of Introduction to Roman-Dutch Law and others.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

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R.W.Ma. Richard W. Macomber. *Professor of Physics, Brooklyn Center, Long Island University, New York.*

LYELL, SIR CHARLES, BARONET (Micropædia)

SMITH, WILLIAM (Micropædia)

R.W.P. Richard W. Pohl. *Distinguished Professor of Botany; Curator of the Herbarium, Iowa State University, Ames. Author of How to Know the Grasses and others. ANGIOSPERMS (in part)*

R.W.St. Robert W. Storer. *Emeritus Professor of Zoology, University of Michigan, Ann Arbor; Curator of Birds, Museum of Zoology, 1956–85. BIRDS (in part)*

R.W.S.-W. Robert William Seton-Watson (d. 1951). *Professor of Czechoslovak Studies, University of Oxford, 1945–49. Masaryk Professor of Central European History, King's College, University of London, 1922–45. YUGOSLAVIA (in part)*

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Cryogenic Technology.

REFRIGERATION (*in part*)

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FISHES (*in part*)

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TRANSPLANTS, ORGAN AND TISSUE

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BIOCHEMICAL COMPONENTS OF ORGANISMS (*in part*)

S.A. Stanley W. Angrist. *Columnist, Forbes magazine. Professor of Mechanical Engineering, Carnegie-Mellon University, Pittsburgh, 1971-82. Author of Direct Energy Conversion.*

ENERGY, THE CONCEPT OF (*in part*)

S.A.K. Samuel Alexander Kirk. *Professor of Special Education, University of Arizona, Tucson. Author of Educating Exceptional Children and others.*

EDUCATION, SPECIAL

S.A.Kr. Stepan Andriyovich Kryzhanivsky. *Professor, Institute of Literature, Ukrainian S.S.R. Academy of Sciences, Kiev. Coauthor of History of Ukrainian Literature, vol. 8.*

UKRAINIAN LITERATURE (*in part*) (Micropædia)

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FOOD PROCESSING (*in part*)

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MUHAMMAD IBN TUGHLUQ (Micropædia)

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SRI LANKA (*in part*)

S.A.Ri. Stefan Albrecht Riesenfeld. *Emmanuel S. Heller Professor Emeritus of Law, University of California, Berkeley. Professor of Law, Hastings College of the Law, San Francisco. Author of Creditors' Remedies and Debtors' Protection.*

BUSINESS LAW (*in part*)

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RIVERS (*in part*)

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UNION OF SOVIET SOCIALIST REPUBLICS (*in part*)

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LANGUAGES OF THE WORLD (*in part*)

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INDIA (*in part*)

S.B. Suri Balakrishna. *Assistant Director, National Geophysical Research Institute, Council of Scientific and Industrial Research, Hyderabad, India. Author of Earth.*

ASIA (*in part*)

S.Be. Staffan Bergsten. *Novelist. Docent in Literary History, University of Uppsala, Sweden. Author of several works on 19th- and 20th-century Swedish poetry.*

SCANDINAVIAN LITERATURE (*in part*)

S.B.-G. Swapna Banerjee-Guha. *Senior Lecturer in Geography, University of Bombay. Coauthor of Declining City-core of an Indian Metropolis.*

CALCUTTA (*in part*)

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DOMINIC, SAINT (*in part*) (Micropædia)

S.Bl. Solomon Bluhm. *Professor of Education, Hunter College, City University of New York, 1930-59.*

FROEBEL, FRIEDRICH (Micropædia)

S.B.O. Sherry B. Ortner. *Professor of Anthropology, University of Michigan, Ann Arbor. Author of Sherpas Through Their Rituals.*

RITEs AND CEREMONIES, SACRED (*in part*)

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MEASUREMENT AND OBSERVATION, PRINCIPLES, METHODS, AND INSTRUMENTS OF (*in part*)

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MALTA

S.C. Seymour Cain. *Fellow, National Endowment for the Humanities, Washington, D.C., 1979-80. Senior Editor, Religion, Encyclopædia Britannica, Chicago, 1967-73. Author of Gabriel Marcel.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (*in part*)

MARCEL, GABRIEL (*in part*) (Micropædia)

S.C.E. Søren Christian Egerod. *Professor of East Asian Languages, University of Copenhagen. Director, Scandinavian Institute of Asian Studies, Copenhagen. Editor, Acta Orientalia. Author of Atayal-English Dictionary and others.*

LANGUAGES OF THE WORLD (*in part*)

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ASIA (*in part*)

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MATHEMATICS, THE FOUNDATIONS OF (*in part*)

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CHARLES XIV JOHN (SWEDEN) (Micropædia)

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THEATRICAL PRODUCTION (*in part*)

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PEKING (*in part*)

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NERVES AND NERVOUS SYSTEMS (*in part*)

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PAINTING, THE HISTORY OF WESTERN (*in part*)

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SENSORY RECEPTION (*in part*)

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PSYCHOLOGY (*in part*)

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TOCQUEVILLE, ALEXIS DE (Micropædia)

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INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (*in part*)

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HOGARTH, WILLIAM (*in part*)
(Micropædia)

PAINTING, THE HISTORY OF WESTERN (*in part*)

SCULPTURE, THE HISTORY OF WESTERN (*in part*)

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UNITED STATES OF AMERICA (*in part*)

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S.E.F. Samuel Edward Finer. *Gladstone Professor Emeritus of Government and Public Administration, University of Oxford. Author of Anonymous Empire: A Study of the Lobby in Great Britain and others.*

POLITICAL PARTIES AND INTEREST GROUPS (*in part*)

Se.M. Sengaku Mayeda. *Professor of Indian Philosophy, University of Tokyo. Editor of Saṅkara's Upadeśasāhasrī. ŚAṆKARA (Micropædia)*

S.E.McG. Samuel Emmett McGregor (d. 1980). *Apiculturist, Bee Research Laboratory, U.S. Department of Agriculture, Tucson, Arizona. Coauthor of Beekeeping in the United States. FARMING AND AGRICULTURAL TECHNOLOGY (in part)*

S.Er. Sirri Erinc. *Director, Institute of Marine Sciences and Geography, University of Istanbul. Author of Geography of Eastern Anatolia. TURKEY AND ANCIENT ANATOLIA (in part)*

S.E.T. Stephen E. Toulmin. *Avalon Professor in the Humanities, Northwestern University, Evanston, Illinois. Author of Philosophy of Science. PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)*

S.F.Be. Samuel Flagg Bemis (d. 1973). *Sterling Professor of Diplomatic History and Inter-American Relations, Yale University, 1945–61. Author of John Quincy Adams and the Foundations of American Foreign Policy and others. ADAMS, JOHN QUINCY (Micropædia) MONROE, JAMES (Micropædia)*

S.Fe. Solomon Feferman. *Professor of Mathematics and Philosophy, Stanford University, California. Author of The Number Systems: Foundations of Algebra and Analysis.*

MATHEMATICS, THE FOUNDATIONS OF (*in part*)

S.F.W. S.F. Wise. *Dean of Graduate Studies and Research, Carleton University, Ottawa. Coauthor of Canada Views the United States: 19th Century Political Attitudes. CANADA (in part)*

S.F.We. Stephen F. Weiss. *Professor and Associate Chairman, Department of Computer Science, University of North Carolina at Chapel Hill. COMPUTERS (in part)*

S.G. Samy Gorgy. *Former Director General, Institute of Oceanography and Fisheries, Alexandria. Author of numerous articles on oceanography. MEDITERRANEAN SEA (in part)*

S.G.B. Stephen G. Brush. *Professor of the History of Science, University of Maryland, College Park. Author of The History of Modern Science: A Guide to the Second Scientific Revolution, 1800–1950.*

PHYSICAL SCIENCES, THE (*in part*)

S.G.C. Sir Stanley George Clayton, M.D. (d. 1986). *Professor of Obstetrics and Gynecology, King's College Hospital Medical School, University of London, 1967–76.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (*in part*)

S.Ge. Saul Genuth, M.D. *Professor of Medicine, Case Western Reserve University, Cleveland, Ohio.*

METABOLISM (*in part*)

S.G.F.B. The Rev. Samuel G.F. Brandon (d. 1971). *Professor of Comparative Religion, Victoria University of Manchester, 1951–71. Author of Man and His Destiny in the Great Religions and others.*

DOCTRINES AND DOGMAS, RELIGIOUS (*in part*)

rites and ceremonies, sacred (*in part*)

S.Gh. Sisirkumar Ghose. *Professor of English, Visva-Bharati, Santiniketan, India. Author of Mystics and Society. RELIGIOUS EXPERIENCE (in part)*

S.G.H. Stephen G. Handzo. *Motion picture projectionist. Audio-visual technician, American Museum of Natural History, New York City. Contributor to Film Sound: Theory and Practice. MOTION PICTURES (in part)*

S.G.K. Samir G. Khalaf. *Professor of Sociology; Chairman, Department of Sociology and Anthropology, American University of Beirut. Coauthor of Hamra of Beirut: A Case of Rapid Urbanization. BEIRUT: Bibliography LEBANON (in part)*

S.Gl. Sidney Glazer. *Former Professor of History, Wayne State University, Detroit. Coauthor of Michigan: From Primitive Wilderness to Industrial Commonwealth.*

UNITED STATES OF AMERICA (*in part*)

S.Go. Stephen Gottschalk. *Associate Professor of History, U.S. Naval*

Postgraduate School, Monterey, California, 1972–75. Author of The Emergence of Christian Science in American Religious Life.

CHRISTIAN SCIENCE (Micropædia)

S.G.P. Stanley G. Payne. *Professor of History, University of Wisconsin, Madison. Author of Franco's Spain. FRANCO, FRANCISCO (Micropædia)*

S.G.S. Stanwyn G. Shetler. *Curator, Department of Botany, Smithsonian Institution, Washington, D.C.*

ANGIOSPERMS (*in part*)

S.G.W. Stephen Graham Wright. *Former Adviser at the National Library of Ethiopia and at Haile Selassie I University, Addis Ababa.*

ETHIOPIAN LITERATURE (Micropædia)

S.Ha. Shirō Hattori. *Director, Tokyo Institute for Advanced Studies of Language. Emeritus Professor of Linguistics, University of Tokyo. Author of Methods in Linguistics; Genealogy of Japanese; and others.*

LANGUAGES OF THE WORLD (*in part*)

S.H.B. Samuel H. Baron. *Professor of History, University of North Carolina at Chapel Hill. Author of Plekhanov: The Father of Russian Marxism and others. PLEKHANOV, GEORGY VALENTINOVICH (Micropædia)*

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MONGOLIA (*in part*)

S.H.Bl. Sheldon H. Blank. *Emeritus Professor of Bible, Hebrew Union College-Jewish Institute of Religion, Cincinnati, Ohio. Author of Prophetic Faith in Isaiah and others. ISAIAH (Micropædia)*

S.H.Br. Stanley Henry Beaver. *Professor of Geography, University of Keele, England, 1950–74. BALKANS (in part)*

S.He. Stanislaw Herbst (d. 1973). *Professor of Pre-18th Century Polish History, University of Warsaw. President, Polish Historic Society, Warsaw. Coauthor of A Thousand Years of Polish History: KOŚCIUSZKO, TADEUSZ (Micropædia)*

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ASIA (*in part*)

INDIA (*in part*)

IRAQ (*in part*)

TURKEY AND ANCIENT ANATOLIA (*in part*)

Sh.H. Shigeru Hayashi. *Professor, Institute of Social Service, University of Tokyo. Author of The Pacific War. KONOE FUMIMARO, KOSHAKU (Micropædia)*

Sh.Ha. Shirley Hazzard. *Novelist and writer on Italian cultural themes. Author*

of The Transit of Venus; The Bay of Noon; and others.

NAPLES

S.H.J. Susan Heyner Joshi. *Professor of Biology, Philadelphia College of Pharmacy and Science.*

BIOLOGICAL SCIENCES, THE (in part)

Sh.M. Shula E. Marks. *Director and Professor of Commonwealth History, Institute of Commonwealth Studies, University of London. Author of Reluctant Rebellion: The 1906-08 Disturbances in Natal and others.*

SOUTHERN AFRICA (in part)

S.H.N. Seyyed Hossein Nasr. *Professor of Philosophy; Dean, Faculty of Letters and Humanities, University of Tehrān. Author of Three Muslim Sages.*

AVICENNA (Micropædia)

S.H.O. Simeon Hongo Ominde. *Professor of Geography; Director, Population Studies and Research Institute, University of Nairobi, Kenya. Author of Land and Population Movements in Kenya.*

EASTERN AFRICA (in part)

S.H.P. Stewart Henry Perowne. *Orientalist, historian, and lecturer. Author of The Life and Times of Herod the Great; The End of the Roman World; The Political Background of the New Testament; and others.*

CLEOPATRA VII THEA PHILOPATOR (Micropædia)

HEROD I (Micropædia)

JERUSALEM (in part)

JULIAN (Micropædia)

S.H.S. Stephen H. Schneider. *Senior Scientist and Head, Natural Systems Group, National Center for Atmospheric Research, Boulder, Colorado. Editor, Climatic Change. Coauthor of The Coevolution of Climate and Life.*

CLIMATE AND WEATHER (in part)

S.H.St. S. Henry Steinberg (d. 1969). *Editor, The Statesman's Year-Book, 1946-69. Author of The Thirty Years' War and the Conflict for European Hegemony, 1600-1660 and others.*

EUROPE (in part)

WALLENSTEIN, ALBRECHT WENZEL
EUSEBIUS VON, HERZOG VON
FRIEDLAND (Micropædia)

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MONGOLIA (in part)

S.H.W. Stanley H. Weitzman. *Curator of Fishes, Division of Fishes, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Author of numerous articles on fishes.*

FISHES (in part)

S.I.B. Solomon Ilich Bruk. *Deputy Director, Institute of Ethnography, Academy of Sciences of the U.S.S.R., Moscow. Coauthor and editor of Ethnographic Maps of Asian Countries.*

ASIA (in part)

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

S.I.F. Stanley I. Fischler. *Broadcaster, Sports Channel TV, New York City. Columnist, The Hockey News. Coauthor of The Hockey Encyclopedia; Everybody's Hockey Book.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

Si.L. Sione Lātūkefu. *Departmental Visitor, Department of Pacific and Southeast Asian History, Research School of Pacific Studies, Australian National University, Canberra. Author of Church and State in Tonga.*

PACIFIC ISLANDS (in part)

Si.T. Sidney Thomas. *Professor of Fine Arts, Syracuse University, New York. Editor of Images of Man; coeditor of The Nature of Art.*

ARTS, PRACTICE AND PROFESSION OF THE (in part)

S.J. de L. Sigfried Jan de Laet. *Former Professor of Archaeology, State University of Ghent. Author of The Low Countries and others.*

LOW COUNTRIES, THE (in part)

S.J.K.B. Samuel John Kenneth Baker. *Emeritus Professor of Geography, Makerere University, Kampala, Uganda. Honorary Lecturer in Geography, University of Leicester, England, 1968-74.*

AFRICA (in part)

S.J.S. Stanford Jay Shaw. *Professor of History, University of California, Los Angeles. Editor in Chief, International Journal of Middle East Studies. Author of History of the Ottoman Empire and Modern Turkey and others.*

TURKEY AND ANCIENT ANATOLIA (in part)

S.K. Shinzo Kiuchi. *Emeritus Professor of Geography, University of Tokyo. Coeditor of Japanese Cities.*

ŌSAKA-KŌBE METROPOLITAN AREA (in part)

TOKYO-YOKOHAMA METROPOLITAN AREA

S.Ka. Sidney Karin. *Director, San Diego Supercomputer Center, California. Coauthor of The Supercomputer Era.*

S.Kh. Stella Kramrisch. *Curator, Indian and Himalayan Art, Philadelphia Museum of Art. Professor of Indian Art, Institute of Fine Arts, New York University, New York City. Author of The Hindu Temple; Unknown India; The Art of Nepal; and others.*

S.K.S. Sylvester K. Stevens (d. 1974). *Executive Director, Pennsylvania Historical and Museum Commission, Harrisburg, 1956-72. Author of Pennsylvania: Birthplace of a Nation.*

S.La. Sylvia Dorothy Lawler, M.D. *Professor of Human Genetics, Institute of*

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BLOOD (in part)

S.L.D. S. Lawrence Dingman. *Professor of Water Resources, University of New Hampshire, Durham.*

ICE AND ICE FORMATIONS (in part)

S.Lr. Samuel Leiter. *Former Seminary Professor of Hebrew Literature, Jewish Theological Seminary of America, New York City. Editor of Selected Stories of S.Y. Agnon.*

HEBREW LITERATURE (in part)

S.L.R. Stanley L. Robbins, M.D. *Visiting Professor of Pathology, Harvard University. Senior Pathologist, Brigham and Womens Hospital, Boston. Author of Pathologic Basis of Disease and others.*

DISEASE (in part)

S.L.S. Shao L. Soo. *Professor of Mechanical Engineering, University of Illinois, Urbana. Author of Fluid Dynamics of Multiphase Systems.*

ENERGY CONVERSION (in part)

S.L.Sm. Sigmund L. Smith. *Emeritus Professor of Metallurgical Engineering, University of Arizona, Tucson. Author of Ore Microscopy.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

S.M. Sonia Moore. *Founder and President, American Center for Stanislavski Theatre Art, Inc., New York City. Founder and Artistic Director, American Stanislavski Theatre. Author of Training an Actor: The Stanislavski System in Class; The Stanislavski System.*

STANISLAVSKY, KONSTANTIN (Micropædia)

S.Ma. Sibyl Marcuse. *Curator, Yale University Collection of Musical Instruments, 1952-60. Author of Musical Instruments: A Comprehensive Dictionary; A Survey of Musical Instruments.*

MUSICAL INSTRUMENTS (in part)

S.M.B. Surinder M. Bhardwaj. *Professor of Geography, Kent State University, Ohio.*

ASIA (in part)

S.McD. Sheila D. McDonough. *Professor of Religion, Sir George Williams University, Montreal. Author of Muhammad Ali Jinnah, Maker of Modern Pakistan and others.*

IQBĀL, SIR MUḤAMMAD (Micropædia)

S.McG. Sharon McGrayne. *Science writer; former journalist.*

ATOMS (in part)

S.M.Ci. Sima M. Ćirković. *Professor of the Medieval History of Yugoslavia, University of Belgrade. Author of Duke Stefan Vukčić Kosača and His Time; Istorija srednjovekovne bosanske države.*

S.M.Co. Sonia M. Cole (d. 1982). *Associate of the British Museum*

(*Natural History*). Author of *The Prehistory of East Africa*; *Leakey's Luck*; and others.

AFRICA (in part)

S.M.D. Stephanie Mary Dalley. Independent researcher. Contributor to *Iraq* (journal).

SARGON (AKKAD) (Micropædia)

S.M.G. Stanley M. Garn. Professor of Human Nutrition and of Anthropology; Fellow of the Center for Human Growth and Development, University of Michigan, Ann Arbor. Author of *Human Races*.

EVOLUTION, HUMAN (in part)

S.M.H. Sigismund M. Herschdoerfer. Consultant and former Chief Chemist and Quality Controller, T. Wall & Sons Ltd. (ice cream), London. Editor of *Quality Control in the Food Industry*.

FOOD PROCESSING (in part)

S.Mi. Sandra Millikin. Free-lance architectural historian. Lecturer in the History of Art, Open University, Walton, England. 1971-73.

ADAM, ROBERT (Micropædia)

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

S.M.I. S.M. Ikram (d. 1973). Director, Institute of Islamic Culture, Lahore, Pakistan. Author of *History of Muslim Civilisation in India and Pakistan* and others.

AHMAD KHAN, SIR SAYYID (Micropædia)

S.M.M. Sidnie M. Manton (d. 1979). Reader in Zoology, King's College, University of London, 1949-60.

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

S.Mo. Sitanshu Mookerjee. President, Indian Institute of Geography. Principal, Morris College, Nagpur University, India.

INDIA (in part)

S.M.R. Sidney Martin Robbins. Chase Manhattan Professor Emeritus of Financial Institutions, Columbia University. Author of *Securities Markets* and others.

MARKETS (in part)

S.M.S. Shekou M. Sesay. Deputy Secretary-General, Mano River Union, Freetown, Sierra Leone. Coauthor of *Sierra Leone in Maps*.

WESTERN AFRICA (in part)

S.M.Sn. Samuel Miklos Stern (d. 1969). Fellow of All Souls College, University of Oxford, 1957-69. Author of *Les Chansons mozarabes*; *Fatimid Decrees*; and others.

COINS AND COINAGE (in part)

S.M.Sz. S.M. Sze. Member of the technical staff, AT&T Bell Laboratories, Murray Hill, New Jersey. Author of *Physics of Semiconductor Devices*.

ELECTRONICS (in part)

S.N.B. Steven N. Blair. Director, Epidemiology, Institute for Aerobics Research, The Aerobics Center, Dallas, Texas. Chair of the editorial committee,

Guidelines for Exercise Testing and Prescription.

EXERCISE AND PHYSICAL CONDITIONING (in part)

S.N.M. S.N. Mukerji. Director, Centre for Advanced Studies in Education, 1962-65; Dean, Faculty of Education, Maharaja Sayajirao University of Baroda, India, 1949-65. Author of *History of Education in India*.

EDUCATION, HISTORY OF (in part)

S.N.R. Sergey Nikolayevich Ryazantsev (d. 1980). Professor of Economic Geography, Moscow Oblast Pedagogical Institute. Author of *Kirgizskaya S.S.R. and many others*.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

S.N.W. S. Nicholas Woodward. Fellow, Templeton College—the Oxford Centre for Management Studies, University of Oxford. Coauthor of *Finance for Managers*.

BUSINESS ORGANIZATION (in part)

So.T. Sol Tax. Emeritus Professor of Anthropology, University of Chicago. Director, Center for the Study of Man, Smithsonian Institution, Washington, D.C., 1968-76. Editor, *Current Anthropology*, 1957-74. Authority noted for his work in American Indian ethnology and in the theory of social anthropology.

BOAS, FRANZ (Micropædia)

S.P. Simeon Potter (d. 1976). Bains Professor of English Language and Philology, University of Liverpool, 1945-65. Author of *Our Language*; *Changing English*; and others.

LANGUAGES OF THE WORLD (in part)

S.P.A. Sara P. Anastaplo. Researcher. Author of *Alexander The Great*; *King of Asia*.

GREECE (in part)

S.P.C. Shiba P. Chatterjee. Emeritus Professor of Geography, University of Calcutta. Author of *Physiography of India and others*; editor of *Selected Papers of the 21st International Geographical Congress*, vol. 1-4.

ASIA (in part)

INDIA (in part)

S.P.D. Stephen Porter Dunn. Director of Research, Highgate Road Social Science Research Station, Inc., Berkeley, California. Coauthor of *The Peasants of Central Russia*.

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

S.Pi. Shlomo Pines. Former Professor of General and Jewish Philosophy, Hebrew University of Jerusalem. Author of *Scholasticism after Thomas Aquinas* and *The Teachings of Hasdai Crescas* and his Predecessors; translator of *Maimonides' Guide of the Perplexed*.

JUDAISM (in part)

S.P.J. S. Paul Johnston (d. 1985). Director, National Air and Space Museum, Smithsonian Institution,

Washington, D.C., 1964-69. Author of *Horizons Unlimited* and others.

SIKORSKY, IGOR (Micropædia)

TRANSPORTATION (in part)

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SOUTHERN AFRICA (in part)

S.P.L. Stephen P. Ladas (d. 1976). Attorney. Partner, Ladas, Parry, Von Gehr, Goldsmith & Deschamps, New York City. Author of *The International Protection of Industrial Property*.

PROPERTY LAW (in part)

S.P.V. Shanti Prasad Varma. Honorary Director, Institute of Development Studies, Jaipur, India. Former Chairman, Department of Political Science; former Director, South Asia Studies Centre, University of Rajasthan, Jaipur. Author of *A Study of Maratha Diplomacy: Anglo-Maratha Relations, 1772-1783*.

INDIA (in part)

S.R. Sydney Ross. Professor of Colloid Science, Rensselaer Polytechnic Institute, Troy, New York. Coauthor of *On Physical Adsorption*; editor of *The Chemistry and Physics of Interfaces*.

PRIESTLEY, JOSEPH (Micropædia)

S.Ra. Sheila Ralphs. Former Senior Lecturer in Italian, Victoria University of Manchester, England.

ITALIAN LITERATURE (in part)

S.R.M. S. Roy Meadow. Professor and Head, Department of Paediatrics and Child Health, St. James's Hospital, University of Leeds, England. Coauthor of *The Child and His Symptoms* and others.

CHILDHOOD DISEASES AND DISORDERS (in part)

S.Rs. Sir Sydney Roberts (d. 1966). Vice Chancellor, University of Cambridge, 1949-51; Master of Pembroke College, Cambridge, 1948-58. A noted Johnson scholar. Author of *Doctor Johnson*, and others; editor of *Samuel Johnson*, Writer; and many other works on Johnson.

JOHNSON, SAMUEL (in part)

S.R.S. Stuart Reynolds Schram. Professor of Politics, School of Oriental and African Studies, University of London. Author of *Mao Tse-tung*; *Mao Zedong: A Political Reassessment*; and others.

MAO TSE-TUNG

S.R.T. Steven R. Tannenbaum. Professor of Toxicology and Food Chemistry, Massachusetts Institute of Technology, Cambridge. Coeditor of *Single-Cell Protein* and others.

FOOD PROCESSING (in part)

S.R.Ty. Spencer Rowe Titley. Professor of Geology, School of Earth Sciences, University of Arizona, Tucson. Coeditor of *Geology of the Porphyry Copper Deposits: Southwestern North America*.

MINERALS AND ROCKS (in part)

S.S. Sergio Sarmiento. *Editor in Chief, Spanish-language publications, Encyclopædia Britannica Publishers, Inc., Mexico City. Author of Lucubraciones: Ensayos económicos y políticos.*

MEXICO CITY (in part)

S.S.A. Stanislas Spero Adotevi. *Director, Institute of Applied Research, Porto-Novo, Benin. Author of Demain la veille.*

WESTERN AFRICA (in part)

S.S.C. S.S. Chern. *Emeritus Professor of Mathematics, University of California, Berkeley. Author of Complex Manifolds Without Potential Theory.*

GEOMETRY (in part)

S.S.Ch. Sukhdev Singh Chib. *Reader and Head, Geography Department, Directorate of Correspondence Courses, Panjab University, Chandigarh, India. Author of Nineteen Fateful Months: A Socio-economic Study and others.*

INDIA (in part)

S.S.D.J. S.S.D. Jones. *Navigation consultant. Former Head, Navigation and Guidance Division, Royal Aircraft Establishment, Farnborough, England. Author of "Recent Developments in Radio Navigation" in Encyclopaedic Dictionary of Physics.*

NAVIGATION (in part)

S.S.F. Sheppard Sunderland Frere. *Emeritus Professor of the Archaeology of the Roman Empire, University of Oxford. Author of Britannia: A History of Roman Britain and others.*

UNITED KINGDOM (in part)

S.S.H. Syed Sajjad Husain. *Professor of English, Umm al-Qūrah University, Mecca, 1975-85. Vice-Chancellor, University of Rājshāhi, Bangladesh, 1969-71. Author of Descriptive Catalogue of Bengali Manuscripts.*

BANGLADESH (in part)

S.Si. Sinnathurai Sivasubramaniam. *Senior Lecturer in Agronomy, Eastern University, Chenkaladi, Sri Lanka. Project Coordinator, Agricultural Research Project, Tea Research Institute of Sri Lanka, Talawakelle, 1988.*

BEVERAGE PRODUCTION (in part)

S.Sk. Stephan Skalweit. *Professor of Modern History, Rhenish Friedrich Wilhelm University of Bonn. Author of Frankreich und Friedrich der Grosse.*

FREDERICK WILLIAM (BRANDENBURG) (Micropædia)

GERMANY (in part)

S.Sm. Stephen Smale. *Professor of Mathematics, University of California, Berkeley. Coeditor of Global Analysis.*

ANALYSIS (IN MATHEMATICS)

(in part)

S.Sp. The Rev. Sidney Spencer (deceased). *Minister, Bath and Trowbridge Unitarian Churches, England. Principal of Manchester College, University of Oxford, 1951-56. Author of Mysticism in World Religion.*

CHRISTIANITY (in part)

S.St. Sewell Stokes (d. 1979). *Author and dramatist. Author of Isadora: An Intimate Portrait and others.*

DUNCAN, ISADORA (Micropædia)

S.T. Stith Thompson (d. 1976). *Distinguished Service Professor of English and Folklore, Indiana University, Bloomington, 1953-55. Author of Motif-Index of Folk-Literature, 6 vol; The Folktale; and others.*

FOLK ARTS (in part)

S.Ta. Shin'ichi Tani. *Professor of the History of Japanese Art, Kyōritsu Women's University, Tokyo. Author of Muromachi-jidai bijutsushiron ("A Study on Arts of the Muromachi Period"); Bijutsushi ("History of Japanese Art").*

EAST ASIAN ARTS (in part)

S.Th. Sigurdur Thorarinsson. *Professor and Director, Division of Geosciences, Science Institute, University of Iceland, Reykjavik.*

ICELAND (in part)

S.Tr. Stanley Trapido. *Lecturer in the Government of New States, University of Oxford.*

SOUTHERN AFRICA (in part)

S.V.G. Stephen Vincent Grancsay (d. 1980). *Curator of Arms and Armor, Metropolitan Museum of Art, New York City, 1929-64. Author of classic studies on arms and metalwork.*

DECORATIVE ARTS AND FURNISHINGS (in part)

S.V.U. Sergei Vasilievich Utechin. *Former Professor of Russian History, Pennsylvania State University, University Park. Author of Everyman's Concise Encyclopædia of Russia and others.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

S.W.B. Salo Wittmayer Baron. *Emeritus Professor of Jewish History, Literature, and Institutions, Columbia University. Author of A Social and Religious History of the Jews.*

JUDAISM (in part)

S.We. Stanley Weintraub. *Research Professor of English; Director, Institute for the Arts and Humanistic Studies, Pennsylvania State University, University Park. Author of Private Shaw and Public Shaw; A Dual Portrait of Lawrence of Arabia and G.B.S.; editor of Shaw: An Autobiography; coeditor of Evolution of a Revolt: Early Postwar Writings of T.E. Lawrence.*

LAWRENCE, T.E. (in part) (Micropædia)

S.W.F. Sidney W. Fox. *Director, Institute for Molecular and Cellular Evolution; Research Professor, University of Miami, Coral Gables. Coauthor of Molecular Evolution and the Origin of Life.*

OPARIN, ALEKSANDR IVANOVICH (Micropædia)

S.W.Fi. Shirley W. Fischler. *Adjunct Lecturer in Journalism, Columbia University. Coauthor of The Hockey Encyclopedia; Everybody's Hockey Book.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

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CIRCULATION AND CIRCULATORY SYSTEMS (in part)

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CHEMICAL ELEMENTS (in part)

S.W.R. Stephen Wentworth Roskill (d. 1982). *Captain, Royal Navy. Official Naval Historian, Cabinet Office of the United Kingdom, 1949-60. Author of The War at Sea, 1939-1945 (4 vol.).*

WAR, THE THEORY AND CONDUCT OF (in part)

S.Y.C. Shou Yi Chen (d. 1978). *Professor of Chinese Culture, Pomona College, Claremont, California, 1941-67. Author of Chinese Literature: A Historical Introduction.*

CHINESE LITERATURE (in part)

S.-y.H. Shan-yüan Hsieh. *Former Assistant Professor of Philosophy, Haverford College, Pennsylvania.*

TSENG KUO-FAN (Micropædia)

S.Z.L. Sid Z. Leiman. *Professor of Jewish History and Literature; Chairman, Department of Judaic Studies, Brooklyn College, City University of New York.*

BA'AL SHEM TOV (in part) (Micropædia)

JUDAISM (in part)

T.A.J. Thomas Athol Joyce (d. 1942). *Subkeeper, Department of Ethnography, British Museum, London, 1902-38.*

SOUTH AMERICA (in part)

T.A.S. Thomas A. Schafer. *Professor of Church History, McCormick Theological Seminary, Chicago.*

EDWARDS, JONATHAN (Micropædia)

T.B.B. Thomas B. Bottomore. *Professor of Sociology, University of Sussex, Brighton, England. Author of Classes in Modern Society; Elites and Society.*

SOCIAL DIFFERENTIATION (in part)

T.B.H. Thomas B. Hinton (d. 1976). *Associate Professor of Anthropology, University of Arizona, Tucson. Author of A Survey of Indian Assimilation in Eastern Sonora.*

AMERICAN INDIANS (in part)

T.B.S. Theodore B. Schwartz, M.D. *Clinical Professor of Medicine, University of Washington, Seattle. Editor, Year Book of Endocrinology, 1964-86.*

ENDOCRINE SYSTEMS (in part)

T.B.T. Terence Barrington Thomas. *Director, Gladding International Ltd. Angling correspondent, The Field, and others. Presenter of "Angling Today," Associated Television, Birmingham, England. Author of Casting.*

FISHING (in part) (Micropædia)

T.C. Theresa Clay. *Former Senior Principal Scientific Officer, Department of Entomology, British Museum (Natural History), London.*

INSECTS (in part)

T.C.M. Terence Croft Mitchell. *Deputy Keeper, Department of Western Asiatic Antiquities, British Museum, London.*

HISTORY, THE STUDY OF (in part)

T.C.O. Tobias Chant Owen. *Professor of Astronomy, State University of New York at Stony Brook. Coauthor of The Search for Life in the Universe.*

SOLAR SYSTEM, THE (in part)

T.C.P. Thomas C. Patterson. *Professor of Anthropology, Temple University, Philadelphia. Author of Pattern and Process in the Early Intermediate Period Pottery of the Central Coast of Peru and others.*

PRE-COLUMBIAN CIVILIZATIONS (in part)

T.Cr. The Rev. Theodore Crowley, O.F.M. *Emeritus Professor of Scholastic Philosophy, Queen's University of Belfast, Northern Ireland. Author of Roger Bacon: The Problem of the Soul in His Philosophical Commentaries.*

BACON, ROGER (Micropædia)

T.C.R. Thomas C. Reeves. *Professor of History, University of Wisconsin, Parkside. Author of Freedom and the Foundation: The Fund for the Republic in the Era of McCarthyism.*

EISENHOWER, DWIGHT D. (Micropædia)

T.C.S. Thomas Clark Shedd. *Editorial Director, Modern Railroads, Park Ridge, Illinois.*

TRANSPORTATION (in part)

T.C.W. T. Carroll Wilson. *Director, Hills Bros. Coffee, Inc., San Francisco, 1964-68; Vice-President, 1945-66. Author of The Art of Coffee Making.*

BEVERAGE PRODUCTION (in part)

T.C.Y., Jr. T. Cuyler Young, Jr. *Curator, West Asian Department, Royal Ontario Museum, Toronto. Professor of Near Eastern Studies, University of Toronto. Author of "A Comparative Ceramic Chronology for Western Iran, 1500-500 B.C." in Iran.*

IRAN (in part)

T.D. Theodosius Dobzhansky (d. 1975). *Professor of Biology, Rockefeller University, New York City, 1962-71. Adjunct Professor of Genetics, University of California, Davis, 1971-75. Author of Mankind Evolving; Genetics of the Evolutionary Process; author of numerous papers on evolutionary genetics.*

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

T.d.A. The Rev. Tarsicio de Azcona. *Former Professor of Theology, University of Navarre, Pamplona, Spain. Author of Isabel la Católica.*

FERDINAND II (SPAIN: ARAGON) (Micropædia)

T.E.A. Thomas Edward Allibone. *External Professor Emeritus of Electrical Engineering, University of Leeds,*

England. Robert Kitchin Research Professor of Physics, City University, London. Director, Research Laboratory, Associated Electrical Industries, Aldermaston, England, 1946-63. Author of The Release and Use of Nuclear Energy and others.

RUTHERFORD

T.E.Ar. T.E. Armstrong. *Emeritus Reader in Arctic Studies, Scott Polar Research Institute, University of Cambridge.*

ARCTIC, THE (in part)

T.E.G. T.E. Gudava. *Professor of Linguistics, Tbilisi State University, Georgian S.S.R.*

LANGUAGES OF THE WORLD (in part)

T.E.Je. Thomas Edmund Jessop (d. 1980). *Ferens Professor of Philosophy, University of Hull, England, 1928-61. Editor of Bibliography of David Hume and of Scottish Philosophy.*

HUME (in part)

Te.K. Terrence Kaufman. *Associate Professor of Anthropology, University of Pittsburgh. Author of Tzeltal Phonology and Morphology.*

LANGUAGES OF THE WORLD (in part)

T.E.K. Thomas Edward Keys. *Emeritus Professor of the History of Medicine, Mayo Graduate School of Medicine, University of Minnesota, Rochester. Emeritus Librarian, Mayo Foundation. Author of The History of Surgical Anesthesia.*

MAYO FAMILY (Micropædia)

T.E.O'T. Thomas E. O'Toole. *Assistant Professor of Interdisciplinary Studies, St. Cloud State University, Minnesota. Author of Historical Dictionary of Guinea.*

WESTERN AFRICA (in part)

T.F.B. Thomas F. Budinger, M.D. *Professor of Research Medicine, Donner Laboratory, Lawrence Berkeley Laboratory; Professor of Bioinstrumentation, University of California, Berkeley. Operations Officer, International Ice Patrol, 1959-60.*

ICE AND ICE FORMATIONS (in part)

T.F.McG. Thomas F. McGann. (deceased). *Professor of History, University of Texas at Austin. Author of Argentina, the Divided Land; Argentina, the United States, and the Inter-American System, 1880-1914.*

PERÓN, JUAN (in part) (Micropædia)

T.F.T. Thomas Frederick Tout (d. 1929). *President, Royal Historical Society, 1925-28. Professor of History, Victoria University of Manchester, 1890-1925. Author of Edward the First; The Place of the Reign of Edward II in English History; and others.*

EDWARD III (ENGLAND AND GREAT BRITAIN) (in part) (Micropædia)

T.G. Sir Tyrone Guthrie (d. 1971). *Theatrical director. Chancellor, Queen's University of Belfast, Northern Ireland, 1963-70. Author of A Life in the Theatre; New Theatre; and others.*

THEATRE, THE ART OF THE (in part)

T.G.B. Thomas G. Benedek, M.D. *Chief, Outpatient Department and Rheumatology Section, Veterans Administration Hospital, Pittsburgh. Professor of Medicine, University of Pittsburgh.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

T.G.H.J. Thomas Garnet Henry James. *Keeper, Department of Egyptian Antiquities, British Museum, London. Editor of The Hekanakhte Papers, and Other Middle Kingdom Documents.*

EGYPTIAN ARTS AND ARCHITECTURE, ANCIENT

T.G.Ms. Thomas G. Mathews. *Secretary General, Association of Caribbean Universities and Research Institutes, San Juan, Puerto Rico. Research Professor of History, University of Puerto Rico, 1969-80.*

WEST INDIES, THE (in part)

T.G.P.S. T.G. Percival Spear (d. 1982). *Fellow of Selwyn College, Cambridge; Lecturer in History, University of Cambridge, 1963-69. Author of India: A Modern History and others; coauthor and editor of Oxford History of India (3rd ed.).*

AURANGZEB (Micropædia)

BĀBUR (Micropædia)

CLIVE, ROBERT, 1ST BARON CLIVE OF PLASSEY (Micropædia)

INDIA (in part)

T.Gr. Theodore C. Grame. *President, Study Center of American Musical Pluralism, Tarpon Springs, Florida. Author of Folk Music; America's Ethnic Music.*

MUSICAL INSTRUMENTS (in part)

T.H. Thomas Herdman (d. 1970). *Senior Lecturer in Geography and Education, Training College, Dudley, England. Author of Geography for To-Day—the World and others.*

GERMANY (in part)

T.H.B. Thornton Howard Bridgewater. *Chief Engineer, Television, British Broadcasting Corporation, 1962-68.*

BROADCASTING (in part)

T.H.C. Theodore Hsi-en Chen. *Emeritus Professor of Education and Asian Studies, University of Southern California, Los Angeles. Author of Maoist Educational Revolution.*

EDUCATION, HISTORY OF (in part)

T.H.D. Tulio Halperin Donghi. *Professor of History, University of California, Berkeley. Author of Historia contemporánea de América Latina and others.*

ARGENTINA (in part)

T.H.E. Thomas H. Everett (d. 1986). *Director of Horticulture, New York Botanical Garden, Bronx. Author of Living Trees of the World.*

TREES (in part)

T.H.G. Theodor H. Gaster. *Emeritus Professor of Religion, Barnard College,*

Columbia University. *Author of Myth, Legend, and Custom in the Old Testament; Thespis: Ritual, Myth, and Drama in the Ancient Near East.*
JUDAISM (in part)

Th.H. **Thor Heyerdahl.** *Member, Norwegian Academy of Science and Letters, Oslo. Organizer and leader of Norwegian Archaeological Expedition to Easter Island and the East Pacific, 1955–56, and many other expeditions. Author of Aku-Aku: The Secret of Easter Island; The Kon-Tiki Expedition.*
PACIFIC ISLANDS (in part)

Th.Ho. **Thomas Howarth.** *Emeritus Professor of Architecture, University of Toronto.*
TORONTO

Th.M. **Thomas Munro** (d. 1974). *Curator of Education, Cleveland Museum of Art, 1931–67. Professor of Art, Case Western Reserve University, Cleveland. Author of The Arts and Their Interrelations and others.*
AESTHETICS (in part)

ARTS, CLASSIFICATION OF THE

T.Hn. **Tom Harrisson** (d. 1976). *Government Ethnologist and Curator, Sarawak Museum, 1947–66. Author of The Malays of Sarawak and others.*
EAST INDIES, THE (in part)
SOUTHEAST ASIA, MAINLAND (in part)

T.Ho. **Thomas Hodgkin** (d. 1982). *Writer. Fellow of Balliol College, Oxford; Lecturer in the Government of New States, University of Oxford, 1965–70. Author of Nationalism in Colonial Africa and others.*
USMAN DAN FODIO (Micropædia)

T.Hor. **Theodore Hornberger** (d. 1975). *John Welsh Centennial Professor of History and English Literature, University of Pennsylvania, Philadelphia, 1968–75. Author of Benjamin Franklin.*
FRANKLIN (in part)

T.H.v.A. **Tjeerd H. van Andel.** *Wayne Loel Professor of Earth Sciences, Stanford University, California. Author of New Views on an Old Planet: Continental Drift and the History of the Earth.*
PLATE TECTONICS

Th.V.G. **Thomas V. Gamkrelidze.** *Director, Oriental Institute, Academy of Sciences of the Georgian S.S.R., Tbilisi. Author of Sibilant Correspondences and Some Questions of the Ancient Structure of the Kartvelian Languages; coauthor of The System of Sonants and Ablaut in the Kartvelian Languages.*
LANGUAGES OF THE WORLD (in part)

T.I. **Toshihiko Izutsu.** *Professor of Islāmic Studies, McGill University, Montreal, 1969–75. Author of A Comparative Study of the Key Philosophical Concepts in Sufism and Taoism.*
IBN AL'ARABĪ (Micropædia)

T.Jc. **Takashi Ichiye.** *Professor of Oceanography, Texas A & M University, College Station.*
EKMAN, V. WALFRID (Micropædia)

T.Io. **Teiji Ichiko.** *Former Director General, National Institute of Japanese Literature, Tokyo. Author of History of Japanese Literature and others.*
LITERATURE, THE ART OF (in part)

T.J. **Thorkild Jacobsen.** *Emeritus Professor of Assyriology, Harvard University. Author of The Sumerian Kinglist; "Mesopotamia" in The Intellectual History of Ancient Man; and others.*
MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

T.J.B. **Trent J. Bertrand.** *Professor of Economics, State University of New York at Binghamton. Senior Economist, World Bank, Washington, D.C.*
INTERNATIONAL TRADE (in part)

T.J.Br. **T. Julian Brown.** *Professor of Palaeography, University of London. Coauthor of Codex Lindisfarnensis.*
WRITING (in part)

T.J.C. **Theodore John Cadoux.** *Senior Lecturer in Ancient History, University of Edinburgh.*
CIMON (Micropædia)
SOLON (Micropædia)

T.J.Co. **Timothy John Connell.** *Senior Lecturer in Hispanic Studies, Ealing College of Higher Education, London. Coauthor of Spain after Franco.*
BARCELONA
MADRID (in part)

T.J.H. **Theo Jozef Hermans.** *Lecturer in Dutch, University College, University of London. Author of The Structure of Modernist Poetry.*
BELGIAN LITERATURE (in part)
BRUSSELS (in part)

T.Jn. **Thorkell Jóhannesson** (deceased). *Professor of Icelandic History, University of Iceland, Reykjavik.*
ICELAND (in part)

T.Jo. **Thomas Jones** (d. 1972). *Professor of Welsh Language and Literature, University College of Wales, Aberystwyth, University of Wales, 1952–70. Editor of Brut y Tywysogion; cotranslator of The Mabinogion.*
CELTIC LITERATURE (in part)

T.Ka. **Thomas Kamanzi.** *Research Assistant, National Institute of Scientific Research, Butare, Rwanda. Lecturer, National University of Rwanda, Butare. Coauthor of Récits historiques Rwanda.*
CENTRAL AFRICA (in part)

T.K.B. **T. Keilor Bentley.** *Director, Owens Art Gallery, Mount Allison University, Sackville, New Brunswick. Superintendent, Alexander Graham Bell Museum, Baddeck, Nova Scotia, 1959–64.*
BELL, ALEXANDER GRAHAM (Micropædia)

T.Ke. **Tom Kemp.** *Reader in Economic History, University of Hull, England. Author of Economic Forces in French History and others.*
EUROPE (in part)

T.K.F. **Thea K. Flaum.** *Producer, WTTW (public television), Chicago.*

Former Editor, Urban Research Corporation, Chicago.

UNITED STATES OF AMERICA (in part)

T.Kh. **Tarif Khalidi.** *Associate Professor of History and Archaeology, American University of Beirut.*
'ABD AL-MALIK (Micropædia)
'ABD AR-RAḤMĀN III (Micropædia)

T.Kl. **Tibor Klaniczay.** *Assistant Director, Institute for the History of Literature, Hungarian Academy of Sciences, Budapest.*
HUNGARIAN LITERATURE (in part)

T.Ku. **Tadachika Kuwata.** *Emeritus Professor of Japanese History, Kokugakuin University, Tokyo. Author of Toyotomi Hideyoshi and others.*
TOYOTOMI HIDEYOSHI (Micropædia)

T.Ky. **Thin Kyi.** *Emeritus Professor of Geography, University of Rangoon. Author of Geography of Burma; Rangoon.*
RANGOON (in part)

T.K.Z. **Tatyana Konstantinovna Zakharova.** *Senior Science Editor, Sovetskaya entsiklopediya (publishing house).*
ASIA (in part)

T.L.K. **Thomas L. Karnes.** *Professor of History, Arizona State University, Tempe. Author of Failure of Union: Central America, 1824–1975 and others.*
CENTRAL AMERICA (in part)

T.L.L. **Thomas L. Lentz, M.D.** *Associate Professor of Cell Biology, School of Medicine, Yale University, New Haven, Connecticut. Author of Primitive Nervous Systems.*
NERVES AND NERVOUS SYSTEMS (in part)

T.L.Pe. **Troy L. Péwé.** *Professor of Geology, Arizona State University, Tempe. Chairman, Fourth International Conference on Permafrost, National Academy of Sciences. An authority on the geomorphology of polar regions. Editor of The Periglacial Environment: Past and Present.*
ICE AND ICE FORMATIONS (in part)

T.L.S. **T. Lynn Smith** (d. 1976). *Graduate Research Professor of Sociology, University of Florida, Gainesville, 1959–74. Author of Brazil: People and Institutions; Latin American Population Studies; and others.*
BRAZIL (in part)
URUGUAY (in part)

T.M. **Tatsuro Matsumoto.** *Emeritus Professor of Geology (Stratigraphy), Kyūshū University, Fukuoka, Japan. Authority on the Mesozoic history of Asia. Coauthor and editor of Historical Geology.*
GEOCHRONOLOGY (in part)

T.M.D. **Thomas M. Davies, Jr.** *Professor of History; Chairman of Latin American Studies; Director, Center for Latin American Studies, San Diego State University, California. Author of Indian Integration in Peru: A Half Century of Experience, 1900–1948.*
PERU (in part)

T.M.K. Sir T. Malcolm Knox (d. 1980). *Principal of the University of St. Andrews, Scotland, 1953–66. Translator of Hegel's Political Writings, Early Theological Writings, and Aesthetics.*
HEGELIANISM, HEGEL AND (in part)

T.Mo. Therald Moeller. *Professor of Chemistry, Arizona State University, Tempe. Author of Inorganic Chemistry: A Modern Introduction.*

CHEMICAL ELEMENTS (in part)

T.N.B. Thomas N. Bisson. *Professor of History, University of California, Berkeley. Author of Assemblies and Representation in Languedoc in the Thirteenth Century.*

FRANCE (in part)

T.O.M. Thomas Ollive Mabbott (d. 1968). *Professor of English, Hunter College, City University of New York, 1946–66. Editor of Complete Works of Poe.*

POE, EDGAR ALLAN (in part)
(Micropædia)

T.O'R. Tarlach O'Raiheartaigh. *Chairman, Cultural Relations Committee, Dublin. Editor of Genealogical Tracts I.*

PATRICK, SAINT (Micropædia)

T.O.S. Thomas O. Sloane. *Professor of Rhetoric, University of California, Berkeley. Author of Donne, Milton, and the End of Humanist Rhetoric; coeditor The Rhetoric of Renaissance Poetry.*
RHETORIC (in part)

To.Ya. Tasaburo Yamada. *Senior Advisor, Japan Atomic Industrial Forum, Inc., Tokyo. Author of Nuclear Power Generation.*

ENERGY CONVERSION (in part)

T.P. Tatiana Proskouriakoff (d. 1985). *Curator of Maya Art, Peabody Museum, Harvard University. Staff member, Carnegie Institution of Washington, D.C., 1939–58. Author of An Album of Maya Architecture.*

CALENDAR (in part)

T.Po. Tom Pocock. *Staff writer, The Standard, London. Author of Nelson and His World; Remember Nelson.*

NELSON, HORATIO NELSON, VISCOUNT (in part) (Micropædia)

T.P.v.B. Theodorus P. van Baaren. *Former Professor of Science of Religions, State University of Groningen, The Netherlands. Author of Menschen wie wir and others.*

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

T.R.H. Theodore R. Higgins. *Director of Engineering and Research, American Institute of Steel Construction, New York City, 1943–69. Editor of AISC Standard Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.*

BUILDING CONSTRUCTION (in part)

T.R.T. Thomas R. Tregear. *Warden, Woodbrooke College, Selly Oak,*

Birmingham, England, 1959–63. Lecturer in Geography, University of Hong Kong, 1951–59. Author of A Geography of China and others.

CHINA (in part)

T.S. Tadao Sato. *Writer. Chairman, Japan Film P.E.N. Club. Author of Kurosawa Akira no sekai and others.*
KUROSAWA AKIRA (Micropædia)

T.Sa. Taro Sakamoto. *Historian. Emeritus Professor, University of Tokyo. Author of History of Japan and others.*
JAPAN (in part)

T.S.Bu. Thomas S. Buechner. *President, Corning Museum of Glass, Corning, New York; Director, 1951–60. Chairman, Corning Glass Works Foundation and Steuben Glass, Inc. Author of Guide to the Collections of the Corning Museum of Glass and others.*
DECORATIVE ARTS AND FURNISHINGS (in part)

T.S.H. Theodore S. Hamerow. *Professor of History, University of Wisconsin, Madison. Author of The Social Foundations of German Unification, 1858–71 and others.*
GERMANY (in part)

T.S.McL. Thomas S. McLeod. *Former Director of Design Technology, Plessey Company Ltd., Ilford, England. Author of Management of Research Development and Design in Industry.*
INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)

T.Sp. Terence John Bew Spencer (d. 1978). *Professor of English Language and Literature, 1958–78; Director, Shakespeare Institute, 1961–78, University of Birmingham, England. General Editor, The New Penguin Shakespeare and the Penguin Shakespeare Library, 1964–78. Author of The Tyranny of Shakespeare; Shakespeare: The Roman Plays.*
SHAKESPEARE (in part)

T.T. Takeshi Toyoda. *Historian. Professor, Tohoku University, Sendai, Japan, and Hōsei University, Tokyo. Author of A History of Pre-Meiji Commerce in Japan and others.*
JAPAN (in part)

T.-t.C. Tse-tsung Chow. *Professor of East Asian Languages, Literature, and History, University of Wisconsin, Madison. Author of The May Fourth Movement: Intellectual Revolution in Modern China and others.*
CH'EN TU-HSIU (Micropædia)

T.T.M. T.T. Macan. *Former Naturalist, Freshwater Biological Association, Windermere Laboratory, Ambleside, England. Author of Freshwater Ecology.*
ECOSYSTEMS (in part)

T.T.P. Theodore Thomas Puck. *Director, Eleanor Roosevelt Institute for Cancer Research; Professor of Biochemistry, Biophysics, and Genetics, University of Colorado Health Sciences Center, Denver. Author of The Mammalian Cell as a Microorganism:*

Genetic and Biochemical Studies in Vitro.

TISSUE CULTURE (in part)

T.T.R. Tamara Talbot Rice. *Author of Ancient Arts of Central Asia; The Scythians; Russian Art; and others.*
CENTRAL ASIAN ARTS (in part)
EUROPE (in part)

T.V.W. Turrell V. Wylie (d. 1984). *Professor of Tibetan Studies, University of Washington, Seattle, 1972–84. Author of The Geography of Tibet According to the 'Dzam-gling-rgyas-bshad.*
CENTRAL ASIAN ARTS (in part)
CHINA (in part)

T.W. Thomas M. Woodard. *Writer and researcher. Instructor in Classics, Princeton University, 1962–64. Editor of Sophocles: A Collection of Critical Essays.*
GREEK DRAMATISTS, THE CLASSICAL (in part)

T.W.B. Thomas W. Burns, M.D. *Director, Cosmopolitan International Diabetes Center, Columbia, Mo. Professor of Medicine; Director, Division of Endocrinology and Metabolism, University of Missouri, Columbia. Author of Endocrine Lecture Syllabus.*
ENDOCRINE SYSTEMS (in part)

T.W.D.S. Tsepon W.D. Shakabpa. *Historian. Author of Tibet: A Political History.*
CHINA (in part)

T.We. Thomas Weigend. *Professor of Law, University of Cologne. Author of "Criminal Procedure: Comparative Aspects" in Encyclopedia of Crime and Justice.*
PROCEDURAL LAW (in part)

T.W.J.G. Theodorus W.J. Gadella. *Lecturer in Systematic Botany, Utrecht University, The Netherlands. Author of Cytotaxonomic Studies in the Genus Campanula.*
ANGIOSPERMS (in part)

T.W.-M. Tu Wei-ming. *Professor of Chinese History and Philosophy, Harvard University. Author of Confucian Thought: Selfhood as Creative Transformation and others.*
CONFUCIANISM, CONFUCIUS AND

T.W.W. Thomas W. Whitaker. *Research Associate, University of California, San Diego, at La Jolla. Collaborator, U.S. Department of Agriculture, La Jolla, California; Research Geneticist and Investigations Leader, Plant Science Research Division, Agricultural Research Service, 1961–73. Coauthor of The Cucurbits: Botany, Cultivation and Utilization.*
ANGIOSPERMS (in part)

T.W.Y. Thomas W. Young. *Brewing Science Course Director; Lecturer in Biochemistry, University of Birmingham, England. Coauthor of Halting and Brewing Science.*
BEVERAGE PRODUCTION (in part)

T.Y. Takeo Yamane. *Former Professor of Food Manufacture, Showa Women's*

University, Tokyo. Author of *Cane Sugar Handbook*.

FARMING AND AGRICULTURAL TECHNOLOGY (in part)
FOOD PROCESSING (in part)

T.-y.L. Tien-yi Li. *Mershon Professor of Chinese Literature and History, Ohio State University, Columbus. Editor of Readings in Contemporary Chinese Literature; Chinese Historical Literature.*

CHINESE LITERATURE (in part)

T.Z. Tayar Zavalani (deceased). *Program Assistant, Albanian Section, British Broadcasting Corporation, London.*

ALBANIA (in part)

U.A.U. Urho A. Uotila. *Professor and Chairman, Department of Geodetic Science and Surveying, Ohio State University, Columbus.*

EARTH, THE (in part)

U.B. Ugo Bianchi. *Professor of the History of Religions, University of Rome. Author of Il dualismo religioso; editor of The Origins of Gnosticism.*

RELIGIONS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

U.Ba. Umberto Baldini. *Art historian. Superintendent Director, Central Institute for the Restoration of Works of Art, Rome. Author of Il Rinascimento nell'Italia centrale and others.*

MASACCIO (in part)
(Micropædia)

U.M. Umberto Marcelli. *Lecturer in History, University of Bologna, Italy. Author of Cavour diplomatico.*

CAVOUR, CAMILLO BENSO, CONTE DI (Micropædia)

U.M.D. Ulrich M. Drobni. *Director, Max Planck Institute for Foreign Private and Private International Law, Hamburg. Professor of Law, University of Hamburg. Author of American-German Private International Law and others.*

BUSINESS LAW (in part)
PROCEDURAL LAW (in part)

U.P.B. Ulick Peter Burke. *Lecturer in History, University of Cambridge; Fellow of Emmanuel College, Cambridge. Author of The Renaissance Sense of the Past and others.*

VALLA, LORENZO (Micropædia)

U.P.S. Umakant Premanand Shah. *Former Deputy Director, Oriental Institute, Maharaja Sayajirao University of Baroda, India. Author of Studies in Jaina Art: Akota Bronzes.*

JAINISM

MAHĀVĪRA (in part) (Micropædia)

V.A. Vernon Ahmadjian. *Professor of Botany, Clark University, Worcester, Massachusetts. Author of The Lichen Symbiosis; coeditor of The Lichens.*

PROTOPHYTES (in part)

Va.K. Valdimar Kristinsson. *Editor, Fjarmalatidindi (Financial Times), Central Bank of Iceland, Reykjavik.*

ICELAND (in part)

V.AI. Victor Alba. *Emeritus Professor of Political Science, Kent State University, Ohio. Author of The Mexicans and others.*

ZAPATA, EMILIANO (Micropædia)

V.A.U. Victor Andrade U. *Former Minister of Foreign Affairs of Bolivia. Ambassador of Bolivia to the U.S., 1944-46; 1952-58. Author of Problemas sociales de Bolivia and others.*

BOLIVIA (in part)

V.B. Victor Barna (d. 1972). *World table tennis champion, men's singles, 1930, 1932-35; men's doubles, 1929-35; mixed doubles, 1932, 1935. Author of Table Tennis Today.*

TABLE TENNIS (in part)
(Micropædia)

V.Ba. Vladimir Bakarić (d. 1983). *Member, Council of the Federation, Socialist Federal Republic of Yugoslavia. Vice President of Yugoslavia, 1975-76. Prime Minister of the Socialist Republic of Croatia, 1953-63. Author of Aktuelni problemi sadašnje etape revolucije.*

YUGOSLAVIA (in part)

V.Bi. Victor J.P. Biel. *Attorney at Law, Luxembourg. Author of numerous articles on law.*

LOW COUNTRIES, THE (in part)

V.B.W. Sir Vincent Brian Wigglesworth. *Emeritus Professor of Biology, University of Cambridge; Director, Agricultural Research Council Unit of Insect Physiology, 1943-67. Author of The Principles of Insect Physiology; The Life of Insects.*

INSECTS (in part)

V.B.Z. Viktor Borisovich Zhmuida. *Former Head, Central Asian Section, Council for Research on Productive Forces, U.S.S.R. Planning Committee, Moscow. Author of numerous publications on Turkmen S.S.R.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

V.C. Vincent Cronin. *Free-lance writer. Author of The Flowering of the Renaissance and others.*

SARPI, PAOLO (Micropædia)

V.Ca. Vernon Carstensen. *Emeritus Professor of History, University of Washington, Seattle.*

UNITED STATES OF AMERICA (in part)

V.C.F. Victor C. Falkenheim *Chairman, Department of East Asian Studies, University of Toronto. Editor of and contributor to Citizens and Groups in Chinese Politics.*

CHINA (in part)

V.D. Vilmos Diószegi (d. 1971). *Research Fellow, Hungarian Academy of Sciences, Budapest. Author of Tracing Shamans in Siberia; editor of Popular Beliefs and Folklore Tradition in Siberia.*

SACRED OFFICES AND ORDERS (in part)

V.D.B. Vasili Dmitrievitch Bykov (d. 1982). *Professor of Geography, Moscow M.V. Lomonosov State University. Author of Hydrology and others.*

HYDROSPHERE, THE (in part)

V.E.I. Verity Elizabeth Irvine. *Writer and researcher.*

ARABIA (in part)

SYRIA (in part)

V.E.McK. Vincent E. McKelvey (d. 1987). *Director, Geological Survey, U.S. Department of the Interior, Reston, Virginia, 1971-78; Senior Research Geologist, 1978-81. An authority on mineral deposits and energy needs of the United States.*

MINERALS AND ROCKS (in part)

V.F.K. Viktor Filipovich Kanayev. *Senior Scientist, Moscow M.V. Lomonosov State University. Coauthor of Principal Features of the Structure of the Bottom of the Northeastern Part of the Indian Ocean.*

OCEANS (in part)

V.F.Ko. Vladimir Fyodorovich Kosov. *Head, Kazakhstan Section, Scientific Council on the Location of U.S.S.R. Productive Forces, Academy of Sciences of the U.S.S.R., Moscow. Coauthor of Development of National Economy of the U.S.S.R. Eastern Regions.*

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

V.G. Viktor Gutmann. *Professor of Inorganic Chemistry, Technical University of Vienna. Author of Halogen Chemistry and others.*

CHEMICAL ELEMENTS (in part)

V.G.N. Viktor Grigoryevich Neyman. *Senior Scientist, Institute of Oceanology, Academy of Sciences of the U.S.S.R., Moscow; Candidate of Sciences (Geography). Author of several articles on oceanology.*

OCEANS (in part)

V.G.S. Victor G. Szebehely. *Professor of Aerospace Engineering, University of Texas at Austin. Coeditor of Methods in Astrodynamics and Celestial Mechanics.*

MECHANICS (in part)

V.I.S. Victor Ilyich Seroff (d. 1979). *Writer. Author of Rachmaninoff.*

RACHMANINOFF, SERGEY (Micropædia)

V.J.C. Valentine J. Chapman (deceased). *Professor of Botany, University of Auckland, New Zealand. Author of The Algae and others.*

PROTOPHYTES (in part)

V.J.M. Vytautas J. Mažiulis. *Professor of Baltic Languages, Vilnius V. Kapsukas State University, Lithuanian S.S.R.*

LANGUAGES OF THE WORLD (in part)

V.J.P. V.J. Parry (d. 1974). *Reader in the History of the Near and Middle East, School of Oriental and African Studies, University of London. Contributor to The New Cambridge Modern History; Encyclopædia of Islam.*

BAYEZID II (Micropædia)

SÜLEYMAN I (Micropædia)

V.J.T. Vello Julius Tarmisto. *Director, Institute of Economics, Estonian S.S.R. Academy of Sciences, Tallinn. Coauthor of Estonian S.S.R.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

V.K. Viola Klein (d. 1973). *Reader in Sociology, University of Reading, England, 1971-73. Coauthor of Women's Two Roles: At Home and Work and others.*

SOCIAL DIFFERENTIATION
(in part)

V.Ka. Vytautas Kavolis. *Charles A. Dana Professor of Comparative Civilizations and Professor of Sociology, Dickinson College, Carlisle, Pennsylvania. Author of Artistic Expression: A Sociological Analysis; History on Art's Side: Social Dynamics in Artistic Efflorescences.*

ARTS, PRACTICE AND PROFESSION OF
THE (in part)

V.Lo. Victor Lowe. *Emeritus Professor of Philosophy, Johns Hopkins University, Baltimore. Author of Understanding Whitehead; The Life of Alfred North Whitehead.*

WHITEHEAD, ALFRED NORTH
(Micropædia)

V.L.S. Victor L. Streeter. *Emeritus Professor of Civil Engineering, University of Michigan, Ann Arbor. Author of Fluid Mechanics.*

MECHANICS (in part)

V.L.S.P.R. Vaddiparti Lova Surya Prakasa Rao. *Senior Fellow, Centre for Economic and Social Studies, Hyderabad, India.*

DELHI (in part)

V.L.T. Victor-Lucien Tapié (d. 1974). *Member, Academy of Moral and Political Sciences, Institute of France, Paris, 1963-74. Professor of Modern History, University of Paris IV, 1949-70. Author of La France de Louis XIII et de Richelieu and others.*

COLBERT, JEAN-BAPTISTE
(Micropædia)

V.M. Valerio Mariani (deceased). *Professor of the History of Art, University of Naples. Author of Pittori protagonisti della crisi del quattrocento; Giotto.*

LIPPI, FRA FILIPPO (Micropædia)

V.M.S. Vasily Mikhaylovich Sinitsyn (d. 1977). *Professor and Head, Laboratory of Paleogeography, Leningrad A.A. Zhdanov State University, 1961-77; Dean, Department of Geology, 1965-72.*

ASIA (in part)

V.M.St. Valery Mikhailovich Strygin. *Head of Section, Geographical Books, Mysl Publishing House, Moscow. Author of numerous papers on the geography of the Soviet Union.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

V.M.W. Vera Muriel White. *Extramural Lecturer, University of Cambridge.*

PITT, WILLIAM, THE ELDER
(Micropædia)

V.N. Victor Nachtergaele. *Professor of French Literature, Catholic University of*

Louvain, Belgium.

BELGIAN LITERATURE (in part)

V.N.D. Vladimir Nikolaevich Dunaev. *Correspondent, Novosti Press Agency, Moscow. Author of numerous papers on administrative and social conditions in the Soviet Union.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

V.N.K. Victor Nikolaevich Kondratiev. *Assistant Director, Institute of Chemical Physics; Member, Academy of Sciences of the U.S.S.R., Moscow. Author of Chemical Kinetics of Gas Reactions.*

CHEMICAL REACTIONS (in part)

V.P.G. Vladimir Petrovich Goncharov. *Head, Geology of the Southern Seas Laboratory, Southern Division, Institute of Oceanography, Academy of Sciences of the U.S.S.R., Gelendzhik. Coauthor of Geomorphology of the Bottom and Tectonic Problems in the Black Sea.*

EUROPE (in part)

V.P.P. Victor P. Petrov. *Professor of Geography, California State University, Los Angeles, 1970-74, Author of China: Emerging World Power and others.*

AFGHANISTAN (in part)

V.P.U. Vernon Philip Underwood. *Former Professor of French, University College, University of London. Author of Verlaine et l'Angleterre; editor of Verlaine's Carnet personnel and others.*

VERLAINE, PAUL (Micropædia)

V.P.Z. Vsevolod Pavlovich Zenkovich. *Former Head of Shore Department, Institute of Oceanology, Academy of Sciences of the U.S.S.R., Moscow. An authority on near-shore oceanography and attendant physical processes.*

OCEANS (in part)

V.R.B. Victor R. Baker. *Professor of Geosciences and of Planetary Sciences, University of Arizona, Tucson. Coauthor of Surficial Geology.*

CONTINENTAL LANDFORMS (in part)

V.R.F. Vernon R. Fryburger, Jr. *Professor of Advertising and Marketing; Chairman, Department of Advertising, Northwestern University, Evanston, Illinois. Coauthor of Advertising Theory and Practice.*

MARKETING AND MERCHANDISING
(in part)

V.R.L. Val R. Lorwin (d. 1982). *Professor of History, University of Oregon, Eugene, 1958-75.*

UNITED NATIONS (in part)

V.R.P. V.R. Pillai. *Member, Kerala State Planning Board. Former Professor of Economics, University of Kerala, India. Coauthor of Land Reclamation in Kerala and others.*

INDIA (in part)

V.S. Vera Sanford (deceased). *Professor of Mathematics, State University of New York College at Oneonta, 1943-59.*

MATHEMATICS, THE HISTORY OF
(in part)

V.S.C. Vasile S. Cucu. *Professor of Geography, University of Bucharest.*

Author of Geografia României.

ROMANIA (in part)

V.Sl. Vladimir Slamecka. *Professor of Information and Computer Science, Georgia Institute of Technology, Atlanta. Coauthor of National Information Systems.*

INFORMATION PROCESSING AND
INFORMATION SYSTEMS (in part)

V.S.M. V. Standish Mallory. *Professor of Geological Sciences; Curator of Invertebrate Paleontology and Chairman, Geology and Paleontology Division, Burke Washington State Museum, University of Washington, Seattle.*

GEOCHRONOLOGY (in part)

V.T.C. Ven Te Chow (d. 1981). *Professor of Civil and Hydrosystems Engineering, University of Illinois, Urbana. Editor in Chief and contributor to Handbook of Applied Hydrology.*

HYDROSPHERE, THE (in part)

V.T.P. Vladimir T. Pashuto. *Corresponding member, Academy of Sciences of the U.S.S.R., Moscow. Author of Vneshnyaya politika drevney Rusi and others.*

ALGIRDAS (Micropædia)

V.U. Valev Uibopuu. *Novelist. Editor, Estonian Writers' Co-operative, Lund, Sweden. Author of Keegi ei kuule meid.*

ESTONIAN LITERATURE (Micropædia)

V.V.I. Vyacheslav Vsevolodovich Ivanov. *Head, Department of Structural Typology, Institute of Slavonic and Balkan Studies, Academy of Sciences of the U.S.S.R., Moscow.*

LANGUAGES OF THE WORLD (in part)

V.V.P. Vladimir V. Pokshishevsky (d. 1984). *Staff member, Institute of Ethnography, Academy of Sciences of the U.S.S.R., Moscow.*

UNION OF SOVIET SOCIALIST REPUBLICS
(in part)

V.V.Z. Vladimir Viktorovich Zhdanov. *Literary critic. Assistant to the Chief Editor, Kratkaya Literaturnaya Entsiklopediya, Moscow. Author of M. Yu. Lermontov and other works on Russian writers.*

LERMONTOV, MIKHAIL (Micropædia)

V.W.v.H. Victor Wolfgang von Hagen. *Director, Roman Road Expeditions in Europe and North Africa, 1961-70. Director, Inca Highway Expedition to Peru, Bolivia, and Ecuador, 1953-55. Author of Realm of the Incas and others; editor of The Incas.*

PRE-COLUMBIAN CIVILIZATIONS
(in part)

V.Z. Vice Zaninović. *Professor of Serbian Literature, University of Zagreb, Yugoslavia. Author of August Cesarec, Life and Work.*

YUGOSLAV LITERATURE
(in part)

V.Zw. Vladimir Zwass. *Professor of Computer Science, Fairleigh Dickinson University, Rutherford, New Jersey. Editor in Chief, Journal of Management Information Systems. Author of*

Introduction to Computer Science.
COMPUTER SCIENCE

W.A. Warren Andrew, M.D. (d. 1982). *Professor of Anatomy, Indiana University, Indianapolis, 1958-82. Author of Textbook of Comparative Histology.*

SUPPORTIVE AND CONNECTIVE
TISSUES (in part)

Wa.B. Walter Blair. *Emeritus Professor of English, University of Chicago. Author of Mark Twain and "Huck Finn"; coauthor of America's Humor; Poor Richard to Doonesbury.*
AMERICAN LITERATURE (in part)

W.A.B. Warren A. Beck. *Professor of History, California State University, Fullerton. Author of New Mexico: A History of Four Centuries; coauthor of An Historical Atlas of New Mexico.*
UNITED STATES OF AMERICA
(in part)

Wa.E.M. Wayne E. Manning. *Emeritus Professor of Botany, Bucknell University, Lewisburg, Pennsylvania. Author of numerous articles on the walnut family.*
ANGIOSPERMS (in part)

W.A.H. Walter A. Harrison. *Professor of Applied Physics, Stanford University, California. Author of Pseudopotentials in the Theory of Metals.*
MATTER (in part)

W.A.Ha. Willard A. Hanna. *Senior Associate, Universities Field Staff International, Hanover, New Hampshire. Author of Bung Karno's Indonesia.*
SUKARNO (Micropædia)

Wa.K. Walter Kolneder. *Professor of Music, University of Karlsruhe, West Germany. Author of Antonio Vivaldi.*
VIVALDI, ANTONIO (Micropædia)

W.A.K. Walid Ahmed Khalidi. *Professor of Political Studies and Public Administration, American University of Beirut.*
PALESTINE (in part)

W.Am. Winslow Ames. *Associate Professor of Art, University of Rhode Island, Kingston, 1966-75. Curator, Gallery of Modern Art, New York City, 1957-61. Author of Great Drawings of All Time, vol. 1, Italian Drawings.*
CARICATURE, CARTOON, AND COMIC STRIP (in part)

Wa.M. Wang Mingye. *Professor of Geomorphology, Ch'eng-tu Institute of Geography, Chinese Academy of Sciences. Author of The Mountains in China and others.*
CHUNGKING (in part)

W.A.McD. Walter A. McDougall. *Professor of History, University of California, Berkeley. Author of The Heavens and the Earth: A Political History of the Space Age and others.*
INTERNATIONAL RELATIONS,
20TH-CENTURY

W.A.N. William Anderson Newman. *Professor of Biological Oceanography, Scripps Institution of Oceanography,*

University of California, San Diego, at La Jolla. Coauthor of "Cirripedia" in Treatise on Invertebrate Paleontology and in Antarctic Research Series.
CRUSTACEANS (in part)

W.A.P. The Rev. William Arthur Purdy. *Secretary for Anglican and Methodist Relations, Secretariat for Promoting Christian Unity, Vatican. Author of The Church on the Move: The Characters and Policies of Pius XII and John XXIII.*
PIUS XII (Micropædia)

W.A.Po. William A. Poucher (d. 1988). *Chief Perfumer, Yardley and Company, Ltd., London, 1929-59. Author of Perfumes, Cosmetics & Soaps.*
DRESS AND ADORNMENT (in part)

Wa.R. Walpola Rāhula. *Supervisor, University of Oxford. Chancellor, University of Kelaniya, Sri Lanka. Author of What the Buddha Taught.*
BUDDHISM, THE BUDDHA AND (in part)

W.A.R. William Alexander Robson (d. 1980). *Professor of Public Administration, University of London, 1947-62. Author of Justice and Administrative Law; coauthor of Great Cities of the World: Their Government, Politics and Planning.*
CITIES (in part)
PUBLIC ADMINISTRATION (in part)

W.A.Ri. William Andrew Ringler, Jr. (d. 1987). *Professor of English, University of Chicago, 1962-1980. Editor of The Poems of Sir Philip Sidney.*
SIDNEY, SIR PHILIP (Micropædia)

W.A.S. W.A. Swanberg. *Free-lance writer. Author of Dreiser and others.*
DREISER, THEODORE (Micropædia)

W.A.T. Wilfred Asquith Townsley. *Chairman, Tasmanian Consumer Affairs Council. Professor of Political Science, University of Tasmania, Hobart, Australia, 1956-75.*
AUSTRALIA (in part)

W.A.W. Warid A. Warid. *Former Professor of Agriculture, University of Al Fateh, Tripoli, Libya. Coauthor of Vegetable Production.*
FARMING AND AGRICULTURAL TECHNOLOGY (in part)

W.B.B. William B. Bean, M.D. *Sir William Osler Professor Emeritus of Medicine, University of Iowa, Iowa City. Editor in Chief, Archives of Internal Medicine, 1962-67. Author of Rare Diseases and Lesions: Their Contributions to Clinical Medicine.*
DIAGNOSIS AND THERAPEUTICS
(in part)

W.B.F. W. Beall Fowler. *Professor of Physics, Lehigh University, Bethlehem, Pennsylvania.*
MATTER (in part)

W.B.Fi. William B. Fisher (d. 1984). *Principal, Graduate Society, 1965-81; Professor of Geography, University of Durham, England, 1956-81. Author of The Middle East; editor of Cambridge*

History of Iran, vol. 1.

AFRICA (in part)

IRAQ (in part)

W.B.F.R. William B.F. Ryan. *Senior Research Scientist, Lamont-Doherty Geological Observatory, Columbia University.*

ASIA (in part)

W.Bi. Walter Biemel. *Emeritus Professor of Philosophy, State Academy of Art of Düsseldorf, West Germany.*

PHILOSOPHICAL SCHOOLS AND
DOCTRINES, WESTERN (in part)

W.B.K. W. Barclay Kamb. *Professor of Geology and Geophysics, California Institute of Technology, Pasadena. A leading authority on the properties of Earth materials, including ice.*

MINERALS AND ROCKS (in part)

W.Bl. Warren Blanding. *Chief Operating Executive, Marketing Publications Inc. Silver Spring, Maryland. Author of Profit Opportunities in Physical Distribution and others.*

HANDLING, PACKAGING, AND STORAGE
(in part)

W.B.McM. William B. McMahon. *Law enforcement and privacy consultant. Coeditor of Law Enforcement Science and Technology III.*
POLICE (in part)

W.B.T. William Bertram Turrill (d. 1961). *Keeper, Herbarium and Library, Royal Botanic Gardens, Kew, England, 1946-57. Author of Plant Life of the Balkan Peninsula and others.*
BALKANS (in part)

W.Bu. William Burrows (d. 1978). *Professor of Microbiology, University of Chicago, 1947-73. Author of Textbook of Microbiology.*
DISEASE (in part)

W.B.W. Wilse B. Webb. *Graduate Research Professor of Psychology, University of Florida, Gainesville. Author of Sleep: An Experimental Analysis.*
SLEEP AND DREAMS (in part)

W.B.Wh. William B. White. *Professor of Geochemistry, Pennsylvania State University, University Park. Author of Hydrology and Geomorphology of Karst Terrains.*

CONTINENTAL LANDFORMS (in part)

W.C. Warren Cowgill (d. 1985). *Professor of Indo-European Linguistics, Yale University, 1972-85. Author of several articles on Indo-European languages.*

LANGUAGES OF THE WORLD (in part)

W.C.A. William C. Atkinson. *Professor of Hispanic Studies, University of Glasgow, 1932-72; Director, Institute of Latin-American Studies, 1966-72. Author of A History of Spain and Portugal; translator of Camões' The Lusads.*

PORTUGUESE LITERATURE (in part)
SPANISH LITERATURE (in part)

W.C.B. William Charles Brice. *Emeritus Professor of Geography,*

Victoria University of Manchester.

BALKANS (in part)

NORTH AFRICA (in part)

PALESTINE (in part)

UNION OF SOVIET SOCIALIST REPUBLICS (in part)

W.C.Be. Wendell Clark Bennett (d. 1953). *Professor of Anthropology, Yale University, 1945–53.*

SOUTH AMERICA (in part)

W.C.Da. William C. Davis, Jr. *Firearms consultant. Former Chief, Small-Caliber-Ammunition Engineering Laboratory, U.S. Army, Frankford Arsenal, Philadelphia.*

WAR, THE TECHNOLOGY OF (in part)

W.C.Di. William C. Dilger. *Associate Professor of Ethology, Cornell University, Ithaca, New York. Author of Psychobiology; 39 Steps to Biology; and others.*

BEHAVIOUR, ANIMAL (in part)

W.C.F. Warren Curtis Frehofer. *Field Associate, Department of Ichthyology, California Academy of Sciences, San Francisco. Author of research papers on the anatomy and systematics of fishes.*

FISHES (in part)

W.C.H. Walther C. Hubatsch. *Professor of Medieval and Modern History, Rhenish Friedrich Wilhelm University of Bonn. Author of Die Ära Tirpitz and others.*

TIRPITZ, ALFRED VON (Micropædia)

W.C.Ho. William Coffeen Holton. *Director, Semiconductor Research Corporation, Research Triangle Park, North Carolina.*

ELECTRONICS (in part)

W.C.McC. W. Cheyne McCallum. *Senior Research Fellow in Psychology, Burden Neurological Institute and University of Bristol, England. Coeditor of The Responsive Brain.*

ATTENTION

W.Cr. William Cruse. *Technical Consultant, Uris Theatre Complex, New York City, and New Orleans Cultural Center. Former Supervisor of Scenic Services, American Broadcasting Company, New York City. Former Technical Director, Ahmandson Theatre, Los Angeles.*

THEATRICAL PRODUCTION (in part)

W.C.Se. William C. Seitz (d. 1974). *George R. Kenan, Jr., Professor of the History of Art, University of Virginia, Charlottesville, 1971–74. Author of Claude Monet.*

MONET, CLAUDE (in part) (Micropædia)

W.C.St. William Campbell Steere. *Emeritus Professor of Botany, Columbia University. Emeritus President, New York Botanical Garden, Bronx. Editor of Fifty Years of Botany.*

BIOLOGICAL SCIENCES, THE (in part)

W.Cu. William Culican (d. 1984). *Reader in History, University of Melbourne, 1972–84. Author of The Medes and Persians and others.*

ARCHITECTURE, THE HISTORY OF

WESTERN (in part)

HANNIBAL (Micropædia)

KHOSROW II (Micropædia)

SCULPTURE, THE HISTORY OF WESTERN (in part)

W.D. Wilma Dykeman. *Free-lance writer. Author of Seeds of Southern Change; coauthor of The Border States and others.*

NORTH AMERICA (in part)

UNITED STATES OF AMERICA (in part)

W.D.B. Wayne D. Bray. *Attorney. Author of The Common Law Zone in Panama; compiler of The Controversy Over a New Canal Treaty Between the United States and Panama.*

CENTRAL AMERICA (in part)

W.De. Wilfrid Desan. *Emeritus Professor of Philosophy, Georgetown University, Washington, D.C. Author of The Tragic Finale; The Marxism of Jean-Paul Sartre; and others.*

SARTRE, JEAN-PAUL (Micropædia)

W.D.H. William Driver Howarth. *Professor of French, University of Bristol, England. Author of Sublime and Grotesque: A Study of French Romantic Drama and others.*

FRENCH LITERATURE (in part)

W.Do. Wendy Doniger. *Mircea Eliade Professor of the History of Religions, University of Chicago. Author of Dreams, Illusion, and Other Realities and others.*

HINDUISM (in part)

W.D.P. W. Douglas Piercey, M.D. (d. 1972). *Associate Professor of Hospital Administration, University of Toronto, 1954–65. Executive Director, Canadian Hospital Association, Toronto; Editor, The Canadian Hospital Journal, 1954–65.*

MEDICINE (in part)

W.D.R. Wayne D. Rasmussen. *Historian, Agricultural History Branch, Economic Research Service, U.S. Department of Agriculture, Washington, D.C., 1940–86. Editor of Agriculture in the United States: A Documentary History.*

AGRICULTURE, THE HISTORY OF (in part)

W.D.S. Wilfred D. Stein. *Professor of Biophysics, Hebrew University of Jerusalem. Author of Transport and Diffusion Across Cell Membranes.*

CELLS (in part)

W.E. William Epstein. *Professor of Psychology, University of Wisconsin, Madison. Author of Varieties of Perceptual Learning.*

PERCEPTION, HUMAN (in part)

W.E.A. Walter E. Allen. *Professor of English Studies, New University of Ulster, Coleraine, Northern Ireland, 1968–73. Author of The English Novel.*

FIELDING, HENRY (Micropædia)

SMOLLETT, TOBIAS (Micropædia)

W.E.D. William E. Duellman. *Curator, Division of Herpetology, Museum of Natural History; Professor of Systematics and Ecology, University of Kansas, Lawrence. Researcher on the biology*

and systematics of frogs, with particular emphasis on the New World tropics. Author of The Hyliid Frogs of Middle America.

AMPHIBIANS (in part)

W.E.K. Walter Emil Kaegi, Jr. *Professor of Byzantine and Roman History, University of Chicago. Author of Byzantine Military Unrest and others.*

LEO III (BYZANTINE EMPIRE) (Micropædia)

W.Em. Walter Emery (d. 1974). *Director, Novello and Company Ltd., London. Specialist on the work of Bach. Author of Bach's Ornaments.*

BACH (in part)

W.E.M. William Edward May. *Commander, Royal Navy. Deputy Director, National Maritime Museum, Greenwich, England, 1951–68. Naval Assistant to the Director, Compass Department, Admiralty, 1929–51. Author of Compass Adjustment.*

NAVIGATION (in part)

W.E.Mo. W.E. Mosse. *Emeritus Professor of European History, University of East Anglia, Norwich, England. Author of Alexander II and the Modernization of Russia and others.*

ALEXANDER II (RUSSIA) (Micropædia)

W.E.M.P.-P. William E.M. Pryse-Phillips, M.D. *Professor of Medicine (Neurology), Memorial University of Newfoundland, St John's. Coauthor of Essential Neurology.*

NERVES AND NERVOUS SYSTEMS (in part)

W.E.P. Warren E. Preece. *Member, Board of Editors, Encyclopædia Britannica, Chicago; Vice Chairman, 1975–79; The Editor, 1964–75. Coauthor of The Technological Order.*

ENCYCLOPAEDIAS AND DICTIONARIES (in part)

PRINTING, TYPOGRAPHY, AND PHOTOENGRAVING (in part)

W.Er. Walter Erben (d. 1981). *Professor of Art Education, College of Education of the Ruhr, Dortmund, West Germany. Author of Joan Miró; Chagall. MIRÓ, JOAN (in part) (Micropædia)*

W.E.S. William Edward Stubbs. *Assistant Judge Advocate General, Office of the Judge Advocate General of the British Forces in Germany, London.*

WAR, THE THEORY AND CONDUCT OF (in part)

W.E.T. William E. Thomson. *Composer. Director, School of Music, University of Southern California, Los Angeles. Author of Materials and Structure of Music; Introduction to Music as Structure.*

MUSIC, THE ART OF (in part)

W.E.V. W. Edgar Vinacke. *Professor of Psychology, State University of New York at Buffalo. Author of The Psychology of Thinking.*

THOUGHT AND THOUGHT PROCESSES (in part)

W.F. Wallace Fowlie. *James B. Duke Professor of French Literature, Duke*

University, Durham, North Carolina.
Author of Jean Cocteau; Stendhal;
 A Guide to Contemporary French
 Literature; Age of Surrealism.
 COCTEAU, JEAN (Micropædia)
 STENDHAL (Micropædia)

W.F.A. William Foxwell Albright (d. 1971). *Professor of Semitic Languages, Johns Hopkins University, Baltimore, Maryland, 1929–58. Author of* Archæology of Palestine; From the Stone Age to Christianity.
 PALESTINE (in part)
 PREHISTORIC PEOPLES AND CULTURES (in part)

W.F.F. William F. Fratcher. R.B. Price *Distinguished Professor Emeritus of Law, University of Missouri, Columbia. Author of* Perpetuities and Other Restraints.
 PROPERTY LAW (in part)

W.F.K. William F. Kieffer. *Emeritus Professor of Chemistry, Wooster College, Ohio. Author of* The Mole Concept in Chemistry; Chemistry Today; and others.
 CHEMICAL COMPOUNDS (in part)

W.F.Kn. Wilfrid F. Knapp. *Dean, Fellow, and Tutor in Politics, St. Catherine's College, Oxford; Lecturer in Politics, University of Oxford. Author of* A History of War and Peace, 1939–65.
 HITLER (in part)

W.Ft. Wesley Frost (d. 1968). *U.S. Ambassador to Paraguay, 1942–44.*
 SOUTH AMERICA (in part)

W.F.V. Walter F. Vella (d. 1984). *Professor of History, University of Hawaii, Honolulu. Author of* Siam under Rama III, 1824–1851; A History of Modern Thailand; and others.
 SOUTHEAST ASIA, MAINLAND (in part)

W.F.W. Warren F. Walker, Jr. *Professor of Biology, Oberlin College, Ohio. Author of* Vertebrate Dissection.
 MUSCLES AND MUSCLE SYSTEMS (in part)

W.F.Wh. William Foote Whyte. *Emeritus Professor of Industrial and Labour Relations, Cornell University, Ithaca, New York. Author of* Organizational Behavior: Theory and Application and others.
 WORK AND EMPLOYMENT (in part)

W. Ga. William Gaunt (d. 1980). *Art historian. Special correspondent on art subjects, The Times, London. Author of* The Pre-Raphaelite Tragedy; The Aesthetic Adventure.
 ROSSETTI, CHRISTINA (Micropædia)
 ROSSETTI, DANTE GABRIEL (Micropædia)
 ROSSETTI, GABRIELE (Micropædia)
 ROSSETTI, WILLIAM MICHAEL (Micropædia)

W.G.A. W. Geoffrey Arnott. *Professor of Greek Language and Literature, University of Leeds, England.*
 TERENCE (Micropædia)

W.G.B. Walter G. Bergmann (d. 1988). *Editor, Schott and Co. Ltd., Music Publishers, London. Author of several articles on Telemann.*

TELEMANN, GEORG PHILIPP
 (Micropædia)

W.G.Br. Walter G. Bradley, M.D. *Professor and Chairman, Department of Neurology, University of Vermont, Burlington. Author of* Disorders of Peripheral Nerves; *coeditor of* Recent Advances in Myology.

MUSCLES AND MUSCLE SYSTEMS (in part)

W.G.C. William G. Constable (d. 1976). *Curator of Paintings, Boston Museum of Fine Arts, 1938–57. Author of* Canaletto: Giovanni Antonio Canal, 1697–1768.

CANALETTO (Micropædia)

W.G.E. W. Gordon East. *Emeritus Professor of Geography, Birkbeck College, University of London. Author of* An Historical Geography of Europe.
 EUROPE (in part)

W.G.Fi. Wolfgang G. Fischer. *Former Director, Landesbibliothek, Oldenburg, West Germany.*
 GERMANY (in part)

W.G.J. Walton Glyn Jones. *Professor of Scandinavian Studies, University of Newcastle upon Tyne, England. Author of* Denmark; Tove Jansson; and others.
 SCANDINAVIAN LITERATURE (in part)

W.G.M. William George Mokray (d. 1974). *Editor and Publisher, Basketball's Best. Writer for* Converse Basketball Yearbook. *U.S. correspondent on* basketball for European publications. *Elected to the* Basketball Hall of Fame, 1965.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

W.G.Mo. Will G. Moore (d. 1978). *Reader in French Literature, University of Oxford. Author of* La Rochefoucauld: His Mind and Art and others.

LA ROCHEFOUCAULD, FRANÇOIS VI,
 DUC DE (Micropædia)
 MOLIÈRE (in part)

W.Go. Walter Otto Julius Görlitz. *Journalist; Editorial Staff, Die Welt, Hamburg. Author of* History of the German General Staff, 1657–1945.
 LUDENDORFF, ERICH (Micropædia)
 ROMMEL, ERWIN (Micropædia)

W.G.O. Willard Gurdon Oxtoby. *Professor of Religious Studies; Director, Centre for Religious Studies, University of Toronto. Author of* Some Inscriptions of the Safaitic Bedouin.
 MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

W.G.Pr. W.G. Prout. *Consultant Surgeon, Portsmouth Group Hospitals, England.*

CIRCULATION AND CIRCULATORY SYSTEMS (in part)

W.G.So. Wilhelm G. Solheim II. *Professor of Anthropology, University of Hawaii, Honolulu. Author of* The Archaeology of Central Philippines.
 EAST INDIES, THE (in part)

W.G.St. William Glenn Steiner. *Professor of Psychology, Bradley University, Peoria, Illinois.*

ALCOHOL AND DRUG CONSUMPTION (in part)

W.G.U. William G. Urry (d. 1981). *Reader in Medieval Western Paleography, University of Oxford; Fellow of* St. Edmund Hall, Oxford, 1969–81.

HISTORY, THE STUDY OF (in part)

W.H. Wolfgang Helck. *Professor of Egyptology, University of Hamburg. Author of* Manetho und die ägyptischen Königslisten and others.

HISTORY, THE STUDY OF (in part)

W.Ha. Walter Harrelson. *Distinguished Professor of Old Testament, Vanderbilt University, Nashville, Tennessee. Author of* From Fertility Cult to Worship and others.
 RITES AND CEREMONIES, SACRED (in part)

W.H.B. William H. Baumer. *Major General (retired), U.S. Army Reserve. President, International General Industries, Inc., Washington, D.C., 1963–72. Coauthor of* The Little Wars of the United States.

WAR, THE TECHNOLOGY OF (in part)

W.H.Br. Walter Henry Breen. *Former Coeditor, Standard Catalogue of United States Coins. Author of* Walter Breen's Encyclopedia of U.S. and Colonial Proof Coins, 1722–1977 and others.
 COINS AND COINAGE (in part)

W.H.C. Walter Houston Clark. *Professor of the Psychology of Religion, Andover Newton Theological School, Newton Centre, Massachusetts, 1962–67. Author of* Chemical Ecstasy: Psychedelic Drugs and Religion.

ALCOHOL AND DRUG CONSUMPTION (in part)

W.H.C.F. William Hugh Clifford Frend. *Professor of Ecclesiastical History, University of Glasgow. Author of* Martyrdom and Persecution in the Early Church and others.
 CYPRIAN, SAINT (Micropædia)

W.H.D. William Henry Dawbin. *Former Reader in Biology, University of Sydney, Australia. Author of papers on* tuataras.
 REPTILES (in part)

W.He. Walter Heinemeyer. *Professor of Medieval History, Philipps University of Marburg, West Germany. Coeditor of* Politisches Archiv des Landgrafen Philipps.
 PHILIPP (HESSE) (Micropædia)

W.H.G. W. Horsley Gantt, M.D. (d. 1980). *Associate Professor of Psychiatry, 1932–58; Director, Pavlovian Laboratory, School of Medicine, Johns Hopkins University, Baltimore. Senior Scientist, Pavlovian Laboratory, Veterans Administration Hospital, Perry Point, Maryland.*

PAVLOV, IVAN PETROVICH (Micropædia)

W.H.G.A. Walter Harry Green Armytage. *Emeritus Professor of Education, University of Sheffield.*

England. Author of *A Social History of Engineering*.

EADS, JAMES BUCHANAN (*Micropædia*)
EVANS, OLIVER (*Micropædia*)

W.H.I. William Harold Ingrams (d. 1973). Adviser on Overseas Information to the Secretary of State for the Colonies, United Kingdom, 1950–54. Author of *Arabia and the Isles and others*.

ARABIA (*in part*)

W.H.M. William H. Miller, M.D. Professor of Ophthalmology and Visual Science, School of Medicine, Yale University.

SENSORY RECEPTION (*in part*)

W.H.McL. William Hewat McLeod. Professor of History, University of Otago, Dunedin, New Zealand. Author of *Gurū Nānak and the Sikh Religion*.

NĀNAK (*Micropædia*)

W.H.McN. William H. McNeill. Robert A. Millikan Distinguished Service Professor Emeritus of History, University of Chicago. Author of *The Rise of the West and others*.

BALKANS (*in part*)

STEPPE, THE HISTORY OF THE EURASIAN

W.Hn. Walter B.O. Hansen. University Professor Emeritus of Oceanography, University of Hamburg.

MECHANICS (*in part*)

W.H.N. William H. Nienhauser, Jr. Professor of East Asian Languages and Literature, University of Wisconsin, Madison. Author of *P'i Jih-hsiu*; editor of *Indiana Companion to Traditional Chinese Literature*.

CHINESE LITERATURE (*in part*)

W.H.O. William Hosking Oliver. Editor, *Dictionary of New Zealand Biography*. Author of *The Story of New Zealand and others*.

NEW ZEALAND (*in part*)

W.H.T. William Homan Thorpe. Emeritus Professor of Animal Ethology, University of Cambridge. Author of *Learning and Instinct in Animals*.

BEHAVIOUR, ANIMAL
(*in part*)

W.H.Th. William Harford Thomas. Journalist. Former Deputy Editor, *The Guardian*, London. Author of *Crisis in the British Press*.

UNITED KINGDOM (*in part*)

W.H.W. William Henry Walsh (d. 1986). Professor of Logic and Metaphysics, University of Edinburgh, 1960–79. Author of *Reason and Experience*; *Metaphysics*.

METAPHYSICS (*in part*)

W.H.Wa. Warren H. Wagner, Jr. Professor of Botany; Curator of Pteridophytes, University Herbarium, University of Michigan, Ann Arbor. Author of *The Fern Genus Diellia*.

FERNS

Wi.B. William Back. Research Hydrologist, Water Resources Division, Geological Survey, U.S. Department of the Interior, Reston, Virginia. An authority on the geochemistry of

fresh waters.

MINERALS AND ROCKS (*in part*)

Wi.G.M. William G. Moulton. Professor of Linguistics, Princeton University, 1960–79. Professor of Germanic Linguistics, Cornell University, Ithaca, New York, 1949–60. Author of *The Sounds of English and German*.

LANGUAGES OF THE WORLD (*in part*)

Wi.M. Wilhelm Matull. Senior Civil Servant, National Centres for Political Education, Hannover, Bonn, and Düsseldorf, West Germany, 1954–68. Author of *Ferdinand Lassalle and others*.

LASSALLE, FERDINAND (*Micropædia*)

W.J. Walter John. Research Scientist, Air and Industrial Hygiene Laboratory, California Department of Health Services, Berkeley.

MECHANICS (*in part*)

W.J.Al. Wybe Jappe Alberts. Former Professor of History, University of Utrecht, The Netherlands.

LOW COUNTRIES, THE (*in part*)

W.J.Ar. W.J. Argyle. Professor of Social Anthropology; Head, Department of African Studies, University of Natal, Durban, South Africa. Author of *The Fon of Dahomey*.

SOUTHERN AFRICA (*in part*)

W.J.B. William J. Baumol. Professor of Economics, Princeton University and New York University, New York City. Author of *Business Behavior, Value and Growth*.

ECONOMIC THEORY (*in part*)

W.J.Bo. William J. Bouwsma. Sather Professor of History, University of California, Berkeley. Author of *Venice and the Defense of Republican Liberty*.

ITALY (*in part*)

W.J.Br. William J. Breed. Head, Geology Department, Museum of Northern Arizona, Flagstaff, 1978–80; Curator of Geology, 1960–78.

CONTINENTAL LANDFORMS
(*in part*)

W.J.Bu. The Rev. Walter John Burghardt, S.J. Theologian in Residence, Georgetown University, Washington, D.C. Editor, *Theological Studies*. Author of *The Image of God in Man According to Cyril of Alexandria*.

JEROME, SAINT (*Micropædia*)

W.J.C. Willie J. Chevalier. Journalist. Editor, *Le Droit* (Ottawa), 1963–67. Managing Editor, *Le Petit Journal* (Montreal), 1959–63.

MONTREAL (*in part*)

W.J.E. W.J. Eccles. Emeritus Professor of History, University of Toronto. Author of *The Canadian Frontier, 1534–1760*; *Frontenac*.

CARTIER, JACQUES (*Micropædia*)

FRONTENAC, LOUIS DE BUADE, COMTE DE PALLUAU ET DE (*Micropædia*)

W.J.F. W.J. Frank. Senior Staff, Lawrence Livermore National Laboratory, University of California, Livermore.

WAR, THE TECHNOLOGY OF
(*in part*)

W.J.G. Willis John Gertsch. Emeritus Curator, Arachnida, Department of Entomology, American Museum of Natural History, New York City. Author of *American Spiders*.

ARACHNIDS (*in part*)

W.J.Gr. William J. Griffith. Emeritus Professor of History, University of Kansas, Lawrence; Director, Center of Latin American Studies, 1970–74. Author of *Empires in the Wilderness: Foreign Colonization and Development in Guatemala, 1834–1844*.

CENTRAL AMERICA (*in part*)

W.J.H. William James Hamilton, M.D. (d. 1975). Professor of Anatomy, Charing Cross Hospital Medical School, University of London, 1947–70. Editor of *Textbook of Human Anatomy*.

SUPPORTIVE AND CONNECTIVE
TISSUES (*in part*)

W.J.He. Wilfrid James Hemp (d. 1962). Inspector of Ancient Monuments for Wales in H.M. Office of Works, United Kingdom. Secretary to the Royal Commission on Ancient Monuments for Wales and Monmouth.

SPAIN (*in part*)

W.J.H.W. Wolfgang J.H. Wickler. Director, Max Planck Institute for Behavioral Physiology, Seewiesen, West Germany. Editor in Chief, *Ethology*. Author of *Mimicry in Plants and Animals and others*.

MIMICRY

W.J.LeV. William Judson LeVeque. Executive Director, American Mathematical Society, Providence, Rhode Island. Professor of Mathematics, Claremont Graduate School, California, 1970–77. Author of *Topics in Number Theory*; *Introduction to Number Theory*; and *others*.

ARITHMETIC (*in part*)

MATHEMATICS, THE HISTORY OF
(*in part*)

W.J.McC. Willard J. McCarthy. Associate Professor of Industrial Technology, Illinois State University, Normal. Coauthor of *Machine Tool Technology*.

TOOLS (*in part*)

W.J.S. W. John Smith. Professor of Biology and Psychology, University of Pennsylvania, Philadelphia. Author of *The Behavior of Communicating*.

BEHAVIOUR, ANIMAL (*in part*)

W.J.T. William John Talbot. Emeritus Professor of Geography, University of Cape Town. Coauthor of *Atlas of the Union of South Africa*.

SOUTH AFRICA (*in part*)

W.J.Tu. William Julian Tuttle. Motion picture makeup artist. Adjunct Professor, School of Cinema-Television, University of Southern California, Los Angeles. President, Custom Color Cosmetics, Pacific Palisades, California. Winner of a special Academy Award, 1965.

DRESS AND ADORNMENT
(in part)

W.Jw. Wadie Jwaideh. *Professor of History and Arabic; Chairman, Department of Near Eastern Languages and Literatures, Indiana University, Bloomington.*

IDRISI, ASH-SHARIF AL-
(Micropædia)

W.J.W. Willem Johan Waworoentoe. *Professor of Regional and Urban Planning, Bandung Institute of Technology, Java, Indonesia. Rector, Sam Ratulangi University, Manado. Author of Recent Urban Growth in Indonesia and Its Regional Development Implications.*

JAKARTA

W.K.C. Wilbert K. Carter. *Associate Professor of Anthropology; Cochairman, Department of Sociology and Anthropology, Tufts University, Medford, Massachusetts.*

ARCTIC, THE (in part)

W.K.H. William K. Holstein. *Professor of Management Science, State University of New York at Albany. Coauthor of Casebooks in Production Management.*

INDUSTRIAL ENGINEERING AND
PRODUCTION MANAGEMENT (in part)

W.Ki. William Kirk. *Professor and Head, Department of Geography, Queen's University of Belfast, Northern Ireland. Author of various articles on southern Asia.*

INDIA (in part)

W.K.M. Woodville K. Marshall. *Professor of History, University of the West Indies, Cave Hill, Barbados.*

WEST INDIES, THE (in part)

W.K.R.M. William K.R. Musgrave. *Emeritus Professor of Organic Chemistry, University of Durham, England. Author of numerous articles on halogen-containing organic compounds.*

CHEMICAL COMPOUNDS (in part)

W.L.J. William Lee Jolly. *Professor of Chemistry, University of California, Berkeley. Author of The Synthesis and Characterization of Inorganic Compounds and others.*

CHEMICAL ELEMENTS (in part)
INDUSTRIES, EXTRACTION AND
PROCESSING (in part)

W.L.M. William Lewis Morton (d. 1980). *Vanier Professor of Canadian History, Trent University, Peterborough, Ontario, 1969–75. Author of The Kingdom of Canada and others.*

CANADA (in part)

W.L.N. Warwick L. Nicholas. *Reader in Zoology, Australian National University, Canberra. Author of The Biology of Free-Living Nematodes.*

ASCHELMINTHS

W.L.O. William L. Ochsenwald. *Professor of History, Virginia Polytechnic Institute and State University, Blacksburg. Author of Religion, Society, and the State in Arabia.*

ARABIA (in part)

ISRAEL (in part)

JORDAN (in part)

LEBANON (in part)

PALESTINE (in part)

SYRIA (in part)

W.L.Re. William L. Reese. *Professor of Philosophy, State University of New York at Albany. Author of Dictionary of Philosophy and Religion: Eastern and Western Thought.*

RELIGIOUS AND SPIRITUAL BELIEF,
SYSTEMS OF (in part)

W.L.S. William L. Schaaf. *Emeritus Professor of Mathematical Education, Brooklyn College, City University of New York. Author of Bibliography of Recreational Mathematics.*

NUMBER GAMES AND OTHER
MATHEMATICAL RECREATIONS

W.L.Sa. The Rev. William L. Sachs. *Assistant Rector, St. Stephen's Episcopal Church, Richmond, Virginia. Coauthor of Of One Body: Renewal Movements in the Church.*

PROTESTANTISM (in part)

W.L.Sc. Waldo L. Schmitt (d. 1977). *Head Curator of Zoology, U.S. National Museum of Natural History, Washington, D.C., 1947–57. Author of The Marine Decapod Crustacea of California.*

CRUSTACEANS (in part)

W.L.St. William Louis Stern. *Professor of Botany, University of Florida, Gainesville. Coauthor of Humanistic Botany.*

ANGIOSPERMS (in part)

W.M. William Montagna. *Professor of Dermatology, Oregon Health Sciences University, Portland. Author of The Structure and Function of Skin.*

INTEGUMENTARY SYSTEMS (in part)

W.Ma. William Markowitz. *Adjunct Professor of Physics, Nova University, Fort Lauderdale, Florida. Astronomer, U.S. Naval Observatory, Washington, D.C., 1936–66; Director, Time Service, 1953–66. Coeditor of Continental Drift, Secular Motion of the Pole, and Rotation of the Earth.*

TIME (in part)

W.MacG. Wyatt MacGaffey. *Professor of Anthropology, Haverford College, Pennsylvania. Author of Custom and Government in the Lower Congo.*

KINSHASA (in part)

W.Man. William Manchester. *Adjunct Professor of History; Writer-in-Residence, Wesleyan University, Middletown, Connecticut. Author of The Death of a President; The Arms of Krupp.*

KENNEDY, JOHN F. (in part)

(Micropædia)

KENNEDY, JOSEPH P. (in part)

(Micropædia)

KENNEDY, ROBERT F. (in part)

(Micropædia)

Wm.A.R.T. William Archibald Robson Thomson, M.D. (d. 1983). *Editor, The Practitioner, 1944–73. Author of The*

Searching Mind in Medicine and others; coeditor of Black's Medical Dictionary.

MEDICINE (in part)

W.M.B. W. Mary Bannerman (d. 1984). *Coauthor of The Birds of the Atlantic Islands (4 vol.).*

WESTERN AFRICA (in part)

W.M.Cl. Wayne M. Clegern. *Professor of History, Colorado State University, Fort Collins. Author of British Honduras: Colonial Dead End, 1859–1900.*

CENTRAL AMERICA (in part)

W.M.E. Walter M. Elsasser. *Adjunct Professor of Geophysics, Johns Hopkins University, Baltimore.*

SOLAR SYSTEM, THE (in part)

Wm.F. William Fleming. *Emeritus Professor of Fine Arts, Syracuse University, New York.*

ARCHITECTURE, THE HISTORY OF
WESTERN (in part)

W.M.-F. Wolfram Müller-Freienfels. *Professor of International Civil Law; Director, Institute of Foreign and International Civil Law, Albert Ludwig University of Freiburg, West Germany. Author of Die Vertretung beim Rechtsgeschäft and others.*

BUSINESS LAW (in part)

W.Mi. Wesley Milgate. *Emeritus Professor of English, Australian National University, Canberra. Editor of John Donne: The Satires, Epigrams and Verse Letters; John Donne: A Life.*

DONNE, JOHN (Micropædia)

W.Mo. Warren Moran. *Professor of Geography, University of Auckland, New Zealand. Editor of Auckland and the Central North Island.*

NEW ZEALAND (in part)

W.Mr. William Miller (d. 1945). *Author of Greece; The Ottoman Empire and Its Successors (1801–1936).*

GREECE (in part)

W.M.S. William Meritt Sale, Jr. (d. 1981). *Goldwin Smith Professor of English, Cornell University, Ithaca, New York. Author of Samuel Richardson: A Biographical Record; Samuel Richardson: Master Printer.*

RICHARDSON, SAMUEL (Micropædia)

W.M.W. William Montgomery Watt. *Professor of Arabic and Islāmic Studies, University of Edinburgh, 1964–79. Author of Muhammad: Prophet and Statesman; Muslim Intellectual: A Study of al-Ghazālī; general editor of Islāmic Surveys.*

GHAZĀLĪ, AL- (Micropædia)

HĀRŪN AR-RASHĪD (Micropædia)

ISLĀM, MUḤAMMAD AND THE RELIGION
OF (in part)

W.M.Wa. Willard M. Wallace. *Emeritus Professor of History, Wesleyan University, Middletown, Connecticut. Author of Appeal to Arms: A Military History of the American Revolution.*

UNITED STATES OF AMERICA (in part)

W.M.Wh. Walter Muir Whitehill (d. 1978). *Director and Librarian, Boston Athenaeum, 1946–73. Author of Boston:*

A Topographical History and others.
BOSTON (in part)

W.M.Y. William Munro Yool (d. 1978). *Air Vice Marshal, Royal Air Force. Military writer. Assistant editor, Brassey's Annual.*

WAR, THE THEORY AND CONDUCT OF
(in part)

W.M.Yo. Warren Melvin Young. *Professor and Chairman, Department of Physics and Astronomy, Youngstown State University, Ohio.*

STARS AND STAR CLUSTERS (in part)

W.N.D. William N. Dember. *Professor of Psychology, University of Cincinnati, Ohio. Author of The Psychology of Perception.*

PERCEPTION, HUMAN (in part)

W.O. Wilfred Owen. *Former Senior Fellow, Brookings Institution, Washington, D.C. Author of The Accessible City and others.*

UNITED STATES OF AMERICA (in part)

W.O.B. William O. Bright. *Professor of Linguistics and Anthropology, University of California, Los Angeles. Editor, Language (journal). Author of American Indian Linguistics and Literature.*

LANGUAGES OF THE WORLD
(in part)

W.O.C. W. Owen Chadwick. *Former Regius Professor of Modern History, University of Cambridge. Author of The Reformation and others.*

GREGORY OF TOURS, SAINT
(Micropædia)

NEWMAN, JOHN HENRY (Micropædia)
PROTESTANTISM (in part)

W.O.W. William Ogwen Williams (d. 1969). *Sir John Williams Professor of Welsh History, University College of Wales, Aberystwyth, 1967-69.*

UNITED KINGDOM (in part)

W.P. Wilhelm Pauck (d. 1981). *Professor of Church History, Union Theological Seminary, New York City, 1953-67. Author of Harnack and Troeltsch and others.*

HARNACK, ADOLF VON (Micropædia)

W.Pa. Władysław Parczewski (d. 1981). *Professor of Physics of the Atmosphere, Technical University of Warsaw. Director, National Institute for Hydrology and Meteorology, Warsaw, 1966-69.*

EUROPE (in part)

W.P.D. W. Phillips Davison. *Professor of Sociology and Journalism, Columbia University. Author of International Political Communication.*

PUBLIC OPINION

W.P.G. Wesley Patterson Garrigus. *Emeritus Professor of Animal Husbandry, University of Kentucky, Lexington. Author of Introductory Animal Science.*

FARMING AND AGRICULTURAL
TECHNOLOGY (in part)

W.Ph.C. W.Ph. Coolhaas (deceased). *Professor of Colonial History, Utrecht*

University, The Netherlands. Coauthor of Jan Pieterszoon Coen and others.

COEN, JAN PIETERSZOOON
(Micropædia)

W.P.M. William P. Malm. *Professor of Music, University of Michigan, Ann Arbor. Author of Japanese Music and Musical Instruments; Music Cultures of the Pacific, the Near East, and Asia.*

EAST ASIAN ARTS (in part)

W.P.McG. William Paul McGreevey. *Senior Economist, The World Bank, Washington, D.C. Author of An Economic History of Colombia, 1845-1930.*

COLOMBIA (in part)

W.R. Willi Reich (d. 1980). *Music critic. Author of The Life and Work of Alban Berg and many others.*

BERG, ALBAN (Micropædia)

W.Ra. William Ravenhill. *Reardon Smith Professor of Geography, University of Exeter, England. Author of Ben Donn's Map of Devon, 1765; coauthor of South-West England.*

UNITED KINGDOM (in part)

W.R.C. William R. Chaney. *Professor of Tree Physiology, Purdue University, West Lafayette, Indiana.*

FORESTRY AND WOOD PRODUCTION
(in part)

W.R.H. William Richey Hogg. *Emeritus Professor of World Christianity, Southern Methodist University, Dallas, Texas. Author of One World, One Mission.*

CHRISTIANITY (in part)

W.R.J. Wilbur R. Jacobs. *Professor of History, University of California, Santa Barbara. Editor of The Letters of Francis Parkman.*

PARKMAN, FRANCIS (Micropædia)

PRESCOTT, WILLIAM H. (Micropædia)

W.R.M. Wilhelm Rudolf Marquardt. *Member, Board of Curators, IFO-Institute for Economic Research, Munich. Author of Seychellen, Komoren und Maskarenen.*

INDIAN OCEAN ISLANDS (in part)

W.R.P. William Roe Polk. *Historian. Professor of Middle Eastern History, University of Chicago, 1965-75. Author of The United States and the Arab World.*

ISRAEL (in part)

SYRIA (in part)

W.R.S. Walter R. Sharp (d. 1977). *Professor of International Relations, Yale University, 1951-64. Author of Field Administration in the United Nations System and others.*

UNITED NATIONS (in part)

W.S. Wilfred Sircus, M.D. *Senior Consultant Physician, Gastrointestinal Unit; former Reader in Medicine, University of Edinburgh. Coeditor of Scientific Foundations of Gastroenterology.*

DIGESTION AND DIGESTIVE SYSTEMS
(in part)

W.Sc. Walter Schulz. *Professor of Philosophy, Eberhard Karl University of Tübingen, West Germany. Member of the F.W.J. Schelling Commission of the Bavarian Academy of Sciences. Author of Schelling.*

SCHELLING, FRIEDRICH WILHELM JOSEPH
VON (in part) (Micropædia)

W.S.-cg. Wu Shih-ch'ang. *Former Senior Lecturer in Chinese, University of Oxford.*

HISTORY, THE STUDY OF (in part)

W.S.F. William S. Fyfe. *Professor and Chairman, Department of Geology, University of Western Ontario, London. Coauthor of The Earth.*

MINERALS AND ROCKS (in part)

W.S.H. Winthrop S. Hudson. *Adjunct Professor of Religion, University of North Carolina at Chapel Hill. James B. Colgate Professor of the History of Christianity, Colgate Rochester Divinity School, Rochester, New York, 1948-77. Author of Baptists in Transition and others.*

PROTESTANTISM (in part)

W.S.MacK. William Scott MacKenzie. *Professor of Petrology, Victoria University of Manchester.*

MINERALS AND ROCKS (in part)

W.S.MacNu. W. Stewart MacNutt (d. 1976). *Professor of History, University of New Brunswick, Fredericton. Author of New Brunswick: A History, 1784-1867.*

CANADA (in part)

W.S.N. William S. Newman. *Alumni Distinguished Professor Emeritus of Music, University of North Carolina at Chapel Hill. Author of A History of the Sonata Idea and others.*

MUSICAL FORMS AND GENRES (in part)

W.S.S. William S. Sahakian. *Professor of Psychology and Philosophy, Suffolk University, Boston. Author of History and Systems of Psychology and others.*

PSYCHOLOGY (in part)

W.S.Sh. Wendy Stedman Sheard. *Art historian. Author of Antiquity in the Renaissance; coeditor of Collaboration in Italian Renaissance Art.*

MANTEGNA, ANDREA (Micropædia)

W.T. Walter Terry (d. 1982). *Dance critic and editor, Saturday Review magazine; New York Herald Tribune; and others. Author of The Dance in America and many others.*

GRAHAM, MARTHA (Micropædia)

W.Ta. William Taylor. *Principal, University of London; Director, Institute of Education, 1973-83. Author of Society and the Education of Teachers.*

TEACHING (in part)

W.-t.C. Wing-tsit Chan. *Anna R.D. Gillespie Professor Emeritus of Philosophy, Chatham College, Pittsburgh. Emeritus Professor of Chinese Philosophy and Culture, Dartmouth College, Hanover, New Hampshire. Author of A Source Book in Chinese Philosophy and others.*

WANG YANG-MING (Micropædia)

W.T.Ca. William Thomas Calman (d. 1952). *Lecturer in Zoology, University of St. Andrews, Scotland, 1940-46. Keeper, Department of Zoology, British Museum, London, 1927-36. Author of The Life of Crustacea.*

CRUSTACEANS (in part)

W.T.G. Wassil Todorov Gjuzelev. *Professor of Bulgarian Medieval History, University of Sofia. Author of Knjaz Boris Parvi and others.*
BORIS I (Micropædia)

W.T.I. William T. Ingram. *Consulting engineer. Adjunct Professor of Civil and Environmental Engineering, Polytechnic Institute of New York, New York City. Author of "Environmental Engineering" in Standard Handbook for Civil Engineers.*

BUILDING CONSTRUCTION (in part)

W.T.Ke. William T. Keeton (d. 1980). *Liberty Hyde Bailey Professor of Biology, Cornell University, Ithaca, New York, 1969-80. Author of Biological Science; Elements of Biological Science.*

DIGESTION AND DIGESTIVE SYSTEMS (in part)

W.T.Sa. William T. Sanders. *Evan Pugh Professor of Anthropology, Pennsylvania State University, University Park. Coauthor of Mesoamerica: The Evolution of a Civilization and others.*
PRE-COLUMBIAN CIVILIZATIONS (in part)

W.T.v.S. Wolfram Th. von Soden. *Emeritus Professor of Ancient Semitic Philology and Ancient Oriental History, University of Münster, West Germany.*
IRAQ (in part)

W.U. Walter Ullmann (d. 1983). *Professor of Medieval History, University of Cambridge, 1972-78; Professor of Ecclesiastical History, 1965-72. Author of The Growth of Papal Government in the Middle Ages and others.*
LEO IX, SAINT (Micropædia)

W.V.D'A. William Vincent D'Antonio. *Executive Officer, American Sociological Association, Washington, D.C. Professor and Chairman, Department of Sociology, University of Connecticut, Storrs, 1971-76. Coauthor of Influentials in Two Border Cities.*

UNITED STATES OF AMERICA (in part)

W.V.E. Wolf Von Eckardt. *Design Critic, Time magazine. Architecture Critic, The Washington Post, 1963-81. Author of A Place to Live: The Crisis of the Cities.*

MIES VAN DER ROHE, LUDWIG (Micropædia)

W.V.M. William Vernon Mayer. *Emeritus Professor of Biology, University of Colorado, Boulder. Emeritus Director, Biological Sciences Curriculum Study. Author of Hibernation.*
BEHAVIOUR, ANIMAL (in part)

W.V.P. William V. Porter. *Associate Professor of Music History and Literature, Northwestern University, Evanston, Illinois.*

MUSICAL FORMS AND GENRES (in part)

W.V.S. Walter V. Scholes (d. 1975). *Professor of History, University of Missouri, Columbia, 1954-75. Author of Mexican Politics During the Juárez Regime, 1855-1872 and others.*
JUÁREZ, BENITO (Micropædia)

W.W. William Watson. *Former Professor of Chinese Art and Archaeology; former Head, Percival David Foundation of Chinese Art, School of Oriental and African Studies, University of London. Author of China Before the Han Dynasty and others.*

HISTORY, THE STUDY OF (in part)

W.W.B. William W. Brickman (d. 1986). *Professor of Educational History and Comparative Education, University of Pennsylvania, Philadelphia, 1962-81. Author of Educational Systems in the United States and others.*

EDUCATION, SYSTEMS OF (in part)

W.W.Bu. Warren W. Burggren. *Professor of Zoology, University of Massachusetts, Amherst. Editor, Physiological Zoology. Coeditor of Biology of the Land Crabs.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

W.W.C. W. Walker Chambers. *William Jacks Professor Emeritus of German, University of Glasgow. Coauthor of A Short History of the German Language.*

GERMAN LITERATURE (in part)

W.W.H. Warren W. Hassler, Jr. *Emeritus Professor of American History, Pennsylvania State University, University Park. Author of Commanders of the Army of the Potomac and others.*
UNITED STATES OF AMERICA (in part)

W.Wi. William Witte. *Emeritus Professor of German, University of Aberdeen, Scotland. Author of Schiller; editor of several of Schiller's works.*
HÖLDERLIN, FRIEDRICH (Micropædia)
SCHILLER, FRIEDRICH VON (in part) (Micropædia)

W.W.R. William Wallace Robson. *Masson Professor of English Literature, University of Edinburgh. Author of Critical Essays: Modern English Literature.*

LAWRENCE, D.H. (in part) (Micropædia)
TENNYSON, ALFRED TENNYSON, 1ST BARON (Micropædia)

W.W.W. William Walter Watts (d. 1948). *Keeper, Department of Metal Work, Victoria and Albert Museum, London, 1879-1923. Author of Old English Silver and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

W.-Y.K. Won-Yong Kim. *Professor of Archaeology, Seoul National University. Author of Treasures of Korean Art; History of Korean Art.*

EAST ASIAN ARTS (in part)
WRITING (in part)

W.Y.W. William Young Willetts. *Former Curator, Museum of Asian Art, University of Malaya, Kuala Lumpur.*

Author of Chinese Art.

DECORATIVE ARTS AND FURNISHINGS (in part)

W.Z. Warren Zeiller. *Vice President and General Manager, Miami Seaquarium. Author of Tropical Marine Fishes of South Florida and the Bahamas and others.*

FISHES (in part)

W.Ze. Wilbur Zelinsky. *Emeritus Professor of Geography, Pennsylvania State University, University Park. Author of The Cultural Geography of the United States and others.*

UNITED STATES OF AMERICA (in part)

Y.A.C. Yehudi A. Cohen. *Professor of Anthropology, Rutgers University, New Brunswick, New Jersey. Editor of Man in Adaptation.*

rites and CEREMONIES, SACRED (in part)

Y.B. Yvon Belaval. *Professor of Philosophy, University of Paris I. Vice President, Leibniz Society, Hanover, West Germany. Honorary President, Society of Eighteenth Century Studies, Paris. Author of Leibniz: Initiation à sa philosophie and many others.*

LEIBNIZ, GOTTFRIED WILHELM (in part) (Micropædia)

Y.-c.K. Yu-chin Kang. *Professor of Atmospheric Sciences, National Taiwan University, Taipei.*

TAIWAN (in part)

Y.C.W. Yi Chu Wang. *Professor of History, Queens College, City University of New York. Author of Chinese Intellectuals and the West.*

CHANG CHIH-TUNG (Micropædia)
SUN YAT-SEN (Micropædia)

Y.-G.G.H. Yueh-Gin Gung Hu. *Researcher in Chinese studies. Assistant Librarian, University of Chicago, 1938-43.*

CHINA (in part)

Y.J. Yette Jeandet. *Former Editor, Literary News, Bayard-Presse, Paris. Author of Blanche de Castille, reine de l'unité française and others.*

BLANCHE OF CASTILE (Micropædia)

Y.K.Y. Yury Konstantinovich Yefremov. *Former Senior Scientist, Geographical Museum, Moscow M.V. Lomonosov State University.*
ASIA (in part)

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 Brown, Maurice J.E. M.J.E.B.
 Brown, Peter R.L. P.R.L.B.
 Brown, Robert Harold. R.H.Br.
 Brown, T. Julian. T.J.Br.
 Browning, Robert. R.B.
 Bruce, Frederick Fyvie. F.F.B.
 Bruce, Michael I. M.I.B.
 Brugiére, Jean-Marie. Je.-M.B.
 Bruhat, Jean. J.Bru.
 Bruk, Solomon Ilich. S.I.B.
 Bruman, Henry J. H.J.Bn.
 Brunner, Hellmut. He.B.
 Brunnschweiler, Dieter. Di.B.
 Bruschi, Arnaldo. Ar.B.
 Brush, Stephen G. S.G.B.
 Brusher, The Rev. Joseph Stanislaus. J.S.Br.
 Bry, Doris. D.Br.
 Bryant, Sir Arthur. Ar.Br.
 Bryant, John H. J.H.Br.
 Buchan, The Hon. Alastair Francis. A.F.B.
 Buchanan, Robert Angus. R.A.Bu.
 Buckmaster, Barbara. B.Br.
 Budden, Julian Medforth. J.M.Bu.
 Budenholzer, Roland A. R.A.B.
 Budinger, Thomas F. T.F.B.
 Buechner, Thomas S. T.S.Bu.
 Buettner-Janusch, John. J.B.-J.
 Bugh, Glenn Richard. G.R.B.
 Buitenen, J.A.B. van. J.A.B.v.B.
 Bullock, Alan Bullock, Baron. A.B.
 Bullough, The Rev. Sebastian. S.Bh.
 Burdeau, Michel. Mi.B.
 Burgess, Anthony. An.B.
 Burggren, Warren W. W.W.Bu.
 Burghardt, The Rev. Walter John. W.J.Bu.
 Burke, Ulick Peter. U.P.B.
 Burn, Andrew Robert. A.R.Bu.
 Burnaby, The Rev. John. Jo.Bu.
 Burns, Sir Alan Cuthbert. A.C.Bs.
 Burns, E. Bradford. E.B.B.
 Burns, Thomas W. T.W.B.
 Burr, Robert N. R.N.Bu.
 Burri, Peter H. P.H.B.
 Burrows, William. W.Bu.
 Burrus, John N. J.N.B.
 Burton, Ivor F. I.F.B.
 Burton, Maurice. M.Bn.
 Burton, Milton. M.Bu.
 Burt, Edward Howland, Jr. E.H.B.
 Buru, Mukhtar Mustafa. Mu.B.
 Busch, Daryle H. D.H.B.
 Bush, Douglas. D.B.
 Bush-Brown, Albert. A.B.-B.
 Bushman, Donald O. D.O.B.
 Bushnell, Geoffrey H.S. G.H.S.B.
 Buss, Robin Caron. R.C.Bu.
 Busuttill, Salvino. S.Bu.
 Butland, Gilbert James. G.J.B.
 Butler, Joseph T. J.T.B.
 Butler, M.H. M.H.B.
 Butlin, Martin. Ma.Bu.
 Butt, John Everett. J.E.Bu.
 Butterfield, Lyman H. L.H.Bu.
 Buttinger, Joseph. J.Bu.
 Butts, Allison. A.Bu.
 Butzer, Karl W. K.W.B.
 Buxton, Richard G.A. R.G.A.B.
 Bykov, Vasilii Dmitrievitch. V.D.B.
 Byrnes, Robert F. R.F.B.
 Cadbury, Henry J. H.J.C.
 Cadoux, Theodore John. T.J.C.
 Cahen, Claude. C.C.
 Cahill, James F. J.F.C.
 Cahir, John J. J.J.Ca.
 Cahn, Robert W. R.W.C.
 Cain, A.J. A.J.Ca.
 Cain, Seymour. S.C.
 Cairns, James Ford. J.F.Ca.
 Calkin, Carleton Ivers. C.I.C.
 Calkins, Philip B. P.B.Ca.
 Callaghan, Peter John. P.J.C.
 Calman, William Thomas. W.T.Ca.
 Calmon, Pedro. P.Ca.
 Calne, Roy Yorke. R.Y.C.
 Calogero, Guido. G.C.
 Camacho, Jorge A. J.A.Ca.
 Camara, Camille. Ca.C.
 Cameron, Kenneth Walter. K.W.C.
 Cameron, Roy Eugene. R.E.C.
 Campana, Pier Paolo del. P.P. del C.
 Campbell, Alan K. A.K.Ca.
 Campbell, Eila M.J. E.M.J.C.
 Campbell, John R. J.R.C.
 Cannon-Brookes, Peter. P.C.-B.
 Canright, James Edward. J.E.Ca.
 Cansdale, George S. Ge.C.
 Capers, Gerald M. G.M.C.
 Caponigri, A. Robert. A.R.C.
 Capper, Comdr. Douglas Parodé. D.P.C.
 Cardona, George. Ge.Ca.
 Cardoze, Nydia Maria. N.M.C.
 Carey, Margret A. Ma.A.C.
 Carli, Enzo. E.Ca.
 Carlsson, Sten C.O. S.C.O.C.
 Carluccio, Luigi. L.Ca.
 Carmagnani, Marcello A. M.A.Ca.
 Carpenter, Malcolm Breckenridge. M.B.C.
 Carr, Bruce Alan. B.A.C.
 Carr, Edward H. E.H.C.
 Carr, Raymond. R.Ca.
 Carrington, Dorothy V. D.V.C.
 Carruthers, John E. J.E.C.

- Carsaniga, Giovanni. G.Car.
 Carson, David. D.Ca.
 Carson, Hampton L. H.L.C.
 Carstensen, Vernon. V.Ca.
 Carter, Francis William. F.W.C.
 Carter, Wilbert K. W.K.C.
 Cartwright, Frederick F. F.F.C.
 Cartwright, Janet M. J.M.Ca.
 Cartwright, Rosalind D. R.D.C.
 Cary, Max. M.Car.
 Cary, Otis. O.C.
 Casey, H.C., Jr. H.C.C.
 Cash, Arthur H. A.H.Ca.
 Casolani, Lieut. Col. Charles Edward. C.E.C.
 Castañeda, Concepción E. C.E.Ca.
 Castle, Peter Henry John. P.H.J.C.
 Caswell, John Edwards. Jo.E.C.
 Catalano, Eduardo F. E.F.C.
 Caudle, Ben H. B.H.C.
 Caughey, John W. J.W.C.
 Causso, Jean-Louis. J.-L.Ca.
 Caverio Lataillade, Iñigo. I.C.L.
 Caviedes, Cesar N. C.N.Ca.
 Cawkwell, George Law. G.L.Ca.
 Cessi, Roberto. R.Ce.
 Cestre, Charles. C.Ce.
 Chadwick, Charles. C.Ch.
 Chadwick, The Very Rev. Henry. H.Cha.
 Chadwick, W. Owen. W.O.C.
 Chaillet, Ned. N.Ch.
 Chaisson, Eric J. E.J.C.
 Chaix-Ruy, Jules-Marie. J.C.-R.
 Chambers, W. Walker. W.W.C.
 Chambre, The Rev. Henri. H.C.
 Chamot, Mary. M.Ch.
 Chan, David B. D.B.C.
 Chan, Hoklam. H.Ch.
 Chan, Wing-tsit. W.-t.C.
 Chandlerli, Abdel Kader. A.K.Ch.
 Chandler, David P. D.P.Ch.
 Chandra, Pramod. P.Ch.
 Chandrasekhar, Sripathi. S.Ch.
 Chaney, William R. W.R.C.
 Chang, Chen-tung. C.-t.C.
 Chang, Sen-dou. S.-d.C.
 Chao Lin. Ch.L.
 Chapanis, Alphonse. Al.C.
 Chapman, Brian. B.Ch.
 Chapman, Floyd Barton. F.B.C.
 Chapman, Frank. F.Ch.
 Chapman, Valentine J. V.J.C.
 Charles, Jean-Léon. J.-L.Ch.
 Charleston, Robert Jesse. R.J.Ch.
 Charlton, Donald Geoffrey. D.G.Ch.
 Chastenot de Castaing, Jacques. J.C. de C.
 Chatterjee, Shiba P. S.P.C.
 Chen, Cheng-Siang. C.-S.Ch.
 Ch'en, Jerome. Je.Ch.
 Chen, Shou Yi. S.Y.C.
 Chen, Theodore Hsi-en. T.H.C.
 Cheng, Bin. Bi.C.
 Cheng, Chu-yuan. C.-y.C.
 Chenu, The Rev. Marie-Dominique. M.-D.Ch.
 Chern, S.S. S.S.C.
 Cherniack, Neil S. N.S.C.
 Cherry, John. J.Ch.
 Chevalier, Willie J. W.J.C.
 Chevallier, Jean-Jacques. J.-J.C.
 Chiang Yee. C.Y.
 Chiappini, Luciano. L.Ch.
 Chib, Sukhdev Singh. S.S.Ch.
 Childers, Norman F. N.F.C.
 Chilver, Guy Edward Farquhar. G.E.F.C.
 Chisholm, Lawrence James. L.J.C.
 Chissell, Joan. Jo.Ch.
 Choay, Françoise. F.C.
 Chong, Byong-Wuk. B.-W.C.
 Chow, Christopher. Ch.C.
 Chow, Tse-tsung. T.-t.C.
 Chow, Ven Te. V.T.C.
 Christensen, Aksel E. A.E.Cn.
 Christensen, Dieter. Di.C.
 Christensen, Jan. Ja.C.
 Christie, Andrew Barnett. A.B.C.
 Christie, Ian R. I.R.C.
 Christie, Robert L. R.L.Ch.
 Chuang Shang-yen. C.S.-y.
 Ćirković, Sima M. S.M.Ci.
 Clagg, Sam E. S.E.C.
 Clark, Eugene. E.Cl.
 Clark, George B. G.B.Cl.
 Clark, John Grahame Douglas. J.G.D.C.
 Clark, Walter Houston. W.H.C.
 Clarke, Donald C. D.C.C.
 Clarke, Martin Lowther. M.L.C.
 Clarkson, Jesse Dunsmore. J.D.C.
 Classen, Peter. P.Cla.
 Clay, Theresa. T.Cl.
 Clayton, Raymond Brazenor. R.B.C.
 Clayton, Sir Stanley George. S.G.C.
 Clegern, Wayne M. W.M.Cl.
 Clemence, Gerald M. G.M.Ce.
 Clench, Mary Heimerdinger. M.H.C.
 Clifford, Derek Plint. D.P.Cl.
 Clifford, James Lowry. J.L.Cl.
 Clifford, Paul R. P.R.Cd.
 Cline, Barbara Lovett. B.L.C.
 Cline, C.L. C.L.Cl.
 Cline, Howard F. H.F.C.
 Clingan, Ian C. I.C.C.
 Closs, Gerhard L. G.L.C.
 Clutton, Cecil. C.Cl.
 Coates, J.E. J.E.Co.
 Cochrane, The Rev. Arthur C. A.C.C.
 Cockshut, A.O.J. A.O.J.C.
 Codazzi, Angela. A.C.
 Coe, Michael Douglas. M.D.C.
 Cofer, Charles N. C.N.C.
 Coffin, David R. D.R.C.
 Coffin, Ivor Cecil. I.C.Cn.
 Coggeshall, Ivan Stoddard. I.S.C.
 Cogley, John. Jo.C.
 Cogniat, Raymond. R.Cog.
 Cohen, Arthur L. A.L.C.
 Cohen, Gerson D. G.D.C.
 Cohen, Jerome B. J.B.Co.
 Cohen, Jozef. J.C.
 Cohen, Yehudi A. Y.A.C.
 Cohn, Paul M. P.M.C.
 Cole, Fay-Cooper. F.-C.Ce.
 Cole, Dame Margaret I. M.I.C.
 Cole, Sonia M. S.M.Co.
 Collins, George R. G.R.Co.
 Collins, James Daniel. J.D.Co.
 Collins, Nigel. N.Co.
 Collins, Peter. Pe.C.
 Collins, Philip. Ph.C.
 Collins, Robert O. R.O.C.
 Collison, Robert L. R.L.C.
 Comhaire, Jean L. J.Co.
 Condliffe, J. B. J.B.C.
 Condon, Edward U. E.U.C.
 Cone, Carl B. C.B.Co.
 Conley, C. Lockard. C.L.C.
 Conn, J.F.C. J.F.C.C.
 Conn, Robert W. Ro.W.C.
 Connell, Timothy John. T.J.Co.
 Connor, Ralph A. R.A.Co.
 Conot, Robert E. R.E.Co.
 Conrad, Barnaby. B.C.
 Constable, William G. W.G.C.
 Contreras R., Jose Daniel. J.D.C.R.
 Conversi, Leonard W. L.C.
 Conybeare, Charles E.B. C.E.B.C.
 Cook, David A. D.A.C.
 Cook, James Gordon. J.G.Co.
 Cook, L. Russell. L.R.C.
 Cooke, Deryck V. D.V.Co.
 Coolhaas, W.Ph. W.Ph.C.
 Coon, Carleton Stevens. C.S.C.
 Cooper, Douglas. D.C.
 Cooper, G. Arthur. G.A.C.
 Cooper, Kenneth H. K.H.C.
 Cooper, Martin Du Pré. M. Du P.C.
 Copp, J. Terry. J.T.C.
 Corbet, Philip S. P.S.C.
 Cordner, Michael. M.Co.
 Cormack, Robin Sinclair. R.S.Co.
 Cornelius, Charles E. C.E.Co.
 Cornevin, Robert. R.Co.
 Cornwall, John L. J.L.C.
 Coser, Lewis A. L.A.C.
 Coste, René. R.C.
 Cotter, Charles Henry. C.H.C.
 Cottle, Richard W. R.W.Co.
 Cotton, F. Albert. F.A.C.
 Coulson, Noel James. N.J.C.
 Coupland, Robert Thomas. R.T.C.
 Court, Nathan Altshiller. N.A.Ct.
 Courthion, Pierre. P.Co.
 Cousin, Jean. Je.C.
 Couzens, Edward Gordon. E.G.C.
 Cowan, Richard S. R.S.C.
 Cowen, Denis Victor. D.V.Cn.
 Cowgill, Warren. W.C.
 Cowie, Alexander. A.Co.
 Cowley, Malcolm. Ma.C.
 Cox, Hiden T. H.T.C.
 Cox, Maria S. M.S.C.
 Coxe, Antony Dacres Hippiisley. A.D.H.C.
 Coxeter, H.S. MacDonald. H.S.MacD.C.
 Crabb, David W. D.W.C.
 Cragg, The Rt. Rev. Albert Kenneth. A.K.C.
 Cranston, Maurice. M.C.
 Cranstone, Bryan A.L. B.A.L.C.
 Cratty, Bryant J. B.J.C.
 Crawshay-Williams, Rupert. R.C.-W.
 Creevey, Peter Raymond. P.R.C.
 Cremin, Lawrence A. L.A.Cr.
 Crews, Eli Rush. E.R.C.
 Crews, Frederick C. F.C.C.
 Crist, Raymond E. R.E.Cr.
 Croizier, Ralph C. R.C.C.
 Croll, Gerhard. G.Cr.
 Cromer, George C. G.C.C.
 Cromer, Orville C. O.C.C.
 Crompton, Robin Huw. R.H.C.
 Crone, Gerald Roe. G.R.C.
 Cronin, Vincent. V.C.
 Cronquist, Arthur. A.Cr.
 Crook, John Anthony. J.A.Cr.
 Crook, Keith A.W. K.A.W.C.
 Crossland, Norman. N.C.
 Crossley-Holland, Peter. P.C.-H.
 Crouzet, François Marie-Joseph. F.Ct.
 Crow, Paul A., Jr. P.A.C.
 Crowley, Daniel J. D.J.C.
 Crowley, The Rev. Theodore. T.Cr.
 Crowther, Bosley. B.Cr.

- Crowther, J.G. J.G.Cr.
 Crozet, René. Re.C.
 Cruickshank, John. J.Cr.
 Cruse, William. W.Cr.
 Cucu, Vasile S. V.S.C.
 Cuffee, Michael. M.Cu.
 Culican, William. W.Cu.
 Cullen, James. J.Cul.
 Current, Richard N. R.N.C.
 Curtin, Nancy A. N.A.C.
 Curtin, Philip De Armond. P. De A.C.
 Curtis, Alan S. A.S.Cu.
 Curtis, Stanley Evan. S.E.Cu.
 Cuthbert, Alan William. A.W.C.
 Cuttler, Charles D. C.D.Cu.
- Daiches, David. D.Da.
 Dalley, Stephanie Mary. S.M.D.
 Dalstrom, Harl Adams. H.A.D.
 Daniel, Glyn Edmund. G.E.D.
 Daniel, Ralph Thomas. R.T.D.
 Daniels, Milton Rockwood. M.R.Da.
 Daniels, Robert V. R.V.D.
 Dansette, Adrien. A.Da.
 D'Antonio, William Vincent.
 W.V.D'A.
 Dantzig, George B. G.B.D.
 Danzig, Allison. A.D.
 Das, Hariprasanna. H.D.
 Das, Manmath Nath. M.N.D.
 Dashtseren, D. D.Dn.
 Dasmann, Raymond F. R.F.D.
 Dauster, Frank N. F.N.D.
 David, René. R.Da.
 Davidsohn, A.S. A.S.D.
 Davidson, Eugene A. E.A.D.
 Davidson, James Norman. J.N.D.
 Davidson, Robert Bruce. R.B.D.
 Davies, Ernest Albert John. E.A.J.D.
 Davies, Hugh Alistair. H.A.Da.
 Davies, The Rev. J. Gordon. J.G.D.
 Davies, Norman. N.D.
 Davies, Oliver. O.D.
 Davies, R.J. R.J.Da.
 Davies, Robert E. R.E.Da.
 Davies, Roger. Ro.D.
 Davies, The Rev. Rupert E. R.E.D.
 Davies, Thomas M., Jr. T.M.D.
 Davis, Gwenda Louise. G.L.D.
 Davis, Harry. Ha.D.
 Davis, H. Grady. H.G.D.
 Davis, M. Edward. M.E.D.
 Davis, Morton D. M.D.D.
 Davis, Richard A., Jr. R.A.D.
 Davis, William C., Jr. W.C.Da.
 Davison, P.H. P.H.D.
 Davison, W. Phillips. W.P.D.
 Davson, Hugh. H.Da.
 Dawbin, William Henry. W.H.D.
 Dawson, Andrew Hutchinson. A.H.D.
 Dawson, Mary R. M.R.D.
 Day, Michael H. M.H.D.
 Dayal, P. P.D.
 Dean, The Most Rev. Ralph Stanley.
 R.S.De.
 DeBakey, Michael E. M.E.DeB.
 de Beer, Sir Gavin. G. de B.
 de Blij, Harm J. H.J. de B.
 Decker, Barbara B. B.B.De.
 Decker, Robert W. R.W.De.
 De Conde, Alexander. A. De C.
 Dédéyan, Charles. C.De.
 de Graft-Johnson, John Coleman.
 J.C. de G-J.
 DeJong, Russell N. R.N.DeJ.
- Dekker, George G. G.De.
 de la Mare, Peter B.D. P.B.D. de la M.
 Delane, Mary. M.De.
 Delebecque, Edouard. E.D.
 Delmelle, Joseph-Edouard-Marie-
 Ghislain. J.E.-M.-G.D.
 DeLong, Dwight Moore. D.M.DeL.
 Delporte, Henri J. H.J.De.
 Delsemme, Armand H. A.H.De.
 DeMaggio, Augustus E. A.E.D.
 Dember, William N. W.N.D.
 Demoz, Abraham. A.Dem.
 Denecke, Ludwig. L.De.
 Denman, Hugh F. H.F.D.
 Deraniyagala, Paul E. Pieris. P.E.P.D.
 Der Nersessian, Sirarpi. S. Der N.
 Desai, Ranjit Ramchandra. R.R.D.
 Desan, Wilfrid. W.De.
 de Santillana, Giorgio D. G. de S.
 Descargues, Pierre. P.De.
 Deschamps, Hubert Jules. H.J.D.
 Descloutres, Robert. R.De.
 Descola, Jean. J.De.
 Desforges, Jane F. Ja.F.D.
 Despić, Aleksandar R. A.De.
 Desrosier, Norman Wilfred. N.W.D.
 Dethan, Georges. G.Det.
 de Vleeschauwer, Herman Jean.
 H.J. de V.
 Devlin, John F. J.F.De.
 de Vries, Johan G.W. J.G.W. de V.
 Dewdney, John C. J.C.D.
 De Wiest, Roger J.M. R.J.M. De W.
 DeWoskin, Kenneth J. K.J.DeW.
 Diakonoff, Igor Mikhailovich. I.M.D.
 Diano, Carlo. C.D.
 Dibner, Bern. B.Di.
 Dickie, James. J.Di.
 Dickinson, Harry T. H.T.D.
 Dickinson, Robert Eric. R.E.Di.
 Dickson, Kwamina Busumafi. K.B.D.
 Dickson, Lovat. L.D.
 Dienst, Heide. H.Di.
 Diethrich, Edward Bronson. E.B.D.
 Dietz, Robert Sinclair. R.S.D.
 Diffloth, Gérard. G.Di.
 Dijkgraaf, Sven. S.Di.
 Dilger, William C. W.C.Di.
 Dillon, Myles. M.D.
 Dimitrovsky, Haim Zalman. H.Z.D.
 Dimock, Edward C., Jr. E.C.D.
 Dingman, S. Lawrence. S.L.D.
 Dinshaw, Fram E. F.E.D.
 Diószegi, Vilmos. V.D.
 Diring, David. D.D.
 Ditchburn, Robert William. R.W.Di.
 Djibladze, Mikhail Leonidovich.
 M.L.D.
 Djordjevic, Dimitrije V. D.V.D.
 Dobzhansky, Theodosius. T.D.
 Dockstader, Frederick J. F.J.D.
 Dodson, Calaway H. C.H.D.
 Dölger, Franz. F.Dr.
 Domanitsky, Anatoly Petrovich.
 A.P.D.
 Domb, Cyril. Cy.Do.
 Domingues, Mário José. M.J.D.
 Domínguez, Jorge I. J.I.D.
 Domke, Martin. M.Do.
 Donald, David Herbert. D.H.D.
 Donald, Larry W. L.W.D.
 Doniger, Wendy. W.Do.
 Donini, Filippo. F.Do.
 Donnellan, Keith S. K.S.D.
 Donoghue, Denis. D.Do.
 Donovan, Bernard Thomas. B.T.D.
- Dooling, David, Jr. Da.D.
 Doorn, Jacques van. J.v.D.
 Dorese, Jean P. J.P.Do.
 Dorfman, Robert. R.D.
 Dorfman, Ron. R.Do.
 Doroshinskaya, Yelena Matveyevna.
 Y.M.D.
 Dorpalen, Andreas. A.Do.
 Dorson, Richard M. R.M.D.
 Dorst, Jean P. J.P.D.
 Doucy, Arthur J.M. Ar.D.
 Douglas, A. Vibert. A.V.D.
 Douglas, Ronald Walter. R.W.D.
 Douie, Decima L. D.L.D.
 Dowd, Douglas F. D.F.Do.
 Dowdey, Clifford. C.Do.
 Dowling, Herndon G. H.G.Do.
 Dowsett, Charles James Frank.
 C.J.F.D.
 Drake, Paul W. P.W.D.
 Dresch, Jean. Je.D.
 Drescher, Seymour. S.Dr.
 Dresden, Mark J. M.J.Dr.
 Driscoll, John S. J.S.D.
 Drobnig, Ulrich M. U.M.D.
 Drower, Margaret Stefana. M.S.D.
 Drucker, Philip. P.Dr.
 Drummond, Boyce A., Jr. B.A.D.
 Dubois, Carlos Pablo. C.P.D.
 Duchesne-Guillemin, Jacques. J.D.-G.
 Duckett, Eleanor Shipley. E.S.D.
 Dudley, Donald Reynolds. D.R.D.
 Dudley, Elizabeth Corning. E.C.Du.
 Due, John F. J.F.D.
 Duellman, William E. W.E.D.
 Dufford, Stanley. S.D.
 Dugdale, Donald Stephen. D.S.D.
 Dull, Jack L. J.L.D.
 Dulles, The Rev. Avery. A.Du.
 Dumesnil, René. R.Dum.
 Dummett, Michael A.E. Mi.D.
 Dunaev, Vladimir Nikolaevich. V.N.D.
 Dunbar, Maxwell John. M.J.Du.
 Dunbar, Moira. M.Dr.
 Dunn, Ethel Deikman. E.D.D.
 Dunn, L.C. L.C.D.
 Dunn, Richard S. R.S.Du.
 Dunn, Stephen Porter. S.P.D.
 Dupree, Louis. L.Du.
 Dupree, Nancy Hatch. N.H.D.
 Durant, Frederick C., III. F.C.D.III.
 Durgnat, Raymond E. R.Du.
 Durham, J. Wyatt. J.W.Du.
 Durko, Janusz. Ja.D.
 Dury, George Harry. G.H.D.
 Dussel, Enrique. E.Du.
 Du Val, Patrick. P. Du V.
 Duveen, Denis Ian. D.I.D.
 Duverger, Maurice. M.Du.
 Dwivedi, R.L. R.L.D.
 Dworken, Harvey J. H.J.Dw.
 Dyck, Cornelius J. C.J.D.
 Dyer, Denys G. D.G.D.
 Dykeman, Wilma. W.D.
 Dykhuizen, George. G.Dy.
- Eardley, Armand J. A.J.E.
 Earl, David Magarey. D.M.Ea.
 Easby, Dudley Tate, Jr. D.T.E.
 East, Robert A. R.A.E.
 East, W. Gordon. W.G.E.
 Eastman, Richard H. R.H.E.
 Easton, Archie H. A.H.E.
 Ebisawa, Arimichi. A.Eb.
 Ebling, F. John G. F.J.G.E.

- Eccles, W.J. W.J.E.
 Eckbo, Garrett. G.Ec.
 Ede, David A. D.E.
 Edel, Leon. L.Ed.
 Edelmann, Chester Monroe, Jr.
 C.M.E.
 Edge, Ian David. I.D.E.
 Edlin, Herbert Leeson. H.L.E.
 Edwards, Clive Arthur. C.A.E.
 Edwards, Kenneth Charles. K.C.E.
 Edwards, Richard Humphrey Tudor.
 R.H.T.E.
 Edwards, Robert Walter Dudley.
 R.W.D.E.
 Edzard, Dietz O. D.O.E.
 Egerod, Søren Christian. S.C.E.
 Eggen, Olin Jeuck. O.J.E.
 Egli, Emil. E.Eg.
 Ehrlich, Blake. B.E.
 Eidt, Robert C. R.C.Ei.
 Eilon, Samuel. S.E.
 Ekstrom, George F. G.F.E.
 Elath, Eliahu. E.E.
 Elekes, Lajos. L.El.
 El Hamamsy, Laila Shukry. L.S.El H.
 Eliade, Mircea. M.Ee.
 El-Kammash, Magdi M. M.M.El-K.
 Elkin, Adolphus Peter. A.P.E.
 Ellér, Ernest McNeill. E.McN.E.
 Elliott, David H. D.H.E.
 Elliott, Geoffrey Kenyon. G.K.E.
 Elliott, Sir Ivo D'Oyly. I.D'O.E.
 Elliott, John F. J.F.E.
 Elliott, Robert C. R.C.E.
 Ellis, E. Earle. E.E.E.
 Ellis, Peter. P.E.
 Elsasser, Walter M. W.M.E.
 Elsen, Albert Edward. A.E.El.
 Elton, Sir Geoffrey R. G.R.E.
 Emerit, Marcel. M.E.
 Emery, Walter. W.Em.
 Emmerick, Ronald Eric. R.E.E.
 Enander, Henrik. H.En.
 Endress, Peter K. P.K.E.
 Engberg, Jens. J.E.
 Engerrand, George C. G.C.E.
 Englekirk, John E. J.E.E.
 Enrico, Eugene J. E.J.E.
 Epperson, Gordon. G.E.
 Epstein, William. W.E.
 Erb, Donald James. D.Er.
 Erb, Hubert Joseph. H.J.Er.
 Erben, Walter. W.Er.
 Ericson, David Barnard. D.B.E.
 Erinc, Sirri. S.Er.
 Erlanger, Philippe. P.Er.
 Erpelding, Jean-Pierre. J.-P.E.
 Erulkar, Solomon D. S.D.E.
 Escarpit, Robert. R.Es.
 Escholier, Marc Marie. M.M.E.
 Eskenazi, Gerald. G.Es.
 Ess, Josef van. J.v.E.
 Esslin, Martin J. M.J.E.
 Eulau, Heinz. H.E.
 Euler, Heinrich Gustav. H.G.E.
 Evans, Graham. G.Ev.
 Evans, Dame Joan. J.Ev.
 Evans, Luther Harris. L.H.E.
 Evans, M. Albert. M.A.E.
 Evenson, Edward B. E.B.E.
 Everard, Cyril Ernest. C.E.E.
 Everett, Richard W. R.W.E.
 Everett, Thomas H. T.H.E.
 Every, Brother George. Ge.E.
 Ewald, Paul P. P.P.E.
 Ewald, Robert Harold. R.H.Ew.
- Eyck, Frank. F.Ek.
 Eyring, Henry. H.Ey.
 Ezell, John S. J.S.E.
- Fadiman, Clifton. C.Fa.
 Fage, John Donnelly. J.D.F.
 Fagg, John E. J.E.F.
 Faherty, Robert L. R.F.
 Fainsod, Merle. M.F.
 Fairbridge, Rhodes W. R.W.F.
 Falkenheim, Victor C. V.C.F.
 Faller, James E. Ja.F.
 Faller, Larry D. L.D.F.
 Faris, Nabih Amin. N.A.F.
 Faris, Robert E.L. R.E.L.F.
 Faron, Louis C. L.C.F.
 Faulkner, Raymond Oliver.
 R.O.F.
 Fautin, Daphne Gail. D.G.Fa.
 Fawcett, Don W. D.W.F.
 Fedan, Jeffrey S. J.S.F.
 Federico, Pasquale J. P.J.F.
 Fedorovich, Boris Aleksandrovich.
 B.A.F.
 Feferman, Solomon. S.Fe.
 Fefferman, Charles L. C.L.F.
 Feigin, Ralph D. R.D.F.
 Feigl, Herbert. H.Fe.
 Feigon, Lee Nathan. L.N.F.
 Feldman, Louis H. L.H.F.
 Fellman, David. D.Fe.
 Fellner, Fritz. F.Fe.
 Felteau, Cyrille. C.Fe.
 Fennell, John Lister Illingworth.
 J.L.I.F.
 Ferdinandy, Michael de. M. de F.
 Ferguson, Ian Keith. I.K.F.
 Ferguson, John. J.Fe.
 Fermín Gómez, Mercedes. Me.F.G.
 Fernald, John Bailey. J.B.F.
 Fernier, Robert J. R.J.F.
 Feuer, Lewis S. L.S.F.
 Feuerwerker, Albert. A.Fe.
 Fieandt, Kai V.J. von. K.V.J.v.F.
 Fiegenbaum, J.W. J.W.F.
 Field, Andrew. A.Fi.
 Fielder, Gilbert. G.Fi.
 Fielding, Raymond E. R.E.Fi.
 Fifer, J. Valerie. J.V.F.
 Filip, Jan. J.F.
 Filliozat, Jean L.A. J.L.A.F.
 Findley, James Smith. J.Fi.
 Finer, Samuel Edward. S.E.F.
 Fink, Donald G. D.G.F.
 Finkbeiner, Daniel T., II. D.T.F.
 Finley, Robert W. Ro.W.F.
 Finn, Bernard S. B.S.F.
 Firth, Sir Raymond William.
 R.W.Fi.
 Fischer, John L. J.L.Fi.
 Fischer, Wolfgang G. W.G.Fi.
 Fischler, Shirley W. S.W.Fi.
 Fischler, Stanley I. S.I.F.
 Fisher, William B. W.B.Fi.
 Fishman, Alfred P. A.P.F.
 Fiske, Donald W. D.W.Fi.
 FitzGerald, Charles Patrick. C.P.F.
 Flannery-Hertzfeld, Regina.
 R.F.-He.
 Flaum, Thea K. T.K.F.
 Fleming, Richard Howell. R.H.Fi.
 Fleming, William. Wm.F.
 Fletcher, Angus Stewart. A.S.F.
 Fletcher, Basil Alais. B.F.
 Fletcher, Joseph O. J.O.Fi.
- Fletcher, Ronald. R.Fi.
 Flew, Antony Garrard Newton.
 A.G.N.F.
 Flint, John Edgar. J.E.Fi.
 Flint, Richard Foster. R.F.F.
 Florinsky, Michael T. M.T.F.
 Florkin, Marcel. M.Fi.
 Flusser, David. D.Fi.
 Fogelson, Raymond D. R.D.Fo.
 Folk, Robert Louis. R.L.F.
 Fomin, Luch Mikhaylovich. L.M.F.
 Foner, Anne. A.F.
 Foner, Philip S. P.S.F.
 Foot, Michael Richard Daniell.
 M.R.D.F.
 Force, Roland Wynfield. R.W.Fo.
 Ford, Arthur B. A.B.Fo.
 Forde, Enid R.A. E.R.A.F.
 Forder, Henry George. H.G.F.
 Fordham, Frieda. F.Fo.
 Fordham, Michael S.M. M.S.M.F.
 Formo, Marvin W. M.W.F.
 Forsdyke, Sir Edgar John. E.J.F.
 Foskett, Douglas John. D.J.F.
 Foss, Lukas. L.Fo.
 Foulkes, David. D.F.
 Fourastié, Jean. J.Fo.
 Fournier, Gabriel. G.Fo.
 Fowler, Catherine S. C.S.F.
 Fowler, Don D. D.D.F.
 Fowler, E. Bert. E.B.F.
 Fowler, Gizella Rochelle. G.R.F.
 Fowler, Murray. M.Fo.
 Fowler, W. Beall. W.B.F.
 Fowlie, Wallace. W.F.
 Fox, Denis Llewellyn. D.L.F.
 Fox, Richard G. R.G.F.
 Fox, Sidney W. S.W.F.
 Fraenkel, Heinrich. H.Fra.
 Fraisse, Paul. P.F.
 Frame, Donald M. D.M.F.
 Francis, Sir Frank C. F.C.F.
 Frank, Peter W. P.W.F.
 Frank, W.J. W.J.F.
 Franke, Herbert. H.Fr.
 Frankel, Joseph. J.Fr.
 Frankel, Marvin. Ma.F.
 Franzius, Enno. E.F.
 Fraser, Lady Antonia. A.Fr.
 Fraser, Peter Marshall. P.M.F.
 Fratcher, William F. W.F.F.
 Fredericksen, Linwood. L.F.
 Freeborn, Richard H. R.H.Fr.
 Freeman-Grenville, Greville Stewart
 Parker. G.S.P.F.-G.
 Freidel, Frank. F.Fr.
 Freihofer, Warren Curtis. W.C.F.
 French, Richard Antony. R.A.F.
 Frend, William Hugh Clifford.
 W.H.C.F.
 Frere, Sheppard Sunderland. S.S.F.
 Freund, Michael. M.Fr.
 Frey, Richard L. R.L.Fr.
 Friedlander, Rabbi Albert H. A.H.F.
 Friedlander, Michael Wulf. M.W.Fr.
 Friedman, Albert B. A.B.F.
 Friedman, Milton. M.Fr.
 Friedmann, Arnold A. A.A.F.
 Friedmann, Herbert. He.F.
 Friedmann, Marion Valerie. M.V.F.
 Friedrich, Hermann. H.F.
 Friermood, Harold T. H.T.F.
 Friis, Astrid. As.F.
 Frings, Hubert William. H.W.F.
 Fritz, Kurt von. K.v.Fr.
 Froelich, Jean Claude. J.C.F.

Froeschner, Richard Charles. R.C.F.
 Frost, David B.J. D.B.J.F.
 Frost, Wesley. W.Ft.
 Fryburger, Vernon R., Jr. V.R.F.
 Fryde, Edmund B. E.B.Fr.
 Frye, Richard N. R.N.F.
 Fuechsel, Charles F. C.F.F.
 Fuhrman, Ralph E. R.E.F.
 Fujimura Michio. Fu.M.
 Fu-Kiau kia Bunseki-L., André.
 A.Fu.
 Fuller, Edmund. E.Fu.
 Furie, Bruce. B.Fu.
 Furon, Raymond-Louis-Charles.
 R.L.C.F.
 Fuson, Robert H. R.H.Fu.
 Fussell, George Edwin. G.E.F.
 Fyfe, Christopher. C.Fy.
 Fyfe, William S. W.S.F.

Gabriel, Ralph Henry. R.H.Ga.
 Gadd, Cyril John. C.J.Ga.
 Gadella, Theodorus W.J. T.W.J.G.
 Gaines, Alan M. A.M.G.
 Gallagher, Robert G. R.G.G.
 Gallaher, John G. J.G.G.
 Gam, Mikael. M.Ga.
 Gamble, David P. D.P.Ga.
 Gamer, Carlton. Ca.G.
 Gamkrelidze, Thomas V. Th.V.G.
 Ganellin, C. Robin. C.R.G.
 Gantt, W. Horsley. W.H.G.
 Garavito, Clemente. C.Ga.
 García-Gómez, Angel M. A.M.G.-G.
 García y Bellido, Antonio. A.G. y B.
 Garden, Edward J.C. E.J.C.G.
 Gardiner, Patrick Lancaster. P.L.G.
 Gardiner, Robert K.A. R.K.A.G.
 Gardner, Ernest Dean. E.D.G.
 Garg, Renu. Re.G.
 Gargi, Balwant. B.Ga.
 Garigue, Philippe. P.Ga.
 Garland, George D. G.D.G.
 Garn, Stanley M. S.M.G.
 Garner, Hesse Filmore. H.F.G.
 Garrad, Kenneth. K.Ga.
 Garrett, Alfred B. A.B.Ga.
 Garrigus, Wesley Patterson. W.P.G.
 Gash, Norman. N.G.
 Gasking, Elizabeth Belmont. E.B.G.
 Gasparini, Evel. E.G.
 Gaster, Theodor H. T.H.G.
 Gates, David M. D.M.G.
 Gaunt, William. W.Ga.
 Gavrilov, Aleksandr Mikhaylovich.
 A.M.Ga.
 Geanakoplos, Deno John. D.Ge.
 Gear, Charles William. C.W.Ge.
 Gebhard, Paul Henry. P.H.Ge.
 Geerlings, Gerald K. G.K.Ge.
 Geiger, Pedro P. P.P.G.
 Geiringer, Karl. K.G.
 Gelb, Arthur. A.Ge.
 Gelb, Barbara. B.Ge.
 Gelb, Ignace J. I.J.G.
 Gelderman, Carol W. C.W.G.
 Gelpi, Ettore. E.Ge.
 Gelston, Arthur S., Jr. A.S.G.
 Gentry, Alan William. A.W.G.
 Genuth, Saul. S.Ge.
 Gerasimov, Innokentii Petrovich.
 I.P.G.
 Gergely, John. J.G.
 Gerig, O. Benjamin. O.B.G.
 Germani, Gino. G.Ge.

Gernsheim, Helmut Erich Robert.
 H.E.R.G.
 Gerow, Edwin. Ed.G.
 Gertsch, Willis John. W.J.G.
 Geyer, Richard A. R.A.G.
 Ghirshman, Roman. R.Gh.
 Ghorl, G.K. G.K.G.
 Ghose, Sisirkumar. S.Gh.
 Ghul, Mahmud Ali. M.A.G.
 Gibb, Andrew Dewar. A.D.G.
 Gibbins, Roger. R.G.
 Gibbons, James L. J.L.Gi.
 Gibbs, Frederick William. F.W.G.
 Gibbs, Gerald V. G.V.G.
 Gibbs-Smith, Charles Harvard.
 C.H.G.-S.
 Gibney, Frank B. F.B.G.
 Gibson, Robert Donald Davidson.
 R.D.D.G.
 Giddings, J. Calvin. J.C.Gi.
 Gies, Frances Carney. F.C.Gi.
 Gifford, Ernest M., Jr. E.M.G.
 Gilbert, Creighton E. C.E.G.
 Gilbert, Douglas Stuart. D.Gi.
 Gilbert, M. Charles. M.C.G.
 Gilbert, Robert Andrew. R.A.Gi.
 Gilchrist, Peter Spence, Jr. Pe.S.G.
 Giles, Charles Hugh. C.H.Gi.
 Giles, James R. J.R.G.
 Gill, The Rev. Joseph. J.Gi.
 Gillies, Alexander. A.Gi.
 Gillmor, Reginald E. R.E.Gi.
 Gilmore, Robert Louis. R.L.Ge.
 Gimbutas, Marija. M.G.
 Gimm, Martin. M.Gi.
 Gingerich, Owen. O.G.
 Ginns, Harry Norwood. H.N.G.
 Ginsberg, Donald M. D.M.Gi.
 Ginsburg, Norton S. N.S.G.
 Giorgetti, Giovanni Pietro. G.P.Gi.
 Girvetz, Harry K. H.K.G.
 Gittings, Robert W.V. R.Gi.
 Gjuzele, Wassil Todorov. W.T.G.
 Gladstone, Reginald John. R.J.Gi.
 Glaessner, Martin F. M.F.G.
 Glasz, Christian. C.G.
 Glatzer, Nahum N. N.N.G.
 Glazer, Sidney. S.Gi.
 Glendon, Mary Ann. M.A.Gi.
 Glubb, Sir John Bagot. J.B.Gi.
 Godbey, John Charles. J.C.G.
 Godechot, Jacques. J.Go.
 Godman, Michael James. M.J.G.
 Godman, Peter. P.Go.
 Goethals, Peter R. P.R.Go.
 Goetz, Hermann. H.Go.
 Gogolák, Ludwig von. L.v.G.
 Goin, Coleman Jett. C.J.G.
 Goldammer, Kurt Moritz Artur.
 K.M.A.G.
 Goldbeck, Frederick. F.Go.
 Goldblatt, Howard C. H.C.G.
 Goldin, Judah. J.Gol.
 Goldscheider, Ludwig. L.Go.
 Gollin, Gillian Lindt. G.L.Go.
 Gomillion, Charles Goode. C.G.G.
 Gomme, Arnold Wycombe. A.W.Ge.
 Gömöri, George. G.G.
 Gonçalves Pereira, António Armando.
 A.A.G.P.
 Goncharov, Vladimir Petrovich.
 V.P.G.
 González, Nancie L. N.L.G.
 González Casanova, Pablo. P.G.C.
 González Díaz, Emilio Fernando.
 E.F.G.D.

Goberman, George L. G.L.G.
 Goodall, David W. D.W.G.
 Goodbody, Ivan M. I.M.G.
 Goode, Richard B. R.B.G.
 Goodman, George J. G.J.G.
 Goodman, Morris F. M.F.Go.
 Goodner, John Ross. J.R.Go.
 Goodnight, Marie Louise. M.L.Go.
 Goodrich, Leland Matthew. L.M.G.
 Goodwin, Albert. A.L.G.
 Goodwin, Noël. N.Go.
 Gordon, Cyrus H. C.H.G.
 Gordon, David Frank. D.F.G.
 Gordon, George N. G.N.G.
 Gordon, Isabella. I.G.
 Gordon-Walker, Patrick Chrestien
 Gordon Walker, Baron. P.G.W.
 Gorgy, Samy. S.G.
 Görlitz, Walter Otto Julius. W.Go.
 Gorman, George C. G.C.G.
 Gosling, L.A. Peter. L.A.P.G.
 Goss, Richard Johnson. R.J.G.
 Gottschalk, Stephen. S.Go.
 Goult, Herman W. H.W.G.
 Gourou, Pierre. P.Gu.
 Goveia, Elsa Vesta. E.V.G.
 Gowans, Alan. Al.Go.
 Gowing, Sir Lawrence. La.G.
 Grabar, Oleg. O.Gr.
 Graf, Alfred Byrd. A.B.Gr.
 Grame, Theodore C. T.Gr.
 Grancsay, Stephen Vincent. S.V.G.
 Grant, Michael. M.Gr.
 Grant, Peter R. P.R.G.
 Grant, Robert M. R.M.G.
 Grastyán, Endre. E.Gr.
 Graue, Jerald C. J.C.Gr.
 Gray, Alic William. A.W.Gr.
 Gray, Eric William. E.W.G.
 Gray, Jane. J.Gr.
 Gray, Peter. Pe.G.
 Grayling, A.C. A.C.G.
 Greaves, Malcolm W. M.W.G.
 Green, Benny. B.Gr.
 Green, Edna R. E.R.G.
 Green, Estill I. E.I.G.
 Green, J. J.Gre.
 Green, Peter S. P.S.G.
 Green, Roger Lancelyn. R.L.G.
 Greenaway, Frank. F.Gre.
 Greenberg, Moshe. Mo.Gr.
 Greene, David. D.Gr.
 Greene, Mark Richard. M.R.G.
 Greenfield, Richard David. Ri.G.
 Greenspan, Morris. M.Gre.
 Greenwood, Peter Humphry. P.H.G.
 Greenwood, Richard Harold. R.H.G.
 Gregg, Alan. Al.Gr.
 Gregoriotti, Guido. G.Gr.
 Gregory, Derek Peter. D.P.G.
 Grenand, Pierre. P.Gd.
 Grenville, John A.S. J.A.S.G.
 Gressitt, Judson Linsley. J.L.G.
 Griffin, Ernst C. E.C.G.
 Griffith, Guy Thompson. G.T.G.
 Griffith, William J. W.J.Gr.
 Grim, Ralph E. R.E.G.
 Grimsley, Ronald. R.Gr.
 Groen, Pier. P.Gr.
 Groover, Mikell P. M.P.G.
 Gross, Harvey S. Ha.G.
 Gross, M. Grant. M.G.G.
 Grudin, Robert. Ro.G.
 Gruijters, Johannes P.A. J.P.A.G.
 Grünbaum, Branko. B.G.
 Gspan, Alfonz. A.Gn.

- Gudava, T.E. T.E.G.
 Gudzii, Nikolai Kallinikovitch. N.K.G.
 Guenther, Herbert V. H.G.
 Guerello, The Rev. Franco. F.Gu.
 Guiart, Jean. J.Gt.
 Guichonnet, Paul. P.G.
 Guiguemde, Pierre H. P.H.Gu.
 Guillemin, Henri. He.Gu.
 Guimaraes, Alberto Passos. A.P.G.
 Guitton, Henri. H.Gu.
 Gulliver, P.H. P.H.Gul.
 Gulyan, Pyotr Vatslavovich. P.V.G.
 Gundermann, Karl-Dietrich. K.-D.G.
 Gungaadash, B. B.Gu.
 Gunner, Elizabeth Anne Wynne. E.A.W.G.
 Gunstone, Frank Denby. F.D.G.
 Gunther, Erna. E.Gu.
 Gurney, Ashley B. A.B.G.
 Gurney, Oliver Robert. O.R.G.
 Gusdorf, Georges Paul. G.P.G.
 Gustafson, Neil C. N.C.G.
 Güterbock, Hans G. H.G.G.
 Guthertz, Elmer J. E.J.G.
 Guthke, Karl S. K.S.G.
 Guthrie, Douglas James. D.J.G.
 Guthrie, Sir Tyrone. T.G.
 Gutmann, Viktor. V.G.
 Gutsche, C. David. C.D.G.
 Guttman, Allen. A.G.
 Gvozdetzky, Nikolay Andreyevich. N.A.G.
 Gwynn, Denis Rolleston. D.R.G.
 Gyftopoulos, Elias Panayiotis. E.P.G.
 Gyllensvärd, Bo Vilhelm. B.V.Gy.
- Haaf, Ernst ten. E.t.H.
 Haar, Dirk ter. D.t.H.
 Hackett, John. Jo.Hac.
 Haedeke, Hanns-Ulrich. H.-U.H.
 Haekel, Josef. Jo.H.
 Hagely, John R. J.R.Ha.
 Haggerty, James J. J.J.Ha.
 Hahn, Bae-ho. B.-h.H.
 Haight, Gordon S. G.S.Ha.
 Hájek, Igor. I.H.
 Haley, K.H.D. K.H.D.H.
 Halfpenny, Eric. E.Hy.
 Hall, The Rev. Basil. B.H.
 Hall, Marshall, Jr. Ma.H.
 Hall, Richard P. R.P.H.
 Hall, Robert A., Jr. R.A.H.
 Halm, George N. G.N.H.
 Halperin Donghi, Tulio. T.H.D.
 Halpern, Jack. J.Ha.
 Halstead, Bruce W. B.W.H.
 Hambly, Gavin R.G. G.R.G.H.
 Hamelin, Louis-Edmond. L.-E.H.
 Hamerow, Theodore S. T.S.H.
 Hamidé, Abdul-Rahman. A.-R.H.
 Hamilton, Bernice Margaret. B.M.H.
 Hamilton, William James. W.J.H.
 Hamman, The Rev. Adalbert G. A.G.Ha.
 Hammen, Oscar J. O.J.H.
 Hammer, A. Gordon. A.G.H.
 Hammond, Mason. M.Ha.
 Hammond, Nicholas G.L. N.G.L.H.
 Hammond Innes, Ralph. R.H.I.
 Hamp, Eric P. E.P.H.
 Hamzah Sendut. Ha.Se.
 Hanahan, Donald J. D.J.H.
 Hancock, Keith J. K.J.H.
 Hand, Cadet H., Jr. C.H.Ha.
 Handzo, Stephen G. S.G.H.
- Hanna, Willard A. W.A.Ha.
 Hansen, Arlen J. A.J.H.
 Hansen, Gladys Cox. G.C.Ha.
 Hansen, Walter B.O. W.Hn.
 Hanshaw, Bruce B. B.B.H.
 Hanson, A.H. A.H.H.
 Hanson, Carl. C.Ha.
 Hanson, Earl Dorchester. E.D.H.
 Hanson, Earl Parker. E.P.Ha.
 Harbaugh, John W. J.W.Ha.
 Harbison, Craig S. C.S.Ha.
 Hardie, Robert H. R.H.H.
 Hardy, Sir Alister C. A.C.Ha.
 Hardy, Edward R. E.R.Ha.
 Hare, F. Kenneth. F.K.H.
 Hargrave, John G. J.G.H.
 Harler, Campbell Ronald. C.R.H.
 Harmel, Claude. C.H.
 Harmon, Mamie. Ma.Ha.
 Harms, Robert Thomas. R.T.H.
 Harper, Peggy. P.H.
 Harrelson, Walter. W.Ha.
 Harris, Chauncy D. C.D.H.
 Harris, David. Da.H.
 Harris, David Russell. D.R.Ha.
 Harris, Enriqueta. E.Ha.
 Harris, James T. J.T.H.
 Harris, Leslie. L.H.
 Harris, Rosemary Lois. R.L.Ha.
 Harrison, John A. J.A.Ha.
 Harrison, Raymond O. R.O.H.
 Harrison, Richard J. R.J.Ha.
 Harrison, Walter A. W.A.H.
 Harrison-Church, Ronald James. R.J.H.-C.
 Harriss, C. Lowell. C.L.Ha.
 Harrison, Tom. T.Hn.
 Harrod, Sir Roy Forbes. R.F.H.
 Harroy, Jean-Paul. Je.-P.H.
 Hart, Harold. H.Ha.
 Hart, Herbert Lionel Adolphus. H.L.A.H.
 Hartenberg, Richard S. R.S.H.
 Hartley, Sir Frank. Fr.H.
 Hartwell, Ronald Max. R.M.Hl.
 Hashisaki, Joseph. Jo.Ha.
 Hassler, Warren W., Jr. W.W.H.
 Hastings, Margaret. M.Has.
 Hatsopoulos, George N. G.N.Ha.
 Hatt, Jean-Jacques. J.-J.H.
 Hatton, Ragnhild Marie. R.M.H.
 Hattori, Shirō. S.Ha.
 Haugen, Einar. Ei.H.
 Haurowitz, Felix. F.Ha.
 Häuser, Karl H. K.Ha.
 Hauser, Philip M. P.M.H.
 Havard, C. William H. C.W.H.H.
 Havelock, Eric Alfred. E.A.Ha.
 Haverschmidt, François. F.H.
 Havighurst, Alfred F. A.F.H.
 Havighurst, Robert J. R.J.H.
 Hawkins, Gerald S. G.S.H.
 Hawkins, Joseph E., Jr. J.E.H.
 Hawting, G.R. G.R.H.
 Hayashi, Shigeru. Sh.H.
 Hayes, J.M. J.M.Ha.
 Hayford, Charles W. C.W.H.
 Hayne, David M. D.M.Ha.
 Hayward, Charles Harold. C.H.H.
 Hayward, John F. J.F.Ha.
 Haywood, John A. J.A.H.
 Hazai, Georg. G.Ha.
 Hazard, John N. J.N.H.
 Hazzard, Shirley. Sh.Ha.
 Healy, Nicholas Joseph. N.J.H.
 Heaney, Robert Proulx. R.P.He.
- Heath, Donald Albert. Do.A.H.
 Heath, Dwight B. D.B.H.
 Heaton, Pauline. Pa.H.
 Hecht, Charles E. C.E.He.
 Hecht, Melvin E. M.E.H.
 Heelan, Patrick Aidan. P.A.H.
 Heerden, Ernst van. E.v.H.
 Heezen, Bruce C. B.C.H.
 Heiber, Helmut. H.Hei.
 Heilbroner, Robert L. R.L.He.
 Heine, Hermann-Heino. H.-H.He.
 Heinemeyer, Walter. W.He.
 Heinen, Heinz. He.H.
 Heirtzler, J.R. J.R.H.
 Heiser, Charles B., Jr. C.B.He.
 Helck, Wolfgang. W.H.
 Held, Julius S. Ju.H.
 Hellie, Richard. R.He.
 Hemp, Wilfrid James. W.J.He.
 Hempel, Carl G. C.G.H.
 Henderson, Philip Prichard. P.P.H.
 Henderson, Robert M. R.M.He.
 Hendricks, George. G.He.
 Hendrickson, James B. J.B.He.
 Hendy, Sir Philip. P.He.
 Henfrey, Norman V. N.V.He.
 Henriksson, Markku Ilmari. M.I.He.
 Hensel, Herbert. H.He.
 Henson, Ronald A. R.A.He.
 Herbert, H.W. H.W.H.
 Herbst, Stanislaw. S.He.
 Herde, Peter. Pe.He.
 Herdman, Thomas. T.H.
 Herivel, John. J.He.
 Herklots, Geoffrey A.C. G.A.C.H.
 Herman, Robert D. R.D.H.
 Hermans, Theo Jozef. T.J.H.
 Herschdoerfer, Sigismund M. S.M.H.
 Hertzberg, Rabbi Arthur. Ar.H.
 Herzfeld, Hans. Ha.He.
 Herzog, Gregory F. G.F.H.
 Herzog, Marvin Irving. M.I.H.
 Herzog, Peter E. P.E.H.
 Heslop, D. Alan. D.A.He.
 Heslop-Harrison, John. J.H.-H.
 Hess, Eckhard H. E.H.H.
 Heston, The Most Rev. Edward Louis. E.L.H.
 Heydenreich, Ludwig Heinrich. L.H.H.
 Heyerdahl, Thor. Th.H.
 Heywood, John B. J.B.H.
 Hezel, The Rev. Francis X. F.X.H.
 Hibbert, Christopher. C.Hi.
 Hick, John. J.Hi.
 Hickey, Gerald C. G.C.H.
 Hieatt, A. Kent. A.K.H.
 Higgins, David J.M. D.J.M.H.
 Higgins, Reynold Alleyne. R.A.Hi.
 Higgins, Theodore R. T.R.H.
 Higgs, Eric S. E.S.H.
 Highet, Gilbert. G.Hi.
 Highfield, J.R.L. J.R.L.H.
 Highsmith, Richard M., Jr. R.M.Hi.
 Hightower, Nicholas Carr. N.C.H.
 Higonnet, Patrice Louis-René. P.Hi.
 Hill, Dorothy. D.Hi.
 Hill, J.E. Christopher. J.E.C.H.
 Hill, John Hugh. J.H.Hi.
 Hill, Laurita L. L.L.H.
 Hill, Richard Leslie. R.L.Hi.
 Hiller, Lejaren. L.Hi.
 Hillers, Delbert R. D.R.H.
 Hills, John M. J.M.Hi.
 Hilton, Peter John. P.J.H.
 Hingley, Ronald Francis. R.F.Hi.
 Hintikka, K. Jaakko J. K.J.Hi.

- Hinton, Thomas B. T.B.H.
 Hiorthøy, Finn. F.Hi.
 Hirai, Naofusa. N.H.
 Hitchins, Keith Arnold. K.A.H.
 Hjelmqvist, Hakon. H.Hj.
 Ho, Robert. R.H.
 Hoaglin, David C. D.C.H.
 Hobbs, F.D. F.D.H.
 Hobson, Richard Hamilton. Ri.H.
 Hodge, Harold C. H.C.Ho.
 Hodge, Paul W. P.W.H.
 Hodges, James A. J.A.Ho.
 Hodgkin, Thomas. T.Ho.
 Hofer, Kenneth E., Jr. K.E.H.
 Hoffmann, Herbert. H.Hn.
 Hofmann, Michel-Rostislav. M.-R.Ho.
 Hogetsu, Keigo. K.Ho.
 Hogg, Helen Sawyer. H.S.H.
 Hogg, William Richey. W.R.H.
 Hohl, Reinhold D. Re.H.
 Hölder, Helmut. H.H.
 Holderbaum, James. J.Hm.
 Hollister, C. Warren. C.W.Ho.
 Holm, Donald August. D.A.H.
 Holmes, Ralph. Ra.Ho.
 Holstein, William K. W.K.H.
 Holt, Edgar Crawshaw. E.C.H.
 Holt, J.C. J.C.H.
 Holt, Peter M. P.M.Ho.
 Holthusen, Hans Egon. H.E.H.
 Holton, William Coffeen. W.C.Ho.
 Holtum, Richard E. R.E.H.
 Holtzman, Jerome. Je.Ho.
 Honeycutt, Baxter D. B.D.H.
 Honigmann, John J. J.J.Ho.
 Honko, Lauri O. L.O.H.
 Hood, M. Sinclair F. M.S.F.H.
 Hoogstraten, Jan S.F. van. J.v.H.
 Hopkins, John Francis Price. J.F.P.H.
 Hopkinson, Ralph G. R.G.H.
 Hopwood, Derek. D.H.
 Hornberger, Theodore. T.Hor.
 Horne, R.A. R.A.Ho.
 Hose, Charles. C.Ho.
 Hoskin, Michael Anthony. M.A.H.
 Hosking, Geoffrey Alan. G.A.H.
 Hospers, John. Jo.Ho.
 Houghton, Lois Chapman. L.C.H.
 Houlton, Sir John Wardle. Jo.W.H.
 Hourani, Albert Habib. A.H.Ho.
 House, Michael R. M.R.H.
 Houston, James. J.Ho.
 Houtgast, Jakob. J.H.
 Houtte, Baron Jean M.J. van. J.M.J.v.H.
 Houwink ten Cate, Philo H.J. Ph.H.J.H.t.C.
 Howard, Ian P. I.P.H.
 Howard, John Lawrence. J.L.H.
 Howard, Perry H. P.H.H.
 Howarth, Thomas. Th.Ho.
 Howarth, William Driver. W.D.H.
 Howell, F. Clark. F.C.H.
 Howie, Alan Crawford. A.C.H.
 Hoy, Cyrus Henry. C.H.Ho.
 Hoyt, Joseph Bixby. J.B.Ho.
 Hoyt, Robert Stuart. R.S.Ho.
 Hrbek, Ivan. I.Hr.
 Hsiao, Kung-chuan. K.-c.H.
 Hsieh, Chiao-Min. C.-M.H.
 Hsieh, Shan-yüan. S.-y.H.
 Hsu, Cho-yun. C.-y.H.
 Htin Aung, Maung. M.H.Au.
 Hu, Charles Y. C.Hu.
 Hu, Yueh-Gin Gung. Y.-G.G.H.
 Hubatsch, Walther C. W.C.H.
- Hübscher, Arthur. Ar.Hü.
 Hucker, Charles O. C.O.Hu.
 Hudnut, Joseph. J.Hud.
 Hudson, Winthrop S. W.S.H.
 Huffman, John W. J.W.Hu.
 Hughes, David C. D.C.Hu.
 Hughes, The Rev. G.E. G.E.H.
 Hughes, Graham McK. G.McK.H.
 Huizing, Peter J. P.Hu.
 Hultkrantz, Åke Gunnar Birger. Å.G.B.H.
 Humphrey, John H. J.H.Hy.
 Hung, Frederick Fu. F.Hu.
 Hunt, Charles B. C.B.H.
 Hunt, Sir David Wathen Stather. D.W.S.H.
 Hunt, Earl B. E.B.H.
 Hunt, Herbert James. H.J.H.
 Hunt, Inez Whitaker. I.W.H.
 Hunten, Donald M. D.M.H.
 Huot, Jean-Louis. J.-L.Hu.
 Huq, Muhammad Shamsul. M.S.H.
 Husain, Mahmud. M.Hu.
 Husain, Syed Sajjad. S.S.H.
 Hussey, Dyneley. D.Hus.
 Hussey, Joan Mervyn. J.M.H.
 Hutter, Heribert R. H.R.H.
 Huxley, Herbert Henry. H.H.Hu.
 Huygens, Gerard Willem. G.W.H.
 Huyghe, René. R.Hu.
 Hyatt, J. Philip. J.P.Hy.
 Hyde, Earl K. E.K.H.
 Hyman, Isabelle. I.Hy.
- Iaboni, John I. J.F.I.
 Ichiko, Teiji. T.Io.
 Ichiye, Takashi. T.Ic.
 Ihde, Aaron J. A.J.I.
 IJsewijn, Jozef A.M.K. J.A.M.K.I.
 Ike, Nobutaka. N.I.
 Ikram, S.M. S.M.I.
 Illick, Joseph E. J.E.I.
 Imshenetsky, Aleksandr Ilyich. A.I.I.
 Inalcik, Halil. H.I.
 Inden, Ronald B. R.B.I.
 Ingham, Kenneth. K.In.
 Ingram, William T. W.T.I.
 Ingrams, William Harold. W.H.I.
 Insall, Donald W. D.W.I.
 Ipfling, Heinz-Jürgen. H.-J.I.
 Irmischer, Hans Dietrich. H.D.I.
 Irvine, Keith. K.I.
 Irvine, Verity Elizabeth. V.E.I.
 Irwin, David. D.I.
 Irwin, John B. J.B.I.
 Isnard, Hildebert. H.Is.
 Issawi, Charles. C.I.
 Ivanov, Vyacheslav Vsevolodovich. V.V.I.
 Ivić, Pavle. P.I.
 Iwasawa, Kenkichi, K.Iw.
 İz, Fahir. F.I.
 Izenour, George C. G.C.I.
 Izutsu, Toshihiko. T.I.
- Jackson, Christopher Stewart. C.S.J.
 Jackson, Gordon. G.J.
 Jackson, Joy Juanita. J.J.J.
 Jackson, Richard T. R.T.J.
 Jackson, Roland John. R.J.J.
 Jackson, Stanley Percival. S.P.Jn.
 Jacob, Stanley W. S.W.J.
 Jacobs, Wilbur R. W.R.J.
 Jacobsen, Thorkild. T.J.
- Jacobson, Bernard. B.Ja.
 Jacoby, Oswald. O.J.
 Jaffe, Bernard. Be.J.
 Jaffé, Hans L.C. H.L.C.J.
 Jaffé, Michael. M.J.
 Jahns, Richard H. R.H.J.
 Jairazbhoy, Nazir Ali. N.A.J.
 James, A. Walter. A.W.J.
 James, C.L.R. C.L.R.J.
 James, D. Clayton. D.C.J.
 James, The Rev. Edwin Oliver. E.O.J.
 James, Preston E. P.E.J.
 James, Thomas Garnet Henry. T.G.H.J.
 Jamieson, John Calhoun. J.C.J.
 Jan, Helmut von. H.v.J.
 Janick, Jules. J.J.
 Jansen, Marius B. M.B.J.
 Janson, H.W. H.W.J.
 Jarry, Madeleine. M.J.
 Järvinen, E. Jaakko. E.J.J.
 Jay, Martin Evan. M.E.J.
 Jayne, Kingsley Garland. K.G.J.
 Jeandet, Yvette. Y.J.
 Jeanloz, Raymond. R.J.
 Jeffares, Alexander Norman. A.N.J.
 Jefferson, Alan R. A.R.J.
 Jelavich, Barbara. B.Je.
 Jelavich, Charles. C.J.
 Jellett, John Holmes. J.H.J.
 Jenkins, The Rev. Daniel T. D.T.J.
 Jenkins, Elizabeth. E.Je.
 Jenks, C. Wilfred. C.W.J.
 Jenkyns, Richard H.A. R.H.A.J.
 Jennings, Burgess H. B.H.J.
 Jerphagnon, Lucien. L.J.
 Jescheck, Hans-Heinrich. H.-H.J.
 Jessop, Thomas Edmund. T.E.Je.
 Jóhannesson, Thorkell. T.Jn.
 Johansson, Ivar K. I.J.
 John, Walter. W.J.
 Johnson, D. Gale. D.G.J.
 Johnson, Dorothy M. D.M.J.
 Johnson, John J. J.J.Jo.
 Johnson, Norman Gardner. N.G.J.
 Johnston, Marshall C. M.C.J.
 Johnston, S. Paul. S.P.J.
 Jolly, William Lee. W.L.J.
 Jolowicz, Herbert Felix. H.F.J.
 Jones, Abeodu Bowen. A.B.J.
 Jones, Arnold Hugh Martin. A.H.M.J.
 Jones, Benjamin A., Jr. B.A.J.
 Jones, Douglas Henry. D.H.J.
 Jones, Emrys. E.J.
 Jones, Frederick L. F.L.J.
 Jones, Gareth H. G.H.J.
 Jones, J. Knox, Jr. J.K.J.
 Jones, Marsden. Ma.J.
 Jones, S.S.D. S.S.D.J.
 Jones, Thomas. T.Jo.
 Jones, Walton Glyn. W.G.J.
 Jongkees, Adriaan G. A.G.J.
 Jonsson, Ingrid Margareta. I.M.J.
 Jordan, David Starr. D.S.J.
 Jordan, Karl H.E. K.J.
 Jordan, Pascual W. P.W.J.
 Josephson, Matthew. M.Jo.
 Joshi, Susan Heyner. S.H.J.
 Joy, Bernard. B.Jo.
 Joyce, Thomas Athol. T.A.J.
 Joys, Charles. C.Jo.
 Jwaideh, Wadie. W.Jw.
- Kadzamira, Zimani David. Z.D.K.
 Kaegi, Walter Emil, Jr. W.E.K.

- Kaepler, Adrienne L. A.Ka.
 Kalinin, Gennadi Pavlovitch. G.P.Ka.
 Kallen, Horace M. H.M.K.
 Kalman, Rudolf E. R.E.K.
 Kalmbach, Olin. O.K.
 Kaltenmark, Max. Ma.K.
 Kalven, Harry, Jr. H.Ka.
 Kamanzi, Thomas. T.Ka.
 Kamb, W. Barclay. W.B.K.
 Kanayev, Viktor Filipovich. V.F.K.
 Kanda, Nobuo. N.Ka.
 Kang, Yu-chin. Y.-c.K.
 Kann, Robert A. R.A.Ka.
 Kanya-Forstner, Alexander Sydney. A.S.K.-F.
 Kapelrud, Arvid S. A.S.K.
 Kaplan, James L. J.L.K.
 Kaplan, Lawrence. L.K.
 Kaplansky, Irving. I.K.
 Karan, Pradyuma P. P.P.K.
 Karasek, Francis W. F.W.K.
 Karger, Barry L. B.L.K.
 Karin, Sidney. S.Ka.
 Karlen, Delmar. D.K.
 Karnes, Thomas L. T.L.K.
 Katritzky, Alan Roy. A.R.K.
 Kaufman, Hyman. Hy.K.
 Kaufman, Terrence. Te.K.
 Kaufmann, Edgar, Jr. E.K.
 Kavolis, Vytautas. V.Ka.
 Kay, John Anderson. J.A.Ka.
 Kazantzis, George. G.Ka.
 Kazimour, Jan. Ja.K.
 Keating, Frank E. F.E.K.
 Kedourie, Elie. E.Ke.
 Keen, Benjamin. B.K.
 Keenan, Edward Louis. E.L.K.
 Keenan, Joseph Henry. J.H.K.
 Keene, Donald. D.Ke.
 Keep, John L.H. J.L.H.K.
 Keerna, Arno Artur. A.A.Ke.
 Keesing, Felix M. F.M.Kg.
 Keesing, Roger M. R.M.Ke.
 Keeton, George Williams. G.W.K.
 Keeton, William T. W.T.Ke.
 Keightley, David N. D.N.K.
 Keith, E. Gordon. E.G.K.
 Keith, G. Stuart. G.S.Ke.
 Kell, John Robert. J.R.K.
 Keller, Mark. M.Ke.
 Keller, Roy A. Ro.A.K.
 Kelley, Fenton Crosland. F.C.Ke.
 Kelling, George L. G.L.Ke.
 Kellner, Charlotte L. C.L.K.
 Kelly, The Rev. John N.D. J.N.D.K.
 Kelly-Gadol, Joan. J.K.-G.
 Kelman, Arthur. Ar.Kn.
 Kemp, The Rev. John Arthur. J.A.Ke.
 Kemp, Martin J. M.J.Ke.
 Kemp, Tom. T.Ke.
 Kendall, Paul Murray. P.M.K.
 Kandler, Howard H. H.H.K.
 Kendrick, John W. J.W.K.
 Kennard, Annajane. A.Ke.
 Kennedy, Kenneth A.R. K.A.R.K.
 Kenney, Edward John. E.J.Ke.
 Kent, George C., Jr. G.C.K.
 Kent-Jones, Douglas W. D.W.K.-J.
 Kenyon, Cecelia M. C.M.K.
 Kenyon, John P. J.P.K.
 Kenyon, Dame Kathleen Mary. K.M.K.
 Kerferd, George Briscoe. G.B.K.
 Kerney, James, Jr. J.Ke.
 Kerr, Malcolm H. M.H.K.
 Kessler, Herbert Leon. H.L.Ke.
 Keuffel, A.W. A.W.Ke.
 Kevles, Bettyann. B.Ke.
 Keynes, Sir Geoffrey Langdon. G.L.K.
 Keys, Thomas Edward. T.E.K.
 Khadduri, Majid. M.Kh.
 Khalaf, Samir G. S.G.K.
 Khalidi, Tarif. T.Kh.
 Khalidi, Walid Ahmed. W.A.K.
 Khan, Zafar Ahmad. Z.A.K.
 Kieffer, William F. W.F.K.
 Kieft, C. van de. C.v.d.K.
 Kiesinger, Carol D. C.D.K.
 Killheffer, John V. J.V.K.
 Killian, Lewis M. L.M.K.
 Kilson, Martin. M.Ki.
 Kim, Won-Yong. W.-Y.K.
 Kimble, George H.T. G.H.T.K.
 Kimble, Gregory A. G.A.K.
 King, Cuchlaine Audrey Muriel. C.A.M.K.
 King, John Louis, Jr. J.L.Ki.
 King, Lester S. L.S.K.
 King, Peter K. P.K.K.
 Kingdon, Robert M. R.M.K.
 Kingsford, Peter W. P.W.K.
 Kingslake, Rudolf. R.K.
 Kinsbruner, Jay. J.Ki.
 Kiralfy, Albert Roland. A.R.Ki.
 Kirby, Anthony John. A.J.K.
 Kirby, F.E. F.E.Ki.
 Kirby, George Hall. G.H.K.
 Kirk, Geoffrey S. G.S.K.
 Kirk, Samuel Alexander. S.A.K.
 Kirk, William. W.Ki.
 Kirkpatrick, Ralph. R.Ki.
 Kish, George. G.Kh.
 Kissam, Philip. P.K.
 Kiste, Robert C. R.C.Ki.
 Kitagawa, Joseph M. J.M.K.
 Kitajima Masamoto. K.Ma.
 Kitson, Michael William Lely. M.W.L.K.
 Kitto, H.D.F. H.D.F.K.
 Kiuchi, Shinzo. S.K.
 Kiwanuka, M. Semakula M. M.S.Ki.
 Klaniczay, Tibor. T.Ki.
 Kleene, Stephen Cole. S.C.K.
 Klein, Larry. L.Ki.
 Klein, Martin J. M.J.K.
 Klein, Viola. V.K.
 Kleinsorge, Paul Lincoln. P.L.Ki.
 Klindt-Jensen, Ole. O.K.-J.
 Kliphardt, Raymond A. R.A.K.
 Klocke, Robert A., M.D. R.A.Ki.
 Klopsteg, Paul E. P.E.K.
 Klots, Alexander B. A.B.K.
 Knapp, Wilfrid F. W.F.Kn.
 Knappert, Jan. Ja.Kn.
 Knechtel, Herbert B. H.B.K.
 Kneller, George Frederick. G.F.K.
 Knight, Arthur. A.Kn.
 Knight, David Marcus. D.M.K.
 Knight, Franklin W. F.W.Kn.
 Knight, George Angus Fulton. G.A.F.K.
 Knight, Roy Clement. R.C.K.
 Knoll, Andrew H. A.H.K.
 Knowles, The Rev. Michael David. M.D.K.
 Knox, Sir T. Malcolm. T.M.K.
 Koch, Sigmund. Sd.K.
 Kochan, Lionel. L.Ko.
 Koegler, Horst. H.Ko.
 Koenigsberger, Helmut Georg. H.G.K.
 Koepfer, H.F. H.F.K.
 Koestler, Arthur. A.Ko.
 Kohl, Margaret. Ma.Ko.
 Köhler, Oswin R.A. O.R.A.K.
 Kohn, Hans. H.K.
 Kolb, Frank P. F.P.K.
 Kolinski, Mieczyslaw. M.Ko.
 Kolneder, Walter. Wa.K.
 Kondracki, Jerzy A. J.A.K.
 Kondratiev, Victor Nikolaevich. V.N.K.
 König, The Most Rev. Franz Cardinal. F.K.
 Kopanev, German Viktorovich. G.V.K.
 Kopp, Otto C. O.C.K.
 Kopytoff, Igor. I.Ko.
 Korab, Harry Edward. H.E.K.
 Korkala, Pekka Yrjö. P.Y.K.
 Kornberg, Sir Hans. Ha.Ko.
 Kosarev, Aleksey Nilovich. A.N.K.
 Koshland, Daniel E., Jr. D.E.K.
 Kosov, Vladimir Fyodorovich. V.F.Ko.
 Kossmann, E.H. E.H.K.
 Kozlov, Innokenty Varfolomeevich. I.V.Ko.
 Kracke, E.A., Jr. E.A.K.
 Krader, Lawrence. L.Kr.
 Kramer, Leonie Judith. L.J.K.
 Kramm, Hans-Joachim. H.-J.K.
 Kramrisch, Stella. S.Kh.
 Kranbuhl, Kathryn Weichert. K.W.K.
 Kranbuhl, Michael Scott. M.S.K.
 Krantz, John C., Jr. J.C.K.
 Kranzberg, Melvin. M.Kr.
 Krebs, Manfred. M.Ks.
 Krishna, Kumar. K.K.
 Kristinsson, Valdimar. Va.K.
 Kroner, Richard. R.Kr.
 Kropotkin, Pyotr Nikolayevich. P.N.K.
 Krueger, Anne O. A.O.K.
 Krueger, John Richard. J.R.Kr.
 Kruger, Daniel Wilhelmus. D.W.K.
 Kryzhanivsky, Stepan Andriyovich. S.A.Kr.
 Krzyżanowski, Julian. J.Kr.
 Kubik, Gerhard. G.K.
 Kuenen, Philip H. P.H.K.
 Kühner, Hans. H.Ku.
 Kuijt, Job. J.Ku.
 Kularatnam, Karthigesapillai. K.Ku.
 Kummel, Bernhard. B.Ku.
 Kunzle, David M. D.M.Ke.
 Kuo, Ping-chia. P.-c.K.
 Kurath, Gertrude Prokosch. G.P.K.
 Kureshy, Khalil Ullah. K.U.K.
 Kurtz, Harold. Ha.K.
 Kus, James S. J.S.K.
 Kuwata, Tadachika. T.Ku.
 Kuzin, Pavel Sergeyevich. P.S.K.
 Kyrrou, Ado. A.Ky.
 Lacey, Brigadier Joseph Harold Spence. J.H.S.L.
 Lack, David L. D.L.L.
 Lacouture, Jean. J.La.
 Ladas, Stephen P. S.P.L.
 Ladd, David. D.La.
 Ladefoged, Peter N. P.N.L.
 Ladner, Gerhart B. G.B.L.
 Laessoe, Jorgen. Jo.La.
 Laet, Sigfried Jan de. S.J.de L.
 Laffan, Robert George Dalrymple. R.G.D.L.

- Laffargue, Gen. Charles-André. C-A.La.
 LaFond, Eugene C. E.C.LaF.
 Lafont, Pierre-Bernard. P-B.L.
 Lagowski, J.J. J.J.L.
 Laitinen, Kai L.K. K.L.K.L.
 Lamb, Hubert Horace. H.H.L.
 Lamb, Norman Jones. N.J.L.
 Lamott, Kenneth. K.La.
 Lampard, Eric Edwin. E.E.La.
 Landau, Jacob M. J.M.L.
 Landes, David S. D.S.La.
 Landgrebe, Ludwig M. L.M.L.
 Landon, H.C. Robbins. H.C.R.L.
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 Lane, Kenneth S. K.S.L.
 Lane, Richard. Ri.L.
 Lane, Robert K. R.K.L.
 Lang, David Marshall. D.M.La.
 Lang, George. G.L.
 Lange, Robert Terence. R.T.La.
 Langevin, Luce-Andrée. L-A.L.
 Lanhers, Yvonne. Y.L.
 La Orden Miracle, Ernesto. E.L.O.M.
 Laoust, Henri. H.L.
 Laracy, Hugh Michael. H.M.La.
 Laroui, Abdallah. A.La.
 Larsen, Helge. H.Ln.
 Larson, J.H. J.H.L.
 Laskey, Ronald A. R.A.La.
 Lasko, Peter Erik. P.E.L.
 Lassen, Erik. Er.L.
 Lasserre, François. F.La.
 Latham, Agnes M.C. A.M.C.L.
 Latham, Earl. Ea.L.
 Latham, Richard C. R.C.L.
 Latil, Pierre de. P. de L.
 Lattimer, John Kingsley. J.K.La.
 Lattimore, Owen. O.La.
 Lattin, Harriet Pratt. H.P.La.
 Lätükefu, Sione. Si.L.
 Laudise, Robert A. R.A.L.
 Laue, Gilbert P. G.P.L.
 Lauwerys, Joseph Albert. J.A.L.
 Lavender, David Sievert. D.S.Lr.
 Laver, James. Ja.L.
 Lavrencic, Karl. Ka.La.
 Lavrin, Janko. Ja.La.
 Law, Philip James Stopford. P.J.S.L.
 Lawler, Sylvia Dorothy. S.La.
 Lawrence, Carl Adam. C.A.L.
 Lawrence, Joseph Collins. J.C.L.
 Lawson, Joan. Jo.L.
 Lawson, Robert Frederic. R.F.L.
 Laya, Diouldé. Di.L.
 Layton, Robert. R.Lay.
 Lea, Sir Frederick M. F.M.L.
 Lea, Kathleen Marguerite. K.M.L.
 Leary, Lewis. L.L.
 Lebel, Robert. R.Le.
 Lecco, Alberto. A.L.
 Lechène, Robert. Ro.L.
 Lechevalier, Hubert Arthur. H.A.L.
 Lee, Chan. C.Le.
 Lee, James A. J.A.Le.
 Lee, Ki-baik. K-b.L.
 Lee, Kwang-rin. K-r.L.
 Lee, Peter H. P.H.L.
 Lee, Robert Warden. R.W.L.
 Leech, Clifford. Cl.L.
 Leeming, Frank Andrew. F.A.L.
 Legge, Dominica. D.Le.
 Legge, John David. J.D.L.
 Legum, Colin. Co.L.
 Legum, Margaret Jean. M.J.L.
 Lehman, Mildred K. M.K.L.
 Lehman, Milton. M.Ln.
 Lehmann, Andrew George. A.G.L.
 Lehmann-Haupt, Hellmut E. H.E.L.-H.
 Leicester, Henry M. H.M.L.
 Leichter, Otto. O.L.
 Leighton, Richard M. R.M.Le.
 Leiman, Sid Z. S.Z.L.
 Leite, Aureliano. A.Le.
 Leiter, Samuel. S.Lr.
 Lejeune, Michel. M.Le.
 Lejewski, Czeslaw. Cz.L.
 Lekachman, Robert. R.L.
 Lenk, Leonhard. L.Lk.
 Lenti, Libero. Li.L.
 Lentz, Thomas L. T.L.L.
 Leonard, Justin W. J.W.L.
 Leone, Lucile P. L.P.Le.
 Leontiev, Oleg Konstantinovich. O.K.L.
 Leprohon, Pierre. P.Le.
 Lerner, Richard M. Ri.M.L.
 Lernet-Holenia, Alexander Marie Norbert. A.L.-Ho.
 Lessing, Lawrence P. L.P.L.
 Leung, Chi-Keung. C-K.L.
 Le Vay, David. D. Le V.
 LeVeque, William Judson. W.J.LeV.
 Levi, Albert William. A.W.L.
 Levi, Herbert W. H.W.L.
 Levi, Lorna R. L.R.L.
 Levi, Michael. Mi.L.
 Levie, Col. Howard S. H.S.L.
 Levron, Jacques. J.Le.
 Lewis, David L. D.L.Le.
 Lewis, David Malcolm. D.M.L.
 Lewis, Geoffrey D. G.D.L.
 Lewis, George Knowlton. G.K.L.
 Lewis, Hywel David. H.D.L.
 Lewis, I.M. I.M.L.
 Lewis, John Wilson. J.W.Le.
 Lewis, Peirce F. P.F.L.
 Leyser, K.J. K.J.L.
 Li, Fang Kuei. F.K.L.
 Li, Tien-yi. T-y.L.
 Libin, Laurence Elliot. La.L.
 Lieberich, Heinz. H.Li.
 Lieberthal, Kenneth G. K.G.L.
 Liebeschütz, Hans. H.Lz.
 Lien, Chan. C.Li.
 Liess, Otto. O.Li.
 Lieuwen, Edwin. E.Li.
 Liley, Bruce Sween. B.S.L.
 Lin, Maung Wai. M.W.L.
 Lindars, Barnabas. B.L.
 Lindauer, Martin. M.Li.
 Lindbeck, Assar. A.Li.
 Lindbeck, George Arthur. G.A.L.
 Lindberg, Carter H. C.H.Li.
 Lindsay, R. Bruce. R.B.L.
 Lindström, Maurits. M.L.
 Link, Arthur Stanley. A.S.L.
 Lippold, Adolf. A.Lip.
 Lisitsin, Aleksandr Petrovich. A.P.L.
 Lissens, René Felix. R.F.Li.
 Little, Donald P. D.P.L.
 Liu, James T.C. J.T.C.L.
 Livermore, Harold V. H.V.L.
 Livet, Georges. G.Li.
 Livi-Bacci, Massimo. M.L.-B.
 Livingstone, Daniel A. D.A.L.
 Llewellyn, Karl Nickerson. K.N.L.
 Lloyd, Albert Lancaster. A.L.Li.
 Lloyd, Seton H.F. S.H.F.L.
 Lloyd-Jones, David Mathias. D.M.L.-J.
 Lloyd-Jones, Hugh. H.L.-J.
 Lo, Jung-pang. J-p.L.
 Lockhart, Richard T. R.T.L.
 Lockley, R.M. R.M.L.
 Lockspeiser, Edward. E.L.
 Lodish, Harvey F. H.F.L.
 Loeffler, M. John. M.J.Lo.
 Loewe, Fritz P. F.P.L.
 Logan, Richard F. R.F.Lo.
 Logan, Robert G. R.G.Lo.
 Lohuizen, Johanna E. van. J.E.v.L.
 Lombardo, Antonino. An.L.
 Long, Charles H. C.H.Lo.
 Long, Edward Ernest. E.E.L.
 Longford, Elizabeth Pakenham, Countess of. E.Lo.
 Longworth, Philip. P.L.
 Lonsdale, Dame Kathleen. K.Lo.
 Loomis, Charles P. C.P.L.
 Loon, Maurits N. van. M.N.v.L.
 Loosli, John K. J.K.L.
 Lopez, Robert Sabatino. R.S.L.
 Lorge, Barry Steven. B.S.Lo.
 Lorig, Clarence H. C.H.L.
 Lorwin, Val R. V.R.L.
 Losey, George S. G.S.Lo.
 Low, D. Anthony. D.A.Lo.
 Low, David Morrice. D.M.Lo.
 Lowe, Victor. V.Lo.
 Lowenthal, Constance. C.Lo.
 Lozinsky, Mikhail Grigoriyevich. M.G.L.
 Luard, Evan. E.Lu.
 Lucas, Donald William. D.W.L.
 Luce, R. Duncan. R.D.L.
 Luck, Georg Hans. G.Lu.
 Luckner, Joseph M. J.M.Lu.
 Lui, Ante. A.Lu.
 Lukoff, Fred. F.L.
 Lüling, Karl Heinz. K.H.L.
 Lumiansky, R.M. R.M.Lu.
 Luntz, Myron. M.Lu.
 Luscombe, David Edward. D.E.L.
 Lustig, Lawrence K. L.K.L.
 Lutfi al-Sayyid Marsot, Afaf. A.L.al-S.M.
 Luttrell, Anthony Thornton. A.T.L.
 Lyman, John. J.Ly.
 Lynch, John. Jo.Ly.
 Lyne, A. Gordon. A.G.Ly.
 Lyons, Sir John. J.Lyo.
 Mabbott, Thomas Ollive. T.O.M.
 Mabee, Carleton. C.Ma.
 Mabogunje, Akinlawon Ladipo. A.L.M.
 Macan, T.T. T.T.M.
 Macartney, Carlile Aylmer. C.A.M.
 McAuley, Mary. M.McA.
 McBirney, Alexander R. A.R.McB.
 McBride, George McCutchen. G.McC.McB.
 McBryde, F. Webster. F.W.McB.
 McCallum, W. Cheyne. W.C.McC.
 McCarthy, Patrick. P.McC.
 McCarthy, Willard J. W.J.McC.
 McChesney, Malcolm. M.McC.
 Macchia, Giovanni. Gi.M.
 McClelland, Charles A. C.A.McC.
 McClintock, Elizabeth. E.McC.
 McComb, Arthur Kilgore. A.K.McC.
 MacConaill, Michael A. M.A.MacC.
 McCully, Marilyn. M.McCu.
 McDavid, Raven I., Jr. R.McD.
 McDivitt, James F. J.F.McD.

- McDonald, Alexander Hugh. A.H.McD.
 Macdonald, Barrie K. B.K.M.
 MacDonald, Charles B. C.B.McD.
 McDonald, Forrest. F.McD.
 McDonough, Sheila D. S.McD.
 McDougall, Walter A. W.A.McD.
 MacDuffee, C.C. C.C.McD.
 Maceda, José. Jé.Ma.
 McElroy, Frank E. F.E.McE.
 McElroy, Michael B. M.B.McE.
 McEwen, The Rev. James Stevenson. J.S.McE.
 McFarlane, James Walter. J.W.McF.
 MacGaffey, Janet. J.MacG.
 MacGaffey, Wyatt. W.MacG.
 McGann, Thomas F. T.F.McG.
 McGeough, Joseph A. J.A.McG.
 McGinn, Bernard J. B.J.McG.
 McGrayne, Sharon. S.McG.
 McGreevey, William Paul. W.P.McG.
 McGregor, Samuel Emmett. S.E.McG.
 Machlis, Joseph. J.Ma.
 McHugh, Christine. C.McH.
 McIntosh, Christopher Angus. C.A.McI.
 MacIntosh, Robert McKinlay. R.Mck.MacI.
 McIntyre, Donald. D.McI.
 McKelvey, Vincent E. V.E.McK.
 Mackenzie, Fred T. F.T.M.
 McKenzie, The Rev. John L. J.L.McK.
 MacKenzie, William Scott. W.S.MacK.
 Mackie, J. Alan. J.A.Ma.
 Mackintosh, Nicholas John. N.J.M.
 McKnight, Brian E. B.E.McK.
 Mackrell, Judith R. J.R.Ma.
 Mackridge, Peter A. P.A.M.
 Mack Smith, Denis. De.M.S.
 McLaughlin, John. J.McL.
 MacLeod, Murdo J. M.J.MacL.
 McLeod, Thomas S. T.S.McL.
 McLeod, William Hewat. W.H.McL.
 McLintock, Peter. P.McL.
 McLure, Charles E., Jr. C.E.McL.
 McMahon, William B. W.B.McM.
 McMullen, Roy Donald. R.McMu.
 McMurtrey, James Edward, Jr. J.E.McM.
 McNeill, William H. W.H.McN.
 McNickle, D'Arcy. D'A.McN.
 MacNutt, W. Stewart. W.S.MacNu.
 Macomber, Richard W. R.W.Ma.
 McPherron, Robert L. R.L.M.
 MacRae, Donald Gunn. D.G.MacR.
 Maeno, Naoaki. Na.Mo.
 Magarshack, David. Da.Ma.
 Magda, Matthew S. M.S.Ma.
 Magdoff, Harry. Ha.Ma.
 Magnus, Bernd. Be.M.
 Magoun, Horace Winchell. H.W.M.
 Mahdi, Muhsin S. M.S.M.
 Majeska, George P. G.P.M.
 Makdisi, George. G.M.
 Maksoud, Clovis F. C.F.M.
 Malcolm, Norman A. N.A.M.
 Malia, Martin E. M.E.Ma.
 Malik, Liliya Konstantinovna. L.K.M.
 Malin, Michael C. M.C.Ma.
 Malina, Frank J. F.J.Ma.
 Mallett, Michael Edward. Mi.Ma.
 Mallory, V. Standish. V.S.M.
 Mallowan, Sir Max. M.Mn.
 Malm, William P. W.P.M.
 Maloney, Francis J. Terence. Fr.J.M.
 Manchester, William. W.Man.
 Mann, Golo. G.Ma.
 Mannheim, Hermann. H.M.
 Mannheim, L. Andrew. L.A.Ma.
 Manning, Raymond B. R.B.M.
 Manning, Wayne E. Wa.E.M.
 Manschreck, Clyde L. C.L.Ma.
 Manske, Richard H. R.H.M.
 Mantell, Charles L. C.L.M.
 Manton, Sidnie M. S.M.M.
 Manuel, Frank Edward. F.E.M.
 Manvell, Roger. R.M.
 Maraini, Fosco. F.M.
 Marcelli, Umberto. U.M.
 March, Benjamin. B.Ma.
 Marc'hadour, The Rev. Germain P. G.P.Ma.
 Marchand, Leslie A. L.A.M.
 Marcus, Leonard M. L.M.M.
 Marcuse, Sibyl. S.Ma.
 Margenau, Henry. H.Ma.
 Margolis, Joseph. J.Ms.
 Mariani, Valerio. V.M.
 Mark, Herman F. H.F.M.
 Markesinis, Basil S. B.S.M.
 Markovitz, Hershel. He.M.
 Markowitz, William. W.Ma.
 Marks, Robert W. R.W.M.
 Marks, Shula E. Sh.M.
 Marlowe, John. Jo.Ma.
 Marquard, Leopold. L.Ma.
 Marquardt, Wilhelm Rudolf. W.R.M.
 Marr, Phebe A. P.A.Ma.
 Marriott, McKim. Mc.M.
 Marrou, Henri-Irénée. H.-I.M.
 Marsh, Christopher Marriage. C.M.
 Marshall, Joe T. J.T.M.
 Marshall, John S. J.S.Ma.
 Marshall, P.J. P.J.M.
 Marshall, Robert L. Ro.Ma.
 Marshall, Woodville K. W.K.M.
 Martin, Boyd A. B.A.M.
 Martin, Gene E. G.E.Ma.
 Martin, Laurence Woodward. L.W.M.
 Martindale, Andrew Henry Robert. A.Ma.
 Martin-Demézil, Jean. J.M.-D.
 Martini, Giuseppe. Gi.Ma.
 Martinot, Roger. R.Ma.
 Martins, Luciano. L.Ms.
 Marty, Martin E. M.E.M.
 Marwick, Maxwell Gay. M.G.Ma.
 Masai, Yasuo. Y.M.
 Mascarenhas, Adolfo C. A.C.M.
 Mason, Sir Basil John. B.J.M.
 Mason, Brian H. B.H.M.
 Mason, Charles T., Jr. C.T.M., Jr.
 Mason, Haydn T. H.T.M.
 Mason, J. Alden. J.A.Mn.
 Mason, Leonard E. L.E.M.
 Mason, Philip. P.Ma.
 Massevitch, Alla Genrikhovna. A.G.Ma.
 Massey, Alan Gibbs. A.G.M.
 Masutani Fumio. Ma.Fu.
 Mathew, The Most Rev. David. D.Ma.
 Mathews, Thomas G. T.G.Ms.
 Mathis, John S. J.S.M.
 Matloff, Maurice. Ma.M.
 Matsumoto, Nobuhiro. N.M.
 Matsumoto, Tatsuro. T.M.
 Matthews, Bernard Edward. B.E.Ma.
 Matthews, Geoffrey Vernon Townsend. G.V.T.M.
 Matthews, J.F. J.F.Ma.
 Matthews, Peter B.C. P.B.C.M.
 Matthias, Erich. E.Ma.
 Matthiasson, Björn. B.M.
 Mattuck, Arthur Paul. A.P.Ma.
 Matull, Wilhelm. Wi.M.
 Matz, Samuel A. S.A.M.
 Maurer, The Rev. Armand. A.A.Ma.
 Maurer, D.W. D.W.M.
 Maxwell, D.E.S. D.E.S.M.
 May, Comdr. William Edward. W.E.M.
 Mayeda, Sengaku. Se.M.
 Mayer, Harold M. H.M.M.
 Mayer, William Vernon. W.V.M.
 Mays, John Barron. J.B.M.
 Mažiulis, Vytautas J. V.J.M.
 Mazur, B.W. B.W.Ma.
 Meade, Robert Douthat. R.D.M.
 Meadow, S. Roy. S.R.M.
 Medina, José Ramón. J.R.Me.
 Medina, Manuel. M.Me.
 Mee, John F. J.F.Me.
 Meerhaeghe, M.A. van. M.A.v.M.
 Meeuse, Bastiaan J.D. B.J.D.M.
 Mehren, Arthur Taylor von. A.T.v.M.
 Mei, Yi Pao. Y.P.M.
 Meier, Mark F. M.F.M.
 Meiggs, Russell. Ru.M.
 Meischner, Dieter. D.M.
 Meland, Bernard E. B.E.M.
 Mellanby, Kenneth. K.Me.
 Mellor, Roy E.H. R.E.H.M.
 Melsen, Andrew G.M. van. A.G.M.v.M.
 Meltzer, Julian Louis. J.L.Me.
 Ménager, Daniel. D.Mé.
 Mendeloff, Albert I. A.I.M.
 Mendenhall, George Emery. G.E.Me.
 Mendoza, Eric. E.M.
 Mensching, Gustav. G.Me.
 Menzies, Robert James. R.J.Me.
 Mercier, Paul. Pa.M.
 Merdinger, Capt. Charles John. C.J.M.
 Merkelbach, Reinhold. R.Me.
 Merlan, Philip. Pp.M.
 Merle, Robert. Ro.M.
 Mernagh, Laurence Reginald. L.R.M.
 Mero, John Lawrence. J.L.M.
 Mertz, Barbara G. B.G.M.
 Mertz, Pierre. P.Me.
 Meškauskas, Kazimieras Antano. K.A.M.
 Messenger, P.S. P.S.M.
 Metford, John Callan James. J.C.J.M.
 Meyendorff, The Rev. John. J.M.
 Meyer, Adolphe Erich. A.E.M.
 Meyer, John Richard. J.R.M.
 Meyer, Michael C. M.C.M.
 Mezei, Kathy. K.M.
 Michael, Franz H. F.H.M.
 Michaelsen, Robert Slocumb. R.S.M.
 Michel, Michel. M.Mi.
 Michelena, Luis. L.M.
 Micheltmore, Peter. P.Mi.
 Middlehurst, Barbara Mary. B.M.M.
 Middleton, Dorothy. D.Mi.
 Middleton, Gerard V. G.V.M.
 Middleton, John F.M. J.F.M.
 Middleton, Robin David. R.D.Mi.
 Miège, Jacques. J.Mi.
 Miers, Earl Schenck. E.S.Mi.
 Mikhaylov, Nikolay Ivanovich. N.I.M.
 Mikoletzky, Hanns Leo. H.L.M.
 Milgate, Wesley. W.Mi.
 Milkov, Fyodor Nikolayevich. F.N.M.
 Miller, George Leslie. G.L.M.
 Miller, James Grier. Ja.G.M.
 Miller, John Donald Bruce. J.D.B.M.

- Miller, John E. J.E.M.
 Miller, Mark D.H. M.D.H.M.
 Miller, Max. Mx.M.
 Miller, Maynard Malcol. M.M.M.
 Miller, William. W.Mr.
 Miller, William H. W.H.M.
 Millikin, Sandra. S.Mi.
 Millner, Maurice Alfred. M.A.M.
 Millon, Henry A. H.A.M.
 Millot, Jacques. Ja.M.
 Mills, Gladstone E.M. G.E.M.M.
 Minarcik, Elbert John. E.J.M.
 Minifie, Bernard W. B.W.M.
 Minio-Paluello, Lorenzo. L.M.-P.
 Minkel, C.W. C.W.M.
 Mints, Aleksey Aleksandrovich. A.A.M.
 Mirreh, Hassan Ali. H.A.Mi.
 Mirsky, Jeannette. J.Mir.
 Misner, Gordon E. G.E.Mi.
 Mitchell, G.A.G. G.A.G.M.
 Mitchell, James Clyde. J.C.Mi.
 Mitchell, Jean Brown. J.B.Mi.
 Mitchell, John. Jo.M.
 Mitchell, John Burnett. Jo.B.M.
 Mitchell, Mairin. M.Mi.
 Mitchell, Terence Croft. T.C.M.
 Mitford, Nancy. Na.M.
 Mitry, Jean. Je.M.
 Mitzman, Arthur. Ar.M.
 Mizener, Arthur. A.Mi.
 Moeller, Therald. T.Mo.
 Moen, Arve Sverre. A.S.M.
 Mohanty, Jitendra N. J.N.M.
 Mokray, William George. W.G.M.
 Moldenhauer, Hans. Ha.M.
 Mollat, Michel J. M.J.Mo.
 Molnar, Peter H. P.H.M.
 Moltmann, Jürgen D. J.D.M.
 Momigliano, Arnaldo Dante. A.D.Mo.
 Momo, Hiroyuki. Hi.Mo.
 Momsen, Richard P., Jr. R.P.Mo.
 Moncada R., J. Roberto. J.R.M.R.
 Monet, The Rev. Jacques. J.Mo.
 Mongan, Agnes. Ag.M.
 Mongrédién, Georges. G.Mn.
 Monick, John A. J.A.Mo.
 Monk, C.B., Jr. C.B.Mo.
 Monnerville, Gaston. G.Mo.
 Monroy, Alberto. A.Mo.
 Montagna, William. W.M.
 Montross, Lynn. L.Mo.
 Moog, Florence. F.M.
 Mookerjee, Sitanshu. S.Mo.
 Moore, Harold E., Jr. H.E.Mo.
 Moore, John Preston. J.P.M.
 Moore, Patrick. P.Mo.
 Moore, Sonia. S.M.
 Moore, Will G. W.G.Mo.
 Moraes, Frank R. F.R.M.
 Morales-Carrión, Arturo. A.M.-C.
 Moran, Francis. F.Mo.
 Moran, Warren. W.Mo.
 Morgan, Neil. N.Mo.
 Morgan, Stephen William Kenneth. S.W.K.M.
 Morley, Cyril John. C.J.Mo.
 Morley, Ronald James. R.J.M.
 Morrey, Charles B., Jr. C.B.My.
 Morris, Charles Nicholas. C.N.M.
 Morris, Donald R. D.R.M.
 Morris, H.S. H.S.M.
 Morrison, Hugh Sinclair. Hu.M.
 Morrissey, Charles Thomas. C.T.Mo.
 Morsey, Rudolf. R.Mo.
 Mortensen, Brita Maud Ellen. B.Mo.
 Morton, John Edward. J.E.Mo.
 Morton, William Lewis. W.L.M.
 Moseley, Maynard F., Jr. M.F.Mo.
 Mosher, Frederick C. F.C.M.
 Mosley, J. Philip. J.P.Mo.
 Mosley, Leonard. Le.M.
 Mosse, W.E. W.E.Mo.
 Mosteller, Frederick. Fr.M.
 Mostofi, Khosrow. Kh.Mo.
 Mostow, George Daniel. G.D.M.
 Moulton, Matthew James. Ma.J.M.
 Moulton, William G. Wi.G.M.
 Moumouni, Abdou. A.M.
 Movius, Hallam L., Jr. H.L.Ms.
 Mozumder, Asokendu. A.Moz.
 Mueller, David Livingstone. D.L.M.
 Mukerji, S.N. S.N.M.
 Mulholland, J. Derral. J.D.Mu.
 Müller, Claudius Cornelius. C.C.M.
 Müller, Edith A. E.A.M.
 Müller, Joachim. J.Mu.
 Müller-Brockmann, Josef. J.M.-Br.
 Multhauf, Robert P. R.P.M.
 Mundel, Marvin E. M.E.Mu.
 Munn-Rankin, J.M. J.M.M.-R.
 Munro, Thomas. Th.M.
 Munroe, John A. J.A.Mu.
 Munson, J. Ronald. J.R.Mn.
 Munsterberg, Hugo. H.Mu.
 Munz, Peter. P.Mu.
 Muranov, Aleksandr Pavlovich. A.P.M.
 Murphy, Arthur D. A.D.M.
 Murphy, The Rev. Francis Xavier. F.X.M.
 Murphy, James J. J.J.M.
 Murra, John V. J.V.M.
 Murray, Anne Wood. A.W.M.
 Murray, Francis J. F.J.M.
 Murray, Peter J. P.J.Mu.
 Murrell, Kathleen Berton. K.B.M.
 Murton, Ronald K. R.K.M.
 Musgrave, William K.R. W.K.R.M.
 Muskie, Edmund S. E.S.M.
 Mutter, Reginald P.C. R.P.C.M.
 Mutton, Alice F.A. A.F.A.M.
 Myers, Alexander Reginald. A.R.M.
 Myers, Raymond R. R.R.M.
 Myers, Rollo H. R.My.
 Myint, Hla. H.My.
 Nachod, Frederick C. F.C.N.
 Nachtergaele, Victor. V.N.
 Nadeau, Maurice. M.Na.
 Naess, Arne D. A.D.N.
 Nagahara, Keiji. K.N.
 Nagel, Heinrich. H.N.
 Nagler, Alois M. A.M.N.
 Naim, C.M. C.M.N.
 Nair, Kusum. K.Na.
 Nair, N. Chandrasekharan. N.C.N.
 Naisbitt, John. Jo.N.
 Naka, Arata. A.Na.
 Nakamura, Hajime. H.Na.
 Nakosteen, Mehdi K. M.K.N.
 Namias, Jerome. J.Na.
 Nanda, B.R. B.R.N.
 Nangeroni, Giuseppe. G.Na.
 Napier, J.R. J.R.N.
 Narasimhan, Chakravarthi V. C.V.N.
 Narasimhan, Raghavan. R.Na.
 Narayana, H.S. H.S.N.
 Narr, Karl J. K.J.N.
 Nash, Manning. Ma.N.
 Nash, Paul. Pa.N.
 Nash, Ray. Ra.N.
 Nasr, Seyyed Hossein. S.H.N.
 Nassau, Kurt. Ku.N.
 Nathan, Peter W. P.W.N.
 Nel, Andries. A.Ne.
 Nelson, Bert. B.Ne.
 Nelson, David M. D.M.Ne.
 Nelson, E. Clifford. E.C.N.
 Nelson, Gareth Jon. G.J.N.
 Nelson, R.J. R.J.Ne.
 Nelson, Robert J. R.J.N.
 Nemerov, Howard. H.Ne.
 Nestyev, Israel Vladimirovich. I.V.N.
 Nettl, Bruno. B.N.
 Neumann, Gerhard. G.N.
 Neumark, Fritz. F.N.
 Nevins, Allan. Al.N.
 Newbigin, Marion I. M.I.N.
 Newburn, Ray L., Jr. R.L.Ne.
 Newcombe, Curtis L. C.N.
 Newhall, Beaumont. Be.N.
 Newlin, Dika. D.N.
 Newman, Robert Bradford. R.B.N.
 Newman, William Anderson. W.A.N.
 Newman, William S. W.S.N.
 Newsom-Davis, John M. J.M.N.-D.
 Newton, Brian E. B.E.N.
 Neyman, Viktor Grigoryevich. V.G.N.
 Nicholas, Herbert G. H.G.N.
 Nicholas, Warwick L. W.L.N.
 Nichols, Robert Brayton. R.B.Ni.
 Nicholson, Norman L. N.L.N.
 Nicol, Davidson S.H.W. D.S.H.W.N.
 Nicol, Donald MacGillivray. D.M.N.
 Nicolai, Henri. He.Ni.
 Nicolle, Jacques-M.-R. J.-M.-R.N.
 Niddrie, David Lawrence. D.L.N.
 Niederer, Arnold. A.Ni.
 Nielsen, Kai E. K.E.N.
 Nienhauser, William H., Jr. W.H.N.
 Nijim, Basheer K. B.K.N.
 Nijinsky, Romola. R.Ni.
 Nikiforov, Leonid Alekseyevich. L.A.N.
 Niklaus, Robert. Ro.N.
 Nisbet, Robert A. R.A.N.
 Niven, Alastair N.R. A.N.R.N.
 Noback, Charles R. C.R.N.
 Noble, Clyde Everett. C.E.N.
 Noble, J. Jeremy. J.J.No.
 Noble, Joseph Veach. J.V.N.
 Noller, Carl R. C.R.No.
 Norbeck, Edward. E.N.
 Nordhagen, Per Jonas. P.J.N.
 Nordtvedt, Kenneth L., Jr. K.L.N.
 Norman, A.V.B. A.V.B.N.
 Norman, Lennart T. L.T.N.
 Norman, Richard O.C. R.O.C.N.
 Norris, David A. D.A.N.
 Norris, David O. D.O.N.
 Norris, Kenneth Stafford. K.S.N.
 North, Robert C. R.C.N.
 Norwich, John Julius Cooper, 2nd Viscount. N.
 Nove, Alexander. A.No.
 Novick, Alvin. A.N.
 Nowell, Charles E. C.E.No.
 Nuwinkware, Pierre-Claver. P.-C.N.
 Oakley, Francis Christopher. F.C.O.
 Oakley-Hill, Dayrell Reed. D.R.O.-H.

- O'Beirne Ranelagh, John. J.O'B.R.
 Oberg, Kalervo. K.O.B.
 O'Brien, Conor Cruise. C.C.O'B.
 O'Callaghan, Joseph F. J.F.O'C.
 Occhialino, Mario E. Ma.E.O.
 Ochsenwald, William L. W.L.O.
 O'Connell, Daniel Patrick. D.P.O'C.
 O'Connor, Daniel William.
 D.W.O'C.
 O'Connor, Francis Valentine.
 F.V.O'C.
 Oddone, Juan A. J.A.O.
 Odlozilik, Otakar. O.O.
 Odum, Eugene P. E.P.O.
 Oehser, Paul H. P.H.O.
 Ogden, Horace Russell. H.R.O.
 Ogilvie, Robert Maxwell. R.M.Og.
 Ogorkiewicz, Richard Marian.
 R.M.O.
 O'Gorman, James Francis. J.F.O'G.
 O'Grady, Brendan Anthony. B.O'G.
 O'Kelly, Bernard. B.O'K.
 Olah, George A. G.A.O.
 Oldenbourg-Idalie, Zoé. Z.O.
 Oldroyd, Harold. H.O.
 Oliver, Jack E. J.E.O.
 Oliver, Michael Francis. M.F.O.
 Oliver, Paul P.O.
 Oliver, William Hosking. W.H.O.
 Olivier, Daria. D.Ol.
 Ollier, Clifford David. C.D.O.
 Olson, David R. D.R.O.
 Olson, Edwin A. E.A.O.
 Olson, Everett C. E.C.O.
 Olson, Jerry S. J.S.O.
 Olson, Maynard V. M.V.O.
 Olver, Ron. R.O.
 Oman, Carola (Lady Lenanton).
 C.O.
 Omar, Farouk. F.Om.
 Ominde, Simeon Hongo. S.H.O.
 Ommanney, Francis D. F.D.O.
 O'Neill, Denis. D.O'N.
 Ooi Jin Bee. O.J.B.
 Oppenheimer, Jane M. J.M.O.
 O'Raiheartaigh, Tarlach. T.O'R.
 Orcibal, Jean. J.Or.
 Ordish, George. G.O.
 Ore, Oystein. O.Or.
 Ornati, Oscar A. O.A.O.
 Orne, Martin T. M.T.O.
 Örsy, The Rev. Ladislav M. L.M.Ö.
 Ortner, Sherry B. S.B.O.
 Orton, Glenn S. G.S.O.
 Orville, Richard Edmonds. R.E.Or.
 Orvin, Anders Kristian. A.K.O.
 Osborn, Frederick Henry. F.H.O.
 Osborn, The Rev. Ronald E. R.E.O.
 Osborne, John W. J.W.O.
 Osborne, Milton Edgeworth. M.E.O.
 Osborne, Richard Horsley. R.H.O.
 Osler, Margaret J. M.J.O.
 Ostenso, Ned Allen. N.A.O.
 O'Toole, James Joseph. J.O'T.
 O'Toole, Thomas E. T.E.O'T.
 Otto, Christian F. C.F.O.
 Otto, Eberhard. E.O.
 Outler, Albert Cook. A.C.O.
 Overbeek, Jan Theodoor Gerard.
 J.T.G.O.
 Overdijkink, Gerrit Willem. G.W.O.
 Overton, Leonard C. L.C.O.
 Owen, D.D.R. D.D.R.O.
 Owen, Peter D. P.D.O.
 Owen, Tobias Chant. T.C.O.
 Owen, Wilfred. W.O.
 Owens, The Rev. Joseph. J.O.
 Oxtoby, Willard Gurdon. W.G.O.
 Pacaut, Marcel. M.Pa.
 Padelford, Norman J. N.J.P.
 Page, Edward C. E.C.P.
 Pai, Raghawendra Mukund. R.M.P.
 Paine, Frank A. F.A.P.
 Paine, Robert P.B. R.P.B.P.
 Painter, George Duncan. G.D.P.
 Pal, Indra. I.P.
 Palerm, Angel. An.Pa.
 Pallis, Christopher A. C.A.P.
 Pallucchini, Rodolfo. R.Pal.
 Palmer, Allison R. A.R.P.
 Palmer, Ralph Anthony. R.A.Pr.
 Pálsson, Hermann. He.P.
 Pannain, Guido. G.Pan.
 Paoletti, John T. J.T.Pa.
 Papadakis, Juan. J.Pa.
 Papike, J.J. J.J.Pa.
 Paproth, Eva. E.P.
 Parczewski, Władysław. W.Pa.
 Park, George Kerlin. G.K.P.
 Parke, Herbert William. H.W.P.
 Parker, Alexander A. A.A.P.
 Parker, Franklin D. F.D.P.
 Parkes, Henry Bamford. H.B.P.
 Parkes, Kenneth C. K.C.P.
 Parkin, Charles William. C.W.Pa.
 Parkinson, Robert Lewis. R.L.P.
 Parrot, André. A.Pa.
 Parry, John Horace. J.H.Py.
 Parry, V.J. V.J.P.
 Parsons, James Bayard. J.B.Pa.
 Parsons, James J. Ja.J.P.
 Pascal, Roy. Ro.Pa.
 Pashuto, Vladimir T. V.T.P.
 Passavant, Günter. G.Pa.
 Passmore, Reginald. R.Pa.
 Pastor, José M.F. J.M.F.P.
 Pathak, Devavrat Nanubhai. D.N.P.
 Patrick, Hugh T. H.T.P.
 Patterson, Colin. C.P.
 Patterson, Thomas C. T.C.P.
 Patze, Hans. H.Pa.
 Patzig, Günther. Gü.P.
 Pauck, Wilhelm. W.P.
 Pauling, Linus C. L.C.P.
 Pavelić, Ante S. A.S.Pa.
 Pavlowitch, Kosta Stevan. K.St.P.
 Pawley, Andrew K. A.K.Pa.
 Pawson, David Leo. D.L.P.
 Payanzo, Ntsomo. N.Pa.
 Payne, Stanley G. S.G.P.
 Percy, G. Etzel. G.E.P.
 Pearson, Charles G. C.G.P.
 Pearson, H.F. H.F.P.
 Pedanou, Macaire K. M.K.P.
 Peel, Edwin A. E.A.P.
 Peel, Ronald Francis. R.F.Pe.
 Peiser, H. Steffen. H.S.P.
 Pelczar, Michael J., Jr. M.J.P.
 Pelikan, Jaroslav Jan. J.J.Pe.
 Pélassier, René. R.P.
 Pélassier, Roger. Ro.Pe.
 Pellat, Charles L.P. C.L.P.P.
 Pelletier, Michel B. M.B.P.
 Pen, Jan. J.P.
 Penčev, Peter Georgiev. P.G.P.
 Pendle, George. G.Pe.
 Penner, Hans H. Ha.P.
 Pennington, D.H. D.H.P.
 Penny, Nicholas B. N.B.P.
 Pepelasis, Adamantios A. A.A.Ps.
 Perelman, Chaim. C.Pe.
 Perham, Dame Margery. M.Pm.
 Perkins, Edward S. E.S.P.
 Pernoud, Régine. R.Pe.
 Perowne, Stewart Henry. S.H.P.
 Perrin, Norman. N.P.
 Perrott, Roy. Ro.P.
 Perry, Harry. H.Pe.
 Peruta, Franco della. F.d.Pe.
 Pessen, Edward. E.Pe.
 Péter, László. L.P.
 Peterdi, Gabor F. G.F.P.
 Peters, James A. J.A.P.
 Peterson, J.E. J.E.P.
 Petit, Paul. P.P.
 Petrov, Mikhail Platonovich. M.P.Pe.
 Petrov, Victor P. V.P.P.
 Petterson, Donald Rahl. D.R.P.
 Pettitt, George A. G.A.P.
 Péwé, Troy L. T.L.Pe.
 Peyre, Henri M. H.M.P.
 Pfaffmann, Carl. C.Pf.
 Phelps Brown, Ernest Henry. E.H.P.B.
 Philby, Harry St. John Bridger.
 H.St.J.B.P.
 Phillips, Sir Cyril Henry. C.H.Ps.
 Phillips, Courtenay Stanley Goss.
 G.S.G.P.
 Phillips, Joseph D. J.D.P.
 Phillips, Melba. M.Ph.
 Phiri, Kings Mbacazwa G. K.M.G.P.
 Pichon, Jean-Charles. J.-C.P.
 Pick, Robert. R.Pi.
 Pickering, Sir George. G.Pi.
 Pickersgill, John Whitney. Jo.W.P.
 Pickles, Dorothy M. D.M.P.
 Picton, John. J.Pi.
 Pielke, Roger Alvin. R.A.Pi.
 Pieper, Josef. Jf.Pi.
 Pierce, A. Keith. A.K.P.
 Pierce, Francis S. F.S.P.
 Pierce, John R. J.R.P.
 Piercey, W. Douglas. W.D.P.
 Pieri, David C. D.C.P.
 Pietka, Mark Jeffrey. M.J.Pi.
 Pike, Dag. D.Pi.
 Pike, Douglas Henry. D.H.Pe.
 Pilikian, Hovhanness Israel. Ho.I.P.
 Pillai, V.R. V.R.P.
 Pincus, Alexis G. A.G.P.
 Pinder-Wilson, Ralph H. R.H.P.-W.
 Pine, Leslie Gilbert. L.G.P.
 Pines, Shlomo. S.Pi.
 Pingree, David E. D.E.P.
 Pinker, Robert A. R.A.P.
 Pipes, Richard E. R.E.Pi.
 Pirsig, Maynard E. M.E.P.
 Pittioni, Richard. Ri.P.
 Piveteau, Jean. J.Piv.
 Plamenatz, John P. J.P.Pl.
 Platnauer, Maurice. M.Pl.
 Playfair, Giles William. G.W.P.
 Plischke, Hans. Hs.P.
 Pluckhahn, J. Bruce. J.B.P.
 Plumb, Sir John. Jo.Pl.
 Pocock, Tom. T.Po.
 Podhajsky, Alois Wilhelm. A.W.P.
 Podlecki, Anthony J. A.J.P.
 Poelhekke, Jan J. J.J.P.
 Pogue, Forrest C. F.C.P.
 Pohl, Frederik. F.Po.
 Pohl, Richard W. R.W.P.
 Pokshishevsky, Vladimir V. V.V.P.
 Polis, Gary A. G.A.Po.
 Polk, William Roe. W.R.P.
 Pollack, Peter J. P.J.P.

Pollard, John Graham. J.G.P.
 Pollard, John Richard Thornhill.
 J.R.T.P.
 Polmar, Norman C. N.C.P.
 Polunin, Nicholas. N.Po.
 Pomeau, René Henry. R.H.Po.
 Pontieri, Ernesto. E.Po.
 Poole, Gary William. Ga.P.
 Poole, Gray Johnson. G.J.P.
 Poole, Kenyon Edwards. K.E.P.
 Poonawala, Ismail K. I.K.P.
 Pope, Clifford Hillhouse. C.H.P.
 Pope, Phillip E. P.E.P.
 Pope-Hennessy, Sir John. J.P.-H.
 Popkin, Richard H. R.H.P.
 Popov, Igor Vladimirovich. I.V.P.
 Poppino, Rollie E. R.E.P.
 Porter, William V. W.V.P.
 Posner, Rebecca. Re.P.
 Potter, David Morris. D.M.Po.
 Potter, George Richard. G.R.P.
 Potter, Simeon. S.P.
 Potthoff, Heinrich. H.P.
 Potts, Malcolm. M.P.
 Poucher, William A. W.A.Po.
 Pounder, Cuthbert Coulson. C.C.P.
 Pournaras, Dimitris. D.P.
 Powell, James M. J.M.Po.
 Powell, Raphael. R.Po.
 Powers, Philip N. P.N.P.
 Pozo Vélez, Homero. H.P.V.
 Prakasa Rao, Vaddiparti Lova Surya.
 V.L.S.P.R.
 Prausnitz, John M. J.M.P.
 Praver, Joshua. Jo.Pr.
 Preece, Warren E. W.E.P.
 Preidel, Helmut. H.Pr.
 Prescott, J.R.V. J.R.V.P.
 Preuschen, Gerhardt. G.P.
 Prevost, Jean. J.Pr.
 Price, Arnold H. A.H.P.
 Price, Cecil John Layton. C.J.L.P.
 Prieto, Justo Pastor. J.P.P.
 Pringle, John Douglas. J.D.Pr.
 Proskouriakoff, Tatiana. T.P.
 Proud, Lieut. Col. Richard Riseley.
 R.Pr.
 Proudlove, James Alan. J.Pro.
 Prout, W.G. W.G.Pr.
 Prown, Jules David. J.D.Pro.
 Pruchnicki, Jerzy. Je.P.
 Pryce, Roy. R.Pr.
 Pryse-Phillips, William E.M.
 W.E.M.P.-P.
 Puck, Theodore Thomas. T.T.P.
 Puhvel, Jaan. J.Pl.
 Pulgar-Vidal, Javier. J.P.-V.
 Pullen, Andrew M. A.M.P.
 Pulleyblank, Edwin G. E.G.P.
 Purdy, Ken W. K.W.P.
 Purdy, The Rev. William Arthur.
 W.A.P.
 Puri, Baij Nath. B.N.P.
 Purković, Miodrag Al. M.A.P.
 Purrington, Philip F. P.F.P.
 Pye, E. Michael. M.Py.

Quimby, Robert S. R.S.Q.
 Quinn, John Francis. J.F.Q.
 Quinones, Ricardo J. R.J.Q.
 Quintana, Ricardo. R.Q.
 Quinton, Anthony M. Quinton,
 Baron. A.M.Q.
 Quittmeyer, Charles Loreaux. C.L.Q.

Rabie, Hassanein Muhammad. H.Ra.
 Rabin, Chaim. Ch.R.
 Raby, Frederic James Edward. F.J.E.R.
 Rae, John Bell. J.B.Ra.
 Raef, Marc. M.Ra.
 Raghavan, Chakravathi. C.Ra.
 Rahman, Fazlur. F.R.
 Rähula, Walpola. Wa.R.
 Ralphs, Sheila. S.Ra.
 Ralston, Robert H. R.H.Ra.
 Ramanujan, A.K. A.K.R.
 Ramm, Agatha. A.Ra.
 Ramsay, James Arthur. J.A.R.
 Ramsey, The Rt. Rev. Ian Thomas.
 I.T.R.
 Rand, Austin L. Au.L.R.
 Rang, Humphrey P. H.P.R.
 Rankin, Bayard. B.R.
 Ransom, Harry Howe. H.H.R.
 Rantsman, Yelizaveta Yakovlevna.
 Y.Y.R.
 Rao, R.V.R. Chandrasekhara.
 R.V.R.C.R.
 Rashid, Sh. Abdur. S.A.R.
 Rasmussen, John O., Jr. J.O.R.
 Rasmussen, Wayne D. W.D.R.
 Ratcliff, Graham. G.Ra.
 Ravenhill, William. W.Ra.
 Rawlings, Arthur Lionel. A.L.Ra.
 Rawlinson, John Lang. J.L.Ra.
 Rawski, Evelyn S. E.S.R.
 Rawson, Philip S. P.S.R.
 Rea, Donald G. D.G.R.
 Rea, Kenneth Grahame. K.G.R.
 Rea, Kenneth John. K.J.R.
 Read, Allen Walker. A.W.Re.
 Read, Donald. D.Re.
 Rebelo, Luís de Sousa. L.de S.R.
 Rechnitzer, Andreas B. A.B.R.
 Reddick, DeWitt C. DeW.C.R.
 Reed, Alan. A.Re.
 Reese, William L. W.L.Re.
 Reeves, Marjorie E. M.E.R.
 Reeves, Thomas C. T.C.R.
 Reich, Willi. W.R.
 Reichardt, Hans. H.Re.
 Reid, John Cowie. J.C.Rd.
 Reilly, John C., Jr. J.C.Re.
 Reindel, Kurt. Ku.R.
 Reinhard, Marcel. M.Re.
 Reish, Donald J. D.J.R.
 Reiss, Hans Siegbert. H.S.R.
 Renger, Johannes M. J.M.R.
 Rentz, George S. G.Re.
 Rescher, Nicholas. N.R.
 Resis, Albert. Al.Re.
 Rexroth, Kenneth. K.Re.
 Reynolds, Charles Edward. C.E.R.
 Reynolds, Christopher Hanby Baillie.
 C.H.B.R.
 Reynolds, Frank E. F.E.R.
 Reynolds, Graham. G.R.
 Rheinstein, Max. M.Rh.
 Rhoads, Edward J.M. E.J.M.R.
 Rhode, Gotthold K.S. G.K.S.R.
 Rhodes, Philip. P.Rh.
 Riasanovsky, Nicholas V. N.V.R.
 Rich, Alan. A.Ri.
 Richard, Jean B. J.B.R.
 Richards, Alan Westcott. A.W.R.
 Richards, D.S. D.S.Ri.
 Richards, Paul Westmacott. P.W.R.
 Richardson, Hugh E. H.E.R.
 Richardson, Margaret Ann. M.A.R.
 Richardson, Robert G. R.G.R.
 Riché, Pierre. P.R.

Richey, Michael William. M.W.Ri.
 Richmond, Rollin C. Ro.R.
 Richter, Gisela Marie Augusta.
 G.M.A.R.
 Richtering, Helmut. He.Ri.
 Rickel, A. Brewster. A.B.Ri.
 Ridolfi, Roberto. Ro.Ri.
 Riesenfeld, Stefan Albrecht. S.A.Ri.
 Rightmire, G. Philip. G.P.Ri.
 Riley, Edward C. E.C.R.
 Riley, Matilda White. M.W.R.
 Ring, Richard R. R.R.R.
 Ringer, Alexander L. A.L.R.
 Ringer, Barbara A. B.A.R.
 Ringgren, Helmer. H.R.
 Ringler, William Andrew, Jr. W.A.Ri.
 Ripin, Edwin M. E.M.R.
 Ritchie, C.T. C.T.R.
 Ritter, Dale F. D.F.R.
 Ritter, Raymond. R.Ri.
 Ritterbush, Philip C. P.C.R.
 Riva, Alfredo. Al.R.
 Riva, Joseph P., Jr. J.P.Ri.
 Rivlin, Helen Anne B. H.A.B.R.
 Rizley, John H. J.H.R.
 Robb, Nesca A. N.A.R.
 Robbins, Jonathan H. J.H.Ro.
 Robbins, Sidney Martin. S.M.R.
 Robbins, Stanley L. S.L.R.
 Roberts, Michael. M.Ro.
 Roberts, Sir Sydney. S.Rs.
 Robertson, Bruce Carlisle. B.C.R.
 Robins, Robert Henry. Ro.H.R.
 Robinson, Arthur. Ar.R.
 Robinson Arthur Napoleon Raymond.
 A.N.R.R.
 Robinson, Christopher. C.Ro.
 Robinson, Daniel Sommer. D.S.R.
 Robinson, David J. D.J.Ro.
 Robinson, Edgar Eugene. E.E.R.
 Robinson, Edward. E.Rn.
 Robinson, Elwyn B. E.B.R.
 Robinson, Frank Neville H. F.N.H.R.
 Robinson, George Clarence. G.C.R.
 Robinson, Gloria. G.Ro.
 Robinson, J. Lewis. J.L.Ro.
 Robinson, Joan Violet. J.Ro.
 Robinson, Romney. R.R.
 Robson, James Scott. J.S.Ro.
 Robson, William Alexander. W.A.R.
 Robson, William Wallace. W.W.R.
 Rockwell, Anne F. A.F.R.
 Rodgers, H.B. H.B.Ro.
 Rodnan, Gerald P. G.P.R.
 Rodríguez-Monegal, Emir. E.R.-M.
 Roe, Michael. Ml.R.
 Roey, Jan L.R. Van. J.V.R.
 Rogers, C. Ambrose. C.A.Ro.
 Rogers, Leonard R. L.R.R.
 Rogers, M. Elizabeth. M.E.Ro.
 Rogg, Lionel A. L.A.R.
 Rogge, Helmut. He.R.
 Rohan-Csermak, G. de. G. de R.-C.
 Rohde, Peter P. P.P.R.
 Rollin, Jack D. J.D.Ro.
 Rollins, Reed C. R.C.R.
 Rolt, L.T.C. L.T.C.R.
 Romas, Nicholas A. N.A.Ro.
 Romer, Alfred S. A.S.R.
 Ronan, Colin Alistair. C.A.R.
 Ronen, Dov. D.Ro.
 Rood, Arnold. A.Ro.
 Roos, Hans. Ha.Ro.
 Roosa, Robert Vincent. R.V.R.
 Rose, Leo E. L.E.R.
 Rosen, Edward. Ed.R.

- Rosenberg, Pierre M. P.M.R.
 Rosenthal, Erwin I.J. E.I.J.R.
 Roseveare, Henry Godfrey. H.G.R.
 Roskill, Capt. Stephen Wentworth. S.W.R.
 Ross, C.D. C.D.R.
 Ross, Marvin Chauncey. M.C.R.
 Ross, Peter McGregor. P.McG.R.
 Ross, Sydney. S.R.
 Rossbacher, Richard I. R.I.Ro.
 Rossi, Mario. M.R.
 Rostovtsev, Mikhail Ivanovich. M.I.R.
 Rothschild, The Hon. Miriam Louisa. M.L.R.
 Rouch, Jean Pierre. J.P.R.
 Roud, Brian James. B.J.R.
 Rouse, Irving. I.Re.
 Rouzé, Michel. Mi.Ro.
 Rowe, James Wilmot. J.W.R.
 Rowe, John A. Jo.R.
 Rowe, Margaret Ann. M.A.Ro.
 Rowen, Herbert H. H.Ro.
 Rowlatt, Mary. Ma.R.
 Rowlinson, John Shipley. Jo.S.R.
 Rowton, Michael B. M.B.R.
 Royde-Smith, John Graham. J.R.-S.
 Rubinstein, Nicolai. N.Ru.
 Rudge, Peter. P.Ru.
 Rudwick, Elliott. El.R.
 Ruggles, Eleanor. E.Ru.
 Ruhmer, Eberhard. Eb.R.
 Ruiter, Leendert de. L. de R.
 Rumney, George Richard. G.R.R.
 Rupp, The Rev. Ernest Gordon. E.G.R.
 Russell, Charles R. C.R.R.
 Russell, Don. D.R.
 Russell, Norman H. N.H.R.
 Russell, Peter Edward. P.E.R.
 Russon, Allien R. A.R.R.
 Ryalls, Alan. A.R.
 Ryan, The Rev. Edward A. E.A.R.
 Ryan, William B.F. W.B.F.R.
 Ryzantsev, Sergey Nikolayevich. S.N.R.
 Rycroft, David K. D.K.R.
 Ryder, John D. J.D.R.
 Rylaarsdam, J. Coert. J.C.Ry.
 Ryland, John S. J.S.R.
- Sabr, Mohy el Din. Me.D.S.
 Sacher, George A. G.A.Sa.
 Sachs, The Rev. William L. W.L.Sa.
 Sadek, Dawlat Ahmed. D.A.Sa.
 Sadler, John E. J.E.Sa.
 Sáez, Emilio. E.Sa.
 Safarian, A. Edward. A.E.Sa.
 Sagan, Carl. C.Sn.
 Saggs, Henry W.F. H.W.F.S.
 Sahakian, William S. W.S.S.
 Sainsbury, John C. J.C.Sa.
 St. John, Robert. R.St.J.
 Sakamoto, Taro. T.Sa.
 Salah, Mostafa Moh. M.M.Sa.
 Sale, William Merritt, Jr. W.M.S.
 Salibi, Kamal Suleiman. K.S.S.
 Salisbury, Sir Edward James. E.J.S.
 Salisbury, Neil E. N.E.S.
 Salita, Domingo C. D.C.S.
 Salmi, Mario. M.Sal.
 Salmon, Edward. E.Sn.
 Salmon, Edward Togo. E.T.S.
 Salmon, John Hearsey McMillan. J.H.McM.S.
- Sammons, Jeffrey L. J.L.Sa.
 Samuel, Alan Edouard. A.E.S.
 Samuel, Pierre. P.S.
 Samuels, Michael Anthony. M.A.Sa.
 Sandeen, Ernest R. E.R.S.
 Sandelin, Carl Fredrik. C.F.S.
 Sander, Emilie T. E.T.Sa.
 Sanders, William T. W.T.Sa.
 Sanderson, R. Thomas. R.T.S.
 Sandvik, Gudmund. G.Sa.
 Saner, Hans. Ha.S.
 Sanford, Vera. V.S.
 Sanger, Clyde William. C.W.S.
 Sanger, Ralph G. R.G.S.
 Sarà, Michele. M.Sa.
 Sarason, Irwin G. I.G.S.
 Sarmiento, Sergio. S.S.
 Sarna, Nahum M. N.M.Sa.
 Sartori, Claudio. C.Sa.
 Sasaki, Genjun H. G.H.S.
 Sastri, R.L.N. R.L.N.S.
 Sato, Tadao. T.S.
 Satter, Heinrich. H.Sa.
 Saunders, Jason Lewis. Ja.L.S.
 Saunders, Robert M. R.M.S.
 Sautter, Gilles François. G.F.S.
 Savage, George. Ge.S.
 Savile, Douglas B.O. D.B.O.S.
 Saville, James Patrick. J.P.S.
 Savory, Roger M. R.M.Sa.
 Sawyer, Geoffrey. G.S.
 Saxon, A.H. A.H.Sa.
 Scarborough, Harold. Ha.Sc.
 Scarne, John. J.S.
 Scarpelli, Dante G. D.G.Sc.
 Scace, Robert I. R.I.S.
 Schaaf, William L. W.L.S.
 Schaden, Egon. Eg.S.
 Schaeffer, Bobb. B.Sc.
 Schaeffer, Claude Frédéric Armand. C.F.A.S.
 Schafer, Thomas A. T.A.S.
 Schaper, Eva. Ev.S.
 Schapera, Isaac. I.S.
 Schapiro, Leonard Bertram. L.B.S.
 Scharf, Aaron. A.Sc.
 Scharlemann, Robert P. R.P.S.
 Schatz-Uffenheimer, Rivka. R.S.-U.
 Schawlow, Arthur L. Ar.L.S.
 Scheepers, Johannes Nicolaas. J.N.S.
 Scheer, Bradley Titus. B.T.S.
 Scheina, Robert L. R.L.Sc.
 Schell, Herbert S. H.S.Sc.
 Schiffers, Heinrich. H.Sc.
 Schimmel, Annemarie. An.Sc.
 Schirmann, Jefim H. J.Sc.
 Schlechten, Albert Wilbur. A.W.S.
 Schlieder, Gunnar. Gu.S.
 Schmale, Franz-Josef. F.-J.Se.
 Schmidt, John D. J.D.Sc.
 Schmidt, Karl Patterson. K.P.S.
 Schmidt, R.A.M. R.Sc.
 Schmitt, Hans Otto. H.O.Sc.
 Schmitt, Waldo L. W.L.Sc.
 Schnath, Georg. Gg.S.
 Schneider, Stephen H. S.H.S.
 Scholes, Walter V. W.V.S.
 Schram, Stuart Reynolds. S.R.S.
 Schregle, Johannes. J.Sch.
 Schreiber, B. Charlotte. B.C.S.
 Schreyvogel, Friedrich. F.Sc.
 Schubert, Bernice Giduz. B.G.S.
 Schultz, Alarich R. A.R.S.
 Schulz, Walter. W.Sc.
 Schumach, Murray. Mu.S.
 Schumacher, Alvin J. A.J.Sc.
- Schumm, Stanley A. S.A.S.
 Schürmann, Reiner. R.Sch.
 Schwanke, Robert. R.Se.
 Schwartz, Jacob T. J.T.Sc.
 Schwartz, Mark F. M.F.S.
 Schwartz, Mischa. M.Sch.
 Schwartz, Paul A. P.A.S.
 Schwartz, Robert S. R.S.S.
 Schwartz, Theodore B. T.B.S.
 Schwarzenberger, Georg. G.Sc.
 Scott, Alfred Eric. A.E.Sc.
 Scott, The Rev. Guthrie Michael. G.M.S.
 Scott, Joseph Frederick. J.F.S.
 Scott, Peter. P.Sc.
 Scranton, Robert L. R.L.S.
 Screech, M.A. M.A.S.
 Scruton, Roger. Ro.Sc.
 Scullard, Howard Hayes. H.H.S.
 Seaborg, Glenn T. G.T.S.
 Seale, Robert L. R.L.Se.
 Sealey, B. Raphael. B.R.S.
 Searle, Humphrey. H.Se.
 Seeger, C. Ronald. C.R.S.
 Šega, Drago. D.Še.
 Segre, Claudio G. C.G.Se.
 Seibert, Jakob. J.Se.
 Seidel, Anna K. A.K.Se.
 Seiff, Alvin. A.S.
 Seitz, William C. W.C.Se.
 Sellwood, David Grenville John. D.G.J.S.
 Selz, Jean. Je.S.
 Sen, Amulya Chandra. A.Se.
 Sen, D.M. D.M.S.
 Sequera de Segnini, Isbelia M. I.S. de S.
 Serjeant, Robert Bertram. R.B.Se.
 Seroff, Victor Ilyich. V.I.S.
 Serventy, D.L. D.L.Se.
 Service, Elman R. E.R.Se.
 Sesay, Shekou M. S.M.S.
 Seton-Watson, Hugh. H.S.-W.
 Seton-Watson, Robert William. R.W.S.-W.
 Severin, Giles Timothy. G.T.Se.
 Sewall, Richard B. R.B.S.
 Seyfert, Carl Keenan. C.K.S.
 Seymour, Charles. C.Se.
 Sez nec, Jean J. J.J.Se.
 Shackleton, Robert. R.Sh.
 Shadbolt, Maurice Francis Richard. M.F.R.S.
 Shaffer, Jerome A. J.A.Sh.
 Shagdarsuren, O. O.Sh.
 Shah, Umakant Premanand. U.P.S.
 Shakabpa, Tsepon W.D. T.W.D.S.
 Shambaugh, George E., Jr. G.E.S.
 Sharlin, Harold I. H.I.S.
 Sharp, Aaron J. A.J.Sh.
 Sharp, The Rev. R. Norman. R.N.S.
 Sharp, Robert Phillip. R.P.Sp.
 Sharp, Walter R. W.R.S.
 Sharrock, Roger. R.S.
 Shaw, Byron Thomas. B.T.Sh.
 Shaw, Ivan Peter. I.P.S.
 Shaw, Stanford Jay. S.J.S.
 Sheard, Wendy Stedman. W.S.Sh.
 Shearman, John K.G. J.K.Sh.
 Shedd, Thomas Clark. T.C.S.
 Sheehy, Ann. An.Sh.
 Shelton, John E. J.E.S.
 Shennan, J.H. J.H.Sh.
 Shepard, Francis P. F.P.S.
 Shepherd, The Rev. Massey H., Jr. M.H.S.

- Sheppard, Richard A. R.A.S.
 Shepperson, George Albert. G.A.S.
 Shercliff, Jose. J.Sh.
 Sheridan, Lionel Astor. L.A.S.
 Sheriff, Robert E. R.E.Sh.
 Sherman, Franklin. F.S.
 Sherrington, Sir Charles Scott. C.S.S.
 Shetler, Stanwyn G. S.G.S.
 Shiel, James. J.Shi.
 Shih, The Rev. Joseph Hsing-san.
 J.H.-s.S.
 Shillinglaw, Gordon. G.Sh.
 Shiloah, Amnon. A.Sh.
 Shiloh, Ailon. An.S.
 Shimahara, Nobuo. N.S.
 Shineberg, D.L. D.L.Sh.
 Shinoda, Minoru. M.Sh.
 Shipman, Frank M. F.M.S.
 Shirendev, B. B.Sv.
 Shirley-Smith, Sir Hubert. H.S.-Sm.
 Shock, Nathan Wetherill. N.W.S.
 Shoemaker, Frank C. F.C.S.
 Shore, Arthur Frank. A.F.Sh.
 Short, Lester L. L.L.S.
 Short, Nicholas M. N.M.S.
 Shrimpton, Nicholas. N.Sh.
 Shu, Frank H. F.H.Sh.
 Shurtleff, Malcolm C. M.C.S.
 Shuster, Donald Raymond. D.R.Sh.
 Sibley, David C.G. D.C.G.S.
 Sick, Helmut. H.S.
 Siebens, Arthur A. A.A.S.
 Sieber, Roy. Ro.Si.
 Siever, Raymond. R.Si.
 Silaev, Evgeny Dmitrievich. E.D.S.
 Silber, Kate. K.Si.
 Silberbauer, George Bertrand. G.Si.
 Silbergeld, Jerome. Je.Si.
 Silberman, Lou Hackett. L.H.S.
 Sillery, Anthony. Ay.Sy.
 Silver, Larry A. L.A.Si.
 Silverman, Joseph. Jo.Si.
 Silverstein, Josef. J.Si.
 Simmons, Ernest J. E.J.Si.
 Simmons, Gustavus J. G.J.Si.
 Simmons, Pauline. Pa.S.
 Simon, Akiba Ernst. A.E.Si.
 Simon, Edith. E.Si.
 Simon, John Y. J.Y.S.
 Simons, Eric Norman. E.N.S.
 Simpson, Dale R. D.R.S.
 Simpson, John M. J.M.S.
 Simpson, Roger Henry. R.H.S.
 Sims, Andrew C.P. A.C.P.S.
 Sinclair, Andrew Annandale. A.A.Si.
 Sinclair, Keith. Ke.Si.
 Singer, Peter. P.Si.
 Singh, H.K. Manmohan. H.K.M.S.
 Singh, Khushwant. K.S.
 Singh, Madan Mohan. M.M.S.
 Singleton, Frederick Bernard. F.B.S.
 Sinha, N.K. N.K.S.
 Sinitsyn, Vasily Mikhaylovich. V.M.S.
 Sinor, Denis. D.Si.
 Sippl, Charles J. C.J.S.
 Sircus, Wilfred. W.S.
 Sivaramamurti, Calambur. C.S.
 Sivasubramaniam, Sinnathurai. S.Si.
 Skalweit, Stephan. S.Sk.
 Sklar, Robert A. R.Sk.
 Slack, Jonathan M.W. J.M.W.S.
 Slamecka, Vladimir. V.Si.
 Sloane, Thomas O. T.O.S.
 Slobin, Mark S. M.S.S.
 Sløk, Axel Mose. A.M.Si.
 Slonimsky, Nicolas. N.Si.
 Sloss, L.L. L.L.Si.
 Smailes, Arthur Eltringham. A.E.Sm.
 Smale, Stephen. S.Sm.
 Smart, John Jamieson Carswell.
 J.J.C.S.
 Smart, Ninian. N.Sm.
 Smelser, Neil J. N.J.S.
 Smethurst, Colin. C.Sm.
 Smith, Anna Hester. A.H.S.
 Smith, Brian K. B.K.S.
 Smith, Bruce Lannes. B.L.S.
 Smith, Charles Gordon. C.G.S.
 Smith, Dale M. D.M.Sm.
 Smith, David Eugene. D.E.S.
 Smith, Gabriel. Ga.S.
 Smith, George Alan. G.A.Sm.
 Smith, Harlan James. H.Sm.
 Smith, James Irvine. J.I.S.
 Smith, J. Beverley. J.B.Sm.
 Smith, John Edwin. J.E.Sm.
 Smith, Jonathan Zittell. J.Z.S.
 Smith, Joseph V. J.V.S.
 Smith, L.P. L.P.S.
 Smith, Lacey Baldwin. La.B.S.
 Smith, Lyman B. L.B.Sm.
 Smith, Neal Griffith. N.G.S.
 Smith, Norman Obed. N.O.S.
 Smith, Peter A.S. P.A.S.S.
 Smith, Phillip J. P.J.S.
 Smith, Ralph J. R.J.Sm.
 Smith, Robert C. R.C.Sm.
 Smith, Robert Leo. R.L.Sm.
 Smith, Sigmund L. S.L.Sm.
 Smith, T. Lynn. T.L.S.
 Smith, W. John. W.J.S.
 Smith-Rose, Reginald Leslie. R.L.S.-R.
 Smogorzewski, Kazimierz Maciej.
 K.M.S.
 Smykay, Edward W. E.W.S.
 Smylie, The Rev. James Hutchinson.
 J.H.Sm.
 Smyth, James Desmond. J.D.Sm.
 Sneddon, Ian Naismith. I.N.S.
 Snell, Esmond E. E.E.Sn.
 Snellgrove, David Llewelyn. D.L.S.
 Snyder, Irvin S. I.S.S.
 Snyder, James E. J.E.Sn.
 Soboul, Albert M. Al.S.
 Soden, Wolfram Th. von. W.T.v.S.
 Sokoloff, Leon. L.S.
 Solem, G. Alan. G.A.So.
 Solheim, Wilhelm G., II. W.G.So.
 Solinger, Jacob. J.So.
 Solmi, Angelo. A.So.
 Solmsen, Friedrich. F.So.
 Solomon, Arthur K. A.K.S.
 Solomon, Peter H., Jr. P.H.S.
 Solt, Leo F. L.F.S.
 Somers, Harold M. H.M.S.
 Soo, Shao L. S.L.S.
 Sorley Walker, Kathrine. K.S.W.
 Sosa, Estanislao Navarro. E.N.So.
 Sourdell, Dominique. D.So.
 Soustelle, Jacques. Ja.S.
 Southall, Aidan William. Ai.S.
 Southam, Brian C. B.C.So.
 Southgate, Donald. Do.S.
 Southward, Alan James. A.J.So.
 Sowers, Robert W. R.So.
 Spalding, David A.E. D.A.E.S.
 Spalding, James C. J.C.S.
 Spalding, J.M.K. J.M.K.S.
 Spaulding, Jay L. J.L.Sp.
 Speaight, George. G.St.
 Spear, T.G. Percival. T.G.P.S.
 Spears, Monroe K. M.K.Sp.
 Spedding, Frank Harold. F.H.S.
 Spekke, Arnold. Ar.Sp.
 Spence, Robert. R.Sp.
 Spencer, J. Brookes. J.B.Sp.
 Spencer, John R. J.R.Sp.
 Spencer, Joseph E. Jo.E.S.
 Spencer, Robert F. R.F.S.
 Spencer, The Rev. Sidney. S.Sp.
 Spencer, Terence John Bew. T.Sp.
 Spengler, Joseph J. J.J.Sp.
 Spiegelberg, Herbert. H.Sp.
 Spinka, Matthew. M.Sp.
 Spiro, Herbert John. H.J.Sp.
 Spring, David. D.Sp.
 Squires, James Duane. J.D.S.
 Srivastava, A.L. A.L.S.
 Stacey, The Rev. John. Jo.S.
 Stadler, Karl R. K.R.St.
 Staehelin, L. Andrew. L.A.St.
 Stains, Howard James. H.J.S.
 Stamp, Sir Laurence Dudley.
 L.D.S.
 Štampar, Emil. Em.Š.
 Standen, Anthony. A.St.
 Standley, Barbara A. B.A.St.
 Stannard, Jerry. Je.St.
 Stannard, Lewis Judson, Jr. L.J.S.
 Stant, Margaret Yvonne. M.Y.S.
 Stanzione, Kaydon Al. K.A.St.
 Stark, Craig L. C.L.S.
 Stark, John E. J.E.St.
 Starke, Helmut Dietmar. H.D.S.
 Starkey, Lawrence H. L.H.St.
 Starkey, Otis P. O.P.S.
 Starkie, Enid. En.S.
 Starr, Chester G. C.G.St.
 Steel, Robert Walter. Ro.W.St.
 Steere, William Campbell. W.C.St.
 Stehkämper, Hugo. H.Sr.
 Stein, Peter G. P.G.S.
 Stein, Wilfred D. W.D.S.
 Steinberg, Alfred. A.Sg.
 Steinberg, Ellis P. E.P.S.
 Steinberg, S. Henry. S.H.St.
 Steiner, H. Arthur. H.A.S.
 Steiner, William Glenn. W.G.St.
 Steingraber, Erich. Er.St.
 Stendahl, The Rev. Krister. K.St.
 Stengers, Jean. Jn.S.
 Stephan, Ruth. Ru.S.
 Stephens, Richard Walton. Ri.W.S.
 Stephenson, Ralph. R.St.
 Stephenson, R.J. R.J.S.
 Stern, Henri. He.S.
 Stern, Joshua. J.Sn.
 Stern, Samuel Miklos. S.M.Sn.
 Stern, William Louis. W.L.St.
 Sternberg, Robert J. R.J.St.
 Sternstein, Lawrence. La.S.
 Steudel, Johannes. J.Ste.
 Stevens, Courtenay Edward. C.E.S.
 Stevens, Denis William. D.W.S.
 Stevens, Halsey. H.Ss.
 Stevens, Sylvester K. S.K.S.
 Stevenson, James. J.St.
 Stevenson, Lloyd Grenfell. L.G.S.
 Stewart, David B. D.B.S.
 Stewart, John I.M. J.I.M.S.
 Stewart, Robert E. R.E.S.
 Stibitz, George R. G.R.St.
 Stigler, George J. G.J.S.
 Stilwell, Rear Adm. James Joseph.
 Ja.J.S.
 Stock, Noel. N.St.
 Stokes, Sewell. S.St.
 Stolberg, Irving J. I.J.S.

- Stoll, Robert R. R.R.S.
 Stone, F. Gordon A. F.G.A.S.
 Stone, Julius. Ju.S.
 Stoner, John Oliver, Jr. J.O.S.
 Storer, Robert W. R.W.St.
 Størmer, Leif. L.St.
 Stotz, Elmer H. E.H.St.
 Stoudt, John J. J.J.S.
 Strahan, Ronald. Ro.S.
 Strand, Kaj Aa. K.A.S.
 Strange, Edward Fairbrother. E.F.S.
 Strasberg, Lee. Le.S.
 Stratford, Alan Howard. A.H.St.
 Street, Brian Vincent. B.V.S.
 Streeter, Victor L. V.L.S.
 Streng, Frederick J. F.J.S.
 Strickmann, Michel. M.St.
 Strode, Hudson. Hu.S.
 Strohl, G. Ralph. G.R.S.
 Strugnell, John. Jo.St.
 Struik, Dirk Jan. D.J.S.
 Strygin, Valery Mikhailovich. V.M.St.
 Stubbs, William Edward. W.E.S.
 Stuewer, Roger H. R.H.St.
 Sturley, Kenneth Reginald. K.R.S.
 Sturmberger, Hans. H.St.
 Sturmthal, Adolf F. A.F.St.
 Styán, J.L. J.L.S.
 Suárez, Jorge A. J.A.S.
 Suárez Fernández, Luis. L.S.Fe.
 Suckling, Eustace E. E.E.S.
 Suettinger, Robert Lee. R.L.Su.
 Suggs, Robert Carl. R.C.Su.
 Sukhopara, Fyodor Nikolayevich. F.N.S.
 Sullivan, Lawrence E. L.E.S.
 Sullivan, Michael. M.Su.
 Summerson, Sir John. J.Sum.
 Sumner, Margaret Ann. M.A.Su.
 Sunblad, Ilmari. I.Su.
 Sundaram, K.V. K.V.Su.
 Suppes, Patrick. P.Su.
 Suryadinata, Leo. L.Su.
 Süsskind, Charles. Ch.S.
 Sutherland, Carol Humphrey Vivian. C.H.V.S.
 Sutherland, James Kenneth. J.K.S.
 Sutherland, James R. J.R.Su.
 Sutherland, N.M. N.M.Su.
 Sutton, Christine. Ch.Su.
 Sutton, Denys. D.Su.
 Sutton, John. J.Su.
 Suzuki, Chusei. C.Su.
 Sverdrup, Harald Ulrik. H.U.S.
 Swain, Frederick M. F.M.Sw.
 Swan, Bradford Fuller. B.F.S.
 Swanberg, W.A. W.A.S.
 Sweet-Escott, Bickham A.C. B.S.-E.
 Swenson, J. Patricia Morgan. J.P.M.S.
 Swink, Roland Lee. R.L.Sw.
 Sylvain, Edmond. E.Sy.
 Sygne, Patrick Millington. P.M.Sy.
 Sze, S.M. S.M.Sz.
 Szebehely, Victor G. V.G.S.
 Tait, Hugh. H.Ta.
 Takeuchi, Yoshinori. Y.T.
 Takhtajan, Armen Leonovich. A.T.
 Talbi, Mohamed. M.Ta.
 Talbot, William John. W.J.T.
 Talbot Rice, David. D.T.R.
 Talbot Rice, Tamara. T.T.R.
 Tanenbaum, Morris. M.T.
 Tani, Shin'ichi. S.Ta.
 Tannenbaum, Steven R. S.R.T.
 Tanner, James M. J.M.T.
 Tapié, Victor-Lucien. V.L.T.
 Taplin, Oliver. O.T.
 Tarmisto, Vello Julius. V.J.T.
 Tate, Allen. A.Ta.
 Tax, Sol. So.T.
 Tayler, Roger John. R.J.T.
 Taylor, A.J.P. A.J.P.T.
 Taylor, Alfred Edward. A.E.Ta.
 Taylor, B.N. B.N.T.
 Taylor, Gordon Ernest. G.E.T.
 Taylor, Sir Hugh S. H.S.Ta.
 Taylor, John Russell. J.R.T.
 Taylor, John W.R. J.W.R.T.
 Taylor, William. W.Ta.
 Teall, John L. J.L.Te.
 Tebeau, Charlton W. C.W.T.
 Tedesco, Edward F. E.F.T.
 Teichert, Curt. C.T.
 Teitelbaum, Michael S. M.S.T.
 Temir, Ahmet. A.Te.
 Temperley, Nicholas. N.T.
 Tepper, Frederick. F.T.
 Terrasse, Henri-Louis-Étienne. H.-L.-É.T.
 Terry, Walter. W.T.
 Thapar, Romila. R.Th.
 Thayer, H.S. H.S.T.
 Thelen, David P. D.P.T.
 Thesleff, Holger. H.T.
 Thielicke, Helmut. H.Th.
 Thieret, John W. J.W.Th.
 Thin Kyi. T.Ky.
 Thom, René Frédéric. R.F.T.
 Thomas, Alan T. A.T.T.
 Thomas, David A. D.A.T.
 Thomas, David Christopher Traherne. D.C.Th.
 Thomas, Harold E. H.E.T.
 Thomas, John A. J.A.T.
 Thomas, John Garèth. J.G.Th.
 Thomas, John L. J.L.T.
 Thomas, John Patrick. J.Th.
 Thomas, Sidney. Si.T.
 Thomas, Terence Barrington. T.B.T.
 Thomas, William Harford. W.H.Th.
 Thomasson, Gordon Conrad. G.C.T.
 Thompson, Brian J. B.J.T.
 Thompson, Carol Lewis. C.L.T.
 Thompson, E.A. E.A.T.
 Thompson, Sir Eric. E.Th.
 Thompson, George Raynor. G.R.T.
 Thompson, John. J.Th.
 Thompson, Laura. L.Th.
 Thompson, Leonard Monteath. L.M.T.
 Thompson, Stith. S.T.
 Thomsen, Helmuth. He.Th.
 Thomson, Sir A. Landsborough. A.L.T.
 Thomson, David. D.Tn.
 Thomson, Derick S. D.S.T.
 Thomson, Sir George Paget. G.P.T.
 Thomson, Robert Young. R.Y.T.
 Thomson, William Archibald Robson. Wm.A.R.T.
 Thomson, William E. W.E.T.
 Thöne, Friedrich. F.Th.
 Thorarinnsson, Sigurdur. S.Th.
 Thorne, Robert Folger. R.F.Th.
 Thornton, Robert James. R.J.Th.
 Thorpe, Lewis. L.T.
 Thorpe, William Homan. W.H.T.
 Tikhotskiy, Constantine Gennadiyevich. C.G.T.
 Tiles, Mary Elizabeth. M.E.T.
 Tilley, Cecil Edgar. C.E.T.
 Timmers, Jan Joseph Marie. J.J.M.T.
 Tinker, Hugh Russell. H.R.T.
 Titley, Spencer Rowe. S.R.Ty.
 Tobias, Cornelius A. C.A.T.
 Tobias, Phillip Vallentine. P.V.T.
 Toby, Ronald P. R.P.T.
 Todd, John Walford. J.W.T.
 Toffoletto, Ettore. E.T.
 Tolson, Richard. R.To.
 Tolson, Rosalind. Rd.T.
 Toni, Youssef T. Y.T.T.
 Tooker, Elisabeth. E.To.
 Toomer, Gerald J. G.J.T.
 Totman, Conrad D. C.D.T.
 Toulmin, Stephen E. S.E.T.
 Toupet, Charles Henri. C.H.T.
 Toussaint, Auguste. Au.T.
 Tout, Thomas Frederick. T.F.T.
 Townsend, Clifford Charles. C.C.T.
 Townsley, Wilfred Asquith. W.A.T.
 Toynbee, Arnold Joseph. A.J.T.
 Toynbee, Jocelyn M.C. J.M.C.T.
 Toyoda, Takeshi. T.T.
 Tracy, James D. J.D.T.
 Trapido, Stanley. S.Tr.
 Traub, Hamilton P. H.P.Tr.
 Traub, Col. Robert. R.T.
 Tregear, Thomas R. T.R.T.
 Tregonning, Kennedy G. K.G.T.
 Treharne, Reginald Francis. R.F.Tr.
 Treves, François. F.Tr.
 Treves, Piero. P.T.
 Tricker, Ronald A.R. R.A.R.T.
 Trinterud, L.J. L.J.T.
 Tripp, Maureen Heneghan. M.H.
 Trunkey, Donald D. D.D.T.
 Trussell, John B.B. J.B.B.T.
 Truswell, A. Stewart. A.S.T.
 Trypanis, Constantine Athanasius. C.A.Tr.
 Tsevegmid, Sh. Sh.Ts.
 Tsoumis, George Thomas. G.Ts.
 Tucci, Giuseppe. Gi.T.
 Tucker, David Gordon. D.G.T.
 Tucker, David H. D.H.T.
 Tucker, Glenn. G.Tu.
 Tulchin, Joseph S. J.S.T.
 Tuma, Elias H. E.H.T.
 Turnbull, Archie Rule. A.R.T.
 Turnell, Martin. M.Tu.
 Turner, B.L. B.L.T.
 Turner, Edward Lewis. E.L.T.
 Turner, Sir Eric Gardner. E.G.T.
 Turner, Ralph H. R.H.T.
 Turnock, David. D.T.
 Turrill, William Bertram. W.B.T.
 Turville-Petre, E.O.G. E.O.G.T.-P.
 Tuttle, William Julian. W.J.Tu.
 Tu Wei-ming. T.W.-m.
 Tweedie, Michael Willmer Forbes. M.W.F.T.
 Twersky, Isadore. I.T.
 Twidale, Charles Rowland. C.R.T.
 Twitchett, Denis C. D.C.T.
 Tyler, James Chase. J.C.T.
 Uda, Michitaka. M.U.
 Udo, Reuben Kenrick. R.K.U.
 Uibopuu, Valev. V.U.
 Ullmann, Walter. W.U.
 Ulrich, Homer. H.U.
 Underwood, Benton J. B.J.U.
 Underwood, E. Ashworth. E.A.U.
 Underwood, Vernon Philip. V.P.U.
 Unhjem, Arne. A.U.

- Untermann, Jürgen. J.U.
 Unwin, George. G.U.
 Unwin, Philip Soundy. P.U.
 Uotila, Urho A. U.A.U.
 Upton, Arthur Canfield. A.C.U.
 Urbach, Peter Michael. P.M.U.
 Urry, William G. W.G.U.
 Usselman, Melvyn C. M.C.U.
 Utechin, Sergei Vasilievich. S.V.U.
- Vaizey, John Vaizey, Baron. J.V.
 Vajda, Georges. G.V.
 Vale, Malcolm G.A. M.G.A.V.
 Valentine, Frederick Albert. F.A.V.
 Valgiglio, Ernesto. E.Va.
 Vallier, Dora. D.V.
 van Andel, Tjeerd H. T.H.v.A.
 Van Caenegem, Raoul Charles.
 R.C.V.C.
 Vance, Robert W. R.W.V.
 Vandenbosch, Amry. A.Va.
 Vanderpool, Eugene. E.V.
 Van Deusen, Glyndon G. G.G.V.D.
 Van Deusen, Hobart Merritt.
 H.M.V.D.
 Vanger, Milton I. M.I.V.
 Van Horn, Kent R. K.R.V.H.
 Vann, Richard T. R.T.V.
 Van Steenberghen, Fernand. F.V.Sn.
 Varela, René Santamaria. R.S.V.
 Varma, Shanti Prasad. S.P.V.
 Vaughan, Richard. R.Va.
 Vázquez, Josefina Zoraida. J.Z.V.
 Velásquez, M. Tulio. M.T.V.
 Vella, Walter F. W.F.V.
 Vendler, Zeno. Z.V.
 Venkataramanan, Lalgudi S. L.S.V.
 Vennesland, Birgit. B.V.
 Verlinden, J. Charles. J.C.V.
 Vernet Ginés, Juan. J.V.G.
 Verniers, Louis. L.Ve.
 Veyret, Paul. P.V.
 Viallaneix, Paul. P.Vi.
 Vidalenc, Jean. J.Vi.
 Vidyarthi, Lalita P. L.P.V.
 Viereck, Peter. Pe.V.
 Vierhaus, Rudolf. Ru.V.
 Vignaux, Paul D. P.D.V.
 Vigne, Randolph. R.V.
 Villari, Luigi. L.Vi.
 Villee, Claude A. C.A.V.
 Villiers, Alan John. A.J.V.
 Vinacke, Harold M. Hd.M.V.
 Vinacke, W. Edgar. W.E.V.
 Vinaver, Eugène. E.Vi.
 Vincent, Paul F. P.F.V.
 Vioux, Marcelle. M.Vi.
 Virtanen, Reino. R.Vi.
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George William Brindley (d. 1983). *Professor of Mineral Sciences, Pennsylvania State University, University Park, 1962–73.*

Max Edwin Britton. *Consultant on environmental science. Biological Scientist, Geological Survey, U.S. Department of the Interior, Reston, Va., 1974–80.*

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Cecil Edgar Tilley (d. 1973). *Professor of Mineralogy and Petrology, University of Cambridge, 1931-61.*

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Charles C. Davis. *Emeritus Professor of Biology, Memorial University of Newfoundland, St. John's.*

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Edward Hindle (d. 1973). *Scientific Director, Zoological Society of London, 1944–51. Regius Professor of Zoology, University of Glasgow, 1935–43.*

Cecil Arthur Hoare (d. 1984). *Wellcome Research Fellow, Wellcome Laboratories of Tropical Medicine, London, 1957–70; Head, Protozoological Department, 1923–57.*

Walter Henricks Hodge. *Section Head for Ecological and Systematic Botany, National Science Foundation, Washington, D.C., 1970–73.*

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Turner Harcourt Hopper. *Chief, Oilseed Crops Laboratory, Southern Utilization Research and Development Division, Agricultural Research Service, New Orleans, 1958–65.*

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Theodor (Karl) Just (d. 1960). *Chief Curator, Department of Botany, Field Museum of Natural History, Chicago.*

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Geoffrey Buckle West. *Honorary Fellow in Pharmacology, North East London Polytechnic.*

G(eorge) W(illard) Wharton. *Emeritus Professor of Entomology, Ohio State University, Columbus; Director, Acarology Laboratory, 1969–76.*

Donald Walter Wilkie. *Director, Aquarium-Museum, Scripps Institution of Oceanography, University of California, San Diego.*

Gordon Roy Williams. *Head, New Zealand Wildlife Service, Department of Internal Affairs, Wellington.*

Louis O. Williams. *Emeritus Curator of Botany, Field Museum of Natural History, Chicago.*

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Keith Arthur John Wise. *Entomologist, Auckland Institute and Museum, N.Z.*

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A.H. Wright (d. 1966). *Professor of Agronomy, University of Wisconsin, Madison, 1931–57.*

Kanichiro Yashiroda. *Proprietor, Yashiroda Acclimatization Garden, Tonosho, Japan. Author of Bonsai: Japanese Miniature Trees.*

Richard Charles York. *Instructor of Ornamental Horticulture, McHenry County College, Crystal Lake, Ill. Former Associate Editor, Biology, Encyclopædia Britannica, Chicago.*

Wolfram Winfried Zillig. *Director, Max Planck Institute for Biochemistry, Munich.*

Martin Huldrych Zimmermann (d. 1984). *Charles Bullard Professor of Forestry, Harvard University; Director, Harvard Forest, Petersham, 1970–84.*

Conway Zirkle (d. 1972). *Professor of Biology, University of Pennsylvania, Philadelphia, 1937–66.*

Solly Zuckerman, Baron Zuckerman. *Sands Cox Professor Emeritus of Anatomy, University of Birmingham, Eng. President, Zoological Society of London, 1977–84.*

Part Four. Human Life

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Rodolfo Almeida Pintos (deceased). *Phthysiologist, Institute of Epidemiology and Contagious Diseases, School of Medicine, University of Montevideo, Uruguay.*

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Alfred Alvin Angrist, M.D. (d. 1984). *Professor of Pathology, Albert Einstein College of Medicine, Yeshiva University, Bronx, N.Y.*

(Edith Kathleen) Charlotte Banks. *Former Lecturer in Psychology, University College, University of London.*

M. Robert Barnett. *Consultant, American Foundation for the Blind, Inc., New York City; Executive Director, 1949–74.*

Edward W. Barrett. *Consultant and writer on communications.*

Frank X. Barron. *Professor of Psychology, University of California, Santa Cruz.*

Sir Frederic Charles Bartlett (d. 1969). *Professor of Experimental Psychology, University of Cambridge, 1931–52; Director, Psychological Laboratory, 1922–52.*

S. Howard Bartley. *Distinguished Research Professor Emeritus of Psychology, Memphis State University, Tenn. Emeritus Professor of Psychology, Michigan State University, East Lansing; Director, Laboratory for the Study of Vision and Related Sensory Processes, 1966–71.*

David V. Bates, M.D. *Emeritus Professor of Medicine, University of British Columbia, Vancouver.*

William B. Bean, M.D. *Sir William Osler Professor Emeritus of Medicine, University of Iowa, Iowa City. Editor in Chief, Archives of Internal Medicine, 1962–67.*

Marc Oliver Beem, M.D. *Professor of Pediatrics, University of Chicago.*

Walter Reginald Bett. *Medical Editor, Wm. Douglas McAdams, Inc., New York City. Author of The Infirmities of Genius and others.*

Emma Mary Birch. *Head Occupational Therapist, Royal Free Hospital Group, London.*

Edwin Garrigues Boring (d. 1968). *Edgar Pierce Professor of Psychology, Harvard University, 1956–57; Professor of Psychology, 1928–56.*

Arthur Hills Brayfield. *Emeritus Professor of Psychology, Claremont Graduate School, Calif.*

Henry W. Brosin, M.D. *Professor of Psychiatry, University of Arizona, Tucson.*

Carroll L. Bryant. *Director, Office of Publications, American National Red Cross, 1954–60.*

William Burrows (d. 1978). *Professor of Microbiology, University of Chicago, 1947–73.*

Sir Cyril Lodowic Burt (d. 1971). *Professor of Psychology, University College, University of London, 1931–50.*

Douglas E. Busby, M.D. *Medical Director, Downtown Healthcare Services, Lutheran Medical Center, Cleveland.*

Donald E. Cassels, M.D. (d. 1981). *Professor of Pediatrics, University of Chicago.*

Andrew Barnett Christie, M.D. *Honorary Physician, Fazakerly Hospital, Liverpool. Former Head, Department of Infectious Diseases, University of Liverpool.*

Conrad Chyatte. *Associate Professor of Psychology, De Paul University, Chicago, 1952–76.*

Leighton E. Cluff, M.D. *Executive Vice President, Robert Wood Johnson Foundation, Princeton, N.J. Professor and Chairman, Department of Medicine, University of Florida, Gainesville, 1966–76.*

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Paul Frederic Cranefield. *Professor of Physiology, Rockefeller University, New York City.*

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Henry P. David. *Director, Transnational Family Research Institute, Bethesda, Md. Associate Clinical Professor of Psychology, School of Medicine, University of Maryland, Baltimore.*

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John Holmes Dingle, M.D. (d. 1973). *Elisabeth Severance Prentiss Professor of Preventive Medicine and Professor of Medicine, Case Western Reserve University, Cleveland.*

Joseph Lewi Donhauser (d. 1964). *Professor of Surgery, Albany Medical College, N.Y. Senior Surgeon, Albany Medical Center Hospital.*

Roy Melvin Dorcus (d. 1968). *Professor of Psychology, 1944–65; Dean, Division of Life Sciences, University of California, Los Angeles, 1950–63.*

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George Hoben Estabrooks (d. 1974). *Professor of Psychology, Colgate University, Hamilton, N.Y., 1935-64.*

Hans Jurgen Eysenck. *Emeritus Professor of Psychology, Institute of Psychiatry, University of London.*

Ernest Carroll Faust (d. 1978). *Professor of Parasitology, Tulane University, New Orleans.*

Louis B. Flexner, M.D. *Emeritus Professor of Anatomy, University of Pennsylvania, Philadelphia.*

Anna Freud (d. 1982). *Director of the Hampstead Child Therapy Course and Clinic, London, 1952-82. Author of The Ego and the Mechanisms of Defence and others.*

William F. Ganong, M.D. *Lange Professor and Chairman, Department of Physiology, University of California, San Francisco.*

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Francis Byron Gordon, M.D. (d. 1973). *Director, Department of Microbiology, Naval Medical Research Institute, Bethesda, Md., 1962-72.*

Ashton Graybiel, M.D. *Chief Scientific Advisor, Naval Aerospace Medical Research Laboratory, Naval Air Station, Pensacola, Fla.; Director of Research, 1945-70.*

Douglas James Guthrie, M.D. (d. 1975). *Medical historian. Lecturer on the History of Medicine, University of Edinburgh, 1945-56.*

Ward Campbell Halstead (d. 1969). *Professor, Department of Psychology and Medicine, University of Chicago, 1946-69.*

A. Gordon Hammer. *Emeritus Professor of Psychology, Macquarie University, North Ryde, Australia.*

Henry Nelson Harkins, M.D. (d. 1967). *Professor of Surgery, University of Washington, 1947-67; Surgeon-in-Chief, University Hospital, Seattle, 1957-64.*

Donald F.N. Harrison, M.D. *Professor of Laryngology and Otology, University of London.*

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Stanley W. Jacob, M.D. *Associate Professor of Surgery, Oregon Health Sciences University, Portland.*

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J.R. Kantor (d. 1984). *Professor of Psychology, Indiana University, Bloomington, 1923-59.*

George Alexander Kelly (d. 1967). *Professor of Psychology, Brandeis University, Waltham, Mass., 1965-67.*

Pearl L. Kendrick (d. 1980). *Lecturer, Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, 1951-60.*

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Heinrich Klüver (d. 1979). *Sewell L. Avery Distinguished Service Professor of Biological Psychology, University of Chicago, 1957-62.*

John Knowelden, M.D. *Professor of Community Medicine, University of Sheffield, Eng, 1960-84.*

Helen Lois Koch (d. 1977). *Professor of Child Psychology, University of Chicago, 1945-60.*

Sigmund Koch. *Professor of Psychology and Philosophy, Boston University.*

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Raymond G. Kuhlen (d. 1967). *Professor of Psychology, Syracuse University, N.Y.*

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Gabriel W(ard) Lasker. *Emeritus Professor of Anatomy, School of Medicine, Wayne State University, Detroit.*

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Morton McCutcheon, M.D. (d. 1962). *Professor of Pathology, University of Pennsylvania, Philadelphia.*

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John Edgar Morison, M.D. *Honorary Professor of Histopathology, Queen's University of Belfast, N.Ire. Consultant in Histopathology, Belfast City Hospital.*

John Douglas Newth. *Former Honorary Secretary, British Council for Doctor Schweitzer's Hospital.*

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Charles Donald O'Malley (d. 1970). *Professor of Medical History, University of California Medical Center, Los Angeles.*

Martin T. Orne, M.D. *Professor of Psychiatry, University of Pennsylvania, Philadelphia; Director, Unit for Experimental Psychiatry, Institute of Pennsylvania Hospital.*

Thomas Parran, M.D. (d. 1968). *Surgeon General, U.S. Public Health Service, 1936-48. Dean, Graduate School of Public Health, University of Pittsburgh, 1948-58. President, Avalon Foundation, New York City, 1958-61.*

Donald G. Paterson (d. 1961). *Professor of Psychology; Member of Staff, Industrial Relations Center, University of Minnesota, Minneapolis.*

Sir George (White) Pickering, M.D. (d. 1980). *Master of Pembroke College, Oxford, 1968-74; Regius Professor of Medicine, University of Oxford, 1956-68.*

Fred Plum, M.D. *Anne Parrish Titzell Professor of Neurology, Medical College, Cornell University, New York City. Neurologist in Chief, New York Hospital.*

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Robert G. Richardson. *Consultant medical editor. Former Editor, Abbotempo (international medical journal).*

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Walther Riese, M.D. (d. 1976). *Associate Professor of the History of Medicine and of Neurology and Psychiatry, Medical College of Virginia, Richmond, 1958-60.*

Austin Herbert Riesen. *Emeritus Professor of Psychology, University of California, Riverside.*

H. Rocke Robertson, M.D. *Principal and Vice Chancellor, McGill University, Montreal, 1962-70.*

Arthur Robinson, M.D. *Professor of Biochemistry, Biophysics, and Genetics and of Pediatrics, University of Colorado, Denver.*

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Arturo Stearns Rosenblueth, M.D. (d. 1970). *Director, Centre for Investigation and Advanced Studies, National Polytechnic Institute, Mexico City.*

Paul Farr Russell, M.D. (d. 1983). *Visiting Professor, Harvard University School of Public Health, 1960-63. Staff member, Rockefeller Foundation, 1923-59.*

Heinrich Satter. *Free-lance writer. Author of Paul Ehrlich, Begründer der Chemotherapie and others.*

T.C. Schneirla (d. 1968). *Curator of Animal Behaviour, American Museum of Natural History, New York City, 1947-68.*

Sidney Schulman, M.D. *Ellen C. Manning Professor of Neurology, University of Chicago.*

Laurance F. Shaffer (d. 1976). *Professor of Psychology and Education, Teachers College, Columbia University.*

Leon Sokoloff, M.D. *Professor of Pathology, State University of New York at Stony Brook.*

Walter Graham Spector (d. 1982). *Professor of Pathology, St. Bartholomew's Hospital Medical College, University of London, 1962-82.*

William Spector. *Senior Editor, Human Life, Encyclopædia Britannica, Chicago, 1967-72. Editor of Handbook of Biological Data and others.*

Wesley William Spink, M.D. (d. 1988). *Regents' Professor of Medicine, University of Minnesota, Minneapolis, 1967-73.*

Howard Burnham Sprague, M.D. (d. 1970). *Honorary Physician to the Massachusetts General Hospital. Lecturer in Medicine, Harvard University, 1956-59.*

Ross Stagner. *Emeritus Professor of Psychology, Wayne State University, Detroit.*

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Robert Henry Thouless (d. 1984). *Reader in Educational Psychology, University of Cambridge, 1945-61; Fellow of Corpus Christi College, Cambridge.*

Betty Tomasi. *Free-lance writer on medical topics.*

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Leroy Vail. *Free-lance writer.*

Ilza Veith. *Emeritus Professor of Psychiatry and the History of Health Sciences, University of California, San Francisco.*

Reino Virtanen (d. 1987). *Professor of Modern Languages, University of Nebraska, Lincoln, 1957-78.*

Nancy Theilgaard Watts. *Professor and Director, Graduate Program in Physical Therapy, MGH Institute of Health Professions, Boston.*

Louis Weinstein, M.D. *Professor of Medicine, Tufts University, Medford, Mass., 1957-75.*

Michael M. Wertheimer. *Professor of Psychology, University of Colorado, Boulder. Consultant, Veterans Administration Hospital, Denver.*

Emil Witschi (d. 1971). *Senior Scientist, Bio-Medical Division of the Population Council, Rockefeller University, New York City, 1967-71.*

Henry D. von Witzleben, M.D. *Emeritus Director of Professional Education, Veterans Administration Hospital, Palo Alto, Calif. Associate Clinical Professor Emeritus of Psychiatry, Stanford University, Calif.*

Rose Wolfson. *Clinical psychologist. Author of A Study in Handwriting Analysis and others.*

Robert E. Wood, M.D. *Associate Professor of Pediatrics, University of North Carolina at Chapel Hill.*

John H. Wykert. *Medical and psychiatric writer.*

Robert Henry Yager, V.M.D. *Former Executive Secretary, Institute on Laboratory Animal Resources, National Research Council, National Academy of Sciences, Washington, D.C.*

Leo M. Zimmerman, M.D. (d. 1980). *Professor of Surgery, Chicago Medical School, 1948–80. Senior Attending Surgeon, Michael Reese Hospital, Chicago.*

Imre Zoltán, M.D. *Professor of Gynecology and Obstetrics, Semmelweis Medical University, Budapest, Hung.*

Joseph Zubin. *Emeritus Professor of Psychology, Columbia University. Chief, Psychiatric Research (Biometrics), New York State Psychiatric Institute and Hospital, 1960–75.*

Part Five. Human Society

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George Plimpton Adams, Jr. *Emeritus Professor of Economics, Cornell University, Ithaca, N.Y.*

John H. Adler (d. 1980). *Director, Programming and Budgeting Department, International Bank for Reconstruction and Development, Washington, D.C., 1968–76.*

Joseph C. Agrella. *Correspondent, The Blood-Horse magazine.*

Leslie Ronald Aldous. *Head of Information Department, United Nations Association of Great Britain and Northern Ireland, 1947–66. Editor, United Nations Association Yearbook and New World.*

Maurice Allais. *Professor of Economic Analysis, National College of Mines of Paris. Professor of Monetary Analysis, University of Paris.*

Francis A. Allen. *Edson R. Sunderland Professor of Law, University of Michigan, Ann Arbor.*

Rex Alston. *Broadcaster and journalist. Staff Sports Commentator and Reporter, British Broadcasting Corporation, 1942–61. Cricket Reporter, Daily and Sunday Telegraph (London), 1961–83.*

John Thomas Amber. *Emeritus Editor in Chief, D.B.I. Books, Inc., Northfield, Illinois; editor of Gun Digest, Handloader's Digest, Single Shot Actions and Rifles, and others.*

Robert T. Anderson. *Professor of Anthropology, Mills College, Oakland, Calif.*

Jack Andresen. *Consulting Engineer. Underwater Photographer. World Champion Trick Water Skier, 1950.*

Pierre Robert Angel. *Professor and Head, Department of Classical and Modern Languages, Literature and Civilizations, University of Tours, Fr.*

John Armitage (d. 1980). *London Editor, Encyclopædia Britannica, 1949–65, President, Rugby Fives Association, London, 1955–60.*

Michael Austin. *Rugby and cricket writer, Daily Telegraph (London).*

Robert Auty (d. 1978). *Professor of Comparative Slavonic Philology, University of Oxford, 1965–78.*

Paul Avrigh. *Distinguished Professor of History, Queens College, City University of New York, Flushing.*

Hans Herman Baerwald. *Professor of Political Science, University of California, Los Angeles; Director, Study Center of the University of California, Tokyo, 1965–67; 1969–70.*

B. Devereux Barker III. *Associate, Brewer & Lord (insurance), Boston. Former Associate Editor, Yachting magazine.*

Victor Barna (d. 1972). *World table tennis champion, men's singles, 1930, 1932–35; men's doubles, 1929–35; mixed doubles, 1932, 1935. Author of Tennis Today.*

Harry Elmer Barnes (d. 1968). *Historian, sociologist, and writer. Author of A History of Historical Writing and others.*

Samuel H. Baron. *Professor of History, University of North Carolina at Chapel Hill.*

Howard Bass. *Winter sports correspondent, Daily Telegraph and Sunday Telegraph (London). Sports broadcaster, British Broadcasting Corporation World Service.*

Richard Reeve Baxter (d. 1980). *Judge, International Court of Justice, The Hague, 1979–80. Professor of Law, Harvard University, 1959–80.*

Lowell John Bean. *Professor of Anthropology, California State University, Hayward.*

Charles-Louis de Beaumont (d. 1972). *President, Amateur Fencing Association of Great Britain. President, British Commonwealth Fencing Federation. Deputy Chairman, British Olympic Association.*

John Matthew Beck. *Executive Director, Chicago Consortium of Colleges and Universities.*

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Louis Stanley Berenson. *Owner and President, Berensons' Hartford Jai-Alai, Conn.*

Stanley F. Bergstein. *Executive Vice President, Harness Tracks of America, Morristown, N.J. Vice President, Publicity—Public Relations, U.S. Trotting Association, and Executive Editor, Hoof Beats magazine, 1968–75.*

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David Bidney (d. 1987). *Professor of Anthropology and of Philosophy of Education, Indiana University, Bloomington, 1965–74.*

George W. Bishop, Jr. (d. 1974). *Professor and Head, Department of Finance, Northern Illinois University, De Kalb, 1965–74.*

Max Black (d. 1988). *Susan Linn Sage Professor of Philosophy, Cornell University, Ithaca, N.Y., 1946–77.*

Mark Blaug. *Professor of the Economics of Education, Institute of Education, University of London.*

Friedrich Blendinger. *Director of Archives, Augsburg, W.Ger., 1966–77.*

Solomon Bluhm. *Professor of Education, Hunter College, City University of New York, 1930–59.*

George Gleason Bogert (d. 1977). *James Parker Hall Professor of Law, University of Chicago.*

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Lloyd Vernet Bridges. *Actor. Author of Masks and Flippers.*

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Martin Bronfenbrenner. Kenan Professor Emeritus of Economics, Duke University, Durham, N.C.

Arthur Joseph Brown. Emeritus Professor of Economics, University of Leeds, Eng.

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William Francis Brown. Editor, *American Field*, Chicago. Author of *How to Train Hunting Dogs and others*.

James Robert Browning. Chief Judge, United States Court of Appeals for the Ninth Circuit, San Francisco.

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Avery Brundage (d. 1975). President, International Olympic Committee, 1952-72.

The Hon. Alastair Francis Buchan (d. 1976). Montague Burton Professor of International Relations, University of Oxford, 1972-76. Founder and Director, International Institute for Strategic Studies, London, 1958-69.

Arthur F. Burns (d. 1987). U.S. Ambassador to the Federal Republic of Germany, 1981-85. John Bates Clark Professor of Economics, Columbia University, 1959-69. Chairman, Board of Governors, Federal Reserve System, Washington, D.C., 1970-78.

Thomas Ferrier Burns. Chairman of Burns and Oates Ltd., Publishers, London, 1948-67. Editor, *The Tablet*.

Asa S. Bushnell (d. 1975). Commissioner, Eastern College Athletic Conference, 1938-70.

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Robert Graham Caldwell. Professor of Criminology, University of Iowa, Iowa City, 1948-72.

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Archibald Hunter Campbell. Regius Professor of Public Law, University of Edinburgh, 1945-72.

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Michael Carey. Cricket writer, *Daily Telegraph* (London).

Edward H. Carr (d. 1982). Wilson Professor of International Politics, University College of Wales, Aberystwyth, 1936-47.

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Floyd Barton Chapman. Ecologist, Metropolitan Park District, Columbus, Ohio.

Elliott E. Cheatham (d. 1972). Charles Evans Hughes Professor of Law, Columbia University, 1950-57. Research Professor of Law, Vanderbilt University, Nashville, Tenn., 1968-72.

Charles Edward Clark (d. 1963). Judge, 1939-63. Chief Judge, U.S. Court of Appeals, 2nd Circuit, 1954-59. Dean, Law School, Yale University, 1929-39.

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Sonia Moore. *Founder and President, American Center for Stanislavski Theatre Art, Inc., New York City. Founder and Artistic Director, American Stanislavski Theatre.*

Will G. Moore (d. 1978). *Reader in French Literature, University of Oxford.*

Albert Mordell (deceased). *Author of Quaker Militant: John Greenleaf Whittier and others.*

Anne-Marie de Moret. *Free-lance writer on African literature.*

Edwin George Morgan. *Poet. Titular Professor of English, University of Glasgow, 1975-80.*

Brita Maud Ellen Mortensen (d. 1958). *Lecturer in Swedish, University of Cambridge, 1950-58.*

Charles Moseley. *Free-lance writer.*

Frank Luther Mott (d. 1964). *Dean, School of Journalism, University of Missouri, Columbia, 1942-51.*

Joachim Müller. *Professor of German Literature, Friedrich Schiller University of Jena, E.Ger.*

Hugo Munsterberg. *Professor of Oriental Art, Bard College, Annandale-on-Hudson, New York.*

Peter J. Murray. *Emeritus Professor of the History of Art, Birkbeck College, University of London.*

Reginald P.C. Mutter. *Emeritus Professor of English Literature, University of Sussex, Brighton, Eng.*

Bernard S. Myers. *Art historian. Editor in Chief and Manager, Art Books Department, McGraw-Hill Book Company, New York City, 1958-70.*

Rollo H. Myers (d. 1985). *Writer on music. Author of Music in the Modern World; Ravel: Life and Works and others.*

Maurice Nadeau. *Editor, Lettres Nouvelles and La Quinzaine Littéraire, Paris.*

Alois M. Nagler. *Henry McCormick Professor Emeritus of Dramatic History and Criticism, Yale University.*

James Thompson Nardin. *Professor of English, Louisiana State University, Baton Rouge.*

Ray Nash (d. 1982). *Professor of Art, Dartmouth College, Hanover, N.H., 1949-70.*

Robert J. Nelson. *Professor of French and Comparative Literature, University of Illinois, Urbana.*

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Norman Cornthwaite Nicholson (d. 1987). *Poet and critic. Author of H.G. Wells and others.*

Romola Nijinsky (d. 1978). *Author of Nijinsky; The Last Years of Nijinsky.*

Robert Niklaus. *Emeritus Professor of French, University of Exeter, Eng.*

Arnoldus Noach (d. 1976). *Professor of the History of Art and Architecture, University of Leeds, Eng.*

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Bonnie Oberman. *Free-lance writer.*

Francis Valentine O'Connor. *Director, Raphael Research Enterprises (fine arts consultants), New York City. Editor, Federal Art Patronage Notes.*

Donald Mitchell Oenslager (d. 1975). *Designer of scenery and theatre consultant. Professor of Scene Design, Yale University.*

James Francis O'Gorman. *Grace Slack McNeil Professor of American Art, Wellesley College, Mass.*

Kenneth O'Leary. *Former Associate Professor of English, Seton Hall University, South Orange, N. J.*

Aladar Olgyay (d. 1963). *Architect. Author of Solar Control and Shading Devices and others.*

Carola Oman (Lady Lenanton) (d. 1978). *Biographer. Author of David Garrick and others.*

Peter M. Opie (d. 1982). *Coauthor of The Oxford Dictionary of Nursery Rhymes; The Lore and Language of Schoolchildren; Children's Games in Street and Playground.*

Masako Osako. *Free-lance writer on Japanese literature and affairs.*

Christian F. Otto. *Professor of Architecture, Cornell University, Ithaca, N.Y.*

Peter D. Owen. *Painter and printmaker. Former Senior Lecturer, Croydon College of Design and Technology, Eng.*

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(William Cyril) Desmond Pacey (d. 1975). *Vice President; Professor of English, University of New Brunswick, Fredericton.*

Sir Denys (Lionel) Page (d. 1978). *Regius Professor of Greek, University of Cambridge, 1950-73.*

George Duncan Painter. *Assistant Keeper in charge of incunabula, Department of Printed Books, British Library, London, 1954-74.*

Rodolfo Pallucchini. *Director, Institute of Art History, Giorgio Cini Foundation, Venice.*

Guido Pannain (d. 1977). *Professor of the History of Music, S. Pietro a Maiella Conservatory of Music, Naples.*

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Alexander A. Parker. *Emeritus Professor of Spanish Literature, University of Texas at Austin.*

Robert Lewis Parkinson. *Chief Librarian and Historian, Circus World Museum, Baraboo, Wis.*

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Roy Pascal (d. 1980). *Professor of German, University of Birmingham, Eng., 1939–69.*

Günter Passavant. *Editor, Journals of the German Institute for the History of Art, Florence.*

David Patterson. *President, Oxford Centre for Post-Graduate Hebrew Studies; Cowley Lecturer in Post-Biblical Hebrew, University of Oxford; Fellow of St. Cross College, Oxford.*

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James Smith Pierce. *Professor of Art History, University of Kentucky, Lexington.*

André Pierre (d. 1966). *Member of Editorial Staff, Le Monde, Paris, 1944–58.*

Hovhanness Israel Pilikian. *Theatre director. Founder and Artistic Director of Hana-no Mask-Theatre Company.*

Vivian de Sola Pinto (d. 1969). *Professor of English, University of Nottingham, Eng., 1938–61.*

Henry C. Pitz (d. 1976). *Writer and painter. Professor of Art, Philadelphia College of Art, 1934–60.*

Adolf K. Placzek. *Avery Librarian Emeritus, Columbia University.*

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Henry A. Pochmann (d. 1973). *Professor of English, University of Wisconsin, Madison, 1938–71.*

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Peter J. Pollack (d. 1978). *Photographer and lecturer. Author of The Picture History of Photography and others.*

Sir John Pope-Hennessy. *Professor of Fine Arts, New York University. Consultative Chairman, Department of European Paintings, Metropolitan Museum of Art, New York City, 1977–86.*

William V. Porter. *Associate Professor of Music History and Literature, Northwestern University, Evanston, Ill.*

Frederick A(lbert) Pottle (d. 1987). *Sterling Professor of English, Yale University, 1944–66.*

John Povey. *Professor of English, University of California, Los Angeles.*

Anthony Powell. *Novelist, playwright, and literary critic.*

Mario Praz (d. 1982). *Professor of English Language and Literature, University of Rome, 1934–66.*

Joseph Prescott. *Emeritus Professor of English, Wayne State University, Detroit.*

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Brian Priestman. *Orchestral conductor. Former Dean, Faculty of Music, University of Cape Town.*

Jules David Prown. *Professor of the History of Art, Yale University.*

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Regula B. Qureshi. *Mactaggart Fellow, Department of Music, University of Alberta, Edmonton.*

Chaim Rabin. *Former Professor of Hebrew Language, Hebrew University of Jerusalem.*

Frederic James Edward Raby (d. 1966). *Fellow and Lecturer, Jesus College, University of Cambridge, 1948–54. Author of A History of Christian Latin Poetry and others.*

Kathleen Raine. *Poet and scholar. Author of Collected Poems; Blake and Tradition; and others.*

Gilbert Reaney. *Professor of Musicology, University of California, Los Angeles.*

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Willi Reich (d. 1980). *Music critic. Author of The Life and Work of Alban Berg and many others.*

John Cowie Reid (d. 1972). *Professor of English, University of Auckland, New Zealand.*

Hans Siegbert Reiss. *Professor of German, University of Bristol, Eng.*

Graham Reynolds. *Keeper, Departments of Prints and Drawings, 1961–74, and of Paintings, 1959–74, Victoria and Albert Museum, London.*

Edgar Preston Richardson (d. 1985). *President, Pennsylvania Academy of the Fine Arts, 1968–70. Director, Detroit Institute of Arts, 1945–62, and Winterthur Museum, Wilmington, Del., 1962–66.*

Margaret Ann Richardson. *Deputy Curator, Drawings Collection, Royal Institute of British Architects, London.*

Gisela Marie Augusta Richter (d. 1972). *Curator, Greek and Roman Department, Metropolitan Museum of Art, New York City.*

Christopher Bruce Ricks. *Professor of English, Boston University.*

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William Andrew Ringler, Jr. (d. 1987). *Professor of English, University of Chicago, 1962–80.*

Charles Martin Robertson. *Lincoln Professor of Classical Archaeology and Art, University of Oxford, 1961–78.*

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Anne F. Rockwell. *Free-lance writer and illustrator. Author of Glass, Stones and Crown: The Abbé Sugar and the Building of St. Denis and others.*

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Cecil Roth (d. 1970). *Editor in Chief, Encyclopaedia Judaica. Reader in Jewish Studies, University of Oxford, 1939–64.*

The Rev. Erik Reginald Routley (d. 1982). *Professor of Church Music, Westminster Choir College, Princeton, N.J., 1975-82.*

Eleanor Ruggles. *Biographer. Author of Prince of Players: Edwin Booth and others.*

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Harold Rutland (d. 1977). *Music critic. Examiner, Trinity College of Music, London. Editor, The Musical Times, 1957-60.*

Elizabeth Sabiston. *Academic Adviser, Stong College, York University, Downsview, Ont.*

Stanley John Sadie. *Music critic, The Times (London). Editor of The Musical Times; The New Grove Dictionary of Music and Musicians.*

William Merritt Sale, Jr. (d. 1981). *Goldwin Smith Professor of English, Cornell University, Ithaca, N.Y.*

Mario Salmi (d. 1980). *Professor of the History of Medieval and Modern Art, University of Rome.*

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Jeffrey L. Sammons. *Professor of German, Yale University.*

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Richard Anthony Sayce (d. 1977). *Fellow of Worcester College, Oxford; Reader in French Literature, University of Oxford.*

Byron Schaeffer, Jr. *Free-lance writer.*

Aaron Scharf. *Professor of Art History, Open University, Milton Keynes, Eng., 1969-82.*

Jefim H. Schirmann (d. 1981). *Professor of Hebrew Literature, Hebrew University of Jerusalem.*

Paul Schlueter. *Writer, editor, and lecturer on literary topics.*

Laurence E. Schmeckebier. *Emeritus Professor of Fine Arts and Emeritus Dean, School of Art, Syracuse University, N.Y.*

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Alexander Mackie Scott. *Reader in Scottish Literature, University of Glasgow.*

M.A. Screech. *Fielden Professor of French Language and Literature, University College, University of London.*

Humphrey Searle (d. 1982). *Composer. Professor of Composition, Royal College of Music, London.*

Nancy Seeger. *Free-lance writer on visual arts.*

Edward G. Seidensticker. *Professor of Japanese, Columbia University.*

William C. Seitz (d. 1974). *George R. Kenan, Jr., Professor of the History of Art, University of Virginia, Charlottesville, 1971-74.*

Charles Coleman Sellers. *Librarian, Dickinson College, Carlisle, Pa., 1956-68. Author of Charles Willson Peale and others.*

Jean Selz. *Art historian and critic. Member, International Association of Art Critics, Paris.*

Victor Ilyich Seroff (d. 1979). *Writer. Author of Rachmaninoff and others.*

Alexandrino E. Severino. *Professor of Portuguese, Vanderbilt University, Nashville, Tenn.*

Charles Seymour, Jr. (d. 1977). *Professor of the History of Art, Yale University, 1954-77.*

Isaac Avi Shapiro. *Honorary Fellow, Shakespeare Institute, University of Birmingham, Eng.; former Senior Lecturer in English.*

Claude L. Shaver. *Alumni Professor Emeritus of Speech, Louisiana State University, Baton Rouge.*

Donald Leslie Shaw. *Professor of Latin American Studies, University of Edinburgh.*

Wendy Stedman Sheard. *Art historian. Author of Antiquity in the Renaissance.*

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Denis Sinor. *Distinguished Professor of Uralic and Altaic Studies and of History, Indiana University, Bloomington.*

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Nicolas Slonimsky. *Conductor, composer, writer, and editor. Lecturer in Music, University of California, Los Angeles, 1964-67.*

F. Basil R. Smallman. *Alsop Professor Emeritus of Music, University of Liverpool.*

Arthur J(ames) M(arshall) Smith (d. 1980). *Professor of English and Poet-in-Residence, Michigan State University, East Lansing, 1960-72.*

Gilbert G. Smith. *Associate Professor of Spanish, North Carolina State University, Raleigh.*

Sheila Mary Smith. *Senior Lecturer in English, University of Nottingham, Eng.*

Whitney Smith. *Executive Director, Flag Research Center; Editor, The Flag Bulletin, Winchester, Mass.*

William Stevenson Smith (d. 1969). *Curator, Department of Egyptian Art, Museum of Fine Arts, Boston, 1956-69. Lecturer in Fine Arts, Harvard University, 1948-69.*

Craig Hugh Smyth. *Director, Villa I Tatti, Harvard Center for Italian Renaissance Studies, Florence; Professor of Fine Arts, Harvard University.*

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Wilbert Snow (d. 1977). *Professor of English, Wesleyan University, Middletown, Conn., 1929-72.*

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Kathrine Sorley Walker. *Free-lance writer, editor, and dance critic. Author of Dance and Its Creators and others.*

Brian C. Southam. *Publisher, Athlone Press, London. Author of Jane Austen's Literary Manuscripts and others.*

John Sparrow. *Warden of All Souls College, University of Oxford, 1952-77.*

George Speaight. *Former Editorial Director, George Rainbird Ltd. Author of The History of the English Puppet Theatre and others.*

Robert (William) Speaight (d. 1976). *Actor, biographer, critic, and fiction writer. Author of Life of Hilaire Belloc and others.*

Monroe K. Spears. *Moody Professor of English, Rice University, Houston, Texas.*

John R. Spencer. *Professor of Art, Duke University, Durham, N.C.*

- Albert Sperisen.** *Vice President in Charge of Production, Foote, Cone & Belding, San Francisco.*
- Radcliffe Squires.** *Poet. Professor of English, University of Michigan, Ann Arbor, 1963–81.*
- William Bedell Stanford** (d. 1984). *Chancellor, University of Dublin, 1982–84; Regius Professor of Greek, 1940–80.*
- Jerry Stannard** (d. 1988). *Professor of History, University of Kansas, Lawrence, 1967–88.*
- Enid Starkie** (d. 1970). *Reader in French Literature, University of Oxford; Fellow, Somerville College, Oxford, 1934–65.*
- Wolfgang Stechow** (d. 1974). *Professor of Fine Arts, Oberlin College, Ohio, 1940–63.*
- Richard G. Stern.** *Professor of English, University of Chicago.*
- Frederick William Sternfeld.** *Former Reader in the History of Music, University of Oxford.*
- Denis William Stevens.** *Professor of Musicology, Columbia University, 1964–76.*
- Halsey Stevens.** *Composer. Emeritus Professor of Music, University of Southern California, Los Angeles.*
- John I.M. Stewart.** *Reader in English Literature, University of Oxford, 1969–73.*
- Noel Stock.** *Professor of English, University of Toledo, Ohio.*
- Göran Stockenström.** *Professor and Chairman, Department of Scandinavian, University of Minnesota, Minneapolis.*
- Sewell Stokes** (d. 1979). *Author and dramatist. Author of Isadora: An Intimate Portrait and others.*
- Eric Stone.** *Lecturer in Modern History, University of Oxford; Fellow and Tutor in Medieval History, Keble College, Oxford.*
- Gleb Struve** (d. 1985). *Professor of Slavic Languages and Literatures, University of California, Berkeley, 1947–67.*
- Michael Sullivan.** *Christensen Professor Emeritus of Oriental Art, Stanford University, Calif.*
- Sir John Summerson.** *Curator, Sir John Soane's House and Museum, London.*
- James R. Sutherland.** *Emeritus Professor of Modern English Literature, University of London.*
- Denys Sutton.** *Editor, Apollo magazine. Art Critic, Financial Times. Author of The Art of James McNeill Whistler and others.*
- W.A. Swanberg.** *Free-lance writer. Author of Dreiser and others.*
- Frederick A. Sweet.** *Curator of American Painting and Sculpture, Art Institute of Chicago, 1952–68.*
- Jean-Guy Sylvestre.** *National Librarian of Canada, Library of Parliament, Ottawa.*
- Charles Johnson Taggart.** *Free-lance writer.*
- Stanley Taikeff.** *Playwright and poet.*
- James S. Tassie.** *Adjunct Professor of French, Carleton University, Ottawa.*
- Allen Tate** (d. 1979). *Poet and critic. Regents' Professor of English, University of Minnesota, Minneapolis, 1966–68.*
- Abdallah at-Tayib.** *Vice-Chancellor; Professor of Arabic, University of Khartoum, Sudan.*
- John Russell Taylor.** *Art Critic, The Times (London); Film Critic, 1962–73. Professor of Cinema, University of Southern California, Los Angeles, 1972–78.*
- Owen Reece Taylor** (d. 1983). *Professor of French, Queen Mary College, University of London, 1969–77.*
- Ronald Jack Taylor.** *Professor of German, University of Sussex, Brighton, Eng.*
- Walter Terry** (d. 1982). *Dance critic and editor, Saturday Review magazine; New York Herald Tribune; and others.*
- David Christopher Traherne Thomas.** *Former Assistant Director of Art, Arts Council of Great Britain, London. Joint compiler of The First Hundred Years of the Royal Academy, 1769–1868 (catalog of Royal Academy Winter Exhibition, London, 1951–52).*
- Lawrance R. Thompson** (d. 1973). *Holmes Professor of Belles-Lettres, Princeton University, 1968–73; Professor of English, 1951–73.*
- Friedrich Thöne** (deceased). *Art historian. Author of Lucas Cranach der Ältere and others.*
- Anthony Thwaite.** *Poet and critic. Coeditor, Encounter. Author of Contemporary English Poetry and others.*
- Marion Rose Tinling.** *Coeditor of The Secret Diary of William Byrd of Westover and others.*
- Joyce M.S. Tompkins** (d. 1986). *Reader in English, University of London, 1948–65.*
- Louis Tremaine.** *Free-lance writer on African literature.*
- Brian Lewis Trowell.** *King Edward Professor of Music, King's College, University of London.*
- C.H. Truman.** *Curatorial staff member, Victoria and Albert Museum, London.*
- Constantine Athanasius Trypanis.** *Minister of Culture and Science, Government of Greece, 1974–77. Professor of Classical Languages and Literatures, University of Chicago, 1968–74.*
- Martin Turnell** (d. 1979). *Writer. Head, Programme Contracts Department, BBC, London, 1959–69.*
- Arlin Turner** (d. 1980). *James B. Duke Professor of English, Duke University, Durham, N.C., 1974–79.*
- Darwin T. Turner.** *Professor of English; Director, Afro-American Studies, University of Iowa, Iowa City.*
- Valev Uibopuu.** *Novelist. Editor, Estonian Writers' Co-operative, Lund, Sweden.*
- Vernon Philip Underwood.** *Former Professor of French, University College, University of London.*
- Dora Vallier.** *Art critic. Author of Henri Rousseau: Catalogue raisonné de l'oeuvre; Henri Rousseau; and others.*
- Norman Vance.** *Lecturer in English, University of Sussex, Brighton, England.*
- Eugene Vanderpool.** *Professor of Archaeology, American School of Classical Studies at Athens.*
- Milos Velimirovic.** *Professor of Music, University of Virginia, Charlottesville.*
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- Michele Vishny.** *Art historian and critic. Contributor to Arts Magazine.*
- Wolf Von Eckardt.** *Design Critic, Time magazine. Architecture Critic, The Washington Post, 1963–81.*
- Klaus Philipp Wachsmann.** *Emeritus Professor of Music, Northwestern University, Evanston, Ill.*
- John Wain.** *Novelist, poet, and critic. Professor of Poetry, University of Oxford, 1973–78.*
- Hugh Wakefield** (d. 1984). *Keeper, Department of Circulation, Victoria and Albert Museum, London, 1960–75.*
- Frank Walker** (d. 1962). *Musicologist and broadcaster.*
- David Harold Wallace.** *Chief, Branch of Reference Services, National Park Service, U.S. Department of the Interior, Harpers Ferry, W.Va., 1974–80.*
- Irving Wallace.** *Novelist and biographer. Author of The Fabulous Showman: The Life and Times of P.T. Barnum; The Man; and many others.*
- Francis James Warne.** *Former Senior Lecturer in French, University of Bristol, Eng.*
- Sir Ellis K. Waterhouse** (d. 1985). *Director of Studies, Paul Mellon Centre for Studies in British Art, London, 1970–73. Barber Professor of Fine Arts; Director, Barber Institute of Fine Arts, University of Birmingham, Eng., 1952–70.*

Sir F.J.B. Watson. *Director of the Wallace Collection, London, 1963–74. Surveyor of the Queen's Works of Art, 1963–72.*

Paul F. Watson. *Associate Professor of the History of Art, University of Pennsylvania, Philadelphia.*

Max Wehrli. *Professor of the History of German Literature, University of Zürich.*

Sharon Weiner. *Free-lance writer.*

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Francis William Wentworth-Sheilds (d. 1969). *Artist. Principal Lecturer, Department of Printing and Graphic Design, Twickenham College of Technology, Middlesex, Eng., 1966–69.*

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Sir Jack Allan Westrup (d. 1975). *Professor of Music, University of Oxford, 1946–71; Fellow of Wadham College, Oxford, 1947–71.*

Harold E. Wethey (d. 1984). *Professor of the History of Art, University of Michigan, Ann Arbor, 1946–72.*

Margaret Dickens Whinney (d. 1975). *Reader in the History of Art, University of London, 1950–64.*

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David White. *Faculty member, Department of Visual Arts, Trinity College, University of Dublin.*

E.B. White (d. 1985). *Writer. Contributing Editor, The New Yorker.*

Eric Walter White. *Former Assistant Secretary and Literature Director, Arts Council of Great Britain, London.*

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John Humphreys Whitfield. *Serena Professor Emeritus of Italian Language and Literature, University of Birmingham, Eng.*

Richard Whittingham. *Free-lance writer.*

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John Ritchie Wilkie. *Emeritus Professor of German, University of Aberdeen, Scot.*

Frank Willett. *Director and Titular Professor, Hunterian Museum and Art Gallery, University of Glasgow.*

John William Mills Willett. *Writer and editor. Planning Editor, The Times (London) Literary Supplement, 1969–71.*

Basil Willey (d. 1978). *King Edward VII Professor of English Literature, University of Cambridge, 1946–64.*

Geoffrey Wills. *Free-lance writer on antiques. Author of "Automata" in The Concise Encyclopedia of Antiques.*

Marjorie Winters. *Free-lance writer on African literature.*

William Witte. *Emeritus Professor of German, University of Aberdeen, Scot.*

Rudolf Wittkower (d. 1971). *Professor of the History of Art, Columbia University, 1956–68.*

Friedrich Wilhelm Wodtke (d. 1973). *Professor of German Literature, Kiel University, W.Ger., and Athens University, Greece.*

Mary Woodall (d. 1988). *Director, City Museum and Art Gallery, Birmingham, Eng., 1956–64.*

George Woodcock. *Free-lance writer. Editor, Canadian Literature (quarterly), University of British Columbia, Vancouver, 1959–77.*

Raymond Bernard Wood-Jones. *Reader in Architecture, Victoria University of Manchester.*

John E. Woods. *Associate Professor of History, University of Chicago.*

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Patrick Maurice Yarker. *Former Senior Lecturer in English Literature, King's College, University of London.*

Percy Marshall Young. *Composer. Director of Music, Wolverhampton College of Technology, Eng., 1944–66.*

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Nicolas M. Zernov (d. 1980). *Spalding Lecturer in Eastern Orthodox Culture, University of Oxford, 1947–66.*

Vladimir Viktorovich Zhdanov. *Literary critic. Assistant to the Chief Editor, Kratkaya Literaturnaya Entsiklopediya, Moscow.*

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Part Seven. Technology

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Robert Theodore Alexander. *Captain, U.S. Coast Guard (retired); former Chief, Civil Engineering Division, U.S. Coast Guard Headquarters, Washington, D.C.*

Bruce E. Anderson. *Former Head, (gun) Propellant Research, U.S. Army Ordnance, Research and Development Division.*

Joseph Chapman Anderson. *Professor of Electrical Materials, Imperial College of Science and Technology, University of London.*

Walter Harry Green Armytage. *Emeritus Professor of Education, University of Sheffield, Eng. Author of A Social History of Engineering.*

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Part Ten. The Branches of Knowledge

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