



A GUIDEBOOK TO LEARNING

For the Lifelong Pursuit of Wisdom

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CHAPTER 8

**Modern Times:
Eighteenth Century**

Denis Diderot [1713–1784] and
Jean d’Alembert [1717–1783]

PUBLISHED in the years 1751 to 1780, the French *Encyclopédie*, comprising thirty-five volumes, not only undertook to report the state of knowledge in the various arts and sciences, but also to put some order and system into the organization of knowledge. Its editors, Diderot and d’Alembert, were greatly influenced by Francis Bacon, departing from his scheme only in one major respect: They ignored his distinction between human and divine knowledge, including sacred theology under philosophy.

In his own article on encyclopedias, Diderot explained that the word “encyclopédie” signified the coverage of all parts of knowledge, encircled systematically and comprehensively. He used Bacon’s tripartite division of all the parts of knowledge according to their dependence, respectively, on memory, imagination, and reason. Consequently, history, poetry, and philosophy constitute the three main categories under which knowledge or learning is to be organized. Diderot presented this scheme in his Prospectus for the *Encyclopédie*. D’Alembert adopted it with slight changes in the Preliminary Discourse that he wrote for the first volume.

History they subdivided into sacred, civil, and natural. Poetry comprised three kinds: narrative, dramatic, and parabolic—the first concerned with an imaginary past, the second with an imaginary present, and the third with matters abstract or theoretical. But they also extended the word “poetry” to include all the fine arts—music, painting, engraving, and sculpture.

When they came to philosophy, they departed slightly from Bacon’s order of the sciences. Bacon had proceeded from God to nature to man. The French encyclopedists reversed the position of nature and man, putting man first and nature second, but like Bacon they gave first place to ontology or metaphysics, or what Bacon had called *philosophia prima*—first philosophy.

For the French encyclopedists, the sciences of man included what we would call psychology, the sciences of communication (the liberal arts of grammar, rhetoric, and logic), and morals or ethics, including here politics, economics, and jurisprudence. They placed mathematics side by side with physics among the sciences of nature. Under the head of physics, they placed astronomy, meteorology, cosmology, botany, mineralogy, and zoology; and under the head of chemistry, chemistry proper, metallurgy, alchemy, and natural magic. They divided mathematics into pure and applied,

including under the latter optics, acoustics, and the theory of probability.

Antoine-Augustin Cournot, a French philosopher of their time, criticized the encyclopedists for adopting Bacon's ordering of the parts of knowledge, which did not take into account the advances in scientific research that had been made in the 145 years since Bacon's *Advancement of Learning* was published. Natural history should no longer be separated from the natural sciences in Cournot's view. Botany should be more closely associated with zoology. The theory of probability should belong in the sphere of pure mathematics, rather than along with optics and acoustics in the sphere of applied mathematics.

Immanuel Kant [1724–1804]

Among Kant's predecessors, the philosophers Gottfried Wilhelm Leibniz and Christian Wolff, exercised the greatest influence upon him. In the year 1700, Leibniz produced a scheme that was based on the organization of the curriculum in the German universities of his day: theology, jurisprudence, medicine, intellectual philosophy, mathematics, physics, civil or political history, and literary history, or the history of the arts.

Wolff made a threefold division of knowledge into empirical sciences, mathematics, and philosophy or the rational sciences. He divided the empirical sciences into cosmology and psychology; mathematics, into pure and applied; and philosophy, or the rational sciences, into the speculative and the practical. Under the speculative sciences he placed ontology, or *philosophia prima*, cosmology, and psychology; under the practical, logic, ethics, politics, and technology.

We find in Kant's works two somewhat different explicit schemes for the organization of knowledge. One occurs in the Preface to the second edition of his *Critique of Pure Reason*, published in 1787. There Kant separates logic or methodology from all other branches of knowledge, and the latter he divides into the theoretical and the practical. In so doing, he appears to be following Aristotle, as he does also in his threefold division of the theoretical sciences into physics, mathematics, and metaphysics.

In his Preface to a later work, the *Fundamental Principles of the Metaphysics of Ethics*, Kant concerns himself only with philosophy or what he calls "rational knowledge." This he divides into one

formal branch, which consists of logic, and two material branches, which consist of physics, or natural philosophy, and ethics, or moral philosophy.

Neither of the Kantian schemes so far presented represent what lies at the heart of his philosophical approach to the whole realm of human knowledge or learning. The most fundamental point for Kant was the differentiation, following Wolff, of the empirical from the rational disciplines. These can be identified with the natural sciences on the one hand, and with mathematics and the branches of philosophy on the other.

However, in one chapter of his *Critique of Pure Reason*, entitled “The Architectonic of Pure Reason,” Kant explains that the differentiation of the natural sciences from mathematics turns on the distinction between concepts that have some derivation from experience and concepts that are purely constructions of the intellect.

In the sphere of knowledge that employs concepts derived from experience, Kant’s most fundamental distinction is between those that are employed in synthetic judgments *a posteriori* and those that are employed in synthetic judgments *a priori*.

For Kant, the judgment that $7 + 5 = 12$ is synthetic, not analytic: It is not, as others think it to be, a direct consequence of the definition of the terms employed. It is also *a priori*, not *a posteriori*—not based on any process of empirical investigation or research.

What we would call the empirical sciences, natural or social, would consist for Kant of all the disciplines in which the judgments made are not only synthetic but also *a posteriori*—the results of empirical investigation or research. Contrasted with these are what Kant called the disciplines of rational science, or the branches of philosophy, all of which are constituted by judgments both synthetic and *a priori*, in no way dependent on empirical investigation or research.

Accordingly, such terms as physics or psychology have for Kant a double use. On the one hand, there are empirical physics and empirical psychology, branches of natural science. On the other hand, there are rational physics and rational psychology, branches of what Kant called transcendental philosophy. Kant at first appears to be following Aristotle in making physics, mathematics, and metaphysics the three main branches of speculative knowledge, but his critical philosophy rejects metaphysics as having any claim to

validity among the branches of speculative thought. This rejection arose from his insistence that no synthetic *a priori* judgments are possible for the existence of God, the freedom of the will, and the immortality of the soul. How to affirm the existence of God, the freedom of the will, the immortality of the soul, Kant thought are the three main problems of metaphysics.

We are thus left with mathematics, rational physics (or a philosophy of nature), rational psychology (or a philosophy of mind), and rational anthropology (or a philosophy of man), in addition to all the empirical sciences (which also include physics, psychology, and anthropology). But that is not all; for in the sphere of practical as contrasted with speculative knowledge, Kant stoutly defends the validity of ethics, or moral philosophy, as a rational discipline, as well as the validity of politics, or the science of right—rational jurisprudence.

Finally, with Kant there comes into a special prominence a new discipline, which has come to be called epistemology: the theory of knowledge itself. This is the heart of Kant's own critical philosophy, his critique of pure reason. Though two English philosophers, John Locke and David Hume, preceded Kant in an examination of the grounds for certifying or validating what is genuine knowledge as distinct from mere opinion, the prominence of epistemology in modern philosophical thought stems from him.

It might be more to the point to say the *predominance* of epistemology rather than its prominence, since, in the centuries following Kant, modern epistemology has not only tended to reject metaphysics as a valid branch of knowledge, but has also replaced metaphysics as the reigning regulative discipline.

CHAPTER 9

Modern Times: Nineteenth Century

Samuel Taylor Coleridge [1772–1834]

LIKE the French encyclopedists of the century before, Coleridge was deeply impressed by the Baconian scheme for the organization of knowledge. He did not follow it, however, as closely as the encyclopedists did. The table of arrangement he drew up in 1817 for his projected *Encyclopedia Metropolitana* was presented in his “Treatise on Method,” which was published in the first volume of that encyclopedia in the following year. Coleridge’s classification and ordering of the branches of knowledge was somewhat altered later by the publishers of his encyclopedia.

His table of arrangement was comprised of four divisions. Of these, the first consisted of the pure sciences, subdivided into the formal and the real. The formal sciences consisted of universal grammar or philology, logic, and mathematics. The real sciences, or the sciences of reality, consisted of metaphysics, morals, and theology.

Coleridge subdivided the second main division into the mixed and applied sciences. The mixed sciences consisted of mechanics, hydraulics, pneumatics, optics, and astronomy. The applied sciences were broken down into five subdivisions: 1) the branches of experimental philosophy—magnetism, electricity, chemistry, light, heat, color, and meteorology; 2) the fine arts—poetry, painting, sculpture, and architecture; 3) the useful arts—agriculture, commerce, and manufactures; 4) natural history, physiology, crystallography, geology, mineralogy, botany, and zoology; and 5) the applications of natural history—anatomy, surgery, *materia medica*, pharmacy, and medicine.

Articles treating the first two of Coleridge’s main divisions of knowledge were to occupy the first eight volumes of the *Encyclopedia Metropolitana*, with articles on subjects in the second division filling six of these eight volumes.

The historical, biographical, and geographical articles that constituted Coleridge’s third main division were planned for the next eight volumes. Remaining for the last eight volumes were the kind of articles that we would include in a lexicon or in a gazetteer, the entries in which would be alphabetically arranged, the whole to be followed by an alphabetical index.

The *Encyclopedia Metropolitana* was never completed according to Coleridge’s plan, which employed a combination of systematic and alphabetical principles for the organization of an encyclopedia,

the first eight volumes being purely topical or systematic in the arrangement of its articles, the last twenty being alphabetical.

The *Encyclopaedia Britannica*, which in its first edition (1769) was purely alphabetical and has remained so in all of its fifteen editions, has survived for more than two hundred years. In contrast, the partly topical *Encyclopedia Metropolitana* was an impressive failure. It did not long remain in print. Probably it failed because the topical arrangement of its articles on the major arts and sciences did not serve the purposes of readers who wanted to use an encyclopedia solely as a reference work and not as a systematic survey of all the major fields of learning.

Nevertheless, subsequent editors of alphabetical encyclopedias, including *Britannica*, were influenced by Coleridge's main categories for the branches of knowledge.

In the nineteenth and even the twentieth centuries, encyclopedia editors used such categories to classify the articles they sought from their contributors, even though, when the articles came in, they placed them in a purely alphabetical order.

An example of this is to be found in the Classified Table of Contents of the eleventh edition of *Encyclopaedia Britannica* (a copy of which can be found in Chapter 2). Unlike Coleridge's chart of categories, which was not alphabetically arranged, *Britannica's* Classified Table of Contents was purely alphabetical.

Andre Marie Ampere [1775–1836]

Toward the close of his life, the French scientist-philosopher Ampere published a treatise, the title of which translated into English runs as follows: *An essay on the philosophy of the sciences; or an analytical exposition of a natural classification of the whole of human knowledge*.

Therein the branches of knowledge were ordered in a manner that has a typically modern ring: mathematics, physics and other natural sciences, medicine, the branches of philosophy, literature and pedagogy, ethnology, and the political sciences.

Expanded somewhat, mathematics for Ampere consisted of arithmetic and geometry; under or associated with physics were mechanics, kinematics, dynamics, astronomy, geology, botany,

zoology, and agriculture; medicine carried with it pharmacy and hygenics.

Auguste Comte [1798–1857]

According to Auguste Comte, progress in human learning proceeds through three stages. The first stage is that of theology, or what for Comte amounts to mythology or superstition. The second stage is that of metaphysics, or speculative philosophy. This for Comte consists of abstract speculation and unfounded theory. Finally, in the modern era, we reach at last the stage of empirically certified valid knowledge, represented by the positive sciences.

It was this picture of the history of human thought that branded Comte as the founder of positivism, which has taken many forms in the nineteenth and twentieth centuries and is especially prevalent in our own day.

The word “positive” characterizes all genuine knowledge as distinct from mere opinion. It is knowledge based on fact. It is not speculation or theorizing, up in the air with no feet on the ground. It is empirical or experimental in method, starting from observed facts and returning to observed facts for verification. It deals only with observable phenomena.

These strictures make it difficult to understand how Comte justified including mathematics along with the empirical or experimental sciences. Pure mathematics is neither an empirical nor an experimental science. Comte’s only ground for doing so was his recognition of the role that mathematics played in the development of the natural sciences, especially celestial and terrestrial mechanics, the first branches of mathematical physics to emerge in modern times. Comte was obviously unaware that the Alexandrian scientists of antiquity, in both astronomy and mechanics, were also mathematical physicists.

Comte’s sixfold division of the positive sciences is ordered according to the degree of simplicity and complexity of the phenomena being investigated, and also the relative abstractness and concreteness of the objects being studied. This gives us the following arrangement of all the disciplines that exhaustively constitute the domain of genuine learning: mathematics, astronomy, physics, chemistry, biology and physiology, and sociology, or what Comte also called social philosophy.

Comte's further subdivision of these six main departments of scientific knowledge need not be considered here, in view of the tremendous advances in science since his day, and the vast proliferation of specialized disciplines under each of his main headings. Of much greater significance are the omissions or eliminations from the field of learning that characterize Comte's positivist approach to the organization of knowledge.

First of all is the elimination on principle not only of theoretical or speculative philosophy (metaphysics, the philosophy of nature, and the philosophy of mind), but also of practical philosophy (ethics and politics). Then there is the omission, with no reasons given, of history, both political and cultural. Finally, there is no mention of poetry and of other fine arts, nor is there any consideration of the traditional liberal arts of grammar, rhetoric, and logic.

Under sociology or social philosophy, Comte included such disciplines as political science, political economy, and social but not physical anthropology; and he would appear to have no place for empirical psychology, both human and animal, as a behavioral science.

Wilhelm Dilthey [1833–1911]

Significantly different from the other modern schemes for the organization of knowledge we have so far examined is Dilthey's division of learning into two major fields: 1) the natural sciences, both those concerned with nonhuman phenomena and those concerned with man's mental processes and behavior; and 2) the humanities, which, for Dilthey, included history and biography, economics, politics, and law, moral philosophy or ethics, religion, poetry, architecture, and music.

This basic twofold division is probably more accurately expressed by the German words "*Naturwissenschaften*" and "*Geisteswissenschaften*." The second of Dilthey's main divisions—poorly designated by the English word "humanities"—is further subdivided according to the method or manner in which the objects considered are studied. On the one hand, there is the historical approach to the study of economics and politics, or of man's moral and social life. On the other hand, there is the systematic approach to the same subjects, in such disciplines as economics, sociology, and psychology, or in moral and political philosophy. So, too, poetry can be studied historically, or it can be approached systematically in literary criticism.

Herbert Spencer [1820–1903]

Spencer, like Comte, proposed a systematic ordering of what he regarded in his day as acknowledged sciences or disciplines. Unlike Comte, he was not a positivist. He did not exclude from the field of learning the whole of philosophy, for he himself attempted to make contributions to moral philosophy or ethics. Nor did he exclude disciplines that were partly scientific and partly philosophical. However, like Comte, he gave little or no consideration to history or poetry and other arts.

His principle for ordering the sciences was in terms of their relative abstractness or concreteness. Thus he placed logic and mathematics first as purely abstract disciplines. Next came mechanics, physics, and chemistry as sciences both abstract and concrete. These were followed by the purely concrete sciences of astronomy, geology, biology, psychology, and sociology.

Both Comte's and Spencer's schemes for the organization of knowledge have the aspect of museum pieces. They have more interest as matters of historical record than as significant for us today. Unlike the map or chart of all human learning laid down by Francis Bacon, and adopted with modifications by the French encyclopedists and others, the schemes of Comte and Spencer are not sufficiently comprehensive. The principles they employ in drawing up these schemes are much more challengeable than those employed by Bacon.

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THE GREAT IDEAS ONLINE

published weekly for its members by the

CENTER FOR THE STUDY OF THE GREAT IDEAS

Founded in 1990 by Mortimer J. Adler & Max Weismann

Max Weismann, Publisher and Editor

Marie E. Cotter, Editorial Assistant
Ken Dzuga, Senior Fellow and Archivist

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