

bold—too bold?—speculative ventures in the field of religious thought.

In these ways the philosophy of religion, of which fashionable philosophers fought very shy about twenty years ago, has become again one of the liveliest interests of philosophers. It is of considerable significance also that some of the major themes of contemporary fiction, including those which seem to have little overtly to do with religion, are found to bear closely on aspects of religion which have most importance for the philosophy of religion. In the blend of new philosophical investigations of religion, sharpened in the challenge and discipline of tough-minded philosophy, and a perceptive understanding of contemporary cultures (in their limitations as well as in their achievements) in other regards may be found a means of genuine advance in the life of religion itself which will enable it to have its place effectively in the sophistication of a developing culture and rapidly changing state of society.

(See also JEWISH PHILOSOPHY and ISLAMIC PHILOSOPHY.)

Bibliography

- Allen, E. L., *Existentialism from Within*. London, 1953.
 Blackham, H. J., *Six Existentialist Thinkers*. New York, 1952.
 Campbell, C. A., *Selfhood and Godhood*. London and New York, 1957.
 Ewing, A. C., *Idealism*. London, 1934.
 Farrer, Austin, *Finite and Infinite*, 2d ed. Naperville, Ill., 1959.
 Ferré, Frederick, *Language, Logic, and God*. New York, 1961.
 Flew, A. G. N., and MacIntyre, Alasdair, eds., *New Essays in Philosophical Theology*. London, 1955.
 Hartshorne, Charles, *The Logic of Perfection*. La Salle, Ill., 1962.
 Henson, H. H., *Christian Morality*. Oxford, 1936.
 Hepburn, Ronald, *Christianity and Paradox*. London, 1958.
 Hick, John, *Philosophy of Religion*. Englewood Cliffs, N.J., 1963.
 Hughes, E. R., and Hughes, K., *Religions in China*. London, 1950.
 James, E. O., *The Worship of the Sky God*. London, 1963.
 Jayatilke, K. N., *Early Buddhist Theory of Knowledge*. London, 1963.
 Knowles, David, *Evolution of Mediaeval Thought*. London, 1962.
 Lewis, H. D., "Survey of the History of Religion." *Philosophical Quarterly*, No. 15 (April 1954) and No. 16 (July 1954).
 Lewis, H. D., *Our Experience of God*. London, 1959.
 Lewis, H. D., *Teach Yourself the Philosophy of Religion*. London, 1965.
 MacGregor, Geddes, and Robb, J. W., *Readings in Religious Philosophy*. Boston, 1962.
 Mascall, E. L., *He Who Is*. London, 1943.
 Mascall, E. L., *Existence and Analogy*. London, 1949.
 Mascall, E. L., *Words and Images*. London, 1957.
 Mascall, E. L., *The Secularization of Christianity*. London, 1965.
 Mitchell, Basil, ed., *Faith and Logic*. London, 1957.
 Moore, Edward C., *American Pragmatism*. New York, 1961.
 Murti, T. R. V., *The Central Philosophy of Buddhism*. London, 1955.
 Paton, H. J., *The Modern Predicament*. London, 1955.
 Perry, R. B., *Present Philosophical Tendencies*. London, 1929.
Philosophy, No. 122 (July 1957). On empiricism and religion.
 Pringle-Pattison, Andrew Seth, *The Idea of God*. Oxford, 1917.
 Ramsey, Ian, *Religious Language*. London, 1957.
 Ramsey, Ian, *Prospect for Metaphysics*. London, 1961.
 Rogers, A. K., *A Student's History of Philosophy*. New York, 1940.
 Rose, H. J., *Ancient Greek Religion*. London, 1946.
 Slater, R. H. L., and Lewis, H. D., *World Religions and World Community*. New York, 1963.

- Smart, Ninian, *Reasons and Faiths*. London, 1958.
 Smart, Ninian, *Historical Selections in the Philosophy of Religion*. New York, 1962.
 Smith, John E., *Philosophy of Religion*. New York, 1965.
 Taylor, A. E., "Theism," in James Hastings, ed., *Encyclopedia of Religion and Ethics*. New York, 1959.
 Wolfson, H. A., *Religious Philosophy*. Cambridge, Mass., 1961.

H. D. LEWIS

PHILOSOPHY OF RELIGION, PROBLEMS OF.

The term "philosophy of religion" is a relative newcomer to the philosophical lexicon, but what is now so designated is as old as philosophy itself. One of the earliest spurs to philosophical reflection, in ancient Greece and elsewhere, was the emergence of doubts concerning the religious tradition; and religious beliefs and conceptions have always formed much of the staple of philosophical discussion.

If one surveys the various things philosophers have done in thinking about religion, it is difficult to find any unifying thread other than the fact that they all spring from reflection on religion. Philosophy of religion is occupied to a large extent with the consideration of reasons for and against various fundamental religious beliefs, particularly the various arguments for the existence of God. But we find many other matters treated in books that are regarded as being within the philosophy of religion. These include the nature and significance of religious experience, the nature of religion, the relation between religion and science, the nature of religious faith as a mode of belief and/or awareness, the nature of revelation and its relation to the results of human experience and reflection, the place of religion in human culture as a whole, the logical analysis of religious language, the nature and significance of religious symbolism, and possibilities for reconstructing religion along relatively nontraditional lines.

Central aim. Some justification can be found for grouping all these topics under the heading "philosophy of religion" if we view them all as growing out of a single enterprise, the rational scrutiny of the claims of religion—the critical examination of these claims in the light of whatever considerations are relevant—with a view to making a reasonable response to them. A highly developed religion presents us with a number of important claims on our belief, our conduct, our attitudes and feelings. It gives answers to questions concerning the ultimate source of things, the governing forces in the cosmos, the ultimate purpose(s) of the universe, and the place of man on this scheme. It tells us what a supreme being is like, what demands he makes on men, and how one can get in touch with him. It offers a diagnosis of human ills, and it lays down a "way of salvation" that, if followed, will provide a way to remedy these ills and satisfy man's deepest needs. All this is very important. If the claims of a given religion on these points are justified, discovering this is a matter of the greatest moment. At bottom the philosophy of religion is the enterprise of subjecting such claims to rational criticism.

It is worth noting that such claims are not made by religion in general but by particular religions exclusively and that although generally we can find claims of all these sorts in any given religion, the specific content will differ wide-

ly from one religion to another. This will have important consequences for the direction taken by the philosophizing that arises in response to each religion. This article is largely concerned with the Western tradition, and thus the philosophy of religion represented has grown out of concern with some aspect of the Judaeo-Christian tradition, either through support or opposition. Philosophical reflection on a very different religious tradition will give rise to different preoccupations. Thus, Western philosophers, unlike their Indian counterparts, are much concerned with arguments for and against the existence of a supreme personal deity and with whether or not the occurrence of miracles is compatible with the reign of natural law. However, in a religious tradition like the Hindu or the Buddhist, which does not feature the notion of a supreme personal deity who has active personal dealings with his creatures, these problems do not arise. Philosophers in such a tradition, by contrast, will be concerned with trying to clarify the relation of a supreme ineffable One to the various things in the world that constitute its manifestations and with considering arguments for the ultimate unreality of the empirical world. There is, however, enough in common among different religions to insure that all philosophy of religion will be directed to recognizably identical problems, though in very different forms. (See RELIGION for a discussion of common characteristics.)

Philosophers have raised critical questions about the justifiability and value of religious beliefs, rites, moral attitudes, and modes of experience. However, philosophers have largely focused their critical powers on the doctrinal (belief) side of religion. This selectivity might be attributed to an occupational bias for the intellectual, but there is a real justification for it. If our basic interest is in questions of justifiability, then it is natural that we should concentrate on the belief side of religion, for the justification of any other element ultimately rests on the justification of some belief or beliefs. If one asks a Roman Catholic why he goes to Mass, or what the value is of so doing, he would, if he knew what he was about, appeal to certain basic beliefs of his religion: that the universe, and all its constituents, owes its existence to and depends for its ultimate fate on a supreme personal being, God; that man inevitably fails to live up to the moral requirements God lays down for him; that God became a man in the person of Jesus of Nazareth and suffered death in order to save man from the fatal consequences of his sinfulness; that as a part of a program designed to enable men to benefit from this, God has ordained that they should participate in the rite of the Mass, in which, in some mysterious way, they actually incorporate the body and blood of Jesus and so partake of the salvation effected through him. The ritual, as conceived by the participants, is a reasonable thing to do if and only if these beliefs are justified.

However, the attention of philosophers is generally more narrowly concentrated than this. Not all the beliefs of a given religion, not even all the beliefs considered crucial by that religion, receive equal attention. In works on the philosophy of religion, one finds little discussion of relatively special doctrines that are peculiar to a given religion, such as the virgin birth of Jesus, the divine mission of the church, or the special status of the priesthood, how-

ever important these doctrines may be for the religion in question. Instead, attention is focused primarily on what might be called the metaphysical background of the doctrinal system, the world view of the religion—the view of the ultimate source and nature of the universe; the nature of man; man's place in the universe; the end to which man is, or should be, tending; and so on. This preferential treatment is partly due to a desire to make philosophical discussions relevant to more than one religion; for example, roughly the same world view underlies Judaism, Christianity, and Islam. It is also partly due to a conviction that philosophical reflection will yield definite results only with respect to the more general aspects of a religious outlook. Very few philosophers have supposed that one can establish the virgin birth by philosophical argument.

It might also be argued that if we abstract from commitment to any particular religion, the world-view aspect of religion is the most undeniably significant one. Without presupposing some particular religious beliefs, it would be difficult to show that the acceptance of elaborate theological dogmas like that of the Trinity, or participation in rites, or singling out certain objects as sacred is an essential part of a fully human life. However, it can be argued on the basis of facts concerning the nature of man and the conditions of human life that human beings have a deep-seated need to form some general picture of the total universe in which they live, in order to be able to relate their own fragmentary activities to the universe as a whole in a way meaningful to them; and that a life in which this is not carried through is a life impoverished in a most significant respect. This would seem to be an aspect of religion that is important on any religious position; and so it seems fitting that it should be at the center of the picture in a general philosophical treatment of religion.

Other investigations and the central aim. In presenting, defending, and criticizing arguments for and against such fundamental beliefs as the existence of a supreme personal deity, the immortality of the human personality, and the direction of the universe toward the realization of a certain purpose, philosophers are directly engaged in critical evaluation. The other major topics listed at the beginning of this article do not have exactly this status, but they are all directly relevant to rational criticism of fundamental religious beliefs. In order to conduct a systematic scrutiny of such beliefs, one must start with an adequate conception of the nature and range of religion, so that he can be sure that he is dealing with genuine religious beliefs and with those which are most fundamental for religion, and so that he will not be unduly limited by the particular interests with which he starts.

Moreover, one needs an adequate understanding of the nature of religious belief in order to filter out irrelevant considerations and arguments. The charge of irrelevancy has been most trenchantly leveled against the traditional enterprise of presenting metaphysical arguments for the existence of God by Søren Kierkegaard, who maintained that anyone who tries to give an argument for the existence of God thereby shows that he has misunderstood the special character of religious belief. Whether or not such charges are justified, the mere fact that they can be made with any plausibility shows that it is incumbent on the

B Linguistics

philosopher of religion to look into the character of religious faith and to try to determine its similarities to and differences from other modes of belief; for example, those in everyday life and in science. With an increasing realization of the way in which thought and belief are shaped by language, this kind of investigation has increasingly taken the form of an inquiry into the type of utterances that express religious belief, an attempt to make explicit the logic of religious discourse—the special ways in which terms are used in religious utterances, the logical relations between religious statements themselves and between religious statements and statements in other areas of discourse, the extent to which religious statements are to be construed as expressive of feelings or attitudes or as directions to action, rather than as factual claims. Also, an appreciation of the extent to which language is used symbolically in religion can easily lead to a general concern with the nature and function of religious symbolism.

Language of Religion

All the concerns listed thus far involve investigation of the relation of religion to other segments of human culture, such as science, art, and literature. The question of the relation of science and religion has a special importance for one who is critically examining religious beliefs in our society. For the last few hundred years the main challenges to religious doctrine in Western society have been made in the name of science. With respect to many segments of science, from Copernican astronomy through Darwinian biology to Freudian psychology, it has been claimed that certain scientific discoveries disprove, or at least seriously weaken, certain basic religious doctrines. Discussions of whether this ever does, or can, happen—and if so, what is to be done about it—have bulked large in works on philosophy of religion.

Religion Culture & Science

Philosophers of religion also investigate the nature of religious experiences because it is often claimed that such experiences provide direct warrant for the existence of God, or of other objects of religious worship. One is naturally led into a survey of the types of religious experience and into questions of their psychological bases. Finally, if a philosopher has decided that the basic beliefs of the traditional religion(s) of his society are unacceptable, he is naturally faced with the question of what to do about it. If he feels that religion is a crucially important aspect of human life, he will want to find some way of preserving religious functions in a new form. Hence, naturalistic philosophers, who reject the supernaturalistic beliefs of our religious tradition, sometimes attempt to sketch the outlines of a religion constructed on naturalistic lines. This will usually involve the substitution of some component(s) or aspect(s) of the natural world for the supernatural deity of the Judaeo-Christian tradition. This may be Humanity (Comte), human ideals (Dewey), those natural processes which make a contribution to the realization of the greatest good (H. N. Wieman), or some combination of these.

Relations to other disciplines. The philosophy of religion is distinguished from theology and from sciences dealing with religion (such as psychology of religion and sociology of religion) in opposite ways. It is distinguished from theology by the fact that it takes nothing for granted, at least nothing religious; in the course of its examination it takes the liberty of calling anything into question. The-

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ology, in a narrow sense of that term, sets out to articulate the beliefs of a given religion and to put them into systematic order, without ever raising the ultimate question of their truth. The philosophy of religion is distinguished from sciences of religion by the fact that it is addressed to questions of value and justification and tries to arrive at some sort of judgment on religious claims. The psychology of religion—for instance, when pursuing strictly psychological questions—studies religious beliefs, attitudes, and experiences as so many facts, which it tries to describe and explain, without attempting to pass judgment on their objective truth, rationality, or importance.

The philosophy of religion, conceived of as an attempt to carry out a rational scrutiny of the claims made by a given religion, will always start from concern with some particular religion or type of religion and will basically aim at a judgment of that religion. It certainly is historically accurate to think of philosophy of religion as arising in this way and, furthermore, it may be taken as its common and most basic form. However, it is also possible for a philosopher to concern himself directly with the fundamental issues involved in the religious claims in question—the ultimate source of things, the destiny of man, and cosmic purpose, for example—without approaching them through the consideration of answers given to these questions by some organized religion. Spinoza's *Ethics* is an outstanding example of this kind of investigation. Other examples are Samuel Alexander's *Space, Time and Deity* (2 vols., London, 1920) and Henri Bergson's *L'Évolution créatrice* (*Creative Evolution*, New York, 1911). Whether we call philosophizing of this kind philosophy of religion is not important, but it is important to realize that these questions can be considered outside the context in which we are explicitly concerned with religion as such.

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Various approaches. One should not suppose that every philosopher of religion concerns himself with the whole range of problems. On the contrary, a given philosopher will usually restrict his attention because of his special interests, his conception of religion, and/or his general philosophical position. The second and third of these factors deserve further notice. Concerning the second, the types of problems that a given philosopher emphasizes will sometimes be influenced by the particular aspect of religion he regards as essential. Thus, the concentration on problems connected with religious belief in traditional philosophy of religion is partly due to the fact that most philosophers of religion have thought of religion primarily as a kind of belief (although this may, in fact, be less important than other factors). W. T. Stace in *Time and Eternity*, for example, considers mystical experience to be the essence of religion. Stace concentrated his main efforts on interpreting and justifying religious doctrine conceived as basically an expression of mystical experience. On the other hand, Kierkegaard thought of religion as basically a matter of an individual maintaining a certain general stance in life, and he devoted himself to an elaborate description of a variety of such stances, combined with indirect recommendations of one of these; he rarely mentioned any of the problems customarily discussed by philosophers of religion.

The operation of the third factor, the individual's philo-

sophical position, is more apparent and, perhaps, more powerful. A few examples, selected more or less at random, will be helpful. Philosophers who are primarily speculative metaphysicians—Plato, Aquinas, Leibniz, Hegel, and Whitehead—naturally take very seriously the enterprise of constructing metaphysical arguments for or against the existence of God, whereas predominantly antimetaphysical philosophers—Hume, Kant, and Dewey—will either criticize such arguments or, as is more common in recent times, ignore them altogether. Those who subscribe to the thesis that the only proper job of philosophy is the analysis (clarification) of concepts will observe the appropriate restrictions when and if they turn their attention to religion. There is a great deal of work of this kind to be done with the concepts of God, creation, revelation, faith, and miracle, to name a few. Traditionally this has been done in connection with attempts to reach substantive conclusions on the existence of God, immortality, and other major issues, but if one thinks that conclusions on such matters cannot be attained by philosophical reflection, as analytic philosophers do, he may still seek to make explicit the concepts involved in religious belief. Such philosophizing will regard itself as a humble servant of theology or of more ordinary religious belief and will pretend to no judicial functions, except where it locates internal confusions or inconsistencies.

The influence of philosophical orientation is clearly exemplified in naturalistic philosophers, who generally rule out all supernaturalism on the basis of their general philosophical position, without giving particular supernaturalistic beliefs any detailed examination. Naturalists devote their energies to revising religious belief and practice so that they will be acceptable within a naturalistic framework.

Finally, one may consider Hegel, who devoted his lectures on the philosophy of religion to demonstrating a dialectical progression in the history of religion. This reflected Hegel's basic philosophical conviction that reality consists of the process of the Absolute coming to full self-consciousness, that this process exhibits a dialectical pattern, and that it is manifested in the history of every cultural form.

In the task of classifying the positions that have been taken in the philosophy of religion, one confronts the difficulty that not all philosophers of religion, even in a single religious tradition, are dealing with the same problems. However, there is a common task underlying all the different approaches. All philosophy of religion is ultimately concerned with arriving at a rational judgment of the religion under discussion and, if the judgment is negative, to present some sort of alternative. The initial principle of division can then be taken as the affirmative or negative character of this judgment. (This cannot be absolutely clear-cut, partly because often some part of the religion is affirmed and some is rejected, partly because it is not absolutely clear what is to be included in the religion in question.) It can then be asked of those whose judgment is affirmative what the basis of their judgment is.

One major group, which includes the great majority of philosophers of religion, presents various arguments in support of such beliefs as the existence of God and the immortality of the soul, arguments that take their start from

premises that are not themselves religious doctrines and that, it is assumed, any reasonable man would accept. In other words, they attempt to support religious belief by resting it on nonreligious premises. A smaller but still considerable group regards religious belief as not needing any such support from the outside; they regard it as somehow self-justifying or at least as justified by something from within religion. Some of them (Bergson and James) suppose that the belief in the existence of God, for example, is justified by religious experience. One can directly experience the presence of God, and therefore one does not need to prove his existence by showing that he must be postulated to explain certain facts. Others regard religious faith as different from other modes of belief in such a way that it does not need support of any kind, either from argument from effect to cause or from direct experience. Kierkegaard, Emil Brunner, and Paul Tillich, for example, all take this position, though there are great differences between them. (The case of Tillich illustrates the point that in some cases it is difficult to distinguish between those who accept the religious tradition and those who reject it. Tillich considers himself a Christian theologian, but his interpretation of Christian doctrine is so unorthodox that many feel he has reconstrued it out of recognition and therefore should be classed with those who substitute a symbolic reinterpretation for traditional beliefs.)

In the other major group we can distinguish between those who simply reject traditional religion (Holbach and Russell) and those who in addition try to put something in its place. In the latter group we can distinguish between those who try to retain the trappings, perhaps even the doctrinal trappings, of traditional religion but give it a nonsupernaturalistic reinterpretation, usually as symbolic of something or other in the natural world (Santayana), and those who attempt to depict a quite different sort of religion constructed along nonsupernaturalistic lines (Comte, Dewey, and Wieman).

Outside this classification are those analytical philosophers who restrict themselves to the analysis of concepts and types of utterances. We may regard them as not having a major position in the philosophy of religion, but rather as making contributions that may be useful in the construction of such a position.

Bibliography

Edwin A. Burt, *Types of Religious Philosophy*, rev. ed. (New York, 1951), and Robert Leet Patterson, *An Introduction to the Philosophy of Religion* (New York, 1958), are useful introductory textbooks. A wide variety of readings in the field can be found in George L. Abernethy and Thomas A. Langford, eds., *Philosophy of Religion* (New York, 1962), and in William P. Alston, ed., *Religious Belief and Philosophical Reflection* (New York, 1963).

The following works are important treatments of a wide variety of topics in this area: John Baillie, *The Interpretation of Religion* (New York, 1928); H. J. Paton, *The Modern Predicament* (New York, 1955); A. E. Taylor, *The Faith of a Moralist* (New York, 1930); and F. R. Tennant, *Philosophical Theology* (Cambridge, 1928). These works are written from a standpoint more or less sympathetic to traditional theism. For fairly comprehensive discussions from a more critical standpoint, see J. M. E. McTaggart, *Some Dogmas of Religion* (London, 1906), and Bertrand Russell, *Religion and Science* (London, 1935).

Works dealing with the nature and significance of religious experience include William James, *The Varieties of Religious*

Experience (New York, 1902), and Rudolf Otto, *The Idea of the Holy*, translated by J. W. Harvey (New York, 1958). The nature of religion is discussed in Josiah Royce, *The Sources of Religious Insight* (New York, 1912), and in Julian Huxley, *Religion Without Revelation* (New York, 1958). For the relation of religion and science, see Bertrand Russell, *op. cit.*, and Michael Pupin, ed., *Science and Religion; a Symposium* (New York, 1931). J. H. Newman, *A Grammar of Assent* (London, 1870), and Paul Tillich, *Dynamics of Faith* (New York, 1957), cover the nature of religious faith as a mode of belief and/or awareness.

In Emil Brunner, *The Philosophy of Religion From the Standpoint of Protestant Theology*, translated by A. J. D. Farrer and B. L. Woolf (Edinburgh, 1937), the nature of revelation and its relation to the results of human experience and reflection are considered. The place of religion in human culture as a whole is dealt with in G. W. F. Hegel, *Lectures on the Philosophy of Religion*, translated by E. B. Speirs and J. B. Sanderson, 3 vols. (London, 1895), and in George Santayana, *Reason in Religion* (New York, 1905). For the logical analysis of religious language, see A. G. N. Flew and Alasdair MacIntyre, eds., *New Essays in Philosophical Theology* (London, 1955), and C. B. Martin, *Religious Belief* (Ithaca, N.Y., 1959). Edwyn Bevan, *Symbolism and Belief* (Boston, 1957), and W. T. Stace, *Time and Eternity* (Princeton, N.J., 1952), discuss the nature and significance of religious symbolism. Possibilities for reconstructing religion along relatively nontraditional lines appear in Immanuel Kant, *Religion Within the Limits of Reason Alone*, translated by T. M. Greene and H. H. Hudson (La Salle, Ill., 1934); John Dewey, *A Common Faith* (New Haven, 1934); and Julian Huxley, *op. cit.*

WILLIAM P. ALSTON

PHILOSOPHY OF SCIENCE, HISTORY OF.

The philosophy of science, as a distinct branch of philosophical inquiry, is of fairly recent origin. Formerly, with the exception of the work of Francis Bacon, the philosophy of science formed part of the general theory of knowledge. In reading Locke, for example, one has to infer from his general epistemology what his views on the specifically systematic, experimentally controlled, critical exploration of nature are. The idea that there are logical, epistemological, and metaphysical problems that are peculiar to or particularly pressing in the systematic sciences and that differ from the corresponding problems in the more ordinary commerce of mind did not really take root until the early nineteenth century. To keep this survey both reasonably detailed and of manageable proportions, we shall begin with the first great controversy of the modern era, that between Whewell and Mill in the second quarter of the nineteenth century.

In the account which follows, a grand opposition is brought out by dividing most of the leading characters into two camps. On the one hand, there are those philosophers who see the generation and justification of hypotheses as inductive processes from particular items of evidence; who hold causation to be nothing but regularity of succession; and who aim at the reduction of all theoretical concepts to functions of those observables from which, by induction, theory is supposed to spring. In this camp since 1850 there have been J. S. Mill, Benjamin Brodie, Ernst Mach, Karl Pearson, Pierre Duhem, Philipp Frank, Carl Hempel, Rudolf Carnap, and R. B. Braithwaite. In opposition there have been William Whewell, Ludwig Boltzmann, N. R. Campbell, and lately a group of philosophers and scientists who hold that the processes of theory construction are more complex than inductivism will

allow; that the meaning of theoretical concepts is not exhausted by logical function and observational basis; and that actual procedures of science have more authority than formal logic has. It would seem that Rudolf Carnap, although originally belonging to the former, reductionist camp, must now be said to belong to the latter, realist group.

The operationist theory of Mach, lately expounded with vigor by P. W. Bridgman, lies at the far extreme of reductionism. This theory of science claims to reduce the meaning of all empirical statements to descriptions of experimental operations. At the other extreme lies the weak romanticism of Henri Bergson, a perennial temptation for those who leave the canons of formal logic too far behind. Finally, there should be mentioned the sophisticated *commodisme* of Henri Poincaré, a view not easy to classify, which has been understood as asserting that in formulating theory we are, under the guidance of convenience, choosing conventions rather than developing a picture of reality, or merely generalizing the results of observation into forms convenient for logical manipulation.

MILL AND WHEWELL

For Mill the central problem in philosophy of science was to give a correct account of the function of the particular facts of observation and experiment; for Whewell it was to give a correct account of the function of theory. For Mill all knowledge was sensory in origin; for Whewell some part of the items of knowledge was contributed by the knower. Unfortunately, the extremely suggestive and potentially fruitful works of Whewell were overshadowed by Mill's elegantly expounded but crude empiricism.

Whewell and Mill each brought into the philosophy of the nineteenth century a leading strand of eighteenth-century thought. Whewell was oriented toward Kant and Mill toward Hume, but both developed less rationalist versions of the doctrines of their philosophical progenitors. Whewell played down the a priori and deductive elements that Kant had emphasized in the establishment of the categories in which knowledge is to be framed, Mill would not allow any necessary truths, not even the axioms of mathematics, which Hume had distinguished from "matters of fact and existence."

Knowledge, Whewell thought, was not derived entirely from the senses but was a product of sensations and ideas. A scientist makes a discovery when he finds that he can, without strain, add an organizing idea to a multitude of sensations. When Kepler, for instance, added the organizing concept of the ellipse, a particularization of the idea of shape, to the known astronomical data, he found that he organized them without strain. This is how we should understand his discovery of the elliptical orbit of Mars. Whewell called this organizing of data by ideas particularized into concepts the colligation of facts. The addition of new data to the scientist's stock of unexplained facts makes demands upon his stock of conceptions, which sometimes can be met from the stock on hand, but sometimes not. New data require that concepts be refined, analyzed, made more precise, in what Whewell called the explication of the conceptions.