

Reviews

The Relevance of Physics. By STANLEY L. JAKI. Chicago: University of Chicago Press, 1966. 604 pages. \$12.50.

This remarkable book should be of special interest to readers of *Zygon*. Written by a man who has a doctorate both in physics and in theology, it attempts to put physics in a historical perspective so that both its power and its limitations can be properly recognized. Jaki's thesis is that physics has achieved such prestige in our culture that its practitioners are likely to be regarded and to regard themselves as the new priests who can lead us to all relevant truth and provide us with the power to achieve our ends. The danger is that both the physicists and their cultural devotees will forget the essential humanity of the scientists and the fallibility, incompleteness, and changeability of physical theories.

Jaki is particularly insistent to deny the omniscience of physics to solve problems in other areas of human experience and concern. With these convictions in mind, the author contends that the only way the proper balance and perspective can be attained with regard to the range and relevance, the power and the poverty, of physics is by a study of its history. Jaki takes note of C. P. Snow's problem of "the two cultures," and he is anxious to show how a bridge can be built across the chasm between the sciences and the humanities. The humanist is likely to display one of three false attitudes toward physics: hostility, indifference, and ignorant exploitation of its conclusions. Our author thinks that if it is recognized that physics and the humanities are dealing with different human needs within their own respective spheres of competence, it is possible to recognize both the unity and complexity of truth and the diversity of approaches toward its achievement. The basic thesis of the book appears to be eminently sound to this reviewer, and it may be said with some confidence that Jaki has made an important contribution toward an end which most think is highly desirable.

The book is divided into four parts: a consideration of the world models of physics, the central themes of physical research, the relation of physics to other disciplines, and the place of physics in the wider cultural context. First of all, Jaki looks at the attempts to find some over-all model or scheme which can provide a clue to the secrets of nature: the view of the world as an organism, stated classically by Aristotle, prevailing until recent centuries, and foolishly revived by Hegel and Schelling; the view of the world as a machine, emerging

to dominance in the seventeenth and reigning until the beginning of the twentieth century; and the view of the world as a pattern of numbers, originating with Pythagoras to become particularly important in recent times, but shown to be limited in its capacity to yield unquestioned truth about nature untrammelled by the fallibilities of perception, for example, by the work of Gödel and the recognition of the roots of geometry in experience. Jaki concludes that none of the three is completely satisfactory and that the first has no methodological place at all in physics. There is no key which alone or in combination has so far unlocked all of nature's mysteries.

The essential incompleteness of physical research at every stage and the perpetual necessity for revision of theory is continued in the second part of the volume in which Jaki deals in turn with the layers of matter, the frontiers of the cosmos, and the quest for precision in measurement. Neither the subatomic world nor the realm of the expanding galaxies has yet been fully grasped by man's relentless investigations. Each new discovery opens up new vistas of possible exploration and knowledge, and there is no convincing evidence that finality will ever be achieved. Particularly fascinating is his account of the importance of the determined efforts of scientists to attain exact measurement of the objects of their study, progressively narrowing the gap but never reaching the perfection of absolute precision. He points out, as Max Born argued, that the argument for determinism in classical physics rested largely on the gratuitous assumption that the ideal case, never attained in actual observation, measurement, and experiment, exemplified a conformity to deterministic principles. The richness, complexity, subtlety, and mystery of nature continues to baffle men, ever revealing new doors to be entered patiently and laboriously one at a time. Our author concludes that only a faith that there is an order waiting to be discovered, that it can be discovered, and that accurate knowledge is important can keep the scientist going in his continuing search.

Turning then to the relationship of physics to biology, ethics, metaphysics, and theology, the author seeks to establish the proper limits of physics. Here he finds scientists, philosophers, and theologians to have fallen into egregious error by uncritically and persistently disregarding these limits. What a spectacle he lays before us! The list includes scientists boldly asserting what can and cannot be true in ethics, philosophy, and religion, presumably on the basis of their physical theory, but actually disclosing more about their state of mind than about the universe; philosophers proclaiming what physicists can, will, and must find on the basis of some metaphysical theory, only to be made to look foolish by the never-ceasing march of scientific discovery; and theologians eagerly and often ignorantly grasping at some new physical theory as confirming what the Bible has always taught or locating the work of God in some present gap in knowledge, only to have their assertions nullified by new scientific theory. Jaki castigates severely the scientific positivists, who profess to have overcome metaphysics with methodology, and the metaphysicians who are quick to base elaborate philosophies on the quicksand of a given stage of science and whose views are just as quickly buried with their soon obsolete and often undigested physics.

In his final section, Jaki elaborates upon the dangers and fallacies of scien-

tism, best illustrated in Comtean positivism and Marxist materialism, and makes an impassioned appeal for the study of the history of physics as the best way for scientists, humanists, and the ordinary citizen to get a perspective on the place of physics in culture. Only in this way can the failures, fallacies, and foibles of physicists be balanced with the power, progress, glorious past, present triumphs, and future prospects of physics in its never-ending truth about the physical world.

Though Jaki functions primarily as a historian, his own philosophical point of view is in evidence. Basic to his outlook is the view that physics is not without metaphysical presuppositions and implications but that no given stage of the development of physical theory can be used as a concrete basis for a metaphysical system. His view is that physics requires a "faith" in the order, intelligibility, and contingency of the physical world, a confidence which is constantly supported but never proven by scientific advance. Given the fact that he is a Catholic theologian, we might expect him to hold the conviction that metaphysics and theology must step in to complete the job, using their own sources and methods. This latter point, however, is more implicit than explicit. I am more of an integrationist than Jaki apparently is, for I think it is useful, for some people at least, to seek correlations between science, philosophy, and theology at a given stage in the development of each. As a liberal Protestant theologian, I am not as convinced as he assumedly is of a perennial philosophy and a perennial theology which stand somewhat above and beyond the development of scientific theory. Philosophy and theology are historically and culturally relative and subject to development, though they are not cumulative disciplines in the same way that physics is. I cannot accept either his or the analytical philosopher's program for relating science and theology. However, I would insist that any proposed correlation or synthesis of science, philosophy, and theology be frankly recognized as tentative, incomplete, experimental, and subject to revision as new evidence from science and new intuitions of reality dictate. We have no choice, I think, but to engage in this kind of continuing effort to see reality as a whole on the basis of what will always remain fragmentary evidence. Unfortunately, there is no perennial philosophy or infallible theology that is not subject to perennial uncertainty. I have the feeling that my philosophical skepticism involves more faith and that my religious faith involves more skepticism than Jaki would find congenial.

I found this book to be informative, provocative, and eminently worthwhile. No brief review can suggest the complexity and detail of his argument or the impressive range of his scholarship. I have looked at the book from the standpoint of a theologian who is concerned about the relationship of physics to the theological task. Others will have to judge Jaki as a historian and tell us whether he has told the story of physics well. However, I would venture to say that his basic thesis about the importance of history as providing the needed perspective is correct. In the Introduction to his classic history of the rise of science, Herbert Butterfield writes: "Considering the part played by the sciences in the story of our Western civilisation, it is hardly possible to doubt the importance which the history of science will sooner or later acquire both in its own right and as the bridge which has so long been needed between the Arts

ZYGON

and the Sciences." Jaki, I believe, has made a significant contribution to the history of science in both these senses.

KENNETH CAUTHEN

*Fellow, Center for Advanced Study in Theology and the Sciences
Meadville Theological School*

A Christian Natural Theology. By JOHN B. COBB, JR. Philadelphia: Westminster Press, 1965. 284 pages.

Readers will enjoy and profit from the solid understanding of Whitehead's metaphysics contained in this volume. It is no easy task to grasp the fine structure of Whitehead's system or to present it in a clear and readable manner. Cobb does both. On the other hand, there are a number of ambiguities, both substantive and methodological, that mar Cobb's effort.

On the positive side, we are given a good summary of Whitehead's system leading into a detailed Whiteheadian analysis of the human soul, value and responsibility, and God. By a Whiteheadian analysis, I mean a full-scale use of Whitehead's categorial scheme and language achieving a detail that goes beyond what Whitehead himself presents. Where such detailed extensions and interpretations of Whitehead are worked out, Cobb presents remarkably sound justifications showing his command of the system. We may disagree, as I do at several points, but such disagreements can be clearly stated because of his fine presentation. As a basic principle of this Whiteheadian analysis, Cobb assumes that "The attempt is to explain the way in which God is related to actual occasions, eternal objects, and creativity, in such a way that at no point do we attribute to him a mode of being or relation inexplicable in terms of the principles operative elsewhere in the system" (p. 179). Further, God as an actual occasion "exemplifies the categories necessary to all actual occasions" (p. 176). Adherence to this principle is absolutely essential to the systematic ideal of Whitehead. Both Whitehead and Cobb, I think, slip a few times in adherence to it.

Concerning the discussion of the human soul, Cobb accepts Whitehead's view that the soul is not a single substance but a society of actual occasions sharing a certain experience probably occurring in higher animals as well as man, without pre-existence or life after death, in no sense supernatural, nor a special point of contact with the divine (p. 48). These points bring into focus a general criticism of Cobb's effort, namely, why import Christian theological terms with quite different and often opposing meanings into Whitehead's system? In *Process and Reality*, Whitehead rarely, if ever, uses the term "soul." Do not the dangers of misunderstanding far outweigh the advantages? Why is this tactic so common to theological writers? To talk of one dominant strand of occasions as soul with respect to other occasions making up the body distorts Whitehead's views in the direction of a body-soul dualism (p. 53). Why run this risk? To seek for the distinctive features of human souls (strands of actual occasions, I remind you) in contrast to other animal souls is not relevant to Whitehead's system but tantalizing for other purposes (pp. 56-63). Does this not shift the perspective in Whitehead? To agree, as Cobb does, with the possibility of life after death again involves a distortion of Whitehead's system. In

Whitehead's system, life and death are not sharply defined or very significant states. Rather, the question technically would be: Among certain nexuses of actual occasions that achieve "personal order," what forms of enduring patterns can take place via prehensions of successive members of the personal society? In his discussion of personal identity for the human soul, Cobb wants to take the line that this does not necessarily depend on a body; but this seems to neglect the very basic principle in Whitehead's system that hybrid and conceptual prehensions presuppose physical prehensions, and surely those physical prehensions are close to what a "body" would be in the system. Cobb closes his discussion of the human soul with a section on the locus of the soul. Here, Cobb's detailed grasp of Whitehead's system shows nicely, since the status of "regions" and "standpoints" has left Whitehead interpreters in disagreement. I believe that Cobb needs to draw a distinction between the "region" as the standpoint of prehending and the region as a projected continuum from that prehending standpoint. Both can loosely be spoken of as the region of that actual occasion (pp. 82-91).

Concerning the chapter on freedom, value, and responsibility, Cobb's analysis is not nearly so Whiteheadian. Readers of Lucian Price's *Dialogues of Alfred North Whitehead* are aware that Whitehead had little sympathy with the usual discussions of ethics which he felt suffered from puritanical, Victorian, and Christian blindness and prudery. In this chapter, Cobb gives too much attention to *Adventures of Ideas*, couched in everyday language, and insufficient attention to the need to restate this material in the technical system of *Process and Reality*, despite the fact that he launches his discussion of freedom from the technical base of *Process and Reality* (pp. 95-97). Cobb admits that his shift to talk about intrinsic value, moral obligation, ought, and responsibility is generally foreign to Whitehead (p. 98). I find it doubtful that Whitehead would allow talk about "the good" in his system. On the contrary, there are many goods, often incompatible, that constitute the subjective aims of actual occasions. Nor do I think Whitehead would assent to Cobb's statements that "Morality presupposes the objectivity of values. Until we know what is valuable in itself, apart from all considerations of further consequences, we have no basis for morality and no meaning for life" (p. 98). Whitehead's view requires that we discard the old dichotomy between objective and subjective. Values are eternal objects, contrasts, or propositions, functioning as data in highly complex prehensions, while valuing is the subjective form of such complex prehensions. Whitehead would have shuddered at the old dictum that we have no basis for morality or meaning for life without intrinsic values. Technically, such statements are simply not well-formed formulas in his system. Informally, he would suggest that bases for morality reside in the subjective aim of individual occasions, or enduring patterns of societies. Similarly, "meaning for life" is a dangerous slogan: "societies" of actual occasions manifest many meanings for life in their vastly diverse functioning, even sometimes radically changing their "meaning." A really detailed account of a Whiteheadian theory of value has yet to appear. I believe Cobb's Christian influences lead him astray on these ethical points. On the other hand, Cobb's account of beauty and harmony strike me as an excellent exegesis of Whitehead, making sound use of the system. Similarly, Cobb's description of our sense of obligation as a

certain subjective form of a complex prehension is Whiteheadian par excellence (pp. 114–15), but his subsequent discussion (pp. 115–25) of “what I ought to do” is quite independent of Whitehead’s system.

Cobb’s account of “Whitehead’s Doctrine of God” (chap. iv) is sensitive and excellent, marred only by a short closing section in which he gives a kind of cosmological argument for God. Cobb begins: “There is a deep human intuition that the order of the world requires for its explanation some principle of order that cannot entirely be attributed to the entities that constitute the world” (p. 170). Some people lack this intuition, and I doubt if Whitehead relied on it. The backbone of the argument is the old standby: “From the *simply* material, the wholly inert, the totally passive lumps of the earlier theory, it is incredible that random variation could produce life and mind” (p. 171). While Whitehead’s system is opposed to such an account of nature, he never argued in this way, being all too aware of the mincemeat philosophers would make out of it. Basically, of course, Cobb is right that Whitehead thought God essential to the orderliness of his cosmological system. But the fact that Whitehead does *not* turn to the usual theological moves to support his view should give us serious pause. He knew the pitfalls.

The purpose of Cobb’s “Whiteheadian Doctrine of God” (chap. v) is excellent: to treat God as an actual entity and in no way as an exception to the categories or principles governing all actual entities (p. 179). This is pure gold and, on the whole, is beautifully adhered to. Cobb’s intimate understanding of the system is shown, for example, in his discussion of God and time. Interpreters of Whitehead are often misled into talking about the concrescence of an actual entity as a temporal process, for Whitehead even talks of an initial phase, subsequent phase, etc. But time and temporality are derivative from prehensive relations among actual entities. An actual entity by itself becomes—has phases—in its concrescence, but not temporally or in time. “It happens all at once as an indivisible unit” (p. 186). So the change, growth, and concrescence of the consequent nature of God (and of every actual entity) is a non-temporal-all-at-once, an everlasting prehension of all other actual entities. Other problems about temporality and actual entities lead Cobb to work out a view of God as a personally ordered society (living person). His analysis is strictly Whiteheadian and interesting although other interpretations are possible, leaving God as an actual entity. Also excellent and exciting are Cobb’s discussions of God in connection with space, eternal objects, and creativity.

On the other hand, I find one crucial discussion missing, namely, how does God, as an actual entity, acquire his initial aim? Cobb holds, with Whitehead, that each actual entity acquires its initial aim from God (pp. 154–55). If this is so, then how does God acquire his initial aim? Not from himself or from another actual entity per contradiction. From whence? This problem seems to me to suggest the need for another Whiteheadian interpretation of God. I do not see how Cobb can resolve this contradiction.

In the chapters on religion, Cobb turns to religious topics, making good use of his earlier Whiteheadian analysis. The task is not easy because he has to take language and concepts usually associated with a different metaphysics, disengage these, and show the reader how they would be understood in Whitehead’s metaphysics. Cobb begins with a fine summary of Whitehead’s religion

and then considers such items as: how God helps provide direction for our life; how God and ourselves have experience of each other; how close we can come in our personal life to God; our experience of God as "wholly other"; how a moral order for man and God is known; and how God's qualified providence occurs.

In order that Whiteheadian readers will not be frightened off by the above items, let me quote Cobb in connection with the first item above (direction for our life): "God entertains with respect to every new occasion an imaginative proposition of which the occasion is the logical subject, and an ideal possibility for its actualization—ideal given the condition of its world—is the logical predicate. . . . The initial aim of the occasion, as the feeling of God's propositional feeling for it, is not a feeling of a pure conceptual feeling on God's part but a feeling of an impure prehension involving the interweaving of physical and conceptual prehensions" (pp. 229–30).

A final chapter, "The Theological Task," is the weakest and least Whiteheadian. Much of it is wasted on a scholastic debate about what "natural theology" is. If, contrary to Cobb, but in accord with the dictionary, we consider a *natural* theology as one in which the premises are claims about the character of nature, a *rational* theology as one in which the premises are claims based on a priori principles of reason, and a *philosophical* theology as one whose premises are based on some philosophical system, then clearly Cobb has not given us a natural theology but, rather, a philosophical one. If Christian, according to Cobb, means "recognizing that for his perception of ultimate importance in the Christ event he is indebted to the Christian Church" (p. 252), then I submit that there is nothing in this Whiteheadian theology that requires this recognition. Therefore, I find this theology to be neither natural nor Christian, but rather Whiteheadian and philosophical. I highly recommend it to all thinkers interested in Whitehead or theology.

PAUL F. SCHMIDT

University of New Mexico

Beyond the Observatory. By HARLOW SHAPLEY. New York: Charles Scribner's Sons, 1967. 209 pages. \$4.50.

"Your next breath will contain more than 400,000 of the argon atoms that Gandhi breathed in his long life. Argon atoms are here from the conversations at the Last Supper, from the arguments of diplomats at Yalta, and from the recitations of the poets. Our next breaths, yours and mine, will sample the snorts, sighs, bellows, shrieks, cheers and spoken prayers of the prehistoric and historic past" (p. 48).

This quote is typical of the tone and direction of the eleven short essays (one of which was previously published in *Zygon* for September, 1966) contained in Harlow Shapley's latest book. Using what might be described as empirical metaphysics, Shapley links the facts of twentieth-century science with speculation on matters philosophical, sociological, and religious.

Internationally recognized as a giant of the "hard sciences," Professor Shapley goes "beyond" to ask "What do all of the enormous natural complexities mean to us, the species *Homo sapiens*?" Heretical as ever, Shapley does not

imply that Nature and the Universe *must* mean anything to us humans. In fact, he continues to place us in a rather ordinary niche in the evolutionary scheme as "the timid descendants of some rather nauseating gases and sundry flashes of lightning!" (p. 94).

Religion has its place in this scheme. "Philosophy and religion, and probably ethics, are profoundly affected by the recent explorations in molecular biology and galactic astronomy" (p. 15). But rather than a "religion" based on the speculations of anthropocentric man, Shapley is asking for a "religious attitude" based on the natural facts around us. By "anthropocentric," Shapley means "the state of being blinded by our presumption of man's cosmic importance—our presumption that we are existing in a universe centered on the terrestrial genus *Homo*" (p. 100). "Creeds that are based only on the knowledge of the world that was available centuries ago will no longer suffice" (p. 98).

One of the essays, "Thirty Deductions from a Glimmer of Starlight," contrasts what we know today with what was known when anthropocentric creeds were being formulated. With twentieth-century instruments and techniques, we can observe and record thirty different facts about any single star, eclipsing binary, or cepheid variable. Some of these facts are color, chemical composition, age, temperature, diameter, etc. And all of these properties are now available from the same pinpoint of light that the Babylonians and Greeks saw. In concluding a discussion on some of the instruments used, Shapley says, "Aristotle didn't know about such gadgets" (p. 133).

But where is a religious attitude possible, then, for us "timid descendants," living on "No. 3 planet of this solar system" (p. 152)? For the term "religion" implies "faith," and "faith" implies "hope." Shapley states that man, uniquely on this planet, has evolved a forebrain that "has so complicated man's life that precise programs for living now seem essential." "Man, while sharing with other organisms some vital drives and immediate goals, has got himself into a transcendency" (p. 114). This transcendency, of man's own making, "requires a philosophy of living and of life that we describe as an assembly of ideals" (p. 115). Those ideals are of hope for the species.

Reverence is, according to Shapley, in our recognition of "the wonders of the whole natural world" (p. 123). Using cosmic evolution as his fifth basic entity—in addition to space, time, matter, and energy—Shapley asks, "Why not go all the way and avow reverence for all things that exist, all that is touched by cosmic evolution, and reserve the greatest reverence of all for existence itself?" (p. 123).

Another essay, "Breathing the Future and the Past," describes some of the mystery that we can revere in Nature. Concluding a clinical discussion of the oxygen-carbon dioxide cycle, Shapley says, "If the plants were completely removed from the surface of the earth, . . . all the animals would gradually smother. On the other hand, if animal life were entirely removed from the earth, the plants would have to depend skimpily on the carbon dioxide of volcanoes and of organic decay. Animals and plants need each other vitally" (p. 46).

Centering on awareness of cosmic evolution, then, and man's natural place in the process as his source of human hope, Shapley asks, "Why should we not expect the penetrating urge towards change that permeates the universe to in-

clude the growth of man's groping philosophies? The answer is that we do expect it; to some extent we witness it. And we note that evolution itself evolves!" (p. 99).

A related practical question asks whether or not "the techniques of psychotherapy cannot be usefully applied in the study and interpretation of that sometimes dim and mysterious urge in man that we call religion" (p. 100). "We need a cosmic psychiatrist," concludes Shapley (p. 158). And awareness of cosmic evolution, with knowledge of the atoms of the microcosmos and the galaxies of the macrocosmos, will help in establishing for ourselves "the dreamy calm of grass and trees" (p. 154). "We are, or should be, atom-minded" (p. 37). It was, after all, the scientific study of atoms that has led to today's "multi-billion dollar budgets that seem so necessary to defend us against ourselves. Certainly we should be atom-conscious, for those tiny chunks of energy carry a mighty wallop and are writing the future of mankind" (p. 38).

GLENN S. JOHNSON

Meadville Theological School

Theoria to Theory (a Quarterly Journal). Epiphany Philosophers, 9 Marion Close, Cambridge, England. \$5.00 a year.

Readers of *Zygon* will be interested in a new British journal which is also dedicated to the exploration of relationships between science and religion. Its contributors, like *Zygon's*, tend to question the adequacy of traditional theological formulations in the light of modern science. Clearly expressed in the first two issues (October, 1966, and January, 1967) is the hope that a radical reformulation can be based, not primarily on the derivation of metaphysical or ethical conclusions from particular scientific discoveries, but rather on the use of methods similar to those of science in developing religious theories to interpret the personal religious experience which is central in the contemplative tradition. The editorial introducing the first issue states:

. . . this journal is attempting a fresh start. For its title we have taken the old word *Theoria*, because in its classical Greek, Greek Christian, and monastic uses it stood for contemplative insight as opposed to disputatiously dogmatic theology. The title also shows that we want to carry *Theoria* forward to *Theory*. We have a reason for this. We believe religious theory must in the end have the same characteristics as scientific theory. That is to say, it must try to explain phenomena through a close-knit intelligible structure which provides a grasp of the underlying interconnexions. And you must have to be able to imagine how the interconnexions work. The theory must not be indefinitely elastic, that is, compatible with every possible state of affairs so that nothing can count as evidence against it, and it should be possible to draw consequences from it which allow experimental testing. . . . We have said that *Theoria* is both a philosophical and a monastic word. Over a considerable period the Epiphany Philosophers, the philosophic and scientific group who are publishing this journal, have found their natural allies from the religious side among monastics, not among the more conventionally pious.

The editor of the journal is the noted philosopher, Dorothy Emmet. Among the articles in these two 100-page issues: a prominent analytical philosopher (Richard Braithwaite) discusses the nature of religious assertions; an Anglican

monastic (George Every) describes early Christian spiritual exercises; an expert in comparative religions (Ninian Smart) looks at Eastern mysticism; and a computer scientist (Margaret Masterman) starts a series on "Theism as a Scientific Hypothesis." On the religious side, the interests of the group incline toward past and present Christian contemplative writings, Zen Buddhism, and Hindu Yoga. On the philosophical side, the difficulties described by linguistic analysts concerning the cognitive status of metaphysical and theological assertions are taken very seriously. On the scientific side, the authors reflect a sophisticated understanding of recent thought concerning the importance of theories in science, as against any positivistic preoccupation with observations. Also represented are some topics which many readers might consider interesting but more esoteric, such as parapsychology (ESP), science fiction, and "concrete poems" (words arranged in star designs on the magazine's cover).

The journal is frankly exploratory. A delightful article by I. J. Good on the function of speculation in science defends the value of discussing "partly-baked ideas"—which may be half-baked (or less) but are sometimes capable of further baking. Future issues of the journal will undoubtedly include many partly baked ideas, but hopefully can serve to subject such speculations to criticism and, occasionally, further elaboration. The venture seems to have significant potentialities if it can answer certain questions not unlike those faced by *Zygon*. Can it draw from a wide variety of new contributors and avoid becoming the house organ of an "in-group"? Can it stand for a particular viewpoint, a specific approach to religion which gives unity to its pages, and yet remain flexible and open enough to avoid defining a "party line" which would exclude those who challenge the assumptions of the journal's founders? Since the majority of scientists, philosophers, and theologians probably reject these assumptions for very varied reasons, it is important that this wider dialogue be maintained without abandoning the dominant concern for the transition "from *theoria* to *theory*." This new publication, which is off to an auspicious start, deserves support on both sides of the Atlantic.

IAN G. BARBOUR

Carleton College

Atom and Organism: A New Approach to Theoretical Biology. By WALTER M. ELSASSER. Princeton, N.J.: Princeton University Press, 1966. 143 pages. \$4.50.

Physicists are continually trying to find the relevance of their discipline to many other fields of knowledge. This is perhaps most evident in the borderlines between biology and physics, and philosophy and theology and physics. This latest book by the theoretical physicist Elsasser continues this tradition.

In tracing the development of physical theories, the author points out that for generations these have moved in the direction of more "openness." He defines an open theory "as one in which many questions have no binary (yes-or-no) answers." Celestial mechanics was the very model of a closed system of abstract theory where, on the basis of Newton's laws, precise predictions could be made starting from a limited number of observations. With the introduction of thermodynamics and statistical mechanics, microscopic variables

had to be ignored, and a continuum behavior of matter replaced any consideration of individual particle dynamics. With the ascendancy of quantum mechanics, an even greater openness of physical theory became evident, and the discussion of properties of matter was relevant only for large classes of objects. Impressed by this direction of development in theoretical physics, Professor Elsasser proposes essentially complete openness for the biological theory of organisms. He proposes that life is a primary phenomenon not deducible from physics or from anything else.

For years there have been two concepts in biology which have competed for recognition, the mechanistic biology and the vitalistic biology. The mechanistic holds that observed biological regularities are either logically or mathematically derivable from the laws of atomic and molecular physics. In the vitalistic concept, biology requires specific modifications of these laws, but the laws are still applicable. Elsasser's theory, which he calls the "theory of organism," agrees with neither of these ideas. To quote his book: "We base ourselves upon the vast extent of inhomogeneity combined with statistical indeterminacy of microstates and the attendant lack of predictability, and assume that this indeterminacy is an essential precondition of the partially autonomous behavior of organisms. A theory of this type which is based on inadequate determinacy within the existing theory rather than any modification of it, as proposed by the vitalists, is here designated as organismic."

One of the characteristics which impresses Elsasser as clearly differentiating atoms and organisms is the basic assumption in the physical sciences that all atoms are identical and indistinguishable, whereas, even for single cells, every organism appears to be different and therefore cannot be substituted for any other cell in a statistical ensemble. He dwells at considerable length on the old adage that "no two blades of grass are ever alike," and he gives considerable historical background on the thinking of Descartes and Pascal in their attempts to develop a continuum theory of matter and a theory of organic life inserted into inorganic nature. He also advances the thesis that biological events are not necessarily predictable even by the application of statistical theory. Again, to quote from his writings, "The question to be raised is whether an averaging process can be carried out successfully in the radically inhomogeneous systems in classes of biology. If we assume that this is not always so, as we do in the type of theory advanced here, then we also imply that prediction of system events cannot always be carried out to an adequate degree. By adequate we mean here that in comparison with later observations we are not losing too much by disregarding more or less the relevant individual variations." And elsewhere he writes, "In other words, there should be no general laws of pure biology."

The position which Elsasser takes is by no means generally held by scientists, either physicists or biologists. In contrast to the author's point of view, we might recall the statement of Dobzhansky in his paper "Of Flies and Men" (*Rockefeller University Review*, November-December, 1966): "Individuality, uniqueness, is not outside the competence of science. It may—in fact it must—be understood scientifically. In particular, the science of genetics investigates individuality and its causes. The singularity of the human self becomes comprehensible in the light of genetics."

ZYGON

It is of considerable interest to compare Elsasser's concepts with those of another famous theoretical physicist whose contributions to quantum mechanics have been so far-reaching as to gain him a Nobel Prize. Erwin Schrödinger's most accessible works on this subject are contained in a book, *What Is Life?* published by the Cambridge University Press in 1944. Schrödinger was particularly fascinated by the concept of entropy as it applied to organisms in contradistinction to entropy in the physical universe. Schrödinger proposed a definition of life based on its antientropic behavior and a quantum mechanical characteristic of the genes which predated the discovery of the DNA molecule. Many scientists have been impressed by Schrödinger's carefully developed concept of entropy in relation to atoms and organism, although not being as penetrating as Schrödinger these scientists may have cluttered up the literature in this area so much that Erwin N. Hiebert has been inspired to comment, "All kinds of private metaphysics and theology have grown like weeds in the garden of thermodynamics" ("The Uses and Abuses of Thermodynamics in Religion," *Daedalus*, Fall, 1966). Elsasser, in contrast to Schrödinger, finds the concept of entropy completely irrelevant: "From the statistical standpoint, the second law expresses a very general tendency of any system of sufficient complexity to change in the direction of increasing disorder, and the abrogation of this law would in fact be equivalent to postulating implicitly some sort of ordering principle. But in our theory such a scheme would have no operational meaning, since such deviations from the second law could not be verified. The selection of certain immensely rare processes which insure the stability of classes is withdrawn from direction observation."

Elsasser has gone much further in this volume than he did in his previous book, *The Physical Foundations of Biology* (New York: Pergamon Press, 1958), in raising the issue whether life, its behavior and its origin, is or is not susceptible to scientific investigation. From the point of view of those interested in science and religion, this is a very crucial issue to have raised and discussed. Scientists in general tend toward the position that all biological origins and developments are susceptible to study and understanding by the scientific approach to knowledge. Therefore, when an eminent theoretical physicist raises clearly and in detail the hypothesis that organic life is too complex by its very nature to be understood by any science which bases one of its fundamental tenets on repeatability and uniformity, religionists have an obvious necessity for understanding the basis of such an inapplicability of the modern scientific method as well as an ally to the often-stated theological position that there is some reality beyond and above the predictability and credibility of the scientific enterprise.

The philosopher and theologian will find this book a very difficult one to read, not so much because the ideas and concepts are not carefully described, but rather because Elsasser has a habit of introducing a whole new set of words and terminologies. Although he defines and explains carefully, his usage must be learned and remembered so that when his terms appear again in the text they will have the meanings which the author has attributed to them, but which are not always obvious in their etymological and philological construction.

SANBORN C. BROWN

Massachusetts Institute of Technology

What Freud Really Said. By DAVID STAFFORD-CLARK. New York: Schocken Books, 1966. 260 pages. \$4.50.

The title of this book is, in some respects, misleading. If one wants to know what Freud really said, one should, of course, read Freud—if not in the original German, then in one of the many other languages into which his works have been painstakingly and gracefully translated. The difficulty is that Freud “said” *so much!* It is estimated (by the author of this volume) that Freud’s total published output was about 3,500,000 words. This book, if my computations are correct, contains fewer than one-fortieth of the words in Freud’s collected works. Therefore, the economy in reading time can be relatively great. The question is: How adequate is the present volume as a summary, and how readily understood will it be by persons with little or no prior familiarity with Freud’s writings?

Because this book is clearly and simply written, and because almost everyone today (even though he has read nothing that Freud himself wrote) has some knowledge of psychoanalytic concepts and principles, the problem of comprehension should not be a serious one for most readers; and on the score of fidelity to Freud’s own thought, this volume ranks very high. The author has a remarkably comprehensive knowledge of Freud’s works (and of collateral sources), and he has organized this knowledge in an orderly and interesting way. The book can therefore be confidently recommended to lay readers who wish to gain a better over-all understanding of classical psychoanalysis, as Freud propounded it; and it is equally valuable to more informed readers as a review and systematic synopsis.

As one reads through the first half of this volume, some apprehension is raised by the frequency with which the author punctuates his otherwise quite objective account with personal eulogy: “one of the most significant pieces of human thought and discovery in the history of ideas” (p. 18); “a man whose name will always rank with those of Darwin, Copernicus, Newton, Marx, and Einstein” (p. 19); “a genius [whose destiny it was] to seek the truth from within this tangle, with patient humility, and to proclaim his findings with tenacious courage” (p. 23); “the monumental breakthrough which this technique made possible” (p. 61); “one of the great classics of human thought” (p. 67); “remarkable originality and penetrating wisdom of Freud’s observations” (p. 68); “the symbolic significance [of dreams is] quite unquestionable” (p. 84); “the most effective [tool] of all . . . the practice of psychoanalysis” (p. 140).

But during the latter half of the book, reservations and criticisms appear with increasing frequency: “the limitations of psychoanalysis as a clinical and therapeutic technique” (p. 143); “total misconceptions” (p. 150); “analysis . . . often excessively difficult and prodigiously long” (p. 158); “the [limited] therapeutic indications of psychoanalysis” (p. 161); “despite the greatness of Freud’s own achievements, his self-analysis . . . one of the most incomplete parts of all his work” (p. 207); “[psychoanalysis] suitable for perhaps one-tenth to one-twentieth of all the people who consult their doctors in states of anguish and emotional distress” (p. 215); “*Analysis, Terminable and Interminable* . . . a pessimistic essay. . . . Psychoanalysis has finally acknowledged its own fallibility” (p. 215).

ZYGON

At the end of the book is a chapter entitled "Coda," in which the author ventures "some final and personal observations" (p. 232). Perhaps the most pithy and pertinent passage in this chapter is the following one:

Psychoanalysis, regarded as a method of study, a technique for treatment and research, or as the body of knowledge which this method and technique have uncovered, has certain solid claims which are beyond dispute. Moreover, as a method which has produced results, it can claim an empirical justification and a certain scientific respectability. The original clinical studies in hysteria, the remarkable interpretation of dreams, the whole concept of depth psychology, the sexual theory and the general theory of the neuroses, all these can stand examination on their merits. By contrast the philosophical theories, beginning with the concept of the death instinct and proceeding to the origins of morality and religion, emerge as simply the unfettered speculations of their originator, eminently worth reading for the sake of the light they shed on the personality of Freud himself, but still no more than speculations [p. 240].

Although Dr. Stafford-Clark is certainly entitled to his own appraisal (which is in many respects an objective and judicious one) of the varied facets of psychoanalytic theory and practice, his statement that "psychoanalysis . . . has certain solid claims which are beyond dispute" surely exceeds the realities of the situation. Virtually all of the contributions of Freud which the author regards as best substantiated have not only been "disputed" but called into question on empirical grounds. At no point in the book is there any reference to the various studies of therapeutic outcome, almost none of which show any advantage in psychoanalysis over the spontaneous remission rate; the projective tests (which are largely predicated on psychoanalytic notions) have turned out to have such low validity that in some departments of psychology they are now regarded as having only historical interest; and of the numerous attempts which have been made to subject psychoanalytic concepts to laboratory verification, few have given clearly positive results.

Notable also is the lack of any reference in this volume to the "behavior therapies," which are today attracting much interest in many quarters. But Stafford-Clark does make fairly extended reference to the new chemotherapies, as importantly supplementing, if not actually supplanting, psychoanalysis in some forms of psychopathology. For example, he says:

Reviewing this aspect of the general theory of neurosis, and its application, from the relative distance of another twenty-five years, with all the advances in the physiological and biochemical treatment of psychotic illnesses which this last twenty-five years have brought, it is easier to see now what Freud was never fully to express or finally to acknowledge: *namely, that what he called the narcissistic neuroses are probably not primarily psychogenic in origin.* It remains true that their psychodynamic components could not be understood without an awareness of psychoanalytic principles. But they themselves correspond more to what Freud had called "actual" neuroses than to transference neuroses—their origin being glandular and biochemical rather than emotionally mechanistic [p. 162].

Paradoxically, at the very time when the greatest advances are apparently being made in chemotherapy, equally impressive progress is occurring in the rehabilitation of drug addicts. Long regarded as untreatable, they are now being successfully rehabilitated by special group procedures, at Synanon in

Santa Monica, California, and at Daytop Village in Staten Island and Swan Lake, New York. As these methods become better established and understood, they may also prove applicable to some, if not all, of the personality disorders in which chemotherapy now seems most clearly indicated.

On several fronts there are thus developments which make classical psychoanalysis considerably less important than it seemed to be two or three decades ago. However, psychoanalysis stands historically as a monumental effort to come to grips in a new and better way with the pervasive problem of psychopathology; and it is useful to have a summary volume such as *What Freud Really Said* for review and reference purposes. Other books now available in the same series are: *What Darwin Really Said* and *What Shaw Really Said*, under the able editorship of Mr. A. N. Gilkes.

O. HOBART MOWRER

University of Illinois

Announcement

The death on April 5, 1967, of Herman Joseph Muller, Nobel laureate in genetics, terminated the direct contributions of a vibrant and creative imagination to science and human values and took from *Zygon's* Editorial Advisory Board an enthusiastic member. His research uncovered, and he dramatically (sometimes hyperbolically) brought to widespread attention, some hitherto unrecognized potential dangers and benefits in the management of genetic inheritance of ultimate concern for human well-being.

We welcome to our Editorial Advisory Board, in his place, another distinguished biological scientist, Dr. Paul A. Weiss of Rockefeller University, who also applies his profound biological understanding to cultural concerns.