

Reviews

The Study of Religion and Its Meaning: New Explorations in Light of Karl Popper and Émile Durkheim. By J. E. BARNHART. The Hague: Mouton, 1977. 216 pages. \$25.50.

J. E. Barnhart criticizes two contemporary fashions in the interpretation of religion: the logical positivist attack on religion, or religious language, as cognitively meaningless and the Wittgensteinian defense of religion, or religious language, as noncognitive in the first place. He objects to these views exactly because they make religion a noncognitive enterprise—the Wittgensteinians contending that religious statements do not seek to be cognitive, the logical positivists assuming that religious statements seek to be cognitive but fail.

Barnhart asserts that religious statements are cognitive in both aim and effect. Against the Wittgensteinians he argues that religion serves its noncognitive functions only in addition to its cognitive function, not in place of it. Against the logical positivists he maintains that religion is genuinely, not just putatively, cognitive: It succeeds, or can succeed, in making cognitively meaningful statements about the world.

Ultimately Barnhart is concerned with reconciling religion with science, but he is concerned with doing so in only one of two main ways. One way is by considering religion unlike science, in which case religion runs askew to science and so cannot conflict with it. Deeming religion noncognitive, as the Wittgensteinians purportedly do, is the most extreme means of preventing a clash with science. Deeming religion metaphysics, or an explanation of ultimate reality rather than, like science, of physical reality, keeps the two apart without sacrificing the cognitive status of religion.

The other main way is by considering religion like, not unlike, science. Deeming religion an explanation of the physical world is the most extreme means of linking the two. Religion here not only makes factual statements but, more, makes factual statements about the physical world. This option, however, reopens the possibility of a clash. Again deeming religion metaphysics makes religion like science insofar as religion makes factual statements but fends off a clash insofar as religion makes factual statements about ultimate, not physical, reality. Barnhart certainly seeks to reconcile religion with science by making the two alike, but whether he means to do so by making religion science or by making it metaphysics he does not make clear.

In the nineteenth century, one might say with bold-faced simplicity, religion was often conceived to be incompatible with science precisely because it was conceived to be a rival explanation of the physical world. Not only philosophers and theologians but also social scientists held this conception, as the views of anthropologists such as Edward Tylor and James Frazer illustrate. In the twentieth century, one might say with equal simplicity, religion has been typically conceived to be compatible with science exactly because it

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has been conceived to be other than an explanation of the physical world, whether because metaphysical or because noncognitive altogether. Again this conception is evident not only in philosophy and theology (e.g., in the development of religious existentialism, with its emphasis on the act rather than the object of commitment) but also in the social sciences (e.g., in the development of functionalism, with its emphasis on the social and psychological functions served by religion when it is believed to be true rather than on the truth itself of religion). The shift in analytic philosophy from logical positivism to Wittgensteinianism—both, to be sure, twentieth-century phenomena—parallels the general shift in philosophy, theology, and the social sciences from an intellectual to a nonintellectual conception of religion.

Against this background Barnhart strives to restore the intellectual dimension of religion not as the whole of religion but as its center or at least starting point. He is not alone in his effort. He is indeed akin to philosophers of religion such as Basil Mitchell and John Hick, who are reacting to the stress by Wittgensteinians such as R. B. Braithwaite and D. Z. Phillips on the nonintellectual nature of religion. He is also akin to sociologists and anthropologists such as Peter Berger, Robin Horton, Victor Turner, Clifford Geertz, Mary Douglas, and above all Claude Lévi-Strauss, all of whom are similarly reacting to the nonintellectual, functionalist views of Émile Durkheim, A. R. Radcliffe-Brown, Bronislaw Malinowski, and others.

Barnhart's attempt to restore the intellectual status of religion is entirely admirable, as are the several means he employs. Against Wittgensteinians, existentialists, and functionalists alike he stresses the preposterousness of denying or demoting the intellectual side of religion. As he in effect says, it is difficult to see how religion can serve any nonintellectual functions without at least being accepted as true. He argues most persuasively against Søren Kierkegaard, whom he faults for not recognizing that the existentialist act of commitment *per se* does not suffice to yield religion: The commitment must be to some belief, the validity of which surely matters.

Against logical positivists Barnhart, unlike Ian Barbour and other proponents of an intellectual view of religion, does not appeal to criticisms of the objectivity of science and of scientific language by Thomas Kuhn, Paul Feyerabend, Russell Hanson, Stephen Toulmin, Willard Quine, and others. He does not, that is, argue negatively that religion is no less objective than science because science is no less subjective than it. Nor does he appeal to the failure of the logical positivists to formulate a verification test which science could pass but religion fail. Instead he appeals positively to the capacity of religion, either at present or in the future, to pass what for him is the true test of cognition: the falsification test devised by Karl R. Popper.

As admirable as Barnhart's aim is, there are some "loose ends" in his effort. First, he never makes clear whether religion is for him science or metaphysics. Second—and underlying this ambiguity—he never makes clear whether the falsification test is for him the falsifiability of empirical claims made by religion, in which case religion itself is empirical, or the recognition of logical contradictions in religious belief, the contradictions constituting a kind of falsification of belief. Since those contradictions can be within the tenets themselves rather than between them and experience, religion itself can be metaphysical rather than empirical.

Third, Barnhart never explains the importance of Durkheim, who, together with Popper, supposedly provides the key impetus to Barnhart's "new

explorations." Presumably Durkheim's importance is, in contrast to Popper's, negative. Emphasizing as he does the function rather than the meaning of religion and the social rather than intellectual function of it, Durkheim presumably epitomizes a nonintellectual approach to the phenomenon. If Durkheim's significance is negative, and negative because nonintellectual, there are surely stronger, clearer culprits—notably, Radcliffe-Brown and Malinowski. If, however, Durkheim's importance is positive, Barnhart never makes that positive importance clear.

Fourth, Barnhart never makes clear whether he opposes Wittgensteinians for deeming religion noncognitive altogether, as he ordinarily says, or, as he sometimes implies, for deeming it cognitive in its own distinctive fashion, one impervious to any assessment by science. In any event not all Wittgensteinians in fact deem religion noncognitive. Braithwaite and Phillips may, but John Wisdom, for one, does not. Moreover, Wittgenstein himself in his *Lectures and Conversations* deems religion a world view and as such cognitive, even if not scientific.

Fifth, Barnhart seemingly overlooks criticisms of Popper's falsification test. That test has been as severely criticized as the verification test of the positivists; yet Barnhart never notes, let alone meets, the criticisms. He thereby implies that Popper has established conclusively the true test of scientific worthiness.

These criticisms aside, Barnhart's book is a bold and refreshing work that seeks above all to bring religion and science closer together.

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The Triumph of Evolution: American Scientists and the Heredity-Environment Controversy, 1900-1941. By HAMILTON CRAVENS. Philadelphia: University of Pennsylvania Press, 1978. 351 pages. \$17.50.

Hamilton Craven's emphasis in this book can best be appreciated perhaps by noting a statement he makes in the preface: "Perhaps inevitably the ideals and the customs denoted by such words as equality, freedom, opportunity, and democracy mean different things for the champions of the hereditarian than for the advocates of the environmental explanation of human behavior." Cravens has a strong bias, permeating the entire book, toward regarding various scientists' ideas on the nature-nurture controversy as being strongly dependent on their social origins and the cultural milieu in which they find themselves. In consequence the book is much more Cravens's sociological analysis of the factors underlying the development of the nature-nurture controversy than a consideration of the actual scientific discoveries that guided the thinking of scientists.

In the first section ("The Discovery of Nature, 1890-1920") Cravens discusses the development of biology and psychology, focusing on the major scientists in this early era, their backgrounds, training, and their contributions to

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the ideas that formed their sciences. In the second section ("The Discovery of Culture, 1900-1941") the same approach is taken with respect to the development of anthropology and sociology.

The scientific discoveries and ideas deriving from them are given only the most shallow treatment, so shallow indeed that a naïve reader would find it impossible to give any real meaning to some of the author's statements. For example, Cravens mentions in passing that, "by the early 1900s, probably most American psychologists were gravitating toward the Mendelian, rather than the biometric, description of inheritance" (p. 80). The nonscientific reader cannot possibly interpret this statement and can have no understanding that the Mendelian versus biometric approaches were not merely different ways of describing inheritance. There was a serious scientific controversy among the proponents of Mendelism and the proponents of biometrics with respect to the fundamental genetic mechanisms governing inheritance. Cravens provides no insight into the theoretical nature of the controversy, the evidence bearing on it, or its resolution.

Even if the book cannot be considered to be a real history of science, it might have been a valuable contribution to the sociology of science. Though Cravens provides some interesting insights into the sociological factors affecting the controversies between the biopsychological scientists on the one hand and the anthropological and sociological scientists on the other, particularly concerning the latter's struggle to define the domains of their investigations, many of his sociological analyses are at the least arguable and impress the reader as being vulgar clichés.

It is Cravens's repeated suggestion, congruent with the position he enunciates in the preface, that scientists holding the "hereditarian" view were conditioned to their ideas by their "middle-class, WASP" origins, that, in other words, these ideas were affected powerfully by self-serving, sociopolitical motives. By contrast those emphasizing environmental determinants of behavior came to their positions through their commitments to social justice and their firm beliefs in the dignity of man. This moral evaluation of scientists on the basis of their scientific inferences, particularly when the scientific foundations of their conclusions are treated with so little depth, is distasteful.

Additionally some of Cravens's statements regarding the effect of social background on scientific thought do not even make sense. He says that "it was natural for most American biologists to approach the issues of the Neo-Lamarckian controversy from a largely biological perspective, for such a point of view was powerfully reinforced by both the intellectual traditions of their science and their cultural backgrounds as middle class, Anglo-Saxon Protestants" (p. 38). Since the Neo-Lamarckian controversy was in fact a controversy regarding the biological mechanisms of evolution, it is difficult to see how any scientist, regardless of background, could have viewed it except from a biological perspective.

The third section ("The Heredity-Environment Controversy, 1915-1941") is meant to be the book's core and culmination. This is divided into three chapters, the first on the rise of the eugenics movement, the second on the instinct-learning controversy, and the third on mental testing. Again the emphasis is on sociological analysis rather than scientific discoveries, though Craven devotes some attention to the new genetical discoveries showing the complexity of the mechanisms of inheritance.

These new discoveries showed that morphological traits can be controlled by multiple genetic loci and alleles and that extreme environmental conditions could affect the genesis of the trait. Cravens maintains that these discoveries weakened the "hereditarian" position and offered support for the "environmentalists." In fact, however, these findings had relevance for the mechanisms of morphogenesis but very little for the issue of what causes differences among people.

The early thinkers (and Cravens evidently) were unclear in their own minds about the distinction between the developmental issue and the variability issue, but at all stages of its development the nature-nurture controversy was centered on the question of what causes people to be different. The proponents of the "instinct school" asserted two claims: (1) The development of behavioral traits was under control of a genetic program that necessarily became manifest with development, and (2) differences among animals were due to differences in instinctive programs. Similarly proponents of the "learning school" made two distinct claims: (1) The development of behavior was under control of environmental contingencies, and (2) differences among animals were due to differences in environmental experiences.

By the 1940s it finally was understood that the developmental controversy was not a real scientific question, that from the moment of conception until death the traits displayed by an organism were the result of an inseparable and intimate transaction between a genetically specified range of reaction and the environment in which the genetic specification was realized. Thus, while Siamese cats normally have darkened fur on the tips of their legs, tail, ears, and face, if the tips are warmed artificially during the developmental period darkening does not take place—the genes for pigmentation in these regions are not expressed. It is not therefore a meaningful scientific question to ask, "Is the coat pattern in Siamese cats due to genes or to environment?" In one environment one coat-color pattern will emerge; in another environment another coat-color pattern will emerge. But these same environmental variations imposed on Persian cats have no effect on the coat-color pattern. It was this inseparability of genes and environment in the control of development that finally was recognized by the 1940s, but this recognition, contrary to Cravens's claims, in no way served to resolve the variability issue.

To ask what causes differences among organisms is a scientific question, and there are means available for answering it. Simply put, the question is: Of all the observed variation in some trait under consideration, what proportion of that variation is due to variation in genes, what proportion is due to variation in the experienced environments, and what proportion is due to a nonadditive interaction between the two? This question may be asked with respect to variations within a given breeding population (e.g., white North Americans), and it may be asked with respect to average variations between breeding populations (e.g., differences between American whites and American blacks).

Though a large majority of knowledgeable researchers (but not all) believes that the answer is in with respect to IQ variations within the white North American population and that probably the answer is the same within the black North American population, there is little, or no concurrence regarding between-group differences. In particular it appears that from 60 percent to 80 percent of the observed differences in IQ among white North Americans is due to genetic variations, and from 40 percent to 20 percent is due to en-

vironmental variations, there being little evidence for any nonadditive interaction between genetic and environmental factors. Those who hold that as much as 90 percent of the variation is due to genetic differences recognize the developmental inseparability of genes and environment just as much as do those who maintain that 100 percent of the variation is due to environmental differences. Thus, while it might be satisfying to accept Cravens's claim that the developmental understanding acquired by the 1940s resolved the nature-nurture controversy, the claim is simply false.

Whatever resolution might be claimed to have been accomplished by the 1940s is of a very different sort from what Cravens asserts. It was not that researchers all concurred that the nature-nurture dichotomy was a meaningless issue but rather that there was a substantial agreement that a large fraction of the IQ variations among white Americans was attributable to genetic variation. It should be noted that the acceptance of this position was not at all incompatible with the fact that improved environments generally result in a raising of IQ. If 70 percent of IQ variations are due to genetic factors and 30 percent to environmental factors, this means that on the average if an environment is improved from one that is worse than 86 percent of all environments to one that is better than 86 percent, IQ will increase by slightly over sixteen points. Studies that merely show that an environmental improvement raises IQ do not provide, as Cravens seems to imply, evidence against the importance of genetic factors.

The question as to what causes the average difference in measured IQ between black and white Americans was not resolved in the 1940s and is not resolved currently. There has been no definitive establishment either that group differences are solely due to environmental differences or that group differences are in part due to genetic differences. There is evidence bearing on this issue, but it is far from sufficient to warrant a contention that the question is settled. Though he never states so directly, Cravens seems to imply that the question is answered in favor of the former hypothesis. There are many who hold this view and also others who hold the opposite view, but in order for Cravens to reach the conclusion he does he would have to assume that, in the first case, opinions are based on careful scientific considerations, while, in the second case, opinions are based on rather base sociopolitical considerations. Again the reader is confronted with a moral evaluation of scientists on the basis of their scientific beliefs, an evaluation that in fact has no empirical foundation.

In a final and very short (slightly over five pages) section entitled "The Triumph of Evolution," Cravens repeats his conclusion that by the 1940s the nature-nurture controversy "had run its course" and that most American scientists considered the issue to be unanswerable in principle. He comments that in recent years there seems to have arisen "a minor revival" of the nature-nurture controversy (a statement dependent on his assumption that at one time it had been resolved), a revival he attributes to a current "racial and ethnic polarization." The central possibility that scientific discoveries themselves have played and continue to play the major role in the continuing controversy, that scientists actually are concerned to understand the data provided by scientific experimentation, and that their central goal is not politically motivated seems to be one that Cravens is unwilling or unable to consider.

In this final section Cravens provides a review of the ideas he has presented throughout the book and finally asks how much impact the discoveries of the first half of this century have had on current thinking. He concludes that, although "only a large minority of . . . Americans who identify with our homogenized middle-class, WASP culture" are adherents of evolutionary science, the ideas themselves have permeated our social institutions. He cites as evidence the fact that industries employ industrial psychologists, that achievement tests are used for admission to schools and colleges, and that various social institutions "operate on particular assumptions" (which Cravens leaves unspecified) derived from "modern human science."

The fact that even in 1980 it is still members of the WASP culture who attempt to institute state laws requiring the teaching of biblical creation in public schools, or that industrial psychologists and standardized achievement tests could legitimately be employed by those who might utterly reject evolution and its implications, seems to have no bearing on the conclusions Cravens reaches. The triumph of evolution, as Cravens sees it, is not a triumph of any grand syntheses of human thought, not a remarkable achievement of human understanding, not a new perspective from which to view the development of human culture itself, but a pragmatic willingness to utilize a few technical developments that, for whatever reasons, happen to work. If this is all that the intellectual breakthroughs of Francis Galton, Karl Pearson, Thomas Hunt Morgan, Ronald Fisher, Sewall Wright, J. B. S. Haldane, Lewis Terman, Edward Thorndike, Robert Yerkes, and the other early scientists have meant, what a tragedy for human genius.

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Mind and Nature: A Necessary Unity. By GREGORY BATESON. New York: E. P. Dutton & Co., 1979. 238 pages. \$11.95.

Gregory Bateson, who died in July 1980, was a highly respected, original, and brilliant teacher and biologist of international renown. He also was considered one of the founders of the family therapy movement.

One of Bateson's main themes here is that biological evolution is a mental process. Quantitative thinking, prevalent in occidental philosophy, is contrary to the natural order. We must analyze the actual patterns of the world around us, their connections, the relations among living creatures including crabs and lobsters, orchids and human beings. We must find the content of patterns through time.

A recurrent thesis is that "it is possible and worthwhile to think about many problems of order and disorder in the biological universe." This book presents an intriguing concept of how the mental aspects of the world are interconnected: How is logic related to the outside world of things and creatures? Do ideas occur sequentially in chains, or is this lineal structure imposed by our philosophical approach? Unfortunately we do not have suitable methods to

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answer these questions. Logic and quantity are inappropriate for describing the interactions or internal organization of organisms: "There is no conventional way of explaining or even describing the phenomenon of biological organization and human interaction."

In spite of these obstacles, bits of information are presented and combined leading to chapter 4 ("Criteria of Mental Process"), explaining the characteristics which seem to be combined in the biosphere to make mind. This is the cornerstone of the book, in which anecdotes and examples are interwoven with philosophical ideas, making the text both readable and enjoyable. The high level of Bateson's abstract thinking is challenging and thought provoking.

In addition to pointing out the excellent qualities of this book, I offer the following critical comments:

The heterogeneous qualities of mental functions are not discussed, and their absence may constitute a source of confusion. Misunderstandings in philosophical discussions often are related to different—but undisclosed—concepts of the mind. Meaningful exchange is difficult if in a discussion of mind one author is considering language and another positive reinforcement as if they were identical functions. In reality the term "mind" includes many functions such as memory, perceptions, ethics, and behavior. Each activity has special anatomical, neurochemical, physiological, and psychological mechanisms. Inquiry may be clarified by identifying determined aspects of the mind and avoiding the vagaries of undefined entities.

The list of criteria of mental processes in chapter 4 is interesting, but I doubt that it captures the essence of mind. For example, many nonmental physiological phenomena such as muscle contraction would satisfy the six points of this list. Also debatable is the premise presented as essential that "mental function is immanent in the interaction of differentiated parts." Unless these parts are identified, the statement is meaningless.

In a previous paper ("Triunism: A Transmaterial Brain-Mind Theory," in *Brain and Mind*, Ciba Foundation Symposium 69 [Amsterdam: Excerpta Medica, 1979], pp. 369-96) I proposed the following elements to identify the mind: (1) existence of the brain, including its anatomical and functional properties; (2) the flow of nonmaterial extracerebral codes of information originating in the environment, entering through the senses, changing material carriers, and being materialized in the anatomical and chemical structure of neurons which they shape; and (3) the manifestations of 1 and 2 internally as perceptions and externally as behavior. In the absence of 1 the mind cannot exist; lacking 2 the mind cannot be structured; and without 3 the mind cannot be recognized by the individual or by the environment. Each of these three elements may be the subject of experimental analysis.

In my opinion an experimental and specific approach toward understanding of the mind should be integrated with Bateson's more philosophical and general systems approach.

The last chapter is a delightful dialogue between "daughter" and "father," summarizing the main controversial issues presented. The appendix ("Time Is out of Joint") offers challenging ideas about the obsolescence of current educational processes, including Cartesian dualism, physicalism of metaphors such as power, tension, and energy used in relation to mental phenomena, and the assumption that all phenomena, including mental, may be considered in quantitative terms.

I agree with Bateson's statement that our schools may offer good technical training but are obsolete in mental and humanistic education, placing the blame both on the board of regents and on the students. The solution is not easy because we are confronted with the dilemma of watching some aspects of culture evolve too fast while others lag far behind.

What is new in the relations between mind and nature is our present tremendous increase in knowledge and technology which is establishing human intelligence as a new element in natural destiny. This fact places upon us the responsibility of defining the kind of human beings we would like to develop, which in turn involves a careful consideration of the purpose of human life. Our future will depend less on nature and more on mind. We must use our atomic power wisely—or else. We must humanize, in my term psychocivilize, the minds of the future for civilization to survive and flourish (see my *Physical Control of the Mind: Toward a Psychocivilized Society* [New York: Harper & Row, 1969]). Bateson's book may be an important step in this direction.

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Our Cosmic Journey: Christian Anthropology in the Light of Current Trends in the Sciences, Philosophy, and Theology. By HANS SCHWARZ. Minneapolis: Augsburg Publishing House, 1977. 379 pages. \$12.95.

In our age attempts at global thinking and cross-disciplinary synthesis usually are met with charges of dilettantism. Still there occasionally appears a book which sweeps courageously if not heroically across the current intellectual scene in the natural and human sciences, theology, and even political science in an effort to achieve a unitary vision of the sciences and the humanities. Hans Schwarz's *Our Cosmic Journey* is such an effort. It is a welcome contribution to a growing realization that synoptic perspectives are valuable, even necessary, if we are to forge a consensus paradigm for survival in the twenty-first century.

Schwarz's treatment of the structures of contemporary science includes sections on the most recent theories of astrophysical cosmogony, population genetics, evolution, and behavior modification. Quite obviously he has engaged in an enormous program of preparatory research and reading; the notes, bibliographical references, and three indices run over one hundred pages. While his exposition of these fields is clear and well controlled, a question still arises as to his own preparation for his ambitious task.

Certainly the scope of the survey is ambitious, but the author makes no claims to being an authority in any of the scientific sectors he explores. We often feel intimidated when credentialed experts in a narrow field of competence argue about esoteric questions in the specialized jargon of their trade. Through his competent exposition Schwarz shows us that such feelings of intimidation are as much our problem as theirs. The basic principles of any

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region of human knowledge surrender to the persistent inquiry of the intelligent layman who wishes to expand his knowledge of that discipline. This book is a fine example of how the taboo against unlocking doors between compartments of knowledge may be overcome responsibly.

These status reports on the current state of the art in science occupy the reader for the first three of the book's seven chapters. Schwarz advances two central reasons for their inclusion in a work guided primarily by a theological impulse. First, he wants to show that theories of cosmic and biological evolution and psychosocial thinking about the human animal are illuminating but incomplete. They fail in themselves to provide the total perspective, the essential meaningful vision of an ultimate purpose required for the continuing success of our journey. Second, he maintains more positively that science and its discoveries offer sharp focus to what otherwise would be impotent generalizations and abstractions about the nature of ultimacy and the purpose of the world process. Hence theology completes what science begins, and science details what theology claims: "Science endows theology with particularity and specificity and theology gives to science ultimacy and universality" (p. 120).

The remaining four chapters of the book, while elaborating somewhat upon the descriptive accounts of the first three, betray an abrupt shift in language and perspective. Here the reader encounters theological categories which control Schwarz's thought. He develops the notions of God as creator, the problem of evil, human sinfulness, and divine providence. With the exception of an eight-page excursus devoted to "the psychoanalytic view of the human predicament" in a chapter on evil, theological issues and supportive resources, that is, the Bible and classical theological figures, dominate the perspective and dictate the content of these chapters. Once again Schwarz's exposition is concise, clear, and highly informative; he shows his mastery of the Judeo-Christian tradition.

Still this sequential treatment of scientific and theological material concerns us. While the author claims that "to arrive at a total view of humanity, we cannot leave the two enterprises remaining standing side by side" (p. 120), he nonetheless places them in just that relationship or, if not side by side, at least in tandem. All the fascinating discoveries of contemporary scientific inquiry are not integrated into the subsequent theological exposition as a contribution to the required specificity of ultimate matters. Hence the reader is left somewhat on his own to speculate about the connections. We feel that reality remains segregated in a version of the two-realms theory involving nature and supernatural, creation and creator. The book seems to suggest that natural and human processes provide the mundane means with which God articulates and approaches the completion of his intentions for the world. However, the real meaning of cosmic processes is disclosed only through divine revelation, essentially the acts of God in human history as found in scripture and elaborated by faithful reason within the confessing community. Once the why of things in their togetherness is known, the how of their particular character is of considerably less importance. Except possibly for evidence in support of the claims that the world disclosed by science is consistent and dependable, suggesting a trustworthy creator, and that things are the consequence of evolutionary processes which continue, suggesting a purposeful creator, Schwarz's position offers no compelling reason why theology should be concerned with the specific theories and discoveries of science at all.

There is a good underlying reason for this predicament. The classic metaphysical categories of Judeo-Christian theology cannot be expected to carry alone the dialogue between science and religion much further than Schwarz carries it. The structure of reality assumed by classic theism is dual and consists of a sovereign and personal God and his companion creation. General revelation, the notion that the fingerprints of the creator remain on his creation to point to his nature and will, is a time-honored method of doing natural theology. Of far greater significance for theology, however, are the data of special revelation as disclosed in specific events, prophets, and savior figures. The content of these historical messages tells the faithful that God cares and that he intends to move things along to an ultimate eschatological reconciliation. Beside this message, all else, including the grandest schemes of science, remains paltry and pale. Metaphysically the absolute gap between God and world abides not to be bridged by an effort from man's side, while soteriologically the message of a future world transformation is complete.

The structures of human life and nature, the author says, "do not suffice to illuminate the origin, direction, and goal of our cosmic journey. . . . this does not mean that the inanimate and animate structures become irrelevant. On the contrary, in the light of God's ultimacy and universality, their particularity and specificity can no longer be assumed to be of accidental occurrence" (p. 268). True, yet the particularity and specificity of natural structures by themselves are irrelevant if just how these structures are linked precisely with the broader aims of God disclosed by revelation cannot be shown.

Although some would find the suggestion reprehensible, it is possible to augment this perspective with a philosophical scheme, such as Alfred North Whitehead's process thought, Charles Hartshorne's panentheism, or Pierre Teilhard de Chardin's cosmogenesis. In such cases a metaphysical model provides common ground for articulating the relationship between the natural and the supernatural by including both realms in a common scheme. Once such integrating models enter the discussion, traditional theological categories may be translated, albeit not without the risk of reductionism, into terms relevant to the scientific enterprise. Schwarz does not develop such a model. He remains true to the original Judeo-Christian metaphysic of a transcendent creator uniquely revealing his will in special events. Hence there is little chance that a mediating language between the rational-empirical and the revealed and inclusive of both will develop. The gap remains between the two points of view.

Schwarz has given us a work that will serve admirably as a text for two reasons. It may be used effectively to introduce students and laity to the more recent speculations of futuristic science, and it serves as an effective introduction to theology. The book represents a consistent attempt to explore the interface between contemporary science and the doctrines of traditional theology without the assistance of mediating models in providing illumination and promoting insight. The conclusion of the exercise is clear; revelation completes nature. Those who seek a pure natural theology based upon Judeo-Christian notions by approaching this end in a reductionistic manner through an exclusive appeal to science and its categories would do well to read *Our Cosmic Journey* and confront its conclusions before embarking on their project.

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Scientists and World Order: The Uses of Technical Knowledge in International Organizations. By ERNEST B. HAAS, MARY PAT WILLIAMS, and DON BABAI. Berkeley: University of California Press, 1977. 368 pages. \$19.50.

The authors of this book gathered information for their analysis in interviews with 146 scientists, engineers, and administrators experienced in international programs. The aim of the survey was to determine the attitudes of these professionals toward their own role in framing, implementing, and managing comprehensive world models. Although the responses were mixed, the authors identified a number of factors in the dynamics of international science and political processes. In the final analysis of the information before them, they see that three world-order models are feasible. These are the rational, pragmatic, and skeptical models. Each arises in the relationship, or lack of it, between expert or scientific and technological knowledge and political goals. Where the two are in consensus and where the total picture is attended to, the rational world-order model emerges. However, when specific goals dominate, the pragmatic option becomes more likely. The skeptical world model applies when the experts cannot reach a consensus on a given issue and thus are incapable of advising political leaders on what course they should pursue.

The questions of this book are whether an integration of scientific knowledge is possible and if such knowledge can be applied globally to human needs. The authors themselves are somewhat optimistic. They maintain that despite the fragmentation of knowledge and programs found in the currently dominant skeptical model there exists a real possibility that a pragmatic world order will evolve from the labor of international science and technology and that this in turn will encourage more consensus and holistic policies to emerge on the political scene.

Although *Scientists and World Order* is intended primarily for administrators and scientists from all fields, it may well command the attention of others whose interests lie in promoting global solidarity as the primary means of securing well-being for all peoples. The attention given to the role of models, their evolution, and application within this establishment community of international science is useful to those who would like to see the broadly inclusive visions of science and religion incorporated into this task of realizing a just world order.

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The Road of Science and the Ways to God. By STANLEY L. JAKI. Chicago: University of Chicago Press, 1978. 478 pages. \$21.00.

Stanley L. Jaki's study is based ultimately on an incontrovertible fact of history—the self-sustaining enterprise of modern empirical science developed within a deeply Christian cultural matrix. While not denying the importance of other factors, such as sufficient technological development, Jaki argues that belief in the personal deity of the Judeo-Christian tradition provided the intellectual atmosphere which allowed and stimulated the development of modern science. His basic thesis may be stated quite simply: Within the world view of traditional Christianity the physical world is intelligible, the work of an intelligent creator. It is also contingent; as the free creation of God, it is the way it is as a matter of fact and not by necessity. Furthermore, it is natural for “man to be in cognitive unity with nature” (p. 37) for man to understand the workings of the cosmos. This trust in the intelligibility of the universe and the related dynamism of the human mind gives the scientist confidence that he or she in fact can know the true workings of nature. The recognition of the contingency of the world forces the scientist to ground his or her theories in observational data. The world is intelligible but can be known only through a posteriori investigation. Furthermore, if science is to flourish (this seems to be Jaki's rationale for the late development of science within Christendom), this belief must not be just the attitude of a few outstanding persons but must have deeply permeated the culture.

The first chapters are a summary of the author's earlier work, *Science and Creation* (New York: Science History Publications, 1974), in which he argues that in the cultures of the ancient world an insufficient natural theology, especially in the guise of the “myth of eternal return,” prevented the development of physical science. Aristotle recognized the need for a moderate realism that charted “a middle road between naive realism and dreamy idealism” (p. 22). However, he ultimately opted for an a priori approach to reality which left only the “secondary details” to be discovered by empirical science. On the other extreme the atomists, such as Epicurus and Lucretius, fell into a naive realism. Thus they could argue that the sun and the moon are as large as they appear, about a foot in diameter.

The greatest thinker of medieval Christendom, Thomas Aquinas, made no significant scientific contribution, but in his proofs of the existence of God he outlined the intellectual framework in which science could develop. Copernicus, Kepler, and Galileo, the three chief figures of the astronomical revolution, were all fervent believers in the personal Christian deity and followed that middle course which recognized both the intelligibility and contingency of the world.

Jaki then considers the major thinkers of the modern and contemporary periods, examining their natural theology and its implications for their formulation of scientific method and for their ability to do (or at least recognize) creative science. Again he argues that a middle road must be charted between an empiricism which denies the creative role of the intellect (Francis Bacon, Thomas Hobbes, David Hume, August Comte, John Stuart Mill and Ernst Mach) and an idealism which either despairs of ever gaining true knowl-

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edge or loses its way in a priori system building (René Descartes, Benedict Spinoza, Immanuel Kant, Johann Fichte, Friedrich Schelling, G. W. F. Hegel, and Friedrich Nietzsche). The great exception to either of these temptations is Isaac Newton who allowed his mind to range beyond simple conjunctions of data or curve fitting to seek the basic intelligibility of mechanical systems; ultimately this creative synthesis had to be rooted in the data of nature.

Jaki argues correctly that in the twentieth century Max Planck and Albert Einstein (originators of the two most powerful theories of modern physics, quantum mechanics and relativity) also accepted the centrist philosophical position of moderate realism. However, Jaki seems to be almost embarrassed by the fact that neither of them professed belief in the personal deity of traditional Judaism or Christianity. He contrasts the positions of these two giants of contemporary physics with the positions of other interpreters of twentieth-century science—the empiricism of the Copenhagen school's interpretation of quantum mechanics, the reductionism of the Vienna Circle and logical positivism, the sensationism of Mach and Percy W. Bridgman, and the sociological analysis of the history of science as exemplified in the work of Thomas S. Kuhn.

In the final chapters he summarizes his position by considering the inability of a reductionistic empiricism to deal with the mind-body problem or to ground an ethics in the Western humanistic tradition. Finally he argues that the a posteriori proofs of God's existence can be reduced to the proof from contingency and that contemporary physics and evolutionary biology point to a contingent, purposeful cosmos, the work of an intelligent and free creator.

Does Jaki succeed in his endeavor? Historical analysis does not admit of the simple cause and effect relations of classical physics. With this caveat I think it is fair to say that he has demonstrated that the theistic culture of the West was a key stimulus to the development of modern science. Furthermore, I would agree that most scientists, when actually doing their science, think in a framework that could be described as moderate realism.

Yet Jaki seems to be asking for something more. His religious vision (which for the most part I share) seems to make it difficult for him to imagine how a thinker can espouse a moderate realism and not immediately profess faith in a personal creator. Yet it is precisely at this point that many contemporary scientists and interpreters of science (including Planck and Einstein) would disagree with Jaki. Jaki argues that his purpose is not to do philosophy but simply to lay out the historical conjunction between the road of science and the ways to a (personal) God. Yet his refusal to do philosophy leaves the reader with a feeling of frustration, for implicitly Jaki is urging the reader to assent to the notion of a personal creator and yet withholding the necessary argumentation.

A similar critique can be made of his espousal of moderate realism. He derides much contemporary history of science for its historicism, "a study of history which derives philosophical conclusions from the facts and trends of history without taking stock of philosophy itself" (p. 234). Yet his own philosophical position, which seems to be based on the neoscholasticism of writers such as Jacques Maritain and Étienne Gilson, is never really spelled out. Process philosophers (e.g., Alfred North Whitehead) and the transcendental Thomists (e.g., Bernard Lonergan) would interpret the history of science in a similar vein and also hold a realist view of epistemology and

metaphysics. Yet the details and conclusions of their analysis would be quite different from Jaki's. The position of moderate realism is not quite so "self-evident" as the author seems to believe.

The book is written in a rapid, polemical style, which on the one hand makes for interesting reading but which on the other hand can border on the infuriating. The author's anecdotal approach is often quite incisive, as, for example, when he pictures Hegel not only arguing on a priori philosophical grounds against the need to search for matter between Mars and Jupiter but also publishing his argument even after the observation of the planetoid Ceres. But then a few paragraphs later Jaki insists on describing the cruelties of Russian and Chinese communism and pointing out communism's intellectual debt to Hegel—a reference which only distracts from the overall argument of the chapter.

Jaki's book is a significant contribution to one of the most important questions of intellectual history—the rise of empirical science and its relation to its cultural framework. From the point of view of one working in a country such as China, such a question is of more than academic interest. We are witnessing a process in which the great cultures of the East are attempting to integrate into their society much of the scientific, technological, and industrial culture of the West. Such a process clearly involves more than the assumption of Western techniques and methods of production. The elucidation of the roots of Western science is an important contribution to understanding this process.

Finally the work is a welcome correction to those who would view religion and science as simply feuding camps or as entirely unrelated spheres of human activity. And if the style and philosophical lacunae of the book prompt the reader to search beyond its covers, I would judge that Jaki will be quite satisfied.

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