JOURNAL OF THE
AMERICAN
SCIENTIFIC
AFFILIATION

An evangelical perspective on science and the Christian faith (US ISSN 0003-0988)

MIND / matter ?

and . . .

Should creation be taught alongside evolution?

Is germinal choice a Christian option?

"The fear of the Lord is the beginning of Wisdom." Psalm 111:10

VOLUME 33, NUMBER 4 DECEMBER 1981

MEMBER EPA EVANGELICAL PRESS ASSOCIATION

Concerning SUBSCRIPTIONS, changes of address, requests for back issues, and other business requests, address: Executive Director, American Scientific Affiliation, P.O. Box J, Ipswich, Massachusetts 01938. The SUBSCRIPTION PRICE: one year $16.00, two years $30.00 *Students:* $8.00. *Institutional rate:* one year, $30.00. *Gift subscriptions:* one year, $8.00. Single copies may be purchased at $4.00 each. Second class postage paid at Ipswich, Massachusetts and at additional mailing offices. Postmaster: please send POD form 3579 (change of address) to American Scientific Affiliation, P.O. Box J, Ipswich, Massachusetts 01938. Published four times a year in March, June, September and December by the American Scientific Affiliation. Telephone: (617) 356-5656. Back issues: $4.00 per issue from 1978 to present; $2.50 per issue from 1974 to 1977; $1.50 per issue from 1963 through 1973; $2.00 per volume or $1.00 per single issue before 1963; *Supplement* 1, 1976; $3.00.

The pages of the *Journal ASA* are open to any contribution dealing with the interaction between science and Christian faith in a manner consistent with scientific and theological integrity. Papers published in the *Journal ASA* do not reflect any official position of the American Scientific Affiliation.

Concerning MANUSCRIPTS, address: Editor, *Journal ASA*, 753 Mayfield Ave., Stanford, California 94305. All manuscripts should be typed double-space on good quality 8 1-2 x 11 paper, with references collected at the end, and with an Abstract of not more than 100 words. Duplicate copies of manuscripts are requested. Figures or diagrams should be clear, black and white line ink drawings or glossy photographs suitable for direct photoreproduction, with a caption provided separately.

REGULAR PAPERS represent major treatments of a particular subject relating science and the Christian position. Such PAPERS should be at least 10 pages and not more than 20 pages long. Accepted PAPERS will be published within 18 months.

COMMUNICATIONS represent brief treatments of a wide range of subjects of interest to the readers of the *Journal ASA*. COMMUNICATIONS must not be longer than 9 pages. Accepted COMMUNICATIONS will be published within 9 months.

LETTERS represent correspondence received by the Editor which comments on previous publications in the *Journal*. All correspondence received by the Editor is deemed suitable for the LETTERS category, unless the writer expressly requests that his/her letter be not published. LETTERS will be published within 6 months of receipt.

Concerning BOOK REVIEWS, address: Book Review Editor, Dept. of Chemistry, Houghton College, Houghton, N. Y. 14744. To avoid duplication in reviews, prospective reviewers should notify the Book Review Editor of their intentions at an early date.

JOURNAL OF THE
AMERICAN
SCIENTIFIC
AFFILIATION

DECEMBER 1981 PRINTED IN THE UNITED STATES OF AMERICA VOLUME 33, NUMBER 4

The Relationship Between the Brain and the Mind

D. GARETH JONES

Department of Anatomy and Human Biology
University of Western Australia
Nedlands, West Australia

Mental Phenomena and the Brain

The "mind-body problem" concerns the way we think about states of consciousness on one hand and states of behavior on the other. What is the interaction between thoughts, feelings and the organ responsible for their expression, the brain? The problem, at heart, is how to hold together the *obvious* characteristics of people and their external behavior, and the not-so-obvious characteristics such as their internal mental states. Often the dilemma is expressed as the tension between the material and the immaterial, between brain and mind, between body and soul. Thought, feelings and beliefs are frequently described as constituting the mind; with increasing comprehension of brain mechanisms, however, they may seem to be products of physical brain processes rather than, or at least as much as, of an immaterial mind or spirit.

Although the mind-body problem is an old issue in philosophy, advances in the neurosciences over the past twenty or thirty years have forced the neuropsychologist to deal with it also. Many topics, especially the split-brain and the brain-damage/personality paradigm, highlight the problem in a new way. Whether they help solve that longstanding dilemma is debatable.

The mind-body problem forces neuroscientists to consider not only their philosophical position on that question but also the nature of their science. Inevitably neuroscientists start from their knowledge of the brain as a physical entity, or of the individual as a group of observable behavior patterns. Once confronted by the possible existence of an immaterial mind, neuroscientists must assess the adequacy of their observable base of physical phe-

A danger of dualism is that once body and mind are separated, the mind can be dealt with as a separate entity.

nomena. They must ask whether it alone provides an all-embracing framework for a complete view of the individual person as a human being like themselves. By the very nature of the scientific endeavour, neuroscientists may find themselves drawn toward some form of materialist answer without analyzing the philosophical implications of such an answer.

Let us briefly review the major positions that have developed in the debate, starting inevitably with Rene Descartes and *dualism*. Descartes devoted some thought to neurobiological considerations along with his better known mathematical and philosophical studies. Living at a time when the natural sciences were being revolutionized by mechanistic thinking, Descartes compared the universe to a vast machine capable of being explained by purely mechanical laws. Everything, including man himself, was encompassed by these all-powerful explanatory principles. In arguing thus, Descartes was being true to his rationlism. Yet, unable to follow rationalism to its logical conclusion, he allowed one exception to his mechanical world view: the human mind.

Descartes, intent on doubting the evidence of the senses and calling in question even the validity of his perceptions of the world, felt able to fall back on the trustworthiness of his own consciousness. Hence the fundamental divide within dualism between the *physical body* and the *nonphysical mind* or consciousness, the former a prisoner of the mechanical world order but the latter the author of uniquely human characteristics such as rational thought and free choice. For Descartes it was the nonphysical mind which rendered a human being unique and which carried the marks of personhood. That nonphysical side of humans—the mind, soul or consciousness—was the critical one, constituting alongside the body, one of the two basic *substances* of the world.

The essence of classic dualism is the existence of body and mind as distinct substances. They were regarded by Descartes as totally interdependent, interacting aspects of a living being. If that is so, however, the way in which they interact becomes a problem. According to Descartes, the mind took up no space but acted on the body through the brain's pineal gland. The nonmaterial mind could thus influence physical happenings in the material brain. The hallmark of this view, *interactionism*, is the implicit suggestion that two different types of reality can affect one another.

Cartesian dualism was little challenged from Descartes's time in the seventeenth century until the late ninteenth century. The inherent difficulty of two different substances acting on each other, however, led some dualists to adopt an aberrant version of dualism, called *parallelism*: the mind and body are still distinct, but run along parallel tracks. To declare them independent proved a convenient way out of the interactionist dilemma, but opened the window to an influx of weird speculation. Without any control of each other, body and mind could go their own ways even to the extent of dispensing with the material body altogether.

We shall return to dualism in the next section when considering the viewpoint of contemporary neurophysiologist John Eccles. But before leaving dualism we should note one reason for its continuing influence up to the end of the last century and, in some quarters, up to the present: it seemed to offer support for the Christian belief in an immortal soul. Reflecting the Platonic concept of the soul, the classical form of that belief was strongly dualistic. A danger of dualism, however, is that once body and mind are separated, the mind can be dealt with as a separate entity. A modern consequence of dualism is that drug-induced perceptions and beliefs can be regarded as a valid—even a commendable—expression of reality. John Lilly is a modern exponent of parallelism. A perennial danger of that outlook is that the exaltation of mind takes place at the expense of the whole person.

The major difficulty with dualism is the unknowability of internal mental states if we have no way of analyzing them by way of behavioral or brain states. If mental states are not publicly observable, we cannot even be sure that we are justified in ascribing them to other people at all. The chasm between unknown internal states and known external ones makes information on how mental and brain states are to be linked difficult (some would say impossible) to obtain. It is far from clear whether any links between the two are of a causal nature; hence the possibility of parallelism.

The difficulties associated with dualism have led to an array of alternatives positions. The first alternative is, strictly speaking, a version of dualism with similarities to parallelism. In *epiphenomenalism*, a nonmaterial mind is considered to exist but is an epiphenomenon or byproduct of physical events. Consequently, the conscious events of the mind are unable to influence the physical brain and its processes. The thoughts, moods and decisions of an individual, therefore, are powerless to influence that individual's actions.

Epiphenomenalism, like classic dualism, accepts an immaterial mind. On the other hand, like materialism, it locates the origin of mind in the material brain. It is a compromise that seems to exhibit the difficulties of both positions without satisfying exponents of either. The contention of epiphenomenalism that consciousness has no effect on the way the brain operates makes a mockery of human beliefs, actions and conscious choices. For anyone with a high view of the human person and human brain, epiphenomenalism is unsatisfactory.

A more rigorous alternative to dualism is *behaviorism*, with attempts to eliminate nonphysical mental states altogether by reducing them to patterns of behavior. That form of behaviorism is sometimes referred to as *negative* behaviorism, signifying that it is essentially a metaphysical

doctrine rather than a straightforward psychological technique.

For a behaviorist, any talk about a mind is simply an inaccurate way of talking about human behavior. It is a form of linguistic confusion because the mind is neither a thing nor a substance, in the way the brain is a thing. Only the brain can be referred to in these terms; such terminology is inappropriate when referring to actions, thoughts, feelings and desires. If they are expressions of brain states, they are best described and analyzed using behavioral concepts.

By denigrating individual consciousness within a Skinnerian framework, behaviorism is driven to look for forces controlling individual behavior either in the physiological makeup of the individual or in that person's environment; hence the significance of conditioning as a technology of behavior. Since individuals are merely the sum of their behavior patterns, behaviorism has dispensed not only with consciousness and internal mental states, but also with human freedom, human dignity and human responsibility.

On the surface, behaviorism, with its simple reduction of mental states to actual or potential behavior, seems a welcome contrast to the tantalizing complexities of dualism. Yet its pitfalls are immense. The argument that all reference to the mind is simply a prescientific description of states of behavior is misleading. To say that "to be angry" means to behave in an angry way overlooks the possibility that someone may be angry but not show it. Further, the statement by itself explains nothing: angry behavior is angry behavior. Another difficulty is that we frequently appear to know more about our own mental states than other people do—a contradiction in terms if our mental states are nothing but patterns of behavior.

That mental states can, to some extent, be analyzed in behavioral terms is not open to question; that they can be *completely* analyzed in that manner, is. If they cannot be completely analyzed in behavioral terms, the issue of the nature of mental states remains. Apart from that dilemma, however, behaviorism can definitely be faulted for its loss of the wholeness and grandeur of the human person.

A third alternative to dualism is based on the presupposition that mental states are identical with brain states. The mind-brain identity theory is called *central-state materialism*. In its simplest expression it asserts that the goings-on in the mind are manifestations of physical happenings within the brain. Unlike behaviorism, it makes no attempt to deny the existence of consciousness or mental events; they are realities, but of the material brain rather than of an immaterial mind.

To equate the mind with the brain bypasses certain difficulties evident in epiphenomenalism and behaviorism. The self-evident phenomenon of consciousness is retained, and the problem of explaining how mind and brain interact does not arise. Central-state materialism has many attractive features to anyone aware of the dependence of conscious states on brain function.

Nevertheless, it too has its drawbacks. It is easy to assert a oneness of the mind and brain but much more difficult to demonstrate what that identity specifically amounts to. J. Z. Young's attempts to do that necessitate a leap of faith to help bridge the gap between brain mechanisms and the meaning of human life. Such a leap may be tantamount to admitting that even if mind and brain processes are not identical, at the very least they provide clues to different aspects of human reality.

If one assumes that mind and brain are identical, what are the implications of that outlook for our view of human nature? Does it threaten the concept of human freedom by necessitating belief in determinism? In other words, acceptance of the validity of materialism precipitates a new discussion—that of determinism.

Neither dualism nor any of its alternatives provide a fully satisfying solution to the brain-mind controversy. Each illustrates some truth about the human person and human brain, yet each fails to hold the available data and insights in a manageable form. We would be tempted to dismiss all philosophical speculation and settle for a formula solution if the stakes were not so high. With the dignity and worth of human beings in the balance, some way forward must be found.

Contemporary Dualism

From the preceding discussion one might conclude that

D. Gareth Jones is Associate Professor and Head of the Department of Anatomy and Human Biology at the University of Western Australia. His research interests center on neurobiology, in which he is particularly concerned with developmental aspects of the synaptic connections between nerve cells. He has written three books and 100 papers on neurobiological topics. In addition, he is actively interested in biomedical ethics, especially in the neurobiological and genetic areas, and in creation-evolution issues. Besides Our Fragile Brains, *Dr. Jones has written books on Teilhard de Chardin and genetic engineering. He is currently working on a book dealing with ethical issues in biomedicine.*

dualism has fallen into such disrepute that no respectable philosopher—certainly no respectable neurobiologist—would give it serious consideration as being of anything but historical interest. Yet dualism has been propounded in its classic form for at least twenty years by a respected and notable neurophysiologist, Sir John Eccles. What is more, his advocacy has become increasingly firm and vigorous over the years, coming to full fruition in the 1970s. Eccles leans heavily on the writings of Sir Karl Popper, particularly on the ideas expressed in Popper's three-world philosophy. The interaction between Popper the philosopher and Eccles the neurobiologist resulted in a joint magnum opus, *The Self and its Brain*, lauding dualism and interactionism. Eccles has expressed his views in many speeches, articles and books, including the 1977-78 Gifford Lectures at the University of Edinburgh, published as *The Human Mystery*.

Eccles's enthusiasm for dualism appears to go back to another great neurophysiologist, Sir Charles Sherrington, whose own Gifford Lectures on the theme *Man on his Nature* were published in 1940. Sherrington was a dualist who felt the pangs of disconnectedness between brain and mind but found no answer to the dilemma of how the two cohere. Eccles also recognizes dualist aspirations in the writings of more recent scientists, notably physicists Erwin Schrödinger and Eugene Wigner, and ethologist W. H. Thorpe. Underlying the views of such thinkers is the primacy of our conscious experiences, which constitute for us primary or first-order reality. By contrast, the so-called objective or material world is a derivative or second-order reality. The world around us is known to exist only because *we* experience it. We are in a position to describe and understand the world only on account of our self-consciousness, which is another way of saying that our minds are primary in knowing.

Emphasis on the primacy of consciousness does not inevitably lead to the strident dualism advocated by Eccles. As we shall see in the next section, it forms the starting point of Donald MacKay's alternative notion of logical indeterminacy. For Eccles, however, the primacy of consciousness leads to a dualism diametrically opposed to what he describes as monist-materialism. The latter he sees as ushering in a world of chance and circumstance, with no meaning for life, no values, no freedom and no responsibility. Against this, he wishes to put forward a world view incorporating the mystery of our existence, its supernatural meaning and the fact that we are part of some great design. Beside being a dualist, therefore, Eccles is also a finalist, believing that our individual lives have a role to play in some great unimaginable supernatural drama.

The motives of Eccles and Popper are, from a Christian perspective, exemplary. They are intent on viewing human beings as ends in themselves, with meaning, values, purpose and responsibility. In starting from the self-consciousness of individuals, they insure that individuals will not be reduced to partial materialistic components and thereby lose their personhood. For such strong premises we are grateful. But when Eccles and Popper proceed beyond basic principles there is cause for concern. Their defense of human dignity and meaning rests on an explicit dualism between the self and the brain; the self-conscious mind is described as acting on the neural centers of the brain, thereby modifying the dynamic spatio-temporal patterns of the neural events. If such *interactionism* par excellence should fail as an explanatory principle, human dignity and meaning are placed in serious jeopardy. The issue is not simply whether dualism and interactionism can be justified, therefore, but whether this is an appropriate way to defend human significance.

Karl Popper's three-world view, developed in the early 1970s, is depicted in Figure 1. *World 1* is the world of physical objects and states. It comprises, therefore, inorganic matter, the whole of biology and the material substratum of all manmade artefacts. *World 2* is the realm of states of consciousness; it is the world each of us knows firsthand, containing our ongoing experiences of perception, thinking, emotions, imaginings and memories. Of particular significance in Popper's philosophical scheme is *World 3*, the world of knowledge in the objective sense. Encompassed by that world are all the records of human culture expressed in scientific, literary and artistic thoughts, plus the theoretical systems comprising scientific problems and the critical arguments generated by the discussion of those problems. World 3 is the world of human intellectual endeavor, a world of culture and storage.

The uniqueness of man, according to Eccles, is that he not only exists in World 1, the world of matter and energy, but can also realize his existence in World 2, the world of self-awareness. It is their World 2 existence that bestows a soul on human beings. Human experience does not stop at World 2, however, because human beings utilize their World 2 knowledge to create yet another world, that of culture (World 3). In that third world human greatness manifests itself with the rise of cultures and civilizations. What we are is dependent on World 3 in which we have been immersed, and on the effectiveness with which we have utilized our opportunities to make the most of our brain potentialities.

At the level of the individual, Eccles argues that the brain in World 1 and the world of culture in World 3 are both necessary for the development of the conscious self in World 2 (Fig. 1). Eccles goes beyond expression of the three-world view, however, to contend that such interaction is not sufficient to explain the uniqueness of our personal self. The explanation must lie outside the field of scientific inquiry; the coming-into-existence of each unique self is the result of a supernatural creation of the soul.

In taking up that position, Eccles has already committed himself to a strong dualist position on the brain-mind problem. He regards brain and mind as independent entities, with the brain in World 1 and the mind in World 2 (Fig. 1). What is more, they are thought to interact, as outlined in Figure 2, across the World 1-World 2 interface. Eccles concludes that the world of matter and energy, including the brain (World 1), is not completely sealed off from the world of experience and subjective experiences (the mind, World 2). Their interaction allows the mind to influence the brain or, more specifically, the self-conscious mind to influence the neuronal machinery of the brain.

In working out his position, Eccles postulates that the self-conscious mind influences neural events in special areas of the neocortex which he terms the *liaison brain*. These areas can perhaps be compared to the pineal gland in Descartes's scheme of things. To substantiate a dualist-interactionist view, there must be loopholes or crevices in World 1 (the brain) enabling it to be modified by World 2 (conscious experience). Eccles's loopholes are provided by the liaison brain (Fig. 2).

Two issues immediately arise. Is it the mind or the brain that is responsible for the unity of conscious experience? What is the evidence for the existence of a liaison brain?

Eccles categorically asserts that the unity of conscious experience is provided by the self-conscious mind and not by the neuronal machinery of the liaison brain. His reason appears to be the inadequacy of any neurophysiological theory in that regard. Eccles rejects the notion that the self-conscious mind is in liaison with single nerve cells, contending instead that liaison occurs with groups of nerve cells in the cerebral cortex known as modules. The liaison modules are found principally in the dominant left hemisphere, particularly the linguistic areas, because in split-brain subjects consciousness is principally located in the left hemisphere with its speech centers. The prefrontal lobe of the dominant hemisphere is also, in Eccles's eyes, a highly probable liaison site, since memory storage and retrieval may be located there. A brain-mind interactionist position is also suggested, Eccles claims, by physiological evidence of a readiness potential and by work on the subjective correlates of cortical stimulation.

The details of these arguments are beyond the scope of this paper, but they are all open to alternative interpretations by neurophysiologists. The areas of the cerebral-hemisphere-designated liaison areas have no morphological distinguishing features from nonliaison areas. It must be admitted that since no one has any idea what to look for, a scientific approach is valueless at present. But that is precisely the difficulty with the liaison brain concept: it expresses in semiscientific language an idea that is essentially ascientific. It must be questioned, therefore, whether the "liaison brain" really does belong to World 1, as Eccles suggests—or to World 2.

How successful has Eccles been in reinterpreting Cartesian dualism in contemporary neuroscientific terms? More important, does he provide grounds for recommending such strong dualism to Christians? Has he given us an alternative to materialistic monism?

Excellent as his intentions are, it is doubtful that Eccles has succeeded in his quest. The inevitably debatable nature of his neurophysiological interpretations is reminiscent of the constantly recurring "God-of-the-gaps" syndrome. The interface between the mind/self/soul and the brain shifts from one brain region or set of nerve cells to another as the scientific evidence and its interpretation shift. There is no escape from that dilemma, as long as one is dealing with the scientific domain. Eccles, who once staked his claim for an interface in the synapse, is now prepared to stake it elsewhere. Any specific location must, by the nature of the situation, prove temporary.

The fundamental problem of dualism is the feasibility of one sort of substance acting on another sort of substance. If the mind/self/soul acts on modules of nerve cells as modules act on each other, is the mind/self/soul something like a module? Alternatively, if the mind/self/soul acts in an inexplicable way, does it become an inexplicable entity? That is where Descartes had to leave the problem. In spite

WORLD 1	WORLD 2	WORLD 3
PHYSICAL OBJECTS AND STATES	STATES OF CONSCIOUSNESS	KNOWLEDGE IN OBJECTIVE SENSE
1. INORGANIC Matter and energy of cosmos	Subjective knowledge	Cultural heritage coded on material substrates philosophical theological scientific historical literary artistic technological
2. BIOLOGY Structure and actions of all living beings – human brains	Experience of perception thinking emotions dispositional intentions memories dreams creative imagination	
3. ARTEFACTS Material substrates of human creativity of tools of machines of books of works of art of music		Theoretical systems scientific problems critical arguments

Figure 1. Three-world view of Popper. Reprinted by permission, from K. R. Popper and J. C. Eccles, *The Self and Its Brain* (1977).

of Eccles's detailed neurophysiological postulates, the mind remains inexplicable and the way it interacts with the brain is a pseudoexplanation in Eccles's system. If the mind is nonphysical, can it have a physical interaction with the brain? If its interaction is nonphysical, does it then become a nonproblem for neuroscientists?

The brain is subject to scientific scrutiny because it is publicly observable; the mind or soul is not open to such investigation and hence can never receive scientific support. Proof that the mind or soul either is or is not influencing the brain is almost impossible to obtain. Either way, it needs to be demonstrated that the brain does or does not possess some device for receiving influences from the mind. Eccles attempts to demonstrate that such a device does exist, bringing us back to the equivocal status of the whole exercise. On the other hand, there is ample evidence that human behavior is caused by neural events; the evidence that every neural event is caused by some physical event is not conclusive, but neither can it be ignored.

A final difficulty with the strong dualism of Eccles and Popper is perhaps surprising. The fact is that radical dualism is in danger of overlooking the human person. It tries to uphold the meaning of human existence not so much at the personal level as at the level of brain-mind interaction. True, Eccles uses as his starting point our awareness of our conscious selves. But that awareness becomes lost amid his neuroscientific justification of how and where the self-conscious mind exerts its control over the brain. It may be that any emphasis on the separation of brain and mind, of body and soul, misses the crucial, intimate relationship *we*, as people, have to our bodies. The form of dualism advocated by Eccles may simply be misplaced.

Before leaving contemporary dualism we should consider two other example from the ranks of neuroscientists. Wilder Penfield, one of the most influential neurosurgeons of this century, made major contributions to the localization of function in the cerebral hemispheres in the 1930s

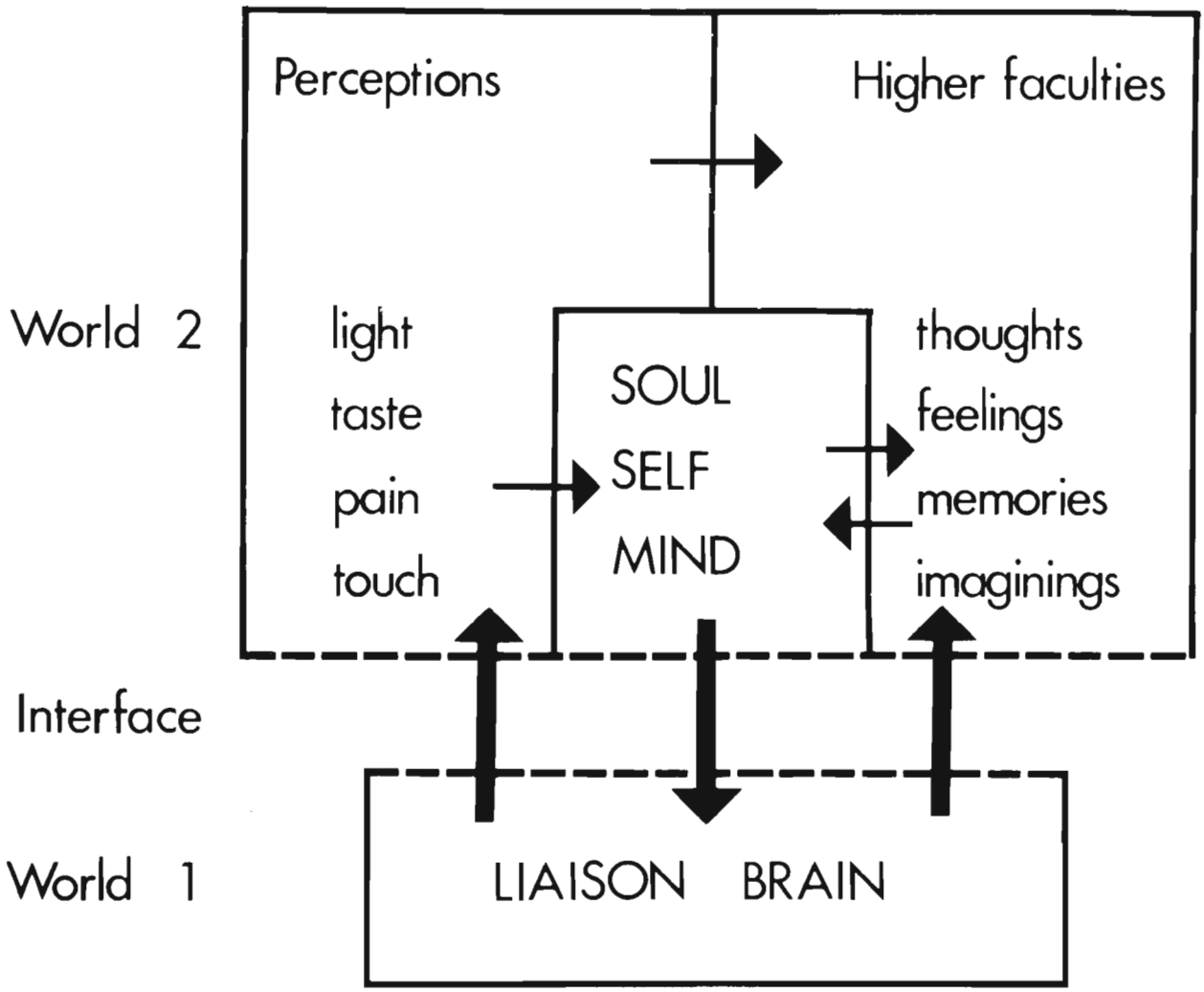


Figure 2. Information flow diagram for brain-mind interaction, as postulated by Eccles. Reprinted, by permission, from J. C. Eccles, *Facing Reality* (1970).

and '40s. Like Eccles, Penfield was influenced by Sherrington's ideas on the relationship between the brain and mind, but an explicitly dualistic position emerged only gradually throughout his long life. Penfield's dualism is expressed most clearly in *The Mystery of the Mind*, published in 1975 when he was eighty-five years old.

For Penfield the mind is aware of what is going on, it focuses attention, reasons and makes decisions, but has no memory of its own. It can put decisions into effect by activating nerve cell mechanisms situated in what Penfield terms the highest brain-mechanism, a region of grey matter in the upper reaches of the brain stem. The highest brain-mechanism, therefore, functions as the messenger between the mind and other brain-mechanisms. It serves as the mind's executive, its normal action constituting the physical basis of the mind.

Penfield was drawn to this view by his experience with patients displaying a variety of brain lesions. In particular he was impressed by attacks of epileptic automatism, in which a patient becomes unconscious but continues to act as an automaton. Penfield recognized in that situation a dissociation between the functions of the automatic sensory-motor mechanism and the highest brain-mechanism. He surmised that the highest brain-mechanism might go out of action during such attacks, depriving the patient of the functions of the mind.

For Penfield, as for Eccles, belief in a distinct and purposeful mind proved a buttress against the inroads of materialism. Its mystery intrigued him, and even if we find his arguments unconvincing, it is hard to escape the sense of the wonder at human thought and the complexity of the neural machinery that comes through in his writings. His awe at the potential of the human intellect and the subtleties of behavior of a brain-damaged patient demands a serious response on our part.

R. W. Sperry is one of the foremost exponents of split-brain studies. Sperry has also written extensively in the brain-mind area. Although not a dualist in the classic sense exemplified by Eccles and Penfield, he fits best within that general category.

Like Eccles and Penfield, Sperry wants to reject both behaviorism and materialism. More specifically, he rejects theories of consciousness that interpret subjective experience as an epiphenomenon, or parallel correlate of brain activity, or is identical to neural events.

Sperry advocates a form of *emergence*, in which consciousness is an emergent property of brain activity. Conscious phenomena are different from, more than, and not reducible to neural events, although they are built of neural and other physicochemical events. He sees value in a description of the neural events generating conscious experience, while denying that such a description can arrive at a complete understanding of consciousness. Most important within Sperry's system is his view that the emergent properties forming the mind are capable of controlling normal brain processes.

Is it the mind or the brain that is responsible for the unity of conscious experience?

Sperry, recognizing that no direct empirical proof exists, argues that his position is more credible than the behaviorist-materialist position. The difference between himself and Eccles is in the absence of a specific dualist interaction in Sperry's system. Instead, conscious experience influences the brain by virtue of the hierarchical organization of the nervous system and in the power exerted by a whole over its parts. From Sperry's perspective, mind moves matter in the brain in much the same way that an organism moves its component organs and cells.

Sperry leans heavily on the rule played by subjective conscious experience in an appreciation of brain function. The significance of that role, in his eyes, is that the value-rich, qualitative world of inner, conscious, subjective experience is reinstated into the domain of science. He is thus able to introduce into neuroscience what he calls humanistic thinking, leading to an erasure of the distinction between objective facts and subjective values.

Sperry's approach to the brain-mind issue, therefore, is part of a much broader issue—that of introducing values into science. Intent on deriving an ethical framework from science, Sperry sets about demonstrating that human values are inherent properties of brain activity and hence amenable to scientific investigation. That assumption leads him to propose a value system built on the orderly design of evolving nature.

Sperry's view seems to be a curious amalgam of materialism and dualism. Although he claims to be strongly antimaterialist, the emergent mind of his scheme is entirely a product of neural events. Once mind has emerged, however, it assumes the dominant role in driving the brain, being the essential directive force of brain processes. The mind is seen as being above the brain processes even though they are described as mutually interdependent. Since Sperry's holism arises from material forces *within* the brain, his stance—unlike that of Eccles—is thoroughly antisupernatural. If an emergent scheme is eclectic, allowing arbitrary values to be introduced into it, it seems to provide no surer way to a humane society than materialism.

Another difficulty with emergence reflects its dualistic leanings. Even if conscious experience does emerge from neural organization, the mode of control then exercised by consciousness remains unexplained. Either we are back at the interaction problem, or consciousness adds nothing to the wholeness generated by the brain itself.

In the end we are not fully satisfied with Sperry's position, although we agree on the importance of subjective conscious experience. A longing for holism is exemplary, but Sperry's rejection of a Christian outlook limits his horizons to the materialism that so distresses him. What Sperry has overlooked is the contribution that can be made

by adopting more than one perspective to the wholeness of the human person. The brain-mind problem, like the science-values issue, should be viewed from different viewpoints. When that is done, previously unrecognized aspects may appear. It is to such a "perspectivalist" approach that we now turn.

Brains and Persons

Dualists take subjective experience seriously but sometimes stumble over its implications. Brain scientist Donald MacKay suggests that we start from our immediate experience of what it is like to be a person. Our primary data constitute a flood of conscious experiences such as seeing, hearing, thinking, meeting people. Taken together, these data form the ground on which *all* our knowledge must rest. Alongside these data one also has other characteristics, so that being a person means being identifiable to other persons as a tangible body and having specific conscious experiences like those of other persons.

MacKay sees in that description of a person a dualism of *two different kinds of data* about ourselves. There are data of our own experience as conscious agents, and data about our correlated brain activity and brain states. Put more simply, the first is the *I-story*, what we see and believe; the second is the *brain-story*, the corresponding processes going on within our brains. Every aspect of our conscious experience, anything we believe or see or hear, will be represented by a particular configuration in the state of our brains. From that it follows that a *change* in our experience will be accompanied by a *change* in the state of our brains. This is a basic assumption of brain science, although we still know very little about the actual organization of the brain under changing circumstances.

If we accept that assumption for the purpose of argument, what follows from it? It has often been suggested that the two must be *causally* related, that is, the I-story must cause the brain-story or vice versa. MacKay's contribution comes in at just that point. He does not deny that such a causal connection may occur, but contends that it is implausible and unnecessary.

Instead of viewing the two sets of events as rivals, so that one must be right and the other wrong, MacKay suggests that we view them as *complementary* aspects of human behavior. "These events," he writes, "admit of analysis at the mechanical level in terms of nerve cells and their interactions, and also not only admit of but demand analysis in terms of their significance as the activity of a conscious being whose thoughts and desires and decisions can determine his behavior."

Taking his argument further, MacKay tackles the problem of determinism. If a "superscientist" were able to specify every aspect of the machinery of an individual's brain, would that individual be correct to believe all the specifications he was told about the state of his brain? In other words, may a point be reached one day when by analyzing an individual's brain a scientist would be able to tell that individual what he would believe at some future time? Or, to be more exact, what he would be *correct* to believe? If so, freedom of action and responsibility would become mere illusions.

MacKay contends there is a logical fallacy in that argument. If an individual were to believe what he was told about the state of his brain, his belief would have a major consequence: the state of his brain would be immediately changed by introduction of that new factor (belief). Therefore, he would be *mistaken* to believe what he was told, because that description would be out of date. Thus no complete specification of a brain's mechanism can exist which would be equally correct whether or not the person concerned believed it. The point of the argument is that an observer's prediction would be valid only if he did *not* inform the individual being observed of his prediction.

The brain is subject to scientific scrutiny because it is publicly observable; the mind or soul is not open to such investigation and hence can never receive scientific support.

Could the time ever come when allowance can also be made for the new factor? MacKay says no: even if it becomes possible to produce a specification which is incorrect at the moment but will *become* correct when it is believed, there would still be a difficulty. The difficulty is that the individual concerned would be under no obligation actually to believe it. If he did believe it, it would be correct; but if he did not believe it, it would be incorrect. And there is no reason why he should believe it. Consequently, MacKay contends, there can never be produced a specification of a person's brain, however sophisticated, that would have an *unconditional* claim to his assent.

The consequence is that, even if the human brain turns out to be as mechanical as the solar system, predictions about it will always differ from predictions about the solar system. Although predictions about the latter may have an unconditional claim to our assent, predictions about our brains do not—because we are under no obligation to believe them. The future state of our brains is *indeterminate* for us until we have decided on a course of action or belief. It is indeterminate not just in the sense of being unknown, but because a future specification does not exist which is inevitable for us until we have made up our minds.

MacKay argues that there are thus no mechanistic grounds for excusing our actions. We *are* responsible beings. MacKay spells out the crux of that responsibility, decision making. "A decision," he says, "is an action whose future form depends on what you believe about the situation in a way that makes it *indeterminate for you* until you have made up your mind: indeterminate, not just in the sense of *unknown* to you, but in the sense that there does

not exist a specification of the outcome which is *inevitable* for you until you make up your mind: until, in other words, you determine what the form shall be."

Human decision making provides a basis of freedom—even in a mechanistic universe. We are free and responsible, not in spite of the way our brain works or because of the way our brain works, but because freedom of action is a demonstrable logical fact. MacKay's principle of *logical indeterminacy* applies even in a physically determinate universe, although of course it is far from certain that the universe is physically determinate. MacKay's point is that, even if such an extreme situation were to prevail, his principle would continue to hold.

A crucial point for MacKay's stance is that the I-story (mind-story) and the brain-story are *correlates* of one another and not translations of one another. That means that the I-story can be indeterministic and the brain-story deterministic without mutual contradiction. The reason is that the two statements are descriptions of different aspects of an event, one referring to people with brains and the other to the brains of the people. When considering the question of freedom, it is important to distinguish between people and brains—because it is people, and not brains, who are free. Conversely, it is brains, and not people, which may be machines.

MacKay's concern throughout is to demonstrate that any denial of human responsibility on the basis of the assumed physical determinateness of the brain is based on a *logical* error. Hence the positive scientific theory that all physical events are determined by physical causes does not, he argues, imply the negative metaphysical belief that the immediate future of a human agent is inevitable. It follows that, even if an individual's action is predictable by observers, there would be no ground for denying that individual's responsibility for it.

We are free and responsible, not in spite of the way our brain works or because of the way our brain works, but because freedom of action is a demonstrable logical fact.

It is evident that MacKay, unlike Eccles, does not seek gaps in physical causality within the brain. Conscious activity is embodied in the brain activity that physically determines what our bodies do. The mental and the physical are in no sense rivals, therefore, but are complementary aspects of our consciousness. Beside the primacy of conscious experience, MacKay stresses the necessity to attach the significance of human identity to a person as a whole rather than to an artificially isolated body or brain.

MacKay's defense of human freedom on the basis of logical indeterminacy has attracted the attention of many philosophers. If legitimate, it provides a means of circumventing the seemingly intractable problems of dualism and the potentially dehumanizing tendencies of materialism.

A major question posed by MacKay's argument is the meaning of the term *freedom*. Stephen Evans, in his book *Preserving the Person*, considers that MacKay's argument can be interpreted in two ways. According to the first, an individual is free as long as he is kept in ignorance of the observer's predictions about his future actions. The individual is free in the sense that he has alternatives he could choose if different conditions prevailed. In that instance, the freedom of the individual lies in his lack of knowledge of the particular prediction made by the observer. The second interpretation entails a more rigorous meaning of freedom, namely, that no logical specifications exist of an individual's beliefs about a subject on which he is at present undecided. An individual's future belief is indeterminate, since any prediction about that belief might change it. Believing is not merely a physical happening, therefore; it includes a normative element about what *ought* to be believed. If that is true, an individual reflecting on the causes of his beliefs may proceed to alter those beliefs, the implication being that beliefs are not just events to be causally determined and predicted. They result from rational reflection and hence may be free because of the nature of such reflection. If so, an onlooker as well as the individual may agree that beliefs of that type are free.

Evans favors the second alternative interpretation of MacKay's argument as a basis for human freedom. Both the potential strengths and weaknesses of MacKay's position seem to lie in its purely logical level. Although MacKay demonstrates the pitfalls of materialism and points the way to a viable alternative to both it and dualism, many find his argument hard to follow. The meaning of freedom may be one issue that needs clarification. It is clear that MacKay believes that freedom is real and not an illusion.

MacKay appears to be saying that, if a future outcome is indeterminate for an individual, that individual has the power to determine the outcome, and therefore is free. Freedom of that kind underlies human responsibility. MacKay has put forward a very strong argument that there are future beliefs that are *indeterminate for* the individual. What is less clear is whether this implies that such beliefs are *determinable by* the individual.

MacKay's logical argument fits well with his Christian presuppositions. It is a clearing operation for working out the meaning and consequences of belief in human freedom and dignity. MacKay has shown that man cannot be written off as a being for whom all future thoughts, actions and decisions are inevitable. Having established that, the task is now to demonstrate what human freedom entails and the uses to which it needs to be put.

In a sense, our discussion has brought us a long way from the brain-mind debate. Yet the direction we have traveled has been almost an inevitable one for a Christian. We dare not isolate a person's brain from the remainder of the body

and personality as though it were a detachable piece of luggage. To reach a person-centered conclusion one must start from *man as a person*, not from man as a brain.

Many discussions of brain-mind relationships bypass a holistic view of human beings, then find it impossible to break free of the bonds of reductionism. To confine one's perspective of the mind to specific regions of the brain demeans the value of human significance, regardless of the conclusions reached. A proper level at which to contemplate the brain-mind debate is that of humans as choosing, deliberating, valuing and purposeful beings. From that vantage point, the primacy of our own consciousness is a valid piece of evidence. Our sense of freedom and purpose is an essential ingredient of any discussion on the human brain and what has traditionally been termed the human mind.

Mechanical Man: A Christian Physiologist's Dilemma?

DAVID S. BRUCE

Department of Biology
Wheaton College
Wheaton, Illinois 60187

The field of contemporary physiology is a mechanistic one. Christian theism maintains that man was created ex nihilo *by a personal God. How can a Christian physiologist reconcile these positions? This paper surveys the historical roots of modern physiology, reviews the essential tenets of the Christian faith, and discusses a personal resolution of the apparent dilemma of mechanical man and personal God: an understanding of the clockwork (physiological mechanisms) does not displace the necessity to understand man on other levels or explain his whole nature.*

The Nature of Physiology

"The science of physiology. . .seeks to explain the underlying machinery of the life processes of the organism." Thus begins the first chapter of a famous physiology text, *The Machinery of the Body*, written about 30 years ago.[1] The view of the human body as a machine is stated even more explicitly in the opening chapter of an excellent current text held in high esteem by physiologists:

> *The mechanist* view of life holds that all phenomena, no matter how complex, are ultimately describable in terms of physical and chemical laws and that no "vital force" distinct from matter and energy is required to explain life. . .Man. . .is a machine—an enormously complex machine, but a machine, nevertheless.[2]

The hallmark of the study of physiology is the unravelling of the "how" of the operating parts. The physiologist strives to explain, in physical and chemical terms, the mechanisms that operate in the living world. The field of contemporary physiology is therefore a mechanistic one. Physiologists reject as unscientific the tenets of vitalism: phenomena are only partly controlled by mechanical forces; they are in some measure self-determining. Vitalism ascribes the functions of a living organism to a "vital principle" distinct from chemical and physical forces.

An Historical Perspective of Physiology

History's first biologist and perhaps greatest philosopher, Aristotle, was a vitalist with a mechanistic streak.[3] He analogized the source of motion or "prime mover" with energy and placed "form" and matter in constant interaction, as a mechanist might. At the same time, his vitalism

was etched in his belief in "causes" in nature, including the final cause or purpose in which the ends are actualized, a potential is achieved. (This "doctrine of final causes" part of vitalism is known as *teleology*). So, the roots of vitalism as well as mechanism can be traced to the Greek period.

Little was done in biology during the Roman period and the Middle Ages. Vitalism was the predominant philosophy. With the coming of the Renaissance and the invention of the printing press, the works of Aristotle resurfaced and were among the first to be printed and distributed throughout Europe. Aristotle's influence was formidable. He was a systematist who tried to explain everything. He believed that the Creator (the "unmoved mover") made nothing in vain, that everything had a purpose which could be discovered and explained.

The adoption of Aristotle's methods characterized the Medieval spirit: the attempt to synthesize the rational with the Christian (or at least theistic) perspective. If man is rational, it is because God is rational.

> Aristotle's explanations took the form of sweeping general theories, sometimes having no connection with experimental verification. And these theories were very strongly put. Consequently, as time passed, what started as theoretical explanation came to be accepted as proven fact. This was the horrible consequence of a highly theoretical approach: conjecture became dogma.[4]

Replacing the philosophy of Aristotle with empiricism was a most difficult task for the men of the scientific renaissance. The Belgian, Andre Vesal, dissected the human body and in 1543 described the formerly forbidden machine with an unprecedented thoroughness. In the 17th century William Harvey used a clever combination of observation and reasoning to argue that the blood circulated. Quantitative biology was born when he measured the cardiac output in animals. According to Coleman,[4] because of Aristotle's strong influence, scientific investigation's pendulum swung radically to the opposite extreme, and emphasis on systematic theory was replaced by emphasis on experimentation. "Possibly, the swing. . .has been too extreme, allowing the emphasis on experimentation to remain in excess."[4]

Descartes, in the mid-17th century, went beyond Harvey's contention that the heart was a mechanical pump forcing blood through conduit vessels. Descartes believed the whole animal body was a machine, but that humans were more than animal machines because they had immortal souls. Descartes is credited with being the founder of mechanism in biology. He was a dualist, believing that human persons had both a physical and a spiritual nature, and he separated mind from matter. LaMettrie, a complete mechanist and materialist of the early 1700's, completely rejected the immortal soul of theologians and the vital force of life in his work *L'Homme Machine* (*The Human Machine*).

Probably the best example of an intense interest in experimentation is Claude Bernard, known as the father of experimental medicine. In the mid-19th century he described the importance of the concept of the constant internal environment.

To the present-day physiologist, the human body is a magnificent machine.

> He fought systematic philosophy, pointing out that sweeping generalizations void of verification were totally valueless. He emphasized careful observation in both the clinical and laboratory setting. Most importantly, he distinguished between observation and experimentation. In the later process, an investigator repeatedly produces some disturbance and then expects to find a consistent response. Before Bernard's time, the life processes were thought to be fragile and composed of many fleeting manifestations somehow controlled by mysterious vital forces.[4]

Bernard believed that a given stimulus would always produce a given response, and therefore emphasized the value of laboratory experimentation and verification.

In the early part of the 20th century, Walter B. Cannon of Harvard extended Bernard's concept of the constant internal environment. In *The Wisdom of the Body*[5] he stressed that life is possible because stability is maintained by regulatory mechanisms. He gave us a most useful and significant conceptual term, still the keystone of today's physiology, when he wrote: "the coordinated physiological processes which maintain most of the steady states in the organism are so complex and so peculiar to living beings—involving, as they may, the brain and nerves, the heart, lungs, kidneys and spleen, all working cooperatively—that I have suggested a special designation for these states, *homeostasis*."[5]

This survey of history has traced contemporary physiology's legacy. What does a physiologist do? Based upon what is currently known about the natural world, he asks: How does a muscle cell shorten, a neuron generate and propagate an impulse, the ear/brain hear? Beyond these considerations, in which the physiologist is a splitter, a dissecter, a "peeler away" of the covering and overlying in order to discover the fundamental mechanisms of function, he is a synthesizer. As he studies the mechanisms of life, he perceives that they are not isolated and autonomous. There is a relatedness among them and among the organs and systems in which they are found. There is feedback, control, preservation of constancy within the body as its mechanical components interact.

To the present-day physiologist, then, the human body is a magnificent machine. Dean Wooldridge states it succinctly in *Mechanical Man*[6]:

> Thus we have failed to discover any aspect of life—whether related to the origin of organisms, to their physical properties, to behavior, to intelligence, or to consciousness—whose explanation appears today to lie beyond the ultimate capabilities of physical science. . .We seem justified in the broadest possible application of what may be called the central thesis of physical biology, that a single body of natural laws operating on a single set of material particles completely accounts for the origin and properties of living organisms as well as non-living aggregations of matter and man-made structures. Accordingly, man is essentially no more than a complex machine.

The Nature of Biblical Theism

Every person has a *weltanschauung* or world view. In James Sire's words, a world view is "a set of presuppositions. . .which we hold. . .about the basic make-up of our world."[7] Until the end of the 17th century, the theistic world view was dominant. Arguments and debates in philosophy and science were conducted within the framework of theism.

Pertinent propositions of the theistic (Christian) world view[7] are:

1. *God is infinite. He is prime reality, beyond measurement.*
2. *God is personal. He has personality.*
3. *God is transcendent and immanent. He is beyond us and our world yet with us.*
4. *God is omniscient. He is all-knowing, the source of all knowledge.*
5. *God is sovereign. Nothing is beyond His authority and control.*
6. *God is good. Goodness is the essence of God's character, expressed in holiness and love.*
7. *God created the cosmos* ex nihilo *to operate with a uniformity of cause and effect in an open system.*
8. *Man is created in the image of God. He therefore has personality, intelligence, morality and creativity.*
9. *History is linear, a meaningful sequence of events leading to the fulfillment of God's purposes for man.*

Christian theism maintains that the universe was created *ex nihilo*, from nothing, by a personal God who is good, all-powerful, and all-knowing. It is He who formed man to have God's image, and therefore to have intelligence, personality, and morality.

The Dilemma of the Christian Physiologist

The theistic world view was jolted with Copernicus' discovery that the earth (mankind) was not the center of the universe. Medieval reality was overturned. Newton showed that there were certain forces which govern the motions of particles that make up the universe. The mechanical nature of matter was quickly applied to man. As Matson states it in *The Broken Image*[8]:

> The Copernican revolution. . .dislodged man from the center of the universe; it remained for the Galilean-Newtonian revolution to remove him from the universe altogether. . .and so, for purposes of science, [man] *was* removed—except as insensitive body, or more accurately as mechanism. The consequences of this displacement have not yet, after three centuries, fully run their course.

A Christian theist believes that God created an ordered and orderly universe and created man in His own image to function as a *person*. Contemporary natural science views the cosmos as an intricate mechanism of cause-and-effect, a vast perpetual motion apparatus devoid of all purpose, and current physiology considers man to be "an enormously complex machine, but a machine, nevertheless."[2]

It is at once obvious that a physiologist who is a Christian, accepting and believing the essential tenets of biblical theism, will experience a tension as his faith and his "machine physiology" interact. Can he/she be genuinely true to Christianity and to physiology? Is resolution of this dilemma possible?

A Resolution

The naturalism of contemporary physiology claims that, "matter exists eternally and is all there is. God does not exist. Man is a complex machine. Personality is an interrelation of chemical and physical properties we do not yet fully understand."[7] Rhodes[9] lists the names of the great men who gave birth to and nurtured the rise of modern science: Copernicus, Galileo, Kepler, Bacon, Descartes, Boyle, Faraday, Dalton, *et al.*, and points out that all were devout Christians. He believes that the original dependence of science on Christian theology is illustrated in an examination of the presuppositions of modern science: belief in an orderly, regular, rational universe, that this orderliness is intelligible to the scientist, and that human reason is reliable. They justified their assumptions, says Rhodes, "on the basis of their belief in a personal, rational and dependable God."[9]

With a background like this, it would appear strange that modern science is so closely allied in the public mind with atheism or agnosticism. Rhodes believes the change came about as a result of the popularization and "explanation" of science by Fontenelle and his descendents of the *philosophes* movement of the 18th century. Quoting Butterfield in *The Origins of Modern Science*, Rhodes continues:

> Many of the scientists of the 17th century had been pious Protestants and Catholics. . .A skepticism which really had a literary genealogy combined to give the results of the 17th century scientific movement a bias which was rarely seen in the scientists themselves, and which Descartes would have repudiated.[9]

I believe it is debatable as to who first promulgated the new religion of *scientism*, the belief that all truth is scientific truth and that the sciences give us our best shot at knowing "how things really are."[10] However it began, scientism is with us today and is espoused by a majority of physiologists and other scientists.

Donald MacKay, a neurophysiologist and a Christian, is helpful as we seek a resolution to the dilemma of "physiology and Christianity." In *The Clockwork Image* he states:

> Our working hypothesis is that the brain is capable of being studied as a mechanistic system. In order to explain human behaviour, chains of cause and effect can legitimately be sought and found in terms of physics, or physiology. . .The last thing I want to suggest is that there is anything improper about a mechanistic approach as such. . .However. . .a mechanistic approach adopted for scientific purposes is being abused if it leads to. . .machine mindedness.[11]

A danger with scientific models, therefore, is their universal application to explanations of everything. Scientific reductionism presupposes that the scientific model *can* be universally applied. MacKay calls this debunking of alternative explanations "nothing buttery." It is characterized by the notion that by reducing any phenomenon to its components you not only explain it, but explain it away:

> Christians believed the world was created by God; Science (with a capital S) showed that 'really' it was 'nothing but' a fortuitous concourse of atoms. Christians thanked God for sending rain and daily bread; Science explained the agricultural cycle as 'nothing but' the workings of an intricate physical mechanism. . .[11]

MacKay hastens to point out that some Christian apologists, especially in the 18th and 19th centuries, asked for the trouble they received from science by posing "arguments for the existence of God" out of phenomena that they thought were beyond scientific explanation, thereby sharing in and encouraging the mistaken presupposition of the scientists.

The fallacy of scientific reductionism ("nothing buttery") is illustrated in this way by MacKay: Suppose an electrician were asked to describe an electric advertising bill-board. He proceeds to give a thorough description of the electrical circuitry so that the listeners understand precisely how each light bulb is activated. But then someone says to him that his technical description is incomplete because he did not mention the message of the advertisement. MacKay's point is that the electrician's account, in its own terms, is complete. What he has not accounted for is the thing *as a whole*. But this is outside of his terms of reference. MacKay says:

> To me this is a helpful picture of the kind of connection there is between the scientific description of the universe and the Christian description. As a scientist, I have the job of helping to build in scientific language—at the scientific level—as complete a description of the pattern of physical events as I can, regarding no accessible events as exempt from examination. As a Christian, I find that the very same pattern of events can bear an additional and vital significance as part of the activity of God himself.[11]

Science, including physiology, may be regarded as the investigation and communication of natural revelation. Richard Bube, a Christian physicist, does not consider science to be an independent method of knowing God, but rather a valid instrument in interpreting revelation.[12] MacKay agrees. He believes that the freedom and autonomy of science is only *methodological*, not *ontological*.

> Science is not an alternative to God as the source of truth, but a specialized way of gathering and discovering patterns in data which Christians believe to have one and the same Source. The discipline of science is autonomous in the sense that we need not have explicit theological convictions in order to practice it. . .Whether it be true or false that all natural happenings have a mechanistic explanation, the notion says nothing—absolutely nothing—either for or against their continual dependence on God in the sense implied by biblical theism.[11]

The latter point is a significant thesis for Bube, who firmly believes that God is the reason everything exists and continues to do so. "The universe exists moment by moment only because of the creative and preserving power of God . . .If God were to 'turn Himself off,' everything would *cease to exist*! Without God there are no laws, no world, no us. Not only do we rely upon God as the Creator at the beginning. . .we rely upon God constantly for our very existence."[13] Bube goes on to cite a number of scripture passages for this position. (Heb. 11:3; 1:3; Col. 1:17; Job 12:10; Acts 17:28; 1 Cor. 8:6).

Bube, like MacKay, believes further that there are levels at which a given situation can be described. Reality can be described on the levels of the physical sciences, biology, psychology, sociology, and theology. Every natural phenomenon can in principle be described on every level. An *exhaustive* description is one in which there are in principle no unknown or unknowable gaps, using *only the particular categories of a given level*. Complete knowledge requires an exhaustive description on *every* level.[13]

Is man only a complex machine? He *is* a complex machine. Every human activity is or may be ultimately physically describable. But these events can also be described in terms of the biological, psychological and social sciences, and ultimately, as Bube puts it, "in terms of that theology which relates the event and the man to God."[13] Bube emphasizes that it is never the question of something happening on one level exclusively (*e.g.* the physical), but of happening on every level simultaneously.

Michael Polanyi perceives that a machine is characterized by an operational principle, that is, the way its components (organs) carry out their special function in working together for an overall operation that achieves the purpose of the machine. "The complete knowledge of a machine as an object tells us nothing about it as a machine."[14] That is, a complete physical and chemical description cannot, in itself, allow us to recognize a machine. It can be recognized as such only by first guessing, a least approximately, what it's for and how it works.

> For centuries past, the workings of life have been likened to the workings of machines and physiology has been seeking to interpret the organism as a complex network of mechanisms. . .Any coherent part of the organism is indeed puzzling to physiology. . .until the

David Bruce was born in Amherst, Ohio. He studied at Taylor University (B.A. and B.S. Ed., 1962) and Purdue University (M.S., 1965; Ph.D., 1968 - both in Physiology). During a recent leave from Wheaton College, where he is Professor of Biology, he engaged in research in the Department of Physiology and Pharmacology at the University of St. Andrews in Scotland. He has taught at DePaul University (1967), Purdue (1967-68), Seattle Pacific College (1968-74), and has been at Wheaton since 1974. He is currently Chairman of the Health Professions Committee at Wheaton, which coordinates the advising and recommending of pre-medical and other students preparing for the health professions. His research is in the physiology of hibernation (bats and ground squirrels), diving physiology (comparative and human), and other aspects of physiological adaptation to environment. He has published more than twenty technical articles in human and animal physiology.

As a Christian physiologist, my task is to learn all I can about the clockwork of the body, while maintaining my perspective that man is not merely the sum of the mechanical parts.

> way it benefits the organism is discovered. . .Any description of such a system in terms of its physical-chemical topography is meaningless, except for the fact that the description covertly may recall the system's physiological interpretation—much as the topography of a machine is meaningless until we guess how the device works, and for what purpose.[15]

When Polanyi brings in *purpose*, he raises the hackles of contemporary physiologists who shudder at its teleological implications. In the examples he chooses, *reasons* and *causes* are addressed. Polanyi contends that all physiology is teleological, that *purpose* is logically inherent in the conception of jointly-functioning organs.[14] The physiologist responds by saying that he is concerned only with a mechanistic explanation. When he asks a student why the heart beats faster when he runs, he wants a detailed answer of the effects of blood chemistry on chemoreceptors whose afferent impulses activate cardiovascular centers in the central nervous system which in turn send efferent signals to the myocardium. He does *not* accept the answer: "So more blood and oxygen can get to my muscles." This recalls the levels-of-explanation issue raised earlier. "Teleology," said von Brücke, "is a lady without whom no biologist can live; yet he is ashamed to show himself in public with her."[8]

Bube is instructive at this point. He states that science is concerned primarily with the immediate or secondary causes of events. The biblical revelation speaks primarily of the ultimate causes of events.

> Christians must not mistake science's preoccupation with immediate mechanisms as in itself a denial of the existence of ultimate causes . . .Scientists. . .must not mistake the preoccupation of Christian theology with ultimate causes as in itself a denial of the importance of immediate mechanisms.[12]

If man's structural and functional parts were completely described in terms of physics, would that mean that the whole man would then be described in terms of physics as he engages in interpersonal relationships? It is very probably true that every human experience has some physical, chemical (certainly physiological) counterpart in the body (especially the brain). The issue is whether everything about man is *explained* by a physical and chemical *description*. As Bube puts it,

> Once these physical and chemical processes have been discovered, is there nothing else meaningful that can be said about the phenomena involved? . . .It is no longer necessary to debate whether man is a machine or a person created by God. Man can be understood only when described as a machine *and* as a person created by God, created with real personality in the image of a personal God but functioning on the biological, biochemical, and biophysical levels according to the laws that govern the rest of nature as well.[13]

Science can never claim to be the only method of apprehending reality.[9] As MacKay says, ". . .we have in human nature a 'unity' which demands at least two levels of discussion: the level of the mechanical, appropriate for an outside observer, and the level of the personal, appropriate from the inside standpoint of the agent himself.[16] Langdon Gilkey speaks of the difference between the biophysical *act* of a human action and the *reason* for its occurrence.

> Like the falling of a leaf, an act without purpose is "merely caused," the determined effect of a preceding physical event. . .Only where freedom and so the power of decision are assumed, only where a purpose is evident, does an action become meaningful to itself or to others as a human action. . .Christian thought must accept the scientific method, which searches for the necessary interrelations between events, as a valid and important means for understanding the observable world around us. But Christianity can never accept science as a total view of finite reality. . .[17]

Donald MacKay crystallizes the essential point of resolution emphasized in this paper. He writes:

> Our nature has a multiplicity of complementary aspects, and no single account at one level of explanation can do full justice to all. In this sense man is indeed a mystery. Even to explain man's brain and body completely, if we could, in mechanistic terms, would not begin to dispose of the mystery which confronts us in the fact that, when all is said and done, here we are as cognitive agents who can contemplate the result. Where do *we* come into the mechanistic description?[11]

In her article "The Man Who Is There,"[18] Mary Jean Newton wonders if man is just a machine, or if there is something special in him that sets him apart from the rest of creation. She states that ultimately this question requires a faith response, because no one has yet found a way to prove conclusively to another person the truth of either alternative.

A Personal Application And Commitment

Is the dilemma resolvable for the Christian physiologist? Is man a machine? Or is there a reason, a purpose for human existence? I believe that man *is* a machine. As a physiologist I shall continue to study the parts, the mechanisms, and to teach my students about them. As a Christian, I believe that man is a personal agent, created by a personal God, and that man is to image God in all that he does. As a Christian physiologist, my task is to learn all I can about the clockwork of the body, while maintaining my perspective that man is not merely the sum of the mechanical parts. The central thesis of my attempt at resolution of the dilemma of the Christian physiologist is that a thorough description of man's physiology does not obviate the need for other levels of explanation of his *whole* nature. I would do my students a great disservice if I failed to help them learn all that is currently known about the mechanisms of the body and their interplay and control. I would do them a greater disservice if I persuaded them explicitly or tacitly to substitute the impersonal god of scientism for the personal God of creation as their ultimate motivator and *raison d'etre*.

I conclude with some final thoughts from MacKay:

> . . .If we would understand what the Bible has to say about our human nature we must try to appreciate the *wholeness* of the biblical concept of man, as a unity of body, mind and spirit. There is absolutely no basis for the idea that the biblical doctrine, in all its

fullness, raises any kind of barrier to the mechanistic explanation of human activity. . .The greatest educational need of our time [is] to restore *wholeness* to our view of life. The machine-image promises unification of a kind—but only at the cost of leaving out, as irrational and fragmentary oddities, those human questions and concerns and values which we feel most deeply. . .The only complete solvent of machine-mindedness, and the only perfect education for freedom, is in a proper conception of God as author of our whole lives, including the marvellously intricate mechanistic story that our science is uncovering.''

I firmly wish to be both a teacher *and* a student in that "freedom education" school.

REFERENCES

[1]Carlson, A. J. and V. Johnson. 1948. *The Machinery of the Body*. 3rd ed. U. Chicago Press. pp. 4, 5.

[2]Vander, A. J., J. H. Sherman and D. S. Luciano. 1980. *Human Physiology - The Mechanisms of Body Function*. 3rd ed. McGraw-Hill. p. 9.

[3]Nicklanovich, M. D. 1973. *From Cell To Philosopher*. Prentice-Hall. p. 521.

[4]Coleman, T. G. 1975. "The Role of Theories in Biological Research," *The Physiologist 18*(4): 509-518.

[5]Cannon, W. B. 1932. *The Wisdom of the Body*. W. W. Norton Co. edition pub. 1963.

[6]Wooldridge, D. E. 1968. *Mechanical Man*. McGraw-Hill.

[7]Sire, J. W. 1976. *The Universe Next Door*. InterVarsity Press.

[8]Matson, F. W. 1966. *The Broken Image*. Doubleday Anchor Books.

[9]Rhodes, F. H. T. 1965. "Christianity in a Mechanistic Universe," In *Christianity In A Mechanistic Universe*, D. M. MacKay ed. Inter-Varsity Fellowship/London.

[10]Evans, C. S. 1975. "Christian Perspectives on the Sciences of Man," unpub. paper from Faith-Learning Seminar, Wheaton College, Illinois.

[11]MacKay, D. M. 1974. *The Clockwork Image*. InterVarsity Press.

[12]Bube, R. H. 1968. *The Encounter Between Christianity and Science*. W. B. Eerdmans.

[13]Bube, R. H. 1971 *The Human Quest*. Word Books.

[14]Polanyi, M. 1958. *Personal Knowledge*. U. Chicago Press.

[15]Polanyi, M. 1968. "Life's Irreducible Structure," *Science 160*: 1308. Reprinted in *J. Amer. Sci. Affil. 22*(4): 123-131 (1970).

[16]MacKay, D. M. 1965. "Man as Mechanism," in *Christianity In A Mechanistic Universe*, D. M. MacKay ed. Inter-Varsity Fellowship/London.

[17]Gilkey, L. B. 1959. *Maker Of Heaven and Earth*. Doubleday & Co. p. 70.

[18]Newton, M. J. 1970. "The Man Who is There," *J. Amer. Sci. Affil. 22*(4): 145-147.

Incest and Sexual Abuse: Approaching the Last Frontier

LARRY McCAULEY

Oklahoma Christian Counseling Center
Oklahoma City
Oklahoma 73112

This article explores one of the fastest growing areas of concern—incest and sexual abuse. Past and current literature on incest and sexual abuse are reviewed. Scripture takes a strong stand against incest and some correlates are drawn from Scripture showing the long term effects of the incestuous act (i.e. the plight of the Moabite and Ammonite tribes, both conceived out of the incestuous relationship between Lot and his daughters).

This article also shows how other Christian morals have been explained away academically and behaviorally and the question that remains is: Will incest, too, become an acceptable form of behavior in the future?

Society, in general, has learned to accept divorce, cohabitation, abortion, homosexuality, and possibly in the near future, incest. In a recent popular magazine, John Money and Gertrude Williams are quoted as saying, "One who commits incest is like a religious deviant in a one-religion society." The connotation seems to be that opposition to incest is quite like religious intolerance. Likewise, Kinsey and Pomeroy (1953) state, "It is time to admit that incest need not be a perversion or a symptom of mental illness. Incest between. . .children and adults. . .can some-

Sensitivity to the problem of child abuse is a surprisingly recent phenomenon.

times be beneficial." This type of thinking is not rare. In fact, with increased awareness of incest and sexual abuse comes the idea of consensual incest. Critics of the incest taboo want to make a distinction between "consensual incest" and "child abuse." By employing such academic tactics and intellectual baggage, they are only trying to justify such behavior.

Approximately 10 years ago, the topic of homosexuality came to the foreground. Much debate was given to the topic, both secular and theological. It became such a strong issue that psychologists and psychiatrists no longer treated it as a problem. In fact, it is not listed as a disorder in the recently published DSM III, which heretofore had been listed. (Homosexuality is restated as "ego-dystonic homosexuality," with the differential diagnosis as "homosexuality without distress") (APA Task Force, 1978). Today, the gay movement is accepted in some "religious" segments of society. Yet when we look at Scripture (Gen. 19; Lev. 18:22; 20:13; Rm. 1:26-32; I Cor. 6:9-11; I Tim. 1:10), there is divine guidance as to what is or is not acceptable.

Historical Roots of the Incest Taboo

In every culture, the incest taboo appears in some form (Murdock, 1949), yet incest seems to occur among virtually all peoples of the world. Perhaps the most widely cited example of ignoring the taboo is the case of the prominent ruling families in ancient Egypt. Brother-sister marriages occurred in the ruling family during the Pharaonic and Ptolemic periods (Middleton, 1962). Probably, the most well-known sibling spouse of this latter period was Cleopatra. Middleton surmised that the royal custom had filtered down to other social classes over the centuries and that brother-sister marriages were often seen as a means of maintaining family property intact and avoiding the future splitting up of an estate among bickering siblings. Anthropological theory suggests that the incest taboo developed gradually as cultures changed from family groupings of hunters to agrarian societies. Berry (1975) states "the taboo provided for the maintenance of the integrity of the family unit, without excessive intrafamilial rivalries, and gave rise to the need for interfamilial extension and reciprocal exchanges of goods and services, precluding isolationism."

The prohibition of intrafamily marriages in primitive Christian culture dates back to such prohibitions obtained in the Greco-Roman and Jewish cultures. During the first three centuries, Christian practice was modeled after current Jewish and Greco-Roman practice. From the fourth century on, changes began to appear. These changes were partly brought on by the Christian outlook itself and partly by "customs and conditions prevalent among the barbarian people who flocked into the church" (Cooper, 1932).

Among a large number of non-Christian peoples, civilized as well as uncivilized, the prohibitions against near-kin marriages are appreciably or markedly more extensive than in our own Western culture. Among some cultures, such as some of the Bantu tribes of South Africa, marriage is prohibited to all relatives between whom relationships can be traced, no matter how remote the connection may be. Athabascan Indians of the Northwest, appear to have prohibited marriage up to the fifth and sixth generation. The Choctaws, of the Southeast, seemingly prohibit marriages of those related within four generations (Theal, 1925). "The sanctions behind the prohibitions of near-kin marriage in non-Christian cultures are sometimes religious, but more commonly social." (Cooper, 1932). The common penalty rendered by tribal authority and thoroughly approved by public opinion, was death. This form of punishment was often quite drastic and striking. The following two examples, taken from many, will make the point clear.

The Tuscarora Indians of North Carolina were forbidden to marry family members as near as first cousins. However, if found guilty of an incestuous relationship, they were put to death, their body burned, and the ashes were scattered into a local stream, thus rendering him/her unfit to remain on earth. Likewise, the Kayans, a tribe on the Island of Borneo, had strict laws regarding incest. Most offenses were punishable by fines with the exception of "the most serious crime—incest." If incest was proven both parties were staked to the river bank by bamboo stakes where the bamboo grew roots. There, the guilty parties died.

Incest and Scripture

Genesis 19 shows us vividly of the utter sinful nature prevailing in Sodom. In verse 5, we read, "Where are the men who came to you tonight? Bring them out to us that we may have relations with them (to have intercourse) (NASB)." Lot refused their demands and "went up out of Zoar, and dwelt in the mountain, and his two daughters with him (vs. 30; NASB)." In the following verses (31-38), the incestuous act is carried out by his daughters. The offspring of these incestuous relations lead to the development of two nations: (a) Moabites, offspring of the oldest daughter and (b) the Ammonites, the offspring of the youngest daughter.

Moabites: Apparently, God had given orders to Moses not to oppose the sons of Moab or provoke them to war because He had the lands given to the "sons of Lot as a possession" (Deut. 2:9, 19). From this point on, there appears to be unrest and sinful upheaval throughout the rest of the Moabite history. Balak hired Balaam to curse Israel because of the fear the Moabites had for the Israelites (Numb. 22:3). However, Balaam was rebuked by the voice of his donkey for his sin. God permitted Balaam to proceed, but only on the condition that he would say what God wanted. As a result, Balaam prophetically gave four blessings to Israel and finally said to Balak and the Moabites, "though you cannot conquer Israel by force of arms, you

can seduce them" and that's exactly what they did. The Moabite girls entered the Israelite camp (Numb. 31:16) and seduced the men (Numb. 25:1-9).

Some one hundred years later, we see the Moabites still in chaos and being subdued by Ehud (Jud. 3:30). Strife continues and we read in II Kings 3:4 that the Moabites continue their hatred toward God's people, the Israelites. After the death of Israel's King Ahab, King Mesha, king of Moab, was thoroughly defeated by Jehoram with Jehoshaphat of Judah. As far as possible, the land of Moab was ruined.

From that time on, we are able to trace the continued decline of the land of Moab in accordance with the word of the Lord as revealed through his prophets. (Isa. 11:14; 15; 16; 25:10; Jer. 9:26, 25-21; 48; Eze. 25:8; Amos 2:1). Finally, Jeremiah (48) describes past and future judgments on Moab, and Zephaniah 2:8-11 predicts utter destruction upon Moab for its wicked people.

Ammonites: "Ammon (ammon) was the name of the descendants of Ben-ammi, Lot's younger son by his daughter, born in a cave near Zoar (Gen. 19:38, New Bible Dictionary, 1962)."

The Ammonites were fierce in nature, rebellious against Israel and idolatrous in their religious practices. Jer. 40:14; 41:5-7 and Amos 1:14 depict their brutish murders. Even though related to Israel, they refused to help when asked (Deut. 23:4). They chose to join Moab to secure Balaam (Gen. 23:3-4). Later on, we see that they decided to side with Sanballat to oppose Nehemiah and his endeavors to rebuild the walls of Jerusalem (Neh. 2:10, 19). As shown in Scripture, the Ammonites were in constant upheaval and discontent. Apparently, they were so disruptive and prone to idolatrous behavior (Eze. 25:1-7) that in Deut. 23:3, it states, "no Ammonite or Moabite shall enter the assembly of the Lord; none of his descendants, even to the tenth generation, shall ever enter the assembly of the Lord."

It seems then, that we can trace God's abhorrence of incestuous sin. The Lord is explicit in Lev. 20 as to what is not acceptable in terms of moral sin. There appears to be a high price to pay for incest as seen through the tribes of Moab and Ammon.

The New Testament speaks of a mother-son incestuous relationship (I Cor. 5:1-13). Again, Scripture does not sanction such behavior and goes further to say, "remove the wicked man from among yourselves." (5:13). Removal from the church was not for incest, but for continuing in the sin rather than repentance. Upon repentance, he is then to be restored officially by the church due to his repentance (II Cor. 2:6-11).

Incestuous Sexual Abuse of Children

Sensitivity to the problem of child abuse is a surprisingly recent phenomenon. Historical records indicate that in the past abuse of children was common and accepted without question. DeMause (1974) has noted that "there would be a point back in history where most children were what we would now consider abused." Numberous factors appear to have contributed to such circumstances. Legally, children were regarded as the property of their parents to be used or abused as they saw fit. Economically, they were seen as burdens when too young to work, then assets to be exploited as they became employable (often as young as four or five years of age). Religious teaching tended toward the "spare the rod, spoil the child" philosophy and the doctrine of the inherent sinfulness of man required stringent punishment of children, literally to "beat the devil out of them." Sociologically, families tended to be large and the fact that many of the children died of disease before adulthood favored callous rather than affectionate and compassionate treatment of children.

In view of these factors, it may not be surprising to note that, in the United States, the first case of a child to be afforded legal protection from the abuse of being starved and beaten by foster parents occurred in 1874 and had to be handled by the Society for Prevention of Cruelty to Animals, because no such agency existed for children (Williams, 1978). And, it was not until 1962 that Kempe clearly described the "battered child syndrome." In the years since, much has been learned about such children and their families. Federal and local support has been marshal-

Larry McCauley received his M.A. from Wheaton College, Wheaton, Ill., and his Ed.D. from Loyola University of Chicago. Upon completion of his studies there, Dr. McCauley worked as a Post-Doctorate Fellow at the University of Oklahoma Health Sciences Center in the Department of Psychiatry and Behavioral Sciences for two years. During that time he conducted research and psychotherapy in the area of incest and sexual abuse. Presently, Dr. McCauley is a Staff Psychologist with the Oklahoma Christian Counseling Center located in Oklahoma City.

ed to provide care for such victims, as well as for some efforts toward prevention.

Likewise, awareness of the problem of incest and sexual abuse is relatively new. Within the past two years, the mass media have given a great deal of attention to this area. For example, "Flesh and Blood," a made-for-T.V. film on incest was produced in 1979; Katherine Brady, author of "Father's Day" (1979) appeared on national television; and a nation-wide T.V. series entitled "The Baxters" discussed incest and sexual abuse (March, 1980). In 1979, a full-length motion picture was released with an incestuous theme entitled, "Bertolucci's Luna." Recent books by Brady (1979), Meiselman (1978), Armstrong (1978), Butler (1978), Finkelhor (1979) and Money and Williams (1980) all deal specifically with incest.

While much has been learned about physical abuse of children (Paulson and Blake, 1967; Williams, 1978), relatively little has been learned about sexual abuse (Summit and Kryso, 1978). The real magnitude of the problem is only beginning to be realized since reporting and investigation of suspected cases has become mandatory, in most states.

All researchers and clinicians familiar with the area agree that sexual abuse is a greatly underreported offense (Giarretto, 1976; Gligor, 1966; Kaufman, Peck and Tagiuri, 1954; and Weiner, 1962). There appear to be several reasons for this: (1) the child often fails to report the incident to authorities and/or parents out of fear of reprisal and blame for the incident by the offender; (2) guilt feelings they may have if they experience any pleasure or excitement during the sexual contact; (3) when a child reports such an event to an adult, the story is often confused and the child appears to change the story on various retellings (the possibility that the child misunderstood what occurred or invented the story cannot be entirely discounted); (4) persons discovering the offense are often unwilling to subject the child to interrogation and possibly traumatic legal proceedings; (5) in most cases no serious physical harm has been inflicted upon the child and proof of the offense may be difficult to establish; and (6) parents and family members are reluctant to report such incidents to the authorities because of the shame and social censure that accompanies such a disclosure.

In a retrospective study of 1,800 college students, almost one-third of the respondents of both sexes reported that they had been subjected to some form of sexual abuse as a child (Landis, 1956). And, in the Kinsey, Pomeroy, Martin and Gebhard (1953) study of 4,441 females, they found that 24% (1,075) of the females had been approached while they were preadolescent by adult males who appeared to be making sexual advances. Eighty percent of the females who were appoached seem to have had only one experience of this type in their preadolescent years.

In the other historical study by Kinsey, Pomeroy and Martin (1948) on "Sexual Behavior in the Human Male," very little seems to be stated regarding incest. However, they reported that "there are some psychoanalysts who contend that they have never had a patient who has not had incestuous relations," (p. 588). They also noted that incestuous relations have been reported representing every social level, including males in the lower levels and males who belong to the socially top levels.

More recently, David Finkelhor (1979) undertook a survey of 795 undergraduates in which 19.2% of the women reported a sexual victimization experience as a child as did 8.6% of the men surveyed. Thus, the actual number of incidents of sexual abuse of children are considerably greater than have generally been brought to the attention of authorities and professionals. One result of this, as noted above, is that little is known about sexual abuse.

The National Center of Child Abuse and Neglect estimates that the current annual incidence of sexual abuse of children is between 60,000 and 100,000 per year (NCCAN, 1978). In 1955, Weinberg estimated the average yearly rate of incest to be 1.9 cases per million. More recently, DeFrancis (1969) estimated a yearly incidence of about 40 per million (American Humane Association).

A precise definition of what constitutes sexual abuse has not emerged from literature to date. The circumstances and effects of the abuse appear to vary along several imortant dimensions, including: (1) age of the victim; (2) sex of the victim; (3) sex of the offender; (4) whether the adult offender was related to the victim or a stranger; (5) blood relative versus non-blood relative (i.e., step-parent); (6) whether violence was or was not involved; and (7) the duration of the victimization which may vary from one isolated instance to repeated abuse over a period of years (Kaufman, et al., 1969; Meiselman, 1978; and Weinberg, 1955).

In an extensive review of the literature, the number of cases studied in most investigations was small, generally ranging from 2 to 15 cases (e.g., Cavallin, 1966; Harbert, Barlow, Hersen, and Austin, 1974; Weiner, 1962; Henderson, 1972; Molner, 1975; Lustig, Dresser, Spellman, and Murry, 1966; Berry, 1975; Cormier, et. al., 1962; Greenland, 1958; and Browning and Boatman, 1977). These can hardly be considered adequate samples. Most studies employed psychological tests, but seldom were complete data regarding the exact scores reported (e.g., Bender and Grugett, 1952; Eist and Mandel, 1968; Weinberg, 1955; Lukianowicz, 1972; Browning and Boatman, 1977; Kaufman, Peck and Tagiuri, 1954; Peters, 1976; Finch, 1973; Frances and Frances, 1976). The most popular psychometric instruments in these studies were the MMPI and the Rorschach, along with some instrument that assessed the intellectual level of the offender. Meiselman (1978) reports that the increased reporting of objective test results are especially desirable because they are less likely to be affected by the subjective biases of the researchers and because of the interesting possibilities that results from different samples by different researchers could be combined. The general overall conclusions from studies reported to date are discussed in the following paragraphs.

To date, there have been only three studies using an adequate experimental design, including control groups (Gebhard, Gagnon, and Pomeroy, 1965; Gligor, 1966; Martin, 1960). All three of these studies were conducted over a decade ago.

The Gebhard, et al. study (1965) used three groups: 477 white males from the general population (control group), 888 white males imprisoned for non-sex related offenses, and 1,356 white males convicted and imprisoned for one or more sexual offenses. Gebhard and his associates concluded that the "early life of the typical incest offender versus children was stigmatized by a poor adjustment between him and his parents, and even worse adjustment between his father and mother, and a rather large number of divorces and separations. To this, was added financial trouble, so that taken as a whole, his home must have been a rather wretched place. The typical offender appears to be a rather ineffectual, nonaggressive, dependent sort of man who drinks heavily, works sporadically, and is preoccupied with sexual matters. To this list can be added a high incidence of extra-marital coitus, a high incidence of masturbation while married, and strong sexual response to thinking of or seeing females" (p. 229). The primary purpose of this massive study was to determine if and how persons who had been convicted of various types of sex crimes differed from those who had not and, likewise, to determine how they differed from one another.

Gligor (1966) studied two forms of sexual behavior, incest and sexual delinquency. Her subjects were obtained from a large metropolitan juvenile court population. The sample was comprised of a group of 57 daughters adjudicated as sexual delinquents. In general, the data revealed the following: (1) marriages of the parents were reasonably stable, (2) socioeconomic status was usually average or above average in terms of income level, and (3) incidence of alchoholism was high among all groups of fathers.

Martin's (1958) research included an experimental group of thirty incest offenders and a control group of forty-one other prisoners in three California penitentiaries. The control group was subdivided into two additional sub-groups. One sub-group of twenty-one men was convicted of statutory rape against non-related minor females. A second subgroup of twenty men was imprisoned for the felony of breaking and entering. Martin's conclusion, in this psychoanalytically oriented research, supported three of his ten hypotheses. These were in the area of oral eroticism, castration anxiety, and Oedipal intensity.

Families of Incest

Knowledge surrounding incestuous families has little organization and is often contradictory. Greenberg (1979, and personal communication) points out that descriptions of these families consist of more opinion than observation and more subjective conclusions than demonstrations based on data. Numerous characteristics and patterns of behavior have been described as pertaining to incestuous families (Cormier, Kennedy and Sangowicz, 1962; Henderson, 1972; Sarles, 1975). However, as one reviews the literature, the lack of consistency in the findings becomes apparent and oftentimes frustrating for the professional. The only generally supported conclusion is that dysfunctions of various sorts, especially sexual, characterize these families (special report from NCCAN, 1978).

The Pro-Incest movement in America, and around the world, is at a ground swell. Mankind is attacking what appears to be the last taboo and is somewhat successful.

Fathers: As was the case with family functioning, the data on the fathers in cases of incest are confused. For example, the fathers involved in father-daughter incest are reported to have pedophilic tendencies (Cavallin, 1966; and Marcus, 1923), and to be lacking in such tendencies (e.g., Cormier, et al., 1962). The fathers tend toward substance abuse according to Gligor (1966), but are noted to be lacking a history of substance abuse (Cormier, 1962). Emotional outbursts and violence have been observed in the abusive father by Boatman and Browning (1977), while others stress their stability (Yorukoglu, 1966). Other significant areas in the abusive fathers' lives which have been noted are: (1) background of emotional deprivation (Weinberg, 1955); Riemer, 1940; Weiner, 1962); (2) poor employment history (Lukianowicz, 1972; Riemer, 1940); and (3) tyrannical dominance by the incestuous father within the family (Raphling, Carpenter, and David, 1967; Weinberg, 1955; Lustig, et al., 1966; Maisch, 1972; Szabo, 1962). Terms such as psychopath, sociopath and character disorder are employed by many incest researchers to characterize incestuous fathers (Lustig, et al., 1966; Lukianowicz, 1972; Weinberg, 1955). Interestingly, very few researchers have found instances of psychosis in the father prior to the incest offense (Weiner, 1962; Cavallin, 1966; Lustig, et. al, 1966). Kubo (1959) is the only researcher to have noted a pattern of psychosis in cases in his sample. However, some studies do indicate that the father often becomes psychotic after the offense has been exposed (Lukianowicz, 1972; Weiner, 1955; Cavallin, 1966). Another area that previous researchers have given consideration to is that of I.Q. Gathered data on the I.Q.'s of abusive fathers is fragmentary. However, all levels of intellectual ability appear to be involved, including below average ability, (e.g., Cavallin, 1977), average intellectual ability (e.g., Peters, 1976) and above average intellectual ability (e.g., Weiner, 1962). To date, there are no conclusive data relating sexual abuse to any specific level of intellectual functioning.

Mothers: While the data in other areas pertaining to incest are sparse, with respect to the mother, they are virtually non-existent. Nevertheless, Marcuse (1923), Kubo (1959) and others reported the mother to be absent or incapacitated. This is to say that the mother has been ill for a long period of time (Maisch, 1972; Kubo, 1959; Gligor, 1966) or has been employed or otherwise pre-occupied, thus leaving it up to the daughter to "take over" as the main female of the house. Other significant characteristics reported were: chronically depressed (Boatman and Browning, 1977); passive, submissive, and dependent (Cormier, et al., 1962; Lukianowicz, 1975; Kaufman, et al., 1954); promiscuous (Kaufman, et al., 1954; Szabo, 1962; Maisch, 1972);

avoiding of sexuality (Riemer, 1940; Maisch, 1972; Lustig, et al., 1966; Cormier, et al., 1962; Weiner, 1962); and role reversal with daughter (Kaufman, et al., 1954; Heims and Kaufman, 1963; Rhinehart, 1961; Machotka, Pittman, and Flomenhaft, 1967). Thus, there appears to be less concrete information regarding the mother in families where father-daughter incest occurs and mother-child incest is sufficiently infrequently reported that there are virtually no data available (Giarretto, 1976; Easton and Vastbender, 1969; Eist and Mandel, 1968; Cormier, Kennedy and Sangowicz, 1962).

In a study of families where father-daughter incest has occurred, Lukianowicz (1972) reported that "none of our mothers were psychotic, and most of them appeared to be normal, hard working, and much suffering women, usually with large families, and either a habitually unemployed, inefficient, good-for-nothing husband, or an aggressive and demanding husband" (p. 305). From the study of Kaufman, et al. (1954), it appears that most of their mothers were dependent and infantile, very attached to their own mothers, and afraid of responsibilities, which they were quite happy to leave to their teenage daughters. Like their husbands, most of them left home and school early—either to go to work or to get married (Lukianowicz, 1971).

There is evidence in the literature that marital discord and the wife's unavailability as a sex partner contributed to incestuous activity. Some data suggest that the mother either consciously or unconsciously sanctions the overt incest (Gentry, 1978; Bender and Blau, 1937; Peters, 1978; Henderson, 1972).

A dilemma that is presented to the mother is the responsibility of decoding a binding double message. On the one hand, wives are told that their primary role is to support their husband, endorse his behavior and decision and to endure through thick and thin—"until death do us part." On the other hand, they are told that their responsibility as a mother should take precedence and that they are to protect their daughter(s) at all costs.

Daughters: Data on the personality of sexually abused girls are again sparse. Lukianowicz (1972) did a follow-up study on twenty-six girls involved in incest. He was able to classify them into four groups as adults. Eleven girls became promiscuous with disorganized anti-social behavior; five became frigid, showing symptoms of hysterical personality with attention-seeking behavior; and four developed neurotic reactions characterized by depression and suicide attempts. Six girls showed no apparent ill effects. The latter married and made adequate sexual and social adjustments, viewing the sexual experience with their father as a pleasant interlude, indicative of his affection for them.

In another study (Nakashima and Zakus, 1977), follow-up data 1-12 years after the reported incest revealed poor adjustment as manifested by depression and a variety of other emotional problems in 13 out of 23 cases. Only four girls seemed to have a reasonable adjustment (in school or in marriage) while no information was available in the other six cases.

Sexual abuse of children is viewed by many as causing long-term bitterness and distrust toward adults and severe conflict resulting in shame, guilt and depression (Henderson, 1972; Peters, 1976; Jones, et al., in press; Greenberg, 1977). An out-growth of the sexual abusive act is a betrayal of trust, a kind of trust that the child will probably never have with regard to his/her parent(s). Many children feel a loss of both parents. At a time when the child needed parents the most, they were not available—as parents.

From a development perspective, younger children usually are affected less by the sexual nature of the incident than are older children (Peters, Meyer, and Carroll, 1976; Weiner, 1964). They appear to be affected less because they have not incorporated society's concepts of right and wrong in sexual matters and lack the awareness of the possible repercussions (Special Report from NCCAN, 1979).

Stages of Coping

While there are no data available to demonstrate stages, clinical observation suggests that just as there are stages of coping with death (Kubler-Ross, 1969), there appear to be stages of coping following sexual abuse. Clincial observation suggests that the victim of incest goes through the following identifiable stages of coping.

(1) *Upset:* The child displays anxiety, tension and emotional upset surrounding the incestuous relationship. This may occur after the abuse has been going on for a period of months or years and when the child finally reaches a level of development in which she knows that the relationship is not socially accepted, or it may occur at the time of the first involvement. The girl often is confused and angry about the sexual pressure and involvement forced on her. Frequently, she displays psychosomatic symptoms (e.g., headaches, abdominal pain, fainting spells) and her school work deteriorates. At this point, the sexual involvement is discovered generally by the girl telling her mother, a school teacher, physician or some other person.

(2) *Uncertainty:* Following the reporting of the incestuous involvement and during the subsequent investigation and legal proceedings, the girl generally goes through a period of uncertainty. She begins to doubt and recant from her earlier version of what really happened, even though her original report may have been quite accurate and verifiable. During this time, she begins to wonder if she misunderstood her father's actions and intentions and questions whether she somehow caused the events to happen. These feelings appear to occur primarily as a result of the reactions and suggestions made to the victim by mother and father, siblings, relatives, peers at school, etc.

(3) *Withdrawal:* A natural evolution from State 2 is that the girl arrives at a point where she feels guilty that she is breaking up the home and hurting her mother and father and she says that she wants everything to be like before. She feels that she has stirred up an involved and confusing "mess" and that she just wants to withdraw. At this time,

she generally asks that legal proceedings cease and that the family be reunited as it was before. Her feelings about how well this will work are often unrealistic and Pollyanna.

(4) *Outcome:* The final outcome of the situation appears to vary depending on whether or not the girl receives treatment. Psychotherapy in such cases helps the girl deal with her feelings and cope realistically with the situation. In the absence of treatment, she is often left with lingering confusion and bitterness.

In the present authors' experience, while victims of physical abuse appear to go through some stages, the stages appear to be less prominent, and more mixed, than with victims of sex abuse. The most prominent reaction of victims of physical abuse appears to be general relief and gratitude toward those currently providing for their needs, though they often miss their parents.

Current Trends in Incest

Current research findings on sexual abuse seems to indicate that a large number of children have had sexual experience with adults (Finkelhor, 1972). Dr. Finkelhor (1979) states that the argument against incest—"such sex is intrinsically wrong"—"seems really inadequate." He goes on to further state, "many assertions of intrinsic wrong made about other sexual taboos, such as homosexuality, have been called into question in recent times." The Sex Information and Education Council of the United States (SIECUS) report seems to depict the incest taboo as a mindless prejudice.

It has only been in the last five years that signs of impatience with the taboo have begun multiplying. For example, in 1979, at a child abuse conference, a professor from West Virginia University said that incest in some cases "may be either a positive, healthy experience or, at worst, neutral and dull."

Likewise, Sweden's minister of justice has appointed an official committee who has recommended that incest be deleted from the list of actionable crimes in the national penal code, and the question has gone to a higher court. Finally, Joan A. Nelson reveals that she had experienced an ongoing incestuous relationship which seemed. . ."the happiest period of my life." She goes further to say, "the ongoing incestuous relationship seemed to be caring and beneficial in nature. There was healthy self-actualization in it (Nelson, 1980)." From the humanistic camp comes the rationalization of, "I who was there, declare that love is the magnification of self-approval and the intensification of sensational life as experienced by a person isolated in inviolable space. I declare this by virtue of a power vested in me that abides no question: the power of truth that I am the sole authority upon myself (DeMott, 1980)."

The Pro-Incest movement in America, and around the world, is at a ground swell. Mankind is attacking what appears to be the last taboo and is somewhat successful.

Conclusion

The moral standards that help form the foundation of our Christian faith are crumbling before our very eyes. Incredible changes have occurred as our moral society has been attacked. Are we, in fact, quickly approaching the situation that Lot escaped in Genesis 19?

Let's take a short, quick look at American "progress." *Divorce:* divorce is quickly approaching the 50% level. Some sections of the country have already "arrived" while others are still striving. Thirty years ago, divorce was only talked about in a whisper, now we see where advertisements "make it easy and painless." (c.f., Gen. 2:24; Deut. 24:1-4; Matt. 5:31, 32; 19:3-8; I Cor. 7:10-24, 33-34, 39-40). *Homosexuality:* sociologists estimate that 13% of the males and 5% of the females in Boston are gay. Out of the closet gays (out-gays), are quite vocal about their rights, as we witness in our school systems, political and professional groups. (c.f., Lev. 18:22, 20-13; Rm. 1:26-32; I Cor. 6:9-11; I Tim. 1:10). *Co-habitation:* co-habitation is becoming so tolerated and popular that the practice of unmarried couples living together may soon become the national norm. Dr. Graham Spanier, sociologist at Penn State University states that most social changes come slowly. Co-habitation increased by 19% in the year 1977 to 1978. He further states that if it continues at this rate, it will be almost universal in another generation. (c.f., Gen. 2:18; Heb. 13:4). *Incest and sexual abuse:* accurate statistics are virtually impossible to get, but conservative estimates are alarming. One researcher, as stated earlier, found that in his population of 795 undergraduates, 19.2% of the females and 8.6% of the males were sexually abused. This translates to be about 1 out of 5 females and 1 out of 10 males have had a sexual victimizing experience at some point in their life (Finkelhor, 1978). Fradkin (1974) suggests that 80% of cases of incest are not reported. (c.f., Gen. 19:38; Lev. 18; Deut. 2:9, 18; I Cor. 5; II Cor. 2).

Are we attacking the last taboo? Will incest and child sexual abuse become a more acceptable behavioral pattern in the future? Are Los Angeles and Boston the functional equivalents to Sodom and Gommorah? Many would say a resounding, "Yes"! As Christians, we need to do as many school systems are doing—"get back to the basics."

REFERENCES

Armstrong, Louise, *Kiss Daddy Goodnight*, Hawthorne Press, 1978.

Bender, L., and Blau, A., The Reaction of Children to Sexual Relations with Adults. *American Journal of Orthopsychiatry*, 1937, *7*, 500-518.

Bender, L., and Grugett, A.E., Jr., A Follow-Up Report on Children Who Had Atypical Sexual Experience. *American Journal of Orthopsychiatry*, 1952, *22*, 825-837.

Berry, G. W., Incest: Some Clinical Variations on a Classical Theme. *Journal of the American Academy of Psychoanalysis*, 1975, *3*, 151-161.

Brady, Katherine, *Father's Day*, Double Day, 1979.

Browning, D. H., and Boatman; B., Incest: Children at Risk. *American Journal of Psychiatry*, 1977, *134*, 69-72.

Butler, Sandra, *Conspiracy in Silence*. Bantam Press, 1978.

Cavallin, H., Incestuous Fathers: A Clinical Report. *American Journal of Psychiatry*, 1966, *122*, 1132-1138.

Cooper, J., Incest prohibitions in primitive culture. *Primitive Man*, 1932, *5*, 1-20.

Cormier, B. M., Kennedy, M., and Sangowicz, J., Psychodynamics of Father-Daughter Incest. *Candadian Psychiatric Association Journal*, 1962, *7*, 203-217.

DeFrancis, V., *Protecting the Child Victim of Sex Abuse*. The American Humane Association, Children's Division, Denver, Colorado, 1969, p. 181.

DeMause, L., *The History of Childhood*. Psychohistory Press, New York, 1974.

Douglas, J. D., *The New Bible Dictionary*. William B. Eerdmans Publishing Co., Grand Rapids, Mich., 1962.

DSM III: Diagnostic and Statistical Manual of Mental Disorders, American Psychiatric Association, (1980).

Easton, A. C., and Vastbender, E., The Sexually-Molested Child: A Plan of Management. *Clinical Pediatrics*, 1969, *8*, 438-441.

Eist, H. I., and Mandel, A. U., Family Treatment of Ongoing Incest Behavior. *Family Process*, 1968, *7*, 216-232.

Finch, S. M., Sexual Activity of Children with Other Children and Adults. *Clinical Pediatrics*, 1967,*6*, 1-2.

Finkelhor, David, *Sexually Victimized Children*. New York: Free Press, 1979.

Fradkin, D., Incest in Middle Class Differs From That Processed By Police. *Psychiatric News*, 1974, *2*, 3.

Frances, V., and Frances, A., *The Incest Taboo and Family Structure*. *Family Process*, 1976, *15*, 235-244.

Gebhard, P. H., et al., *Sex Offenders: An Analysis of Types*. New York: Harper & Row, 1965.

Gentry, C., Incestuous Abuse of Children: The Need For An Objective View. *Child Welfare*, 1978, *6*, 355-365.

Giarretto, H., Humanistic Treatment of Father-Daughter Incest. In Helfer and Kempe (Ed.), *Child Abuse and Neglect*, Ballinger (P.B.) 1976.

Giarretto, H., The Treatment of Father-Daughter Incest. *Children Today*. July/August, 1976.

Gligor, A. M., Incest and Sexual Delinquency: A Comparative Analysis of Two Forms of Sexual Behavior in Minor Females. Unpublished doctoral dissertation, Case Western Reserve University, 1966, 27/108/6371 (1967).

Greenberg, N. H., *Childhood Sexual Abuse: Four Case Studies*. Schillar Park, Ill. Motorola Teleprograms, 1977.

Greenberg, Nahman, The Epidemiology of Childhood Sexual Abuse. *Peditric Annals*, 1979, *8*, 5.

Greenland, C., Incest. *British Journal of Delinquency*, 1958, *9*, 62-65.

Harbert, T., Hersen, M., Barton, D., Austin, J., Measurement and Modification of Incestuous Behavior: A Case Study. *Psychological Reports*, 1974, *34*, 79-86.

Heims, L. W., and Kaufman, I., Variations on a Theme of Incest. *American Journal of Orthopsychiatry*, 1963, *33*, 311-312.

Henderson, D. J., Incest: A Synthesis of Data. *Canadian Psychiatric Association Journal*, 1972, *17*, 299-313.

Kaufman, I., Peck, A. L., and Tagiuri, C. K. The Family Constellation and Overt Incestuous Relations Between Father and Daughter. *American Journal of Orthopsychiatry*, 1954, *24*, 266-277.

Kinsey, A. C., Pomeroy, W. B., and Martin, C. E., *Sexual Behavior in the Human Male*. Philadelphia: Saunders, 1948.

Kinsey, A. C., et al., *Sexual Behavior in the Human Female*. Philadelphia: Saunders, 1953.

Kubler - Ross, E., *On Death and Dying*. New York: The Macmillan Company, 1969.

Kubo, S., Researches and Studies on Incest in Japan. *Hiroshima Journal of Medical Sciences*, 1959, *8*, 99-159.

Landis, J. T., Experiences of 500 Children with Adult Sexual Deviation. *Psychiatric Quarterly (supplement)*, 1956, *30*, 91-109.

Lukianowicz, N., Incest. *British Journal of Psychiatry*, 1972, *120*, 301-313.

Lustig, N., et al., Incest: A Family Group Survival Pattern. *Archives of General Psychiatry*, 1966, *14*, 31-40.

Machotka, P., Pittman, F. S., and Flomenhaft, K., Incest as a Family Affair. *Family Process*, 1976, *6*, 98-116.

Maisch, H., *Incest*. (C. Bearne, Trans.) New York: Stein & Day, 1972.

Marcuse, M., Incest. *American Journal of Urology and Sexology*, 1923, *16*, 273-281.

Martin, J. O., A Psychological Investigation of Convicted Incest Offenders by Means of Two Projective Techniques. (Unpublished doctoral dissertation, Michigan State University, 1958).

Meiselman, Karin, *Incest: A Psychological Study of Causes and Effects with Treatment Recommendation*. Jossey-Bass, San Francisco, California, 1978.

Middleton, R., Brother-Sister and Father-Daughter Marriage in Ancient Egypt. *American Sociological Review*, 1962, *27*, 603-611.

Molnar, G., and Cameron, P., Incest Syndromes: Observations in a General Hospital Psychiatric Unit. *Canadian Psychiatric Association Journal*, 1975, *20*, 373-377.

Money, John and Williams, Gertrude, *Traumatic Abuse and Neglect of Children*, In Press.

Murdock, G.P., *Social Structure*, New York: Macmillan, 1949.

Nakashima, I. and Zakus, G., Incest: Review Four Clinical Experiences. *Pediatrics*, 1977, *60*, 696-701.

National Center on Child Abuse and Neglect. *Child Sexual Abuse: Incest, Assault, and Sexual Exploitation*. A special report no. (OHDS) 79-30166, August, 1978.

Paulson, M. and Blake, P., The Abused, Battered and Maltreated Child: A Review. *Trauma*, 1967, *9*, 3-134.

Peters, J., Children Who Are Victims of Sexual Assault and The Psychology of Offenders. *American Journal of Psychology*, 1976, *30*, 398-421.

Peters, Meyer, Carroll, 1976.

Raphling, D. L., Carpenter, B. L., and Davis, A. Incest: A Genealogical Study. *Archives of General Psychiatry*, 1967, *16*, 505-511.

Rhinehart, J. W., Genesis of Overt Incest. *Comprehensive Psychiatry*, 1961, *2*, 338-349.

Riemer, S., A Research Note on Incest. *American Journal of Sociology*, 1940, *45*, 566-575.

Sarles, R., Incest. *Pediatric Clinics of North America*, 1975, *22*, 633-641.

Summit and Kryso, Sexual Abuse of Children. *American Journal of Orthopsychiatry*, 1978, *48*, 237-251.

Szabo, D., Problems de Socialisation et d'Integration Socioculturelles: Contribution a' l'Etiologie de l'Inceste (Problems of Socialization and Sociocultural Integration: A Contribution to the Etiology of Incest). *Canadian Psychiatric Association* Journal, 1962, 7, 235-252.

Theal, G. McC., Ethrography and Conditions of South Africa Before A.D. 1505, 2d rev. ed., London, 1919, p. 261.

Weinberg, S. K., *Incest Behavior*. New York: Citadel, 1955.

Weiner, I. B., Father-Daughter Incest: A Clinical Report. *Psychiatric Quarterly*, 1962, *36*, 607-632.

Williams, J., Child Abuse. *In Psychological Management of Pediatric Problems*, Vol. II, (Ed.) P. Magab, Univ. Park Press, Baltimore, 1978.

Yorukoglu, A., and Kemph, J. P., Children Not Severely Damaged by Incest with a Parent. *Journal of the American Academy of Child Psychiatry*, 1966, *5*, 111-124.

The Neurotic Christian: Ecclesiogenic Neurosis

PAUL D. YOUNG

University of Alberta[a]
Edmonton
Alberta, Canada

Why are there neuroses among church members? Does being raised in a Christian family contribute to the development of neurosis?

The problem of the neurotic Christian is discussed from a psychological standpoint. Empirical investigations and actuarial predictions are discussed in an attempt to find an explanation of the problem, and the question of the Church producing, developing or drawing neurotic individuals is addressed. Some speculation about causes and cures is offered.

Why are there neurotic Christians? Does the Church produce, develop or attract people with neurotic symptoms? How can neurotic Christians be helped?

The presence of neurotic symptoms in the general population is a societally-recognized problem. Neurotic symptoms interfere with productivity in the work force, affect interpersonal relations, contribute to political instability and produce great unhappiness in individuals and families. Societal institutions are most concerned with neurotic symptoms when they actually disrupt social function. While paying some lip-service to the pursuit of individual happiness and adjustment, society generally leaves the responsibility for treatment of non-disruptive symptoms with the suffering individual or his or her family.

The Church, however, takes a different view. The Church focusses on the individual: on individual salvation, on individual happiness, on individual relations with God. Similarly, the Church's emphasis on collective unity again requires optimal health and adjustment for each of the members of the body. So the presence of neurotic symptoms among her members must be cause for great concern.

What are neurotic symptoms? They are behaviors, or introspective reports of emotion-states, which interfere with the individual's optimal performance and adjustment to the environment. The disruptive influence may be more or less severe, but neurotic symptoms by definition do not interfere with behaviour to the extent that the individual is totally unable to cope with environmental demands.

While the aetiology for neurotic symptoms is diverse, the present theoretical approach will focus on two areas of causality: stress, or chronic diffuse emotional strain, and guilt.

Stress

Stress-induced neurotic symptoms, including many of the psychosomatic disorders, result when the perceived demands of the environmental situation exceed the individual's perceived ability to perform. This occurs, for example, when the demands of the work situation demand more time investment or decision-making capacity than the worker is willing or able to give. The perceived discrepancy is stressful, assuming that the individual wants to perform well, and the resultant emotional stress, or anxiety, affects various organ systems. If the suffering individual is unable to dissipate this anxiety, he or she may experience a breakdown in a given organ system, resulting in a psychosomatic disorder such as a duodenal ulcer. Alternatively, the in-

Paper presented at the Thirty-fourth Annual Meeting of the American Scientific Affiliation, Stanford University, August 13, 1979.

[a] *Now at Houghton College, Houghton, New York 14744.*

Many neurotic Christians exist because their sense of guilt has not been relieved.

dividual may develop behaviors which serve to dissipate the excessive emotional energy: long walks, running, reading, hobby activities. To the extent that such activities serve to dissipate anxiety without interfering with general performance and interpersonal adjustment, they are certainly adaptive. Frequently, anxiety-reducing activities become functionally autonomous, and continue even when their stress-relieving value is no longer necessary.

In some cases, the dissipation of emotional energy is so rewarding or so marginally effective that the behavior becomes compulsive: engaged in repetitively as if for its own sake, interfering with other behavior and adjustment. When this occurs, the behavior is no longer adaptive, but neurotic. Typically, this is apparent where extreme investments of time are made in the symptomatic behavior, where it dominates the individual's conversation, or is the focus of all interpersonal activities. Some people are compulsive runners or joggers, for example. The original motivating factor of concern for one's health fades in importance, and running becomes an end in itself. Other people are compulsive church-workers. The stress of family interactions, and concern over raising the family in a good Christian home in the face of perceived personal inadequacy leads some people to devote excessive amounts of time to church work, to the detriment of the family. Such people are engaging in a motherhood, America and apple pie behavior—beyond criticism—and are thus able to reduce anxiety. Further, since they are serving God so faithfully, they tend to project on Him the responsibility for ensuring that the family grows up right rather than doing the job themselves.

Guilt

Guilt, the other main causal agent in neurosis, is of more direct concern to the Church. Similar in its action to stress, and itself producing stress, guilt is nonetheless different because it arises specifically from the evaluative function in the individual.

As Lewis (1971) observed, a relationship between superego-induced guilt and neurotic symptoms was hypothesized by Freud in 1923. Others have concurred with the hypothesis that unresolved guilt produces neurotic complaints, from psychosomatic upsets to obsessive-compulsive disorders (Tournier, 1962, 1965). Classic literature gives such excellent examples as Lady Macbeth. Freud's postulated relationship between unresolved guilt and neurotic symptoms centers on the individual's self-concept, lowering it drastically. Thus, with such a poor opinion of the self, "the patient *must not* be healthy, he must remain ill, for he deserves no better" (1938). Whence comes this guilt?

"Guilt may be conceptualized as a special kind of negative self-evaluation which occurs when an individual acknowledges that his behavior is at variance with a given moral value to which he feels obligated to conform" (Ausubel, 1955). As an individual grows and develops, moral values and principles are internalized: they are learned and remembered. The child is taught moral precepts by command and by example, through training and through modelling. This process proceeds rapidly, and is relatively complete at an early age. The child acquires a conscience, or an active superego, or a readily-accessible set of moral values.

Unfortunately, the development of matching behaviour does not keep pace, and for most people it lags behind throughout life. St. Paul has not been alone in his admission that "the good that I would, I do not. . ." When behavior does not conform to moral standards, and as the individual becomes aware of this, the resultant is guilt (Ausubel, 1955). And unresolved guilt induces anxiety and stress, which may then be revealed in neurotic symptoms.

The presence of neurotic symptoms in the general population, then, is not surprising. More problematic is the high incidence of neurotic symptoms among adherents to the Christian faith, which, as Freud pointed out, claims to save mankind from a sense of guilt (1930).

There are a number of potential explanations for this phenomenon. First, it may be postulated that guilt is not the precursor to the development of neurotic symptoms among Christians. That is, stress may induce these symptoms of neurosis. If this were true, it would not be expected that Christians should be symptom-free even if they were guilt-free. Such a postulate negates the earlier, still unproven, hypothesis that unresolved guilt underlies the bulk of neurotic symptomatologies, even among Christians. Many practitioners, among them Dr. Paul Tournier, have found strong evidence to support the direct-relationship hypothesis. Its summary dismissal, without convincing contradictory evidence, seems unwarranted at this time. It must be remembered, however, that causes other than unresolved guilt may lie behind neurosis, and these causes may be found among church members.

A second potential explanation is that Christian faith, in fact, does not save mankind from a sense of guilt. If this were true, we would not expect Christians to be any more symptom-free than the general population, simply on the basis of their being Christians.

This is a most challenging postulation, one that is contradicted by many writers who have claimed freedom from guilt through Christian faith: St. Paul, St. Augustine, Martin Luther, John Wesley. The postulate remains, however: some Christians may be neurotic because their faith has not saved them from a sense of guilt. Many neurotic Christians exist because their sense of guilt *has not* been relieved.

It should not be assumed in such cases that the sense of guilt *cannot* or *will not* be relieved; it is stated that it simply *has not*. That guilt can be and is relieved by Christian faith is attested to not only by personal testimony, as alluded to earlier, but also by empirical investigation.

Barton and Vaughan (1976) conducted a longitudinal study relating church membership and personality, as assessed by Cattell's 16PF questionnaire. They found that the church member group scored significantly higher on guilt proneness than the non-member control group at the first of the study. This finding supports the hypothesis that individuals espousing Christians faith are not thereby free of guilt. Further, Cattell's guilt proneness has a salient loading on the second-order questionnaire factor, anxiety, which, as has been seen, is an important variable in neurosis.

In a five-year followup, however, Barton and Vaughan (1976) found that the church-member group had fallen dramatically on guilt proneness, and were now statistically equivalent to the non-member group. Similarly, as would be expected given the factor loadings, the church-member group fell *below* the non-member group on the second-order anxiety factor. Barton and Vaughan conclude by suggesting that "although the church may attract active members who originally tend to be anxious and guilt-prone, the effects of membership are to allow a decrease in both these factors and hence generally a more peaceable state of mind."

To suggest that Christian faith was effective in lowering guilt proneness and anxiety would support the hypothesis that Christian faith can and does relieve a sense of guilt, but the alternative hypothesis, that simply membership in a cohesive, supportive organization produced the personality change is an equally valid explanation of the Barton and Vaughan findings. While further investigation and correlational research is necessary to differentially verify these alternative hypotheses, it is sufficient for the moment to take Barton and Vaughan's findings as supportive of the hypothesis that Christian faith can and does decrease a sense of guilt. Whether the effect is due directly to the act of faith or indirectly through concomitant church affiliation is an open question.

Why Are There Guilty and Neurotic Christians?

If Christian faith can reduce a sense of guilt or guilt proneness, why are there guilty—and neurotic—Christians? Allport (1955) suggests a few sources—the arresting forces of training, producing infantile, self-serving and superstitious religious belief; religious insecurity, leading to compulsive rituals of reassurance; and extremely rigid training in home or church. It will be helpful to classify potential reasons into six areas: ecclesiogenic neurosis, inadequate understanding, convoluted thinking, inferiority feelings, attraction of neurotics, and actuarial explanation.

1. *Ecclesiogenic Neurosis.* The German psychiatrist Klaus Thomas coined the term *ecclesiogenic neurosis* (1965) to describe the induction of neurotic symptoms in individuals who are expected to live up to moral standards of the Church without having or before gaining the necessary saving faith (Harnik, 1978). The unreasonable—at a particular point in time—demands of the Church, or of a moralistic Christian family, may set the behavior ideal so high above behavior potential that the individual despairs of ever measuring up. Sin abounds, guilt abounds, and where grace does not intervene through saving faith, the result is neurosis.

   Thomas's postulation centers around the development of neurosis in the child, but it is likewise applicable to the adolescent or adult individual. Even with saving faith, an individual Christian may have ethical standards or moral values set far beyond his or her ability to equal behaviorally. The recognized disparity then produces dissatisfaction and anxiety, if not actual guilt. A conscious sense of guilt may be precluded in some individuals through cognitive acceptance of forgiveness, without concomitant anxiety reduction. Where the acceptance of forgiveness does not extend to the point of accepting the failure and moving to better efforts, the sense of guilt is simply repressed as cognitively and logically dissonant. The repressed guilt then continues to contribute to free-floating anxiety, producing neurotic symptoms.

   Examples of ecclesiogenic neurotic symptoms in adults may be found among ascetic mystics, extreme penitents, and the mediaeval flagellants. It is also possible that St. Paul's "thorn in the flesh" was a psychosomatic ailment induced by feelings of anxiety over his pre-Damascus treatment of the Christians—forgiven, but not forgotten, as evidenced by his later sermons.

Paul Young is Assistant Professor of Psychology at Houghton College, a Christian college of liberal arts associated with the Wesleyan Church. His BA degree was from Houghton College, and his MA from the University of Alberta, where he is currently a candidate for PhD. His research interests are directed at the interaction of biopsychology and personality.

A second, more reprehensible form of ecclesiogenic neurosis is that produced by the haranguing preacher who, in an attempt to shore up his or her own feelings of inadequacy or insecurity—neurotic symptoms—subjects his or her congregation to moral diatribes to which many are susceptible. Few have passed the preceding week without error, and some preachers, sharing the same lot, work out their own guilt by projecting it upon the all-too-receptive congregation. Many members, having the wickedness of their failings thus pointed out to them week after week, develop a sense of personal inadequacy and worthlessness which may lead to the development of neurotic symptoms.

Accusations that one has behaved wrongly, has performed inadequately, or has failed miserably levelled by a respected individual such as a member of the clergy, go a long way toward countermanding realistic self-evaluation. It is thus that the Church, through her ministers, can directly induce neurotic symptoms among her adherents.

2. *Inadequate Understanding.* Inadequate understanding of Christian principles of behavior, rather than actual demands of the Church, is responsible for many cases of neurosis among Christians.

Many Christians, following Christ's admonition, "Be ye perfect, even as I also am perfect," set a standard of absolute perfection against which to measure their behavior. While such a belief set may be theologically debatable, it does not in itself produce neurotic symptoms. When individuals espouse such a belief set with an inadequate understanding of what to do when their behavior is not in line, they must either experience guilt or deny the non-conforming nature of the behavior. Both results occur—witness the story of the gentleman who thanked the Lord that he had not sinned in over 20 years—and both induce neurotic symptoms. Denial itself represents a loss of reality contact, and is as such a neurotic symptom.

3. *Convoluted Thinking.* This is a more extreme form of inadequate understanding. Many people in history have been convinced that *matter* separates us from God, hence matter and even our material body are evil. Some of these ascetics have gone to extremes, believing for example that sexual relations, even in marriage, are intrinsically evil. Such convoluted thinking pervades much of modern Christian practice, often on a subtle level. Examine the lyrics of some contemporary gospel music for expressions of a desire to be "set free from this earthly prison," where "bars of bone hold my soul."

Convoluted thinking may also produce deviant behavior in the name of Christian faith. Where individuals establish themselves as special emissaries of God, claiming a unique *revelation* from Him (symptomatic of a psychotic delusional state), they may then gather neurotically subjugated converts to their new sects. Using repressive techniques and paranoiac harangues, such individuals may impress their convoluted thinking onto their followers, inducing at least a massive set of *folies à deux*, and at worst a pseudo-psychotic organization.

4. *Inferiority Feelings.* Humility, one of the virtues of the Christian faith, induces behavior which is in many ways undifferentiable from that produced by feelings of inferiority. Preference for another over oneself, recognition of one's sinful nature, perception of the distance between self and God, all are aspects of humility and are all relative to inferiority feelings. Humble behavior due to inferiority feelings is no more valuable than humble behavior due to pride—"I can be humbler than you can."

Freud observed that the sense of inferiority and the sense of guilt are difficult to distinguish (1932). In fact, inferiority feelings are representative neurotic symtoms. Where the Church encourages humility without adequately distinguishing it from feelings of inferiority, without emphasizing the worth of the individual in God's sight, it encourages neurosis among its adherents.

When improperly used, aspects of Christian faith can and do contribute to the induction and development of neurotic symptoms.

5. *Attraction of Neurotics.* When improperly used, aspects of Christian faith can and do contribute to the induction and development of neurotic symtoms. This does not in itself account for the presence of all neurotics in the Church. Many individuals from the general population, who complain of neurotic symptoms and an unassailable sense of guilt are drawn by the Church's promise of nurturant support and forgiveness. Spellman, Baskett and Byrne (1971) found that sudden religious converts had a higher level of anxiety than a group of regular church attenders and nonattenders combined, leading them to suggest that manifest anxiety—a neurotic symptom—was a contributing factor in religious conversion. Rappaport (1978) combined the anxiety dimension with a dogmatism scale (Rokeach, 1956) and found that individuals who switch to a different religious affiliation tended to be low on dogmatism and high on anxiety, while those who abandoned religious belief tended to be high dogmatism/low anxiety. The high dogmatism/high anxiety group maintained their religious beliefs. Thus both Spellman et al. and Rappaport found evidence relating high anxiety to religious conversion. The Church, then, does draw neurotics, or is at least the target of their movement.

That the church is successful in decreasing the anxiety of its adherents is attested to by the already-cited study by Barton and Vaughan (1976). At any given time, there will be highly anxious individuals in the church who

have affiliated in an attempt to cope with their neurotic symptoms.

The implicit offer of free counselling by ministerial staff of the Church, much as it leaves to be desired, may be a drawing card for neurotics in the general population. A sympathetic ear, as psychologists from Freud to Rogers have observed, goes a long way in helping an individual cope with free-floating anxiety. Inasmuch as neurotic individuals recognize this, they may seek the Church as a venue for cathartic experience.

6. *Actuarial Prediction.* Actuarial models—cf. Eysenck & Eysenck, 1975—suggest that important personality factors, such as extraversion and neuroticism, are normally distributed in the population. Thus, in any large, relatively random sample—the Church, for example—one would expect to find individuals with a high tendency to express neurotic symptoms. From this point of view, there are neurotic Christians simply because there are neurotic people.

Causality of neurotic symptoms is non-central to this viewpoint. Differential induction of guilt in Christians and non-Christians is thus of little importance.

If these are the causes, what are the cures?

It is not sufficient, in dealing with the Christian neurotic, to simply encourage him or her to "have faith", to accept God's forgiveness and live a free life. Many neurotic Christians are in that state because their guilt feelings persist: they have not been able to accept God's forgiveness. They may cognitively believe it, but they are unable to phenomenologically experience it.

One successful and psychologically valid technique for the reduction of neurotic anxiety due to guilt is confession—and age-old practice of the Church. Confession is similar to Freud and Breuer's catharsis—the talking cure. Christian confession is more closely tied to the problem than is secular psychotherapeutic usage, for Christian confession is the admission to a fellow-Christian minister, priest or counsellor of a specific failure to live up to the shared Christian standards. The guilt was not over the activity itself, but was due to the discrepancy between the behavior and the shared ideal. The same behavior that the secular therapist views as rather innocuous may be recognized by the Christian counsellor as a guilt-inducing deviation from shared values. Confession itself can be used as a venue for neurotic, compulsive ritual, and so is not necessarily always of value. There are compulsive confessors, attempting to confess away their feelings of guilt. Others find comfort from their anxiety in ritualized confession, saving them from coming to grips with the source of their anxiety.

Another useful technique is that of restitution. Restitution is psychologically valid to the extent that it enables reconstruction of the shattered self-concept: the individual in effect says, "I was a worthless person for the wrong that I did, but since I have made up for it, I must be a better person than I thought I was." Restitution towards God for sins not against other people often takes the form of penance. While theologians may debate the value of penance, its psychological import should not be overlooked. The Christian therapist can help the suffering individual to reach the true problem by emphasizing his or her worth in God's sight. When the low self-concept is contradicted by evidence of God's love and care, through the accepting, nurturant presence of the Christian therapist, the prognosis is vastly improved.

So then, there are neurotic Christians. The Church, especially through her ministers and excessive early moral demands in her families, produces a few. Offering rituals for reassurance and an easy sense of belonging, she doubtless develops a few more. And with offers of acceptance and a sympathetic ear, she attracts some others. But in a more promising vein, she heals, she frees from guilt. She offers, through Christian faith, a cure for many of the underlying causes of neurotic behavior.

REFERENCES

Allport, G.W. *Becoming.* New York: Yale University Press, 1955.

Ausubel, David. Relationships Between Shame and Guilt in the Socializing Process. *Psychological Review, 62,* 378-390.

Barton, Keith and Vaughan, G.M. Church Membership and Personality: A Longitudinal Study. *Social Behavior and Personality,* 1976, *4,* 11-16.

Eysenck, H.J. and Eysenck, S.B.G. *Manual of the Eysenck Personality Questionnaire.* San Diego: Educational and Industrial Testing Service, 1975.

Freud, S. *Civilization and its Discontents.* 1930. *Standard Edition, 21,* 59, New York: 1961.

Freud, S. *An Outline of Psycho-analysis.* 1938. *Standard Edition, 23,* 141, New York: 1968.

Freud, S. *New Introductory Lectures on Psychoanalysis.* 1932. Harmondsworth, England: Penguin, 1973.

Harnik, Bernard. The Relevance of Faith to the Health of the Whole Person. Paper given at University of Alberta, Edmonton, 5 October, 1978.

Lewis, Helen Block. *Shame and Guilt in Neurosis.* New York: International Universities Press, 1971.

Rappaport, Edward. The Effects of Dogmatism and Anxiety on Changes in Religious Identification. *Journal of Social Psychology,* 1978, *104,* 141-142.

Rokeach, M. Political and Religious Dogmastism: an Alternative to the Authoritarian Personality. *Psychological Monographs,* 1956, *70,* Whole No. 425.

Spellman, C.M., Baskett, G.D. and Byrne, D. Manifest Anxiety as a Contributing Factor in Religious Conversion. *Journal of Consulting and Clinical Psychology,* 1971, *36,* 245-247.

Thomas, Klaus. *Praxis Der Selbsthypnose Des Autogenen Trainings.* Stuttgart: Georg Thieme Verlag, 1967.

Tournier, Paul, *Guilt and grace.* Trans. A.W. Heathcote, with J.J. Henry and P.J. Allcock. New York: Harper and Row, 1962.

Tournier, Paul. *The healing of persons.* Trans. Edwin Hudson. New York: Harper and Row, 1965.

Competition and Christian Ethics

CHARLES P. FLYNN

Department of Sociology and Anthropology
Miami University
Oxford, Ohio 45056

This paper discusses the ways in which the emphasis on competitive striving relates to Christ's teachings. Many aspects of the emphasis on winning at all costs are discussed as contrary to the anti-competitive character of many teachings of Christ and the apostle Paul. The competitive ethic is examined in terms of its origins in Darwinian thought. Despite these negative implications, however, there are ways in which competition can be and has been made not only congruent with, but an aid to fulfilling, God's will and living a Christian life. When competitive victory is sought not for the false immortality it can bring, but for the purpose of fulfilling ourselves and others in the sense of allowing Christ to live in and through us and to participate in eternal life through Him, competition can be an important motivational basis for actualizing the full extent of our God-given abilities.

A basic question faced by all Christians is the extent to which they should accommodate themselves to worldly values. Though Christ Himself used many worldly examples in His parables, He set forth values and norms that often contradicted the accepted wisdom of His time and place.

A key question of His followers in this regard was the extent to which they should subject themselves to the prevailing authorities of their religious rulers and their Roman subjugators. Today, the questions that Christians face are perhaps more subtle than their predecessors—it is no longer so much the arbitary authority of Pharisees, Saducees, or Romans, but the pervasive influence of competitive values, that Christians must face and deal with.

In traditional societies, though various forms of competition exist, they are not the central motif of social life. Born into a particular level of society, the traditional person, with a few rare exceptions, remains in his or her "station" in life, one which is often seen as ordained by God. With the advent of the mobile society that was a major outgrowth of the social and political revolutions of the late eighteenth century, competition became the major determinant of one's "place" in life. Moreover, one's degree of competitive success took on religious connotations. One's degree of competitive success began to be seen as reflective of the degree of God's favor.

In this paper, we examine a number of ways in which Christ, and Christians, have dealt with competition. In a time when competitive success has become *the* worldly value influencing many aspects of the lives of both Christians and non-Christians, it seems of central importance to examine both Christ's attitudes toward competition, and the ways Christians have come to grips with competitive pressures.

Christ and Competition

In many of His teachings, Jesus appears to adopt a generally negative attitude toward competition. When His disciples argue among themselves as to who should be considered the most important disciple, Christ admonishes them against seeking to gain ascendancy. He frequently emphasizes that even He Himself is not to be considered first, as He is primarily a servant. The importance He attaches to

His servant role is illustrated in His washing of the disciples' feet.

Further evidence of Jesus' negative attitude toward competition is apparent in His condemnation of those who ostentatiously pray, give alms, or otherwise try to compete with one another outwardly to demonstrate their greater degree of supposed piety. Those who thus compete with one another for God's favor and to impress one another are seen as already having received their reward. Only those who pray and give aid in such a way as to deliberately avoid pretentious claims to moral or religious superiority can, in His view, lay claim to the Kingdom of God.

Jesus' negative view of worldly success in the forms of riches and other things that "moth and rust doth corrupt," and His admonition to lay up treasures of a spiritual sort, are further indications of His attitudes toward competition, for it is most frequently such worldly things as money and other material objects that are used as yardsticks of competitive success, "markers" by which to judge our status vis-a-vis others.

In many of Christ's teachings, a process of what sociologists have termed "status inversion" takes place. Values and categories by which we usually measure competitive success—wealth, etc., are reversed, most directly in the statement that the "last shall be first and the first shall be last" in the Kingdom of Heaven. (Mark 9:33; 10:35-45)

The Apostle Paul also exhibits a generally negative attitude toward competitiveness. In I Corinthians 15:9, he states that he is the "least of the Apostles," and in I Timothy 1:15 that he was the "greatest of the sinners." In Galatians 6:4, he admonishes us to do our very best so as to have no need to compare ouselves to others, an important theme we will return to later.

Christianity and Competition

Given such generally negative attitudes toward competitiveness expressed by Christ and the Apostle Paul, how have Christians dealt with competition?

The earliest Christians evinced a communal, sharing orientation that de-emphasized and even condemned competitiveness. Using this as a model, many subsequent Christians have throughout history, and into the present, formed communities in which sharing and anti-competitiveness were and remain major elements of the supposedly ideal Christian life.

Many such communal Christians have, along with de-emphasis on competitiveness, recognized a need to separate themselves from the "world" both physically and, as much as possible, spiritually. Thus, the Amish, the Hutterites, as well as many past and present groups not necessarily of an Anabaptist origin, have rejected competitiveness as part of their overall effort to live lives in conformity with God's will and rejective of worldly values.

At the opposite end of the spectrum, many Christians,

In many of His teachings, Jesus appears to adopt a generally negative attitude toward competition.

particularly contemporary Americans, regard competitive success as evidence of Godliness. In a book entitled *Gamelife: The Competitive Ethic and Modern Society*, I gathered material on and interviewed many sports figures, particularly coaches, who believe very strongly that being a Christian means being a fierce competitor. The most striking examples come from athletics:

——Coach Tony Mason, formerly of the University of Cincinnati and the University of Arizona, gives (as do many other coaches) inspirational talks at church and business meetings. His major theme is, in his words, that "losing is sinning," since it means that one has failed to do one's utmost to win.

——Grant Tieff, coach of the Baylor football team that won the Southwest conference in 1973, wrote a book entitled *I Believe* in which he describes the way his strong Christian faith helped him gain success on the gridiron.

——Gerry Faust, Notre Dame head coach emphasizes prayer as the basis of motivation for his players and constantly emphasizes that they have a "duty to God" to do their best.

——In his autobiographical account of his days as a football player at the University of Texas, *Meat on the Hoof*, Gary Shaw tells how his coaches and trainers insisted that it was necessary to be a good Christian to be a good football player.

——In a tape of a talk given by a leader of Athletes in Action, a group of Christian athletes sponsored by the Campus Crusade, the pain associated with athletic training and "paying the price" in preparation for competition is compared with Christ's pain on the Cross.

These and similar attitudes are not confined to the realm of athletics; many coaches and successful players give speeches to business groups, and many business people associate competitive success with Christian virtue. Some of the coaches who have given such talks have, only half-jokingly, been compared with Christ, in stories which refer to their "walking on water" and other facetious accounts which are meant to be humorous, but carry a serious undertone. How and why have many contemporary Christians come to associate success with Christian virtue?

From the Protestant to the Competitive Ethic

In his classic, *The Protestant Ethic and the Spirit of Capitalism*, Max Weber maintained that the uncertainty of

early Calvinist capitalists as to their membership in the Elect caused them to seek success in business not as an end in itself, but as an indication of God's favor. Weber's thesis was criticized by many scholars as simplistic and downright erroneous; these critiques are too numerous to recount here. The vast majority took issue with the failure of the thesis to take into account numerous factors other than Calvinist predestination in the origins of capitalism. R. H. Tawney, for example, maintained in *Religion and the Rise of Capitalism* that changes in Christian attitudes toward usury were central to the emergence of capitalism, which of course rests upon money-lending and investment.

My approach emphasizes that Weber's thesis may well help explain the *emergence* of capitalism, but is no longer adequate as a means of gaining insight into the *maturation and development* of capitalism into the present-day multinationalism and dominance of large corporations throughout the economies and societies of both modern and developing nations.

The central transformation of capitalist consciousness involves the supplanting of the Protestant Ethic with the competitive ethic. Specifically, fear of otherworldly damnation and its obverse, desire to be among the Elect, has been replaced by fear of failure and yearning for competitive success. Worldly success has become the modern functional equivalent of otherworldly salvation. Thus, winning is sought after so avidly not only for the material and other rewards it brings, but to gain the same sense of ultimate meaning and purpose in life that earlier, more supernaturally oriented Christians sought not in this life, but in the Hereafter.

Many present Christians would maintain that they believe in salvation as much as their forebears. Even the most sincere church-going Christian, however, cannot help but be influenced by the intense emphasis on competitive striving and success that is the lifeblood of the majority of modern societies, particularly America.

Many studies, not necessarily dealing specifically with competition, have shown the pervasiveness of competitive values in modern society. Studies of corporate behavior have demonstrated the absolute centrality of competitive factors in the business world: the businessman must compete not only against other companies, but against his fellow employees for status and promotion. Children are taught competitiveness almost from the cradle; the "hidden curriculum" of schools from kindergarten through graduate and professional school is the strong sense of competitiveness that students cannot help internalizing in their efforts to meet the pressures of grades and requirements for entrance into desirable occupations and professions.

What does all this emphasis on competition mean in relation to Christian values? Is competitiveness compatible with a full commitment to Christ's teachings?

Competition vs. Compassion

In many respects a strong emphasis on competitive success, particularly when this excludes or eclipses other values in a person's life, inhibits our ability and willingness to obey Christ's teachings. At the same time, there are some forms of competitiveness which can and do provide a basis for a particular kind of Christian service. First, the negative side.

The inspirational speeches of football coaches and other competitively successful Christians often, if not nearly always, fail to mention the other side of competitive striving. Deception, detestation (real or contrived) of opponents, "psyching out" opponents, and a measure of ruthlessness and lack of concern for others are basic ingredients of competitive success.

In his account of his experiences as a four-Gold Medal winning Olympic swimmer, Don Schollander discusses how being a winner in swimming is largely mental.[1] Not only is it necessary to be able to endure more pain than one's opponents, it is necessary to do as much as possible to undermine their confidence. "If you can get a guy to think that he can't win, he won't."

I interviewed many sports figures, particularly coaches, who believe very strongly that being a Christian means being a fierce competitor.

This spirit of undermining one's opponents is present in one way or another in any competitive striving. As General Motors executive Thomas Murphy recently stated with respect to his attitude toward his company's efforts to expand its already dominant share of the auto market:

> If we get sixty percent (of the automotive market), we secured it because its a dog-eat-dog business. I've told our guys to get everything they can get.

This statement, and countless others like it that could be cited by contemporary businessmen, athletes, and others involved in competitive striving, points out in sharp relief an inescapable reality of competition: every success rests on someone else's (usually many peoples') failure. For every individual superstar, there are hundreds of failures.

It is the zero-sum nature of competition, in the way it usually exists in our society, that is at the heart of its partially unChristian nature. In its most virulent form, strong emphasis on competitive success can and often has severely undermined Christian compassion.

In his important study of corporate attitudes entitled *The Gamesman*, Michael Maccoby emphasizes that the major shortcoming of the predominant type of corporate executive is his failure to develop compassionate attitudes toward peoples in underdeveloped nations whose desires to escape poverty and hopelessness have led to revolutionary

movements that threaten the continuation of capitalist endeavor. As Maccoby makes clear, executives are not so much callous as so involved in competitive striving that they have no time or energy to adopt compassionate attitudes. Conditioned to looking at others either as competitors or as actual or possible customers or markets, the intensely competitive modern executive has left out compassion because it is simply irrelevant to his competitive goals.

In part, the unChristian character of the competitive ethic stems from its origin in the Darwinian view of man and nature. Most anti-evolutionists have stressed Darwin's denial of the Genesis account of Creation. Much more significant socially and politically, however, was (and remains) the complete reversal of Christian compassion and many of Christ's related teachings associated with helping others.

Matthew 25 stresses the need to help others as intrinsic to salvation. The competitive worldview, in its Darwinian form, states that human progress can take place only if the "unfit," i.e., the losers in the overall rat-race of life, are allowed to die off. In its most extreme form, this "ethic" justified and rationalized brutality and callousness not only of factory owners toward their workers, but the political programs of Nazism and similar atrocities, all in the name of raising humanity to a "higher" level of progress by allowing the weaker to die off. Nietzche condemns Christianity because it protects the weak and hence inhibits "progress."

If competitiveness in its extreme forms of ruthless Social Darwinism is clearly contrary to the teachings of Christ, does this mean that Christians must avoid all forms of competition? Is there a way of looking at and participating in competition that is congruent with Christ's precepts?

Immortality-Striving and Competition

Before exploring ways in which competition can be made congruent with Christianity, we must locate the root of competitive striving. As Ernest Becker has stated, the worldly things that human beings strive toward: money, fame, competitive success of whatever sort, "glory" in a military sense, are at root efforts to "rise above" our "creatureliness." We are physical organisms who must inevitably die, yet we try with varying degrees of self-awareness to transcend our condition by seeking the false immortality that money (with its potential to allow us to leave behind monuments to our having existed); glory (the dream of being remembered and adored forever), and being a winner (by having defeated the symbolic death of losing).

All forms of human immortality striving exact costs from others. To be rich means that others must be poor; to be famous renders others obscure; the glory of the soldier or the leader comes only at the expense of the defeated enemy and the oppressed and exploited followers of the powerful. *It is only through accepting the immortality that Christ offers that this inevitable cost of immortality-striving can be overcome.*

By refraining from the vain effort to gain immortality through competitive success of one type or another, and by accepting the salvation offered by Christ, we transcend the limits of our organic existences and gain eternal life without denying it to anyone else.

When this is fully understood, the way is open for a Christian to participate in certain kinds of competitive endeavors in such a way that he or she does not idolize the competitive success that non-Christians unconsciously uphold as their hope for eternal life.

Doing One's Best and Actualizing the Christ in Others

A phrase one hears most often in asking people how they feel about competition is, "I feel it is important to do the best I can." The most positive aspect of competition is that it is a tremendous motivating force. When involved in a competitive situation, people are forced to summon the fullest extent of their capacities if they are to have any chance of winning.

Many people maintain that they do not really compete against others, but against themselves. They see competition not in zero-sum terms, in the sense of "beating" others, but in terms of actualizing their full potentialities. If

Charles P. Flynn is Associate Professor of Sociology at Miami University, Oxford, Ohio. He studied with Ernest Becker at Berkeley, where he received the M.A. degree in Sociology in 1968, and obtained his Ph. D. in the same field under the direction of Peter L. Berger at Rutgers in 1972. Currently President-Elect of the Association for Humanistic Sociology, he co-founded the Association in 1975 and was the founder and first editor of its journal, Humanity and Society. *His work has focused on the study of values, morality, and meaning systems, and he is currently completing work on a book examining the prevalence and implications of competitiveness, to be entitled* Gamelife: The Competitive Ethic and Modern Society. *He is also working on books and articles dealing with violence, militarism, worldview transformations, and their relation to Christian ethics. He hopes his work will contribute to the creation of a society more congruent with Christ's teachings of compassion and unconditional love.*

involved in a competitive situation, they assert that whether or not they win is irrelevant; if they have "done their best," they have, in effect, won.

Viewing competition in this way is more congruent with, even enhancing of, a Christian commitment than the view that "winning is everything." God has given us abilities which we should utilize as fully as possible.

The question that this raises, however, is the ultimate goal to which we direct the energies mobilized by competitive striving, either against others or in terms of attempting to do our best to utilize our full capacities. If this is done to gain immortality—i.e., fame, glory, honor, money, recognition, whatever—it is liable to lead, directly or indirectly to unChristian consequences. But if one's capacities are exercised with the aim of glorifying God and Christ, competitive striving can have positive consequences. For if we believe that our abilities and talents are God-given, we must assume that He has given them to us as part of His plan for our lives. And that, moreover, if we are to do His will in our lives, "doing our best" is centrally important.

Despite the unChristian character of much of the obsessive competitiveness of our society, therefore, if we view it in terms not of trying to "beat" someone else but of trying to elicit their full potentialities, and if we exercise our motivation to try to bring out the best in others (whether or not we happen to be competing against them), competition in the sense of actualizing the best in ourselves can be done in such a way as to actualize the full capacities in others. The ultimate goal of the competitive Christian should be to actualize the Christ in him/herself, and in others with whom one has competitive or non-competitive relationships. For "doing one's best" can, for a Christian, mean only that in the final analysis, we have let Christ live through us, and done our utmost to actualize the potential for Christ to live in and through others. Reformulating the competitive ethic in this way can provide the basis for moving beyond the unChristian excesses that have characterized competitiveness in the past and continue to pervade much competitive striving in the present. And perhaps most significantly, it is most fully in congruence with one of Christ's most important parables—the Parable of the Talents. For in utilizing our talents to the utmost, and helping others to do the same, we are fulfilling His teaching to do "the best we can" with the gifts that are bestowed on us.

REFERENCES

[1]Don Schollander, *Deep Water* (New York: Ballantine, 1971)
[2]Quoted in *Newsweek*, January 15, 1979, p. 74.

There is no way to peace along the way of safety. For peace must be dared. It is the great venture. It can never be made safe. Peace is the opposite of security. To demand guarantees is to distrust, and this distrust in turn brings further war. To look for guarantees is to want to protect oneself. Peace means to give oneself altogether to the law of God, wanting no security, but in faith and obedience laying the destiny of the nations in the hand of Almighty God, not trying to direct it for selfish purposes. Battles are won not with weapons, but with God. They are won where the way leads to the cross. Which of us can claim to know what it might not mean for the world if one nation should meet the aggressor, not with weapons in hand, but praying, defenseless, and for that very reason protected by a "bulwark never failing"?

Dietrich Bonhoeffer
Informal talk at a daily gathering for prayer at the Universal Christian Council for Life and Work at Fanø,1934.

The Establishment of a Heliocentric View of the Universe

JERRY BERGMAN

Department of Educational Foundation and Inquiry
Bowling Green State University
Bowling Green, Ohio 43403

Using both primary and secondary sources, the history of both the secular and sacred resistance to the heliocentric view of the universe was researched. It is concluded that much of the resistance was because acceptance of the heliocentric position required a radical re-evaluation of man's view of the universe and the fact that the evidence was slow in accumulating. The resistance to the heliocentric position is often seen as emanating primarily from the Catholic Church for religious reasons. It is more accurate to say that the resistance was primarily from the academic community who used the church as a tool to oppress a belief they felt was incorrect and which required a thorough re-evaluation of the secular view of the universe but only a minor change in the sacred view of the universe.

Historically, most civilizations have understood the earth to be the center of what they viewed as the universe. The sun and other stars, they believed, rotated around the Earth. The Earth was the home of man, and the ancients tended to see the total universe as functioning for their benefit. Therefore, as the most important person sits at the head of the group, they saw the Earth as, in essence, the "head" of the stellar and planetary system, and the universe revolving around their home.

It is difficult for many people today to understand the importance of a controversy in the 16th century between the new heliocentric and the old geocentric theory of the universe. We must remember, though, that the entire Aristotelian system was based upon the geocentric theory of the universe, and much of man's view of the world and himself was likewise based on this system (Nash, 1929). Falsifying the geocentric theory radically affected the thinking of both the scientists and the masses.

Europeans were accustomed to view the world in a certain way, and when one grows up with a certain world view, especially one that has been almost universally prevalent for thousands of years, it is *very difficult to change this world view* (Hagen, 1908:353). It would be difficult for the reader to imagine the problems if, for example, it were discovered that the earth was flat, that the planets did in fact revolve around the Earth, and that they were only a few miles away from the Earth. This idea would, at first, seem ludicrous. Actually, the heliocentric theory was *more ludicrous* to the Europeans in the 16th century than the geocentric theory would be to us today.

Both the populace and the scientists strongly believed that the Copernican theory was ludicrous (Nash, 1929). They buttressed this opinion with such reasoning that if it were true, the wind would constantly blow from the east at a uniform speed and would not vary in power. In addition, they felt that buildings and the ground itself would fly off with such a rapid motion that only firm holds could keep it on the earth. Humans would have to be provided with large claws like cats to enable them to hold fast to the Earth's surface. Most people and scientists reasoned that the Earth would fall into the sun, and if it really was round, that the people on the other side of the Earth would fall off into space. Further, some felt that if the Earth is only one of several planets, then the other planets *must* be inhabited, as God does not make anything in vain but all of his creation,

The opposition to the heliocentric theory of the universe was primarily because the new theory was radically different from the view of the universe which had been accepted for hundreds of years.

including the planets, is for a purpose. And, if the other planets were inhabited, how could these people be descendants from Adam? How could they trace back their ancestry to Noah's Ark? And how could they have been redeemed by the Savior?

The Earth must stand at the *center* of the universe for otherwise how could the sun revolve about the Earth as the Scriptures say it does? How could the sun rise in the east and set in the west if the Earth circles the sun? It was "obvious" to everyone who had two eyes that the sun rises and sets, and that the Earth does not move. If the Earth moved why do we not feel its movement? It was axiomatic, they felt, that the Sun moves around the Earth, and anyone who denied it was grossly ignorant.

Such were the arguments against the heliocentric theory, the arguments wielded not only by the masses, but by the scientists and university professors who were able to *develop complex reasoning to justify the geocentric theory*. This is why it took so long (several generations) to "prove" it false. Further, for the academicians to admit that they were wrong would be greater than the pride of many of them could tolerate. Their whole science was based upon the geocentric theory, and the assumption that they were wrong caused havoc in their complex belief structure. Most importantly, heliocentricity went against the Aristotelian system, which was firmly held by the professors in most universities. It must be remembered that heliocentricity and the Aristotelian belief structure were part of the textbooks and lectures in Europe and the rest of the world for generations. As Ronan (1974:125) stated:

> We can now look back and see the Aristotelians as obscurantists, as men whose minds were closed to any new interpretation, and in a sense we should be right. Yet it is important to remember that they were not used to assessing experimental evidence from any but their own viewpoint: to them observations, tests even, could never be more than demonstrations to underline the validity of Aristotelian doctrine, not a means of probing that validity. It was in Aristotle's writings, in the books of his learned commentators that the basic truth was to be found; these were the touchstone, an attitude typified by Magini, by then professor of astronomy at Bologna, who openly declared that he would see Galileo's Jovian satellites "extirpated from the sky." Bookish argument was more to be trusted than the evidence of the senses. Galileo, of course, severely criticized this refusal to let observations speak for themselves, and when some of the Pisan academics declined even to put an eye to the telescope, he wrote to Kepler: "What would you say of the learned here, who, replete with the pertinacity of the asp, have steadfastly refused to cast a glance through the telescope? Shall we laugh or shall we cry?"

Copernicus

The person credited with the modern development of the heliocentric planetary theory, or the belief that the center of the solar system is the Sun with the Earth revolving around it, was Nicolas Copernicus. Copernicus was born at Thorn on February 19, 1473 and died at Frauenburg, on May 24, 1543. Both of these cities have been part of several countries, depending upon the historical period.

While Copernicus was a student of canon law, he became a disciple of Novara. Later, he became a professor of astronomy. Copernicus also studied Greek, medicine and jurisprudence. In Ferrara, he took the degree "Doctor of Canon Law." He practiced medicine for some time, and later entered the priesthood.

In 1522 he wrote a paper on monetary reforms which was so highly thought of that the King of Poland adopted substantial portions of it in 1528. Copernicus was also deputy counselor of financial regulations for Prussia from 1522 to 1529. Aside from these many involvements, one of Copernicus' main interests was the sun, moon and planets. His research in this area eventually resulted in his great work entitled *On the Revolutions of the Celestial Bodies*, published just before he died.

In time, his observations of the heavens caused him to accept a heliocentric view of our solar system. He hesitated, though, for years from publishing his work primarily because of the fear of exposing himself to the contempt of the common people. His friends became very interested in the theory and urged him to at least write an abstract for them, which he did.

The theory of the heliocentric system began to spread, and in 1533 Albert Widmanstadt lectured before Pope Clement VII on the Copernican solar system (Hagen, 1908: 354). In 1536 Copernicus was encouraged by Cardinal Schönberg, then Archbishop of Capua to publish his research (Hoyle, 1973). Incidentally, Schönberg urged both Copernicus and Galileo to disseminate their research. Evidently, he agreed with their conclusions. Copernicus, though, hesitated until a younger man, George Joachim Rheticus, entered the picture. Rheticus was the head of the Department of Mathematics at Whittenburg University. Rheticus became a disciple of Copernicus, and at Rheticus' urging, Copernicus submitted his manuscript for publication.

Thus far there was no opposition from the Catholic Church to the new theories. Actually the Catholic Church generally openly supported Copernicus' research (Hoyle, 1973). Likewise, the other Protestant churches supported, or at least did not oppose, the theory. As we will discuss, the opposition came primarily from *the academic community*. Rheticus found that the faculty at the University of Whittenburg opposed the theory, and for this reason they refused to publish Copernicus' research. Later Rheticus tried to resume the chair of his department in Whittenburg, but on account of his acceptance of the Copernican theory

he was forced to resign from the University in 1542.

Finally, Cardinal Schönberg and Osiander, a Protestant clergyman, personally engaged the printing house of Petreius to publish the work. The work was dedicated with permission to Pope Paul III. With the publication of the book, opposition from a number of quarters began to surface, although it was not of any importance until several decades later.

Why The Opposition?

It is often incorrectly assumed that the academic community of the time accepted the Copernican theory, but that it was opposed by the church and religious leaders in general. The opposition to the heliocentric theory of the universe was primarily because *the new theory was radically different from the view of the universe which had been accepted for hundreds of years.* In addition, it opposed the "common sense" view of the world. Although most of the organized opposition came from the academicians, the common people likewise found it very difficult to accept the theory (Barbour, 1971). In addition, many churchmen opposed the theory and used their position as a platform to push their own opinions (White, 1955). Evidently, though, neither Calvin or Luther were openly in opposition to the theory, but some of their followers were (Barbour, 1971:29; Harris, 1973:4).

On the other hand support was especially strong from a number of leading churchmen of the day. Catholic opposition did not commence until *73 years after Copernicus first published his famous work.* This opposition was partly a result of the personality conflicts Galileo had with a number of academic and church authorities. On March 5, 1616, the work of Copernicus was forbidden "until corrected." In 1620 these corrections were indicated, and they involved only nine sentences, all of which taught that the heliocentric system was a *proven* fact. The committee required that these sentences either be omitted, or changed to teach that the heliocentric theory was a theory or a hypothesis, which at that time it was; there was still a large body of evidence in support of the geocentric system.

Actually, it is surprising that the Copernican system was accepted as rapidly as it was with as little resistance as did occur. The lack of opposition was partly because most people thought that the new theory was ridiculous and not even worthy of consideration. Those who openly opposed it were more likely to be the educated persons who knew the problems of the Ptolemaic system, and could recognize to some degree the validity of the arguments in favor of the heliocentric system; thus they felt compelled to respond. If they felt it was totally lacking in validity, they were more likely not to bother to respond until a better case for the theory developed.

Chapter Two: Galileo

Aside from Copernicus, the other leading advocate of the heliocentric theory of the solar system was Galileo. Galileo was born February 18, 1564 at Pisa, Italy and died January 8, 1642. Although Galileo is famous for supporting the heliocentric theory of the universe, he did not discover it, nor did he do much to scientifically support it. More importantly, Galileo helped to develop the telescope and to establish the "scientific method" as a way of finding out knowledge. The sciences of Galileo's day tended to rely heavily on authority, especially that of Aristotle "who was supposed to have spoken the last word upon all such matters, and upon whom many erroneous conclusions have been fathered in the course of time" (Gerard, 1908:342). Other important discoveries of Galileo were in the area of mechanics, especially dynamics, a science which may be said to owe its existence to him and his research. Galileo is also famous for noting the oscillations of a swinging lamp in the cathedral of Pisa, which evidently led him to the discovery of isochronism of the pendulum (Ronan, 1974). In 1588 he wrote a treatise on the center of gravity in solids, and later he laid the experimental foundations for the theory of falling bodies, demolishing the prevailing belief that the rate of descent is proportional to the weight of an object. In other words, Galileo demonstrated that all objects fall at the rate of 32 feet per second per second, which means that heavier objects do *not* fall faster than lighter objects. In 1592 he was nominated for the chair of mathematics at the University of Padua, which he occupied for 18 years with ever increasing renown (Brewster, 1841). In addition, he demonstrated the law of equilibrium and the principle of virtual velocities. In the field of hydrostatics he set forth principles of flotation. In addition, he invented the thermometer.

Jerry Bergman is an Assistant Professor in the College of Education (Department of Educational Foundations and Inquiry) at Bowling Green State University, Bowling Green, Ohio, where he has been since 1973. Before that, he taught Psychology and Sociology at Oakland Community College in Michigan. He has also worked in research for the court system in Oakland County Michigan. His Ph.D. is in Evaluation and Research from Wayne State University. Dr. Bergman has published over 160 articles in both general and professional journals in the areas of sociology, psychology, education and biology. He has written fourteen books and professional monographs. One of his recent monographs was published by Phi Delta Kappa, and is on the creation/evolution controversy in the schools.

Galileo became famous for championing the heliocentric theory chiefly because he wielded an exceedingly able pen, and "unsparingly ridiculed and exasperated his opponents. Undoubtedly, he did much to bring upon himself the troubles for which he is now chiefly remembered" (Gerard, 1908:342; see also Ronan, 1974:85). As Santillana (1955:18) stated:

> . . .Galileo's fatal mistake lay in his rash indiscretion, his insistence on throwing open to the common people, by writing in the vernacular, a question which was far from being settled and could only, in that form, give scandal to the pious, whereas the proper approach would have been to write elaborate tomes in Latin and then patiently wait for the appraisal of the scholars and theologians.

Galileo supported the heliocentric theory partially because he was convinced of Copernicus' arguments, and partially because his work with the telescope and subsequent observations taught him much about the universe that contradicted what had been previously accepted. For example, he discovered that the moon was not a perfect sphere as taught by the old astronomy, but possessed hills, valleys, and other features resembling the earth. He discovered that the planet Jupiter had satellites, thus displaying a solar system in miniature. These discoveries supported the heliocentric theory, and not the geocentric theory. He found that the planets Venus and Mercury exhibited phases like those of the moon, and discovered that the sun had "spots" which rotated, supporting the supposition that either the sun rotated or the Earth moved around the sun, or both.

Even prior to these discoveries, Galileo had already abandoned the geocentric hypothesis. He was hesitant, at first, to advocate the new system because of fear of public ridicule. His discoveries through the telescope, though, supported heliocentric theory to the extent that he felt he could no longer withhold his opinions from the public. It should be noted that Galileo's discoveries were not profound, and could have been made by anyone who had access to a telescope and spent the time observing the solar system.

In spite of the evidence many, if not most, of the leading scientists of the day remained unconvinced. Galileo, "profoundly assured of the truth of his cause, set himself with his habitual vehemence to convince others, and so contributed in no small degree to create the troubles which greatly embittered the latter part of his life" (Gerard, 1908:344). As mentioned above, there had been no major opposition to the theory by the Church or religion in general for 73 years; the originator of the system was a churchman; and the publication finally came about only at the urging of Cardinal Schönberg and Tiedemann Giese, Bishop of Culm. The book was dedicated by permission to Pope Paul III in order that it might be protected from the attacks by which it was sure to encounter on the part of the academic establishment and the public at large because of its contradictions with the evidence of man's senses and the age-old pattern of thinking. Neither Pope Paul, nor any of the nine Popes that followed him, nor the Roman congregations raised much alarm or concern. Galileo's main concern was ridicule, and this primarily from the public and the academic community, *not* from the religious community (Santillana, 1955:16-18). When Galileo first presented his ideas to the world, he was received with trumpet in Rome. It was not until four years later that trouble arose, partially because the church authorities were alarmed at the persistence with which Galileo proclaimed the truth of the heliocentric theory. Ronan (1974:127; 131) summarized Galileo's first visit to Rome as follows:

> Galileo arrived safely in Rome and lost no time in getting in touch with Father Clavius and the other Jesuit astronomers at the Roman College. He took one of his telescopes along and demonstrated it, and then left it at the College so that they could observe at their leisure, for his discoveries could not all be checked in a single night and some, such as Jupiter's satellites, would require at least days of careful observing. Yet it was not long before the Jesuit astronomers saw the phenomena for themselves, were convinced, and turned to honouring and feasting Galileo: after all, was he not Jesuit trained, a true son of the Church, whose fame brought distinction to the Order?
>
> On this visit to Rome Galileo also had an audience with the Pope, Paul V, during which he seems to have made such a favourable impression that afterwards church dignitaries vied with one another to do him honour. In brief, the trip was an unqualified success, a triumph for Galileo and his telescope. Indeed the Florentine Cardinal del Monte wrote to the Grand Duke to say that, during his stay in Rome, Galileo, "had given the greatest satisfaction." As far as Galileo was concerned, he was overjoyed with the reception he had received; his telescopic observations had been confirmed by the highest astronomical authority in the land; he had the support and friendship of Prince Cesi and, it seemed, the sympathy at least of a prelate as senior as Cardinal Barberini. Church and society were on his side; what more could he ask?

Although many people agreed with many of Galileo's ideas, the academic community itself was convinced, along with Roger Bacon and others, that the new teaching was false, nonscientific and against the whole scheme of Aristotle—a most important objection (Barbour, 1971:32-33). These reasons were the primary basis for the Church's later objection, although pressure from the academic community forced a crystallization of these views. The Holy Scriptures were used to condemn his theory *primarily because they were universally believed to be the supreme authority in matters of science*, as well as all other areas (Gerard, 1908:344) and thus it was felt *more effective* to condemn heliocentricity on scriptural grounds than scientific grounds, although much of the actual objection was on "scientific grounds."

Publishing in the vernacular of the people caused serious problems. The new doctrine was startling for the learned, but the masses were largely incapable of forming any solid judgment concerning the theory. The Church felt Galileo's boldness was premature. In addition, most individuals of the time who were well educated were, in some way, connected with the Catholic church or another church. Some of these individuals took it upon themselves to condemn his theory and *used their influence in the church to add weight to their condemnation* (Ronan, 1974:145).

A further problem was that some of the radical elements of the time, such as *The Skeptical Party*, which aimed at the overthrow of all religions, lent Galileo its support. Galileo's association with these groups did not help, and probably did much harm to his cause.

Ronan (1974:131-132) summarizes the development of the opposition as follows:

> Galileo returned to Florence in June 1611, flushed with success, quite unaware that storm clouds were already gathering, generated by a body of *dissident professors* at Pisa who, for further support, had allied themselves with a set of courtiers at Florence. They were all jealous of the special treatment Galileo was given, of his large salary and of the continual favours bestowed on him personally by the Grand Duke. In addition, the academics were furious that this braggart of an anti-Aristotelian should be in a position to promote his iconoclastic views. He must be attacked, but since his astronomy was receiving such adulation, it seemed better tactics to leave this alone and do battle on problems of physics. Led by Ludovico delle Colombe, an arrogant academic, they decided to begin in the restricted intellectual atmosphere of Florence where Galileo had the fewest allies, rather than in Pisa where he would receive more support, and they met to argue in Filippo Salviati's villa.

Upon hearing that some persons denounced his doctrine as anti-scriptural, Galileo presented himself in Rome in December of 1615. He was received courteously and endeavored to present the position that the Scriptures intend to teach men how to go to heaven, not how the heavens go. For reasons which are not entirely clear, but largely due to the pressure from the academic community as channeled through the church, Galileo declared that his system was scientifically false and unscriptural. He then promised to stop teaching it. Part of the situation which led up to this was as follows (Ronan, 1974:144-145):

> If the full implications of the sunspot controversy were to take time to manifest themselves, there was another more immediate danger that Galileo had to face in 1613. Ludovico delle Colombe's anti-Galileo faction, disappointed with the way the argument on floating bodies had gone, decided that it was time to carry the attack on Galileo into court circles, and to shift the emphasis from problems in physics to the far more dangerous ground of religious fidelity. Formal court banquets provided suitable occasions, and one day, when Galileo was not present, the opening salvo was fired by the pious Dowager Grand Duchess Cristina who raised the question of the religious orthodoxy of the Copernican view. Unwittingly primed by Boscaglia, the university's strongly pro-Aristotelian professor of philosophy, the Grand Duchess questioned the Benedictine monk Benedetto Castelli, who was a well-known pupil of Galileo's, asking him whether a moving Earth was not contrary to the Scriptures.

The Inquisition's actions have been greatly stressed by those endeavoring to present the view that historically religion has opposed "scientific truth" where the scientists themselves supported their colleagues. It is true that the heliocentric theory was later almost universally accepted to be factual and the geocentric theory false; nonetheless, at the time there was not sufficient proof for the heliocentric theory and most authorities were convinced of the truth of the geocentric position (Ronan, 1974). In addition, the Church has opposed a number of so-called "scientific" theories which were later found to be inaccurate or false, and did *not* oppose many ideas and theories *which they probably should have*, such as Nazi theories of racism. Likewise, the Church has not opposed many theories which, at first, seemed to be totally wrong, but eventually were demonstrated to be valid.

In the case of the heliocentric theory, the Catholic Church did not object to its being taught as a hypothesis which explained certain phenomena in a simpler way than did the Ptolemaic system of eccentrics, epicycles, etc. Nor

The Church has been painted as the enemy of science, when actually the professors, the "scholars," and the establishment were the real enemies of science.

did the Inquisition state that the theory contradicts Scripture, but only that it "appears to contradict Scripture" (Gerard, 1908). In addition, the authors of the judgment did not consider their opinions to be irreversible. Cardinal Bellarmine, the most influential member of the sacred college, writing to Foscarini, a theologian who was one of Galileo's strongest supporters, stated that

> if a real proof be found that the sun is fixed and does not revolve around the earth, but the earth round the sun, then it will be necessary, very carefully, to proceed to the explanation of the passages of Scripture which appear to be contrary, and we should rather say that we have misunderstood these than pronounce that to be false which is demonstrated" (Gerard, 1908:305; see also Drake, 1957:163-164).

Bellarmine added that, because of the scientific evidence against the new theory, it is unlikely that it will ever be accepted (Drake, 1957:164).

We are not attempting to apologize for or excuse the actions of the Inquisition, but are trying only to understand them under the circumstances of the time. Indeed, a review of the actions of the Inquisition should help us understand the abuses of religion. Unfortunately, individuals often cloak their own beliefs with a religious cover and endeavor to defend them on these grounds (Drake, 1957). It would seem advisable that all individuals connected with a religious system should be thoroughly familiar with these events. Yet, the fact is that the Church was far less dogmatic and hostile to the new theory than were the secular academicians.

When Galileo left Rome, he evidently did not intend to uphold his promise to support the geocentric system but "lost no opportunity of manifesting his contempt for the astronomical system which he had promised to embrace" (Gerard, 1908:345). In 1624 he went to Rome, evidently to try to have the former judgment annulled. He was met with "a noble and generous reception" (Gerard, 1908:345) partly because the reigning Pope, Urban VIII, had been his friend and had openly opposed his condemnation in 1616. Urban VIII even conferred upon Galileo a pension which was actually an endowment of science itself and, in particular, of Galileo's contributions (Brewster, 1841). Yet, the Inquisition had little choice but to condemn Galileo for going against his word, and Urban VIII refused to go against the judgment, probably because the weight of science at the time was against Galileo (Santillana, 1955).

Galileo returned to Florence and in 1632 published a scathing attack against the geocentric system. This was interpreted by the Roman authorities as a direct challenge

and he was therefore again cited before the Inquisition. Ironically, he endeavored to maintain that since his trial in 1616 he had never held the Copernican theory, but had faithfully kept his pledge. It should be noted that he was called before the Inquisition only twice, in 1616 and in 1632. He did visit Rome in 1624, but this was at his own volition.

The Inquisition was obviously not very impressed with Galileo's denial that he had never promoted the Copernican theory, especially in view of his book published in 1632. As punishment, he was not mistreated or even imprisoned, but was required only to recite seven Penitential Psalms once a week for three years. Galileo spent altogether 22 days in the buildings of the Holy Office (the Inquisition) and even then he lived in the spacious, well furnished apartment of an official of the Inquisition (Nash, 1929). For the rest of the time he lived with friends, "always comfortable and always luxurious." He was treated courteously, with a great deal of respect.

He was not brought before the Inquisition again, and lived his life researching and writing about his theories. The interference of the Church in his work was actually minor. When Galileo was dying, Pope Urban VIII sent a special blessing to him. He was interred in consecrated grounds within the church of Santa Croce, at Florence, an honor given only to men viewed as faithful Catholics by the Church.

The heliocentric system was never condemned by any Pope, but only by the Congregation of the Index (commonly called the Inquisition), an organization which, while it was supported by the Church, occasionally acted against the wishes of the Pope and other Church officials.

Some Conclusions

Although the case of Galileo is often used to support the contention that the Church, and religion in general opposed scientific progress, actually the opposition came *primarily from the academicians* and the secular as well as sacred universities. It must be remembered that the professors at the religious universities were primarily teachers, even though many were nominal, and a few, devout Christians. The opposition was primarily on philosophical grounds, not religious (Barbour, 1971:32-33). Religion was used only to support their arguments because it was felt opposition on these grounds would be more effective.

As Walsh (1911:385-386) stated ". . .it was not Ecclesiastics [who refused to look through his telescope] but professors of science at the University of Pisa, who were quite as unsympathetic towards certain of his astronomical discoveries as were any of the Ecclesiastic of his time."

Santillana (1955), the eminent scholar and Professor of the History and Philosophy of Science at Massachusetts Institute of Technology, concludes that the Galileo incident occurred primarily because Urban VIII based his decision upon a paper *prepared by several scientists* which was to objectively present all the evidence on the controversy. Actually, the scientists gathered all the evidence they could find in support of the geocentric system, and all the evidence against the heliocentric system.

Santillana (1955:xii), from his extensive research on this topic also concluded that:

> the long-drawn-out polemic is not strictly. . .one between the confessional and the anticonfessional faction. It has been made to look like that; in reality it is a confused free-for-all in which prejudice, inveterate rancor, and all sorts of special and corporate interests have been the prime movers. Those who dragged and keep dragging the Church into it are no candid souls. As L'Epinois says rightly, the church has all to gain and nothing to lose from the truth.

Santillana (1955:xii) added that

> it has been known for a long time that a major part of the Church intellectuals were on the side of Galileo, while the clearest opposition to him came from secular ideas. It can be proved further. . .that the tragedy was the result of a plot of which the hierarchies themselves turned out to be the victims no less than Galileo—an intrigue engineered by a group of obscure and disparate characters in strange collusion who planted false document in the file, who later misinformed the Pope and then presented to him a misleading account of the trial for decision.

The church relied upon the scholars to decide the truth, and the scholars both deliberately and innocently misled the Church into supporting their incorrect position. The Church ended up in the middle of the controversy, and was used by the established academic powers in order to maintain their position. The Church has been painted as the enemy of science, when actually the professors, the "scholars," and the establishment were, in this situation, the real enemies of science. The same is often no less true today.

REFERENCES

[1]Barbour, Ian G. *Issues in Science and Religion*. New York: Harper and Row, 1971.

[2]Brewster, David. *Martyrs of Science: Or the Lives of Galileo, Tycho, Brake and Kepler*. London: Cupar, 1841.

[3]Drake, Stillman. Editor and Translator. *Discoveries and Opinions of Galileo*. New York: Doubleday & Co., 1957.

[4]Draper, John William. *History of the Conflict Between Religion and Science*. New York: D. Appleton & Co., 1875.

[5]Gerard, John. "Galileo." *The Catholic Encyclopedia*. New York: The Encyclopedia Press, 1908, p. 342-346.

[6]Hagen, J.G. "Copernicus." *The Catholic Encyclopedia*. New York: The Encyclopedia Press, Inc., Edition of 1908, p. 352-354.

[7]Harris, R. Laird. "Copernicus and the Church," *Christianity Today*, September 14, 1973, p. 4.

[8]Hoyle, Fred. *Nicolas Copernicus*. New York: Harper & Row, Publishers, 1973.

[9]Nash, J.V. *How Galileo Was Gagged by the Inquisition*. Girard, Kansas: Haldeman-Julius Publication, 1929.

[10]Ronan, Colin. *Galileo*. New York: G. P. Putnam's Sons, 1974.

[11]Santillana, Giorgio de. *The Crime of Galileo*. Chicago: The University of Chicago Press, 1955.

[12]Walsh, James. *The Popes and Science*. New York: Fordham University Press, 1911.

[13]White, Andrew. *A History of the Warfare of Science with Theology in Christendom*. New York: George Braziller, 1955.

Biblical Creation: Should It Be Taught in the Public Schools as a Mandated Subject Alongside Evolution?

(A public discussion on May 14, 1980 sponsored by the Community Services Office, San Diego Community College, and the Biology Department of San Diego Mesa College.)

Nell Segraves

Nell Segraves is a co-founder and an administrative assistant at the Creation Science Research Center. She has been involved in the evaluation of science, social science and health textbooks for approximately eighteen years.

Those of us involved in the Creationist Movement are not attempting to legislate biblical creation into science classrooms. Biblical creation is a belief that we hold, but we are no more advocating our belief in the Scriptures as a science subject than is the humanist advocating atheism as a subject for classroom discussion in science. The Creation Science Research Center is not attempting to introduce to public schools Bible stories or Bible verses. Neither are the other established responsible Creationist organizations. What we are advocating, rather, is the introduction into the science classroom of scientific data which are currently being excluded. . .namely, scientific data which conflict with the evolutionary theories of origin, and which are needed for the critical evaluation of evolutionary theories as science. In conjunction with this, we are advocating the introduction into science textbooks of the scientific data which support the alternative explanation of origins, namely, intelligent, purposeful design and special creation. We are calling for reform in the teaching of science. Theories in science must not be protected. They must be continually open to critical evaluation. They must be thrown into open competition with alternative explanations. This is how science advances to better understanding of the natural world. If evolutionary theories are to be studied in science classrooms, the current protectionist policy must cease. . .in the name of good science, good education, and simple intellectual integrity.

The premise on which we base our need for alternative theories is protection of religious beliefs. We use a legal premise under the first and fourteenth amendments of the U.S. Constitution and the Civil Rights Act in protection of creed. It is our understanding that philosophical belief systems constitute a religious or a creed position. Creed, as defined in the dictionary, can represent political as well as religious points of view. The Supreme Court, in the decisions on Bible reading and prayer, ruled out any recognition of any particular religious point of view and pointed out that secular humanism is equally religious as an orthodox religious belief. Attorney General Stanley Moss said that the neutrality requirements of the State and Federal Constitutions require the State of California to balance philosophical belief systems, and that atheist, agnostic and irreligious beliefs would be equally unconstitutional. The penalites for prescribing or advocating an atheist, agnostic or irreligious belief system would be the loss of the license of the teacher or the loss of State aid to the school, in exactly the same way that you would discipline a teacher for advocating Christianity or a particular religious-point of view. What the schools are forbidden from doing is indoctrinating a particular philosophical system or belief. What they can do is teach about all points of view, giving recognition and respect for alternative points of view.

The fact that the Creationists have gone a second mile and presented alternative scientific theories and explanations for origins is simply the frosting on the cake. We don't owe the educational system good science. We only require them to recognize alternative belief systems. It has been charged that we are trying to legislate into science classrooms theories that would not be supported in science. It is our contention that this is what has already been done by the humanist and the evolutionist. . .that they have legislated into the science classrooms a particular point of view, mandating that every student adhere to it and making their grades dependent upon it. In years past, teachers could not even be hired if they did not adhere to this doctrinaire position. When we first began our studies, those scientists that are now part of the Creation Research Society were fearful of identifying themselves as not adhering to the evolutionary system for fear they would be fired. They could not achieve their Doctorate if they did not adhere to that point of view. We contend that is not science. That is scientism, and a religion. When we have asked the Board of Education to open up the science curriculum and subject evolution to falsification, we have been denied the privilege of criticizing it, or bringing into the classroom evidence that would tend to militate against it or falsify it. We contend that is not science instruction . . .That is religious indoctrination into a particular philosophical belief system taught at tax expense. It violates the neutrality requirements of our State Constitution, puts the State in the position of having adopted a particular religion of secular humanism, the State prescribing it and forcing every student to adhere to it. And that is why the Creationist Movement is so active today.

Fred Jappe

Fred Jappe is a member of the Department of Physical Sciences at Mesa College. He teaches chemistry and also science and religion. He received his B.A. degree from the University of Washington and has done graduate studies at San Diego State University and Seattle University.

As a Christian and as a Baptist, I respond to the stated question with a resounding, "No". The Baptist position since before the time of Roger Williams has been one of belief in separation of Church and State. Let me quote just two of twelve arguments from Roger Williams written in 1644.

> "Firstly, all Civil states with their officers of justice in their respective constitutions and administrations are proved essentially Civil and therefore not judges, governors, or defenders of the spiritual or Christian state of worship."

That was an acknowledgement on the part of Baptists that the State is secular.

> "Sixthly, it is the will and command of God that a permission of paganism or anti-Christian conscience or worship be granted to all men and that they be fought against only with the Word of God."

Baptists have continued to argue this position. My own Convention (Southern Baptist) has, for example, consistently argued against prayer in public schools. I believe, as a Christian, that this position is correct. Religion, as well as the State, suffers when this wall of separation is breached. Religion in general, and Judaism and Christianity in particular, would suffer from legislation of this sort. It is harmful to religious values to have them taught by the non-religious. To do so is to profane that which is holy. The gospel of Jesus Christ does not need secular help. By extension, neither does Genesis 1 or 2. Neither, of course, should religion be hindered by the State. I do not expect the Hindus' belief in vegetarianism, the Buddhist's belief in reincarnation, the Orthodox Jewish belief in the infallibility of Genesis 1 and 2, or the Christians' belief in the Incarnation and Resurrection of Jesus Christ to be the object of ridicule by the State.

We also should not legislate biblical creationism into the schools because of the lack of agreement as to what that term means. It is true that Christians and Jews share much in common on the importance of Creation as an idea, but there is a widespread disagreement as to how God carried out his creative acts. A friend of mine, Jerry Albert, who has a PhD in biochemistry and is a Christian member of a Missouri-Synod Lutheran Church (not noted for its liberalism), debated Dr. Duane Gish, who also possesses a PhD in biochemistry, and is another fine Christian. They debated under the auspices of Fuller Theological Seminary, one of America's orthodox schools. Dr. Albert argued for theistic evolution, the idea that evolution took place as described by the biologists, but under God's direction. Dr. Albert argued that no Christian doctrine creedal statement was threatened by evolution. I have also had Dr. Gish and other speakers from both the Creation Science Research Society and the Institute for Creation Research speak to my science and religion classes. I have found them to be warm, honest, sincere Christians, but they reflect a much different point of view, the view of *fiat* creation and a young earth. I also know Dr. Bernard Ramin, who is a progressive creationist, a view which fits somewhere in between the views of Dr. Albert and Dr. Gish. In fact I'm confident that Christians hold to literally all possible views on how God did it. I personally have reached the conclusion that the question, "How?", is best answered by the scientist. As a Christian, I do, of course, affirm that God is the maker of heaven and earth. A study of Christian theology also reveals a full spectrum of ideas as to how God created. I therefore oppose trying to legislate Biblical Creationism, because not all views could possibly get a hearing, which is manifestly unfair to those left out.

I oppose trying to legislate Biblical Creationism into schools also because it directs Christians from their main task of witnessing by their lives to Christ's love and redemption, and misdirects monies and energies that, I believe, could be better spent elsewhere. Christianity centers in Christ, his life, his death, his resurrection. It does not center in Genesis 1 and 2. Activities that divert either group from their central theme hurts their witness. My personal experience has been that attempts to legislate Biblical Creationism do not further the Gospel, but, indeed, hinder it by making people believe that one must choose between belief in evolution or belief in God.

I oppose trying to legislate Biblical Creationism into public schools because I believe it is based on a false understanding of science. Evolution is a theory. At the present time, it is the grand, glorious all pervasive theory of biology. But if biology follows the path of other sciences, astronomy, physics, and chemistry, it will see this theory change and most likely even be replaced by other theories. Science is self-correcting, partly, I'm sure, because its theories are subject to scrutiny by all members of its community. The scientist is not generally anti-God. His task is to understand how the material universe works. As a Christian, to paraphrase Kant, I would suggest that we cannot help but be filled with awe as we study the heavens above, or the feedback mechanisms of enzymes within, as well as experiencing the need for values for moral judgements.

I oppose legislating Biblical Christianity into schools because to do so would interfere with the prophetic voice of the Church by tying its interests to that of the State. An important aspect of both Judaism and Christianity is the need to speak out against the wrongs of the State, whether in the fields of war, censorship, nuclear power, abortion, the abuse of the poor, or the lack of medical facilities. By demanding special privileges for our doctrines we lose the ability to speak out on critical issues, and speak out, we must.

Lastly, I oppose trying to legislate the teaching of Biblical Creationism into schools because I don't think the legislators could do it properly. I work as a grievance chairperson and use the State education code a lot. Anyone who has read that mass of redundant inconsistency could not possibly be in favor of having that group of legislators write or prescribe anything they were in favor of.

Bette Chambers

Bette Chambers is President Emeritus of the American Humanist Association. She did extensive biological studies at the University of Washington, Sacramento State University, Humboldt State College, and Eastern Washington State College, emphasizing primarily the zoological sciences.

Dr. Jappe has already defined the various kinds of creationism. The way in which I use the term Creationism is the extreme anti-evolutionist point of view which holds to a belief in a young earth, six to ten thousand years old, to the necessity for a universal flood, and to a relative fixity of species. In all the states in the Union (over the last dozen years or so there have been about twenty of them), which have had Bills in their state legislatures to mandate the teaching of Creationism in the schools, these have been the points of view behind the individuals who lobbied for and wrote the model Bills. Theistic evolutionists are those who believe that God directs the course of evolution toward a goal and purpose; none of the organizations representing that form of theistic evolution or evolutionary theism are in fact part of the political struggle to get Creationism mandated in the public schools.

I, of course, take the negative in the present question. My first reason for doing so is that evolution theory is not mandated. The only mandates of Congress, and in the State of California, under the California Constitution and the State Education Code, require merely that a modern and up to date education in the sciences be provided for the children in the public schools. Decisions regarding textbook adoption are left to the State Board of Education and to local districts.

Creationism is a strictly religious point of view vigorously supported by some religious persons and sects, and as vigorously opposed by other religious persons and sects, almost all of them broadly Judaeo-Christian. The arguments favoring mandating

Creationism have been dealt with by the courts and judicial bodies over the last decade to fifteen years; they have ruled consistently so far that Creationism is religious and has no place in the science curriculum of a public school. One of these citations is: the California State Attorney General's opinion, April 2, 1975. Again in Burston vs Wilson, United States Supreme Court, Mr. Justice Clark stated in 1952, "The State has no legitimate interest in protecting any or all religions from views distasteful to them."

The claim has been made that teaching evolutionary biology is a religion in itself, which is offensive to the beliefs of the *fiat* Creationists, hence, in violation of both the establishment and the free exercise clause of the First Amendment. The courts have never agreed that evolutionary biology is a religious view. However, in the Amish case, the ruling of the Supreme Court notes the existence of remedies for religious objectors. The State maintains a high interest in a creditable education in the sciences for a majority and provides exemption or the choice of a parochial education for objectors. In Daniel vs Waters, the Tennessee case in 1975 which struck down an equal time for Creationism proposal similar to those in other states, the Court for the Sixth District in Tennessee held: "There is, and can be no doubt that the First Amendment does not require that teaching and learning must be tailored to the principles or prohibitions of any religious sect or dogma."

Again I affirm the negative because the allegation of *fiat* Creationists that evolution is a religion, the religion of humanism, is false. I don't know of anyone better equipped to speak to this point than myself, as past President of the American Humanist Association and a member of its Board of Directors for the past eighteen years. Creationists claim widely that evolution is a tenet or a creed of Secular Humanism or Humanism. All of the current State legislative Bills rest on this allegation. It is claimed that evolution is a tenet of Humanism, that Humanism is a religion, and that therefore it should not be taught in science classes lest it violate the establishment clause and the free exercise clause of the First Amendment. These statements are false for the following reasons. Neither the State or the Federal Government nor its judiciary may define the mission of a church or define the beliefs of any faith. Only the adherents of a faith may do that, or its authorized leaders or both, as is the democratic tradition within humanism. The American Humanist Association is this nation's largest humanist organization. It's structure provides that its leaders and its members alone define the meaning of Humanism in its late twentieth century variety of expression. Evolutionary theory is not a tenet, creed, or required belief for membership in the American Humanist Association. It never has been and it never will be. No Humanist applying for membership need pass an evolutionary belief litmus test nor need even know anything about evolutionary theory.

The fact that most Humanists accept evolutionary theory as well established in science is of no more importance than the demonstrable fact that large numbers of Protestants, Catholics and Jews also accept evolutionary theory as well established in science. To illustrate this let me remark about two cases: in Dallas in the month of April, 1977, when the Dallas Independent School District adopted one of the Creationist texts by the name of, *Biology: A Search for Order in Complexity,* published by Zondervan Publishing Company, Catholic, Protestant and Jewish clergy organized an opposition to the adoption of it. Of the signatories, a statement was produced declaring: "The principal reason for our objection is that this textbook is expressly and avowedly organized in terms of sectarian religious beliefs." Again on January 27, 1980, in the city of Atlanta thirty-nine of the religious leaders of the Atlanta Ministerial Association representing Congregational, Episcopalian, Jewish, Methodist, Presbyterian, and Unitarian bodies petitioned the Georgia House of Representatives to oppose the so-called House Bill #690, which was narrowly defeated in the State of Georgia not by a vote, but by a motion to adjourn *sine die*. They opposed this Bill which would have mandated the Equal Time Theory, the Young Earth Theory, the Noachian Flood Theory, and the Fixity of Species Theory. They opposed this on the grounds that it was the establishment of dogma in the schools, and, again, there was not a Humanist among them.

Allegations that evolutionary theory is a tenet or creedal belief peculiar to and almost limited to Secular Humanism is denied by Humanist leaders and members who alone define the tenets and beliefs of the Humanist faith. Allegations to the contrary come almost exclusively from the extreme minority wing of fundamentalist Protestantism and from pressure groups interorbital with right wing fundamentalist groups.

The inverse allegation that all evolutionists are atheists and that evolution is atheistic is common only to the publications of *fiat* Creationist groups: even such remarkable statements as "no Christian can be an evolutionist". Thus, the claim that evolution is a religion, the religion of Humanism, is refuted. Inasmuch as this issue is pivotal to the success of any legislative act or court case in which this view is argued, it fails.

Ray Menegus

Ray Menegus is a member of the Department of Physical Sciences at Mesa College. He teaches classes in physics and also in science and religion. He has his B.S. degree from Stevens Institute of Technology in New Jersey, and has done graduate work at the University of California, San Diego.

As a Christian, a scientist, and an educator I too answer the question with a "No". Biblical Creation should not be legislated into our schools, but neither should we legislate it out. The real problem we have is how we can best serve the educational needs of our children. The controversy that has been raised between creationism and evolution over the last hundred years has really come about because of a misunderstanding of the philosophical foundations of science, the methods of science, and what science really has to say.

To begin with, neither creation nor evolution are scientific theories. Science has very rigid standards as to what it accepts as a theory. The method of science is the method of observation and experimentation with the so-called facts of science that scientists call data. In order for data to be admissable into science there are basically three criteria. The first criterion is that the data must be observable; the observations must also be recordable for retrieval and comparison with later data. The data are then accumulated into laws and the laws become fixtures of science: for example, the relationship between the pressure of a gas and its temperature . . .But the laws in themselves do not constitute a theory. In order for a scientist to come up with a theory, there has to be a creative component. Many scientific theories are developed partly by imagination and sometimes accidents, but the theory itself is a way of organizing the laws and the data into a comprehensive scheme.

Theories must satisfy four basic criteria. First, they should be in agreement with the data. Second, there should be internal consistency between the laws and the data themselves. Thirdly, and very importantly, they should have the ability to produce understanding of the laws that hitherto were not necessarily completely understood. And fourthly, they should propose new

hypotheses which could be tested by experiment. A theory that has no test, and cannot be in principal falsified, does not constitute a scientific theory. This means for example, that creation is not a theory because it cannot predict any new events which are testable by experiment. But neither is evolution a theory, because evolution cannot predict what new species are going to be, and evolution cannot be falsified. You open a typical biology book and you'll see a tree of evolution. If, for example, scientists were to dig up new fossils that disagreed with parts of the tree, the evolutionists would just rearrange the branches. Evolution in principal is not falsifiable, it cannot predict anything new, and it does not even correlate the data very well. However, creation and evolution are paradigms of science: they are ways of looking at the data and interpreting the data. Since neither evolution nor creation are scientific theories, it is my proposal that both paradigms be allowed to be taught in public schools. Ideally, the instructor would allow for discussion from both perspectives and this would encourage critical thinking on the part of the students rather than promoting lazy, closed-minded intellects, which are detrimental to the educational process.

I would like to explore some of the consequences that we face if we allow only evolution to be taught in our schools. What has made science great is the fact that it has proceeded on an unproven assumption: the assumption of reductionism. If we assume that evolution has occurred, then we can say that therefore biology and living systems can be explained in terms of chemistry, and that chemistry can, in turn, be explained in terms of physics. The hope of biological evolutionists is to completely explain human behavior and everything about the universe simply in terms of the laws of physics. That is reductionism, the basic assumption that evolutionists proceed by and that has led to many developments in science.

A famous evolutionist, Albert Szent Gyŏrgyi A Nobel Prize winning biologist for his work in the discovery and work in vitamin A, says, "In my hunt for the secret of life, I started my search in histology. Unsatisfied by information that cellular morphology could give me about life I turned to physiology. Finding physiology too complex, I took up pharmacology. Still finding the situation too complicated I turned to bacteriology. But bacteria were even too complex, so I descended to the molecular level studying chemistry and physical chemistry. After twenty years of work I was led to conclude that to understand life we have to descend to the electronic level and to the world of wave mechanics. But electrons are just electrons and have no life at all. Evidently, along the way, I lost life. It had run out between my fingers." One of the grave implications of teaching solely evolution in our public schools is that by proceeding with an evolutionary reductionistic ethic, life is reduced simply to the meaning of an electron. But an electron has no inherent meaning. One electron is the same as all electrons. One electron has no life, no consciousness. Therefore, our children are being programed and indoctrinated to the belief that they, themselves, have no meaning.

Another aspect of reductionism is that the whole can be understood in terms of the sum of its parts. But what I've tried to show is that we cannot understand life and the processes of life in terms of simply the physics of an electron. Scientists are now beginning to realize that the whole is greater than the sum of its parts, that reductionism has failed, and that, in fact, it has left residues, unexplained assumptions, and ad hoc assumptions all along the way.

Teaching only evolution in our public schools is detrimental to the educational process. The most beneficial thing that we can do for our children is to teach both sides of the question, since neither are scientific theories, but are rather belief systems. Since the question of origins has plagued man since time immemorial, the best way we can serve the educational needs of our students is to teach both Creation and Evolution, leaving it up to the discretion of the instructor.

Robert Ball

Robert Ball is a member of the Department of Biology at San Diego Mesa College, and is responsible for teaching various courses in the field of biology. He received his Bachelor's degree from San Diego State University, and has done graduate work at University of California as well as San Diego State University.

The question, "Should Biblical Creationism be legislated in a public schools?" is not the real issue. This question has already been answered by the California Attorney General in 1975, when he stated that religious beliefs may be discussed in public schools provided they "do not constitute instruction in religious principals or aid any religious sect, church, creed or sectarian purpose." And I further doubt that many protagonists of the evolutionary theory would object to the advent of creationism in the classroom. The real question is under what guise it should be presented—as a true science or as a religious philosophy? This question leads us to two separate theses that the creationists would like us to believe: (1) that the creation theory which parallels Biblical Creationism is scientifically oriented and sound; and (2) that evolutionary theory and its model systems are based on a set of philosophical beliefs and therefore it, in itself, is also categorically a religion. The first statement allows for the legislation of a fundamentalist belief system masquerading as science into public schools. The second position allows for the removal of an albatross from the neck of fundamentalists, by removing evolutionary biology from the curriculum of science classes. This, in fact, would be the accomplishment of an old political goal through a new tactic: the transmutation of a theological concept into science, and of a scientific concept into religious philosophy, once again, drawing the creation-evolution issue back into the polical arena.

There is an inherent danger in this approach. Can such questions as "Is the creationist philosophy a religious minority position or a true science?", be answered by a scientifically lay group such as the state legislature, or state and local school boards without the necessary backgrounds of experience? What does the lesson of Russian Lysenkoism teach us about science and politics? If the scientific community acknowledges that evolutionary biology has been derived from scientific empiricism, then we must also ask the scientific creationist to acknowledge, for the sake of intellectual honesty, that the origin of the creationist hypothesis is the literal interpretation of Genesis. Both models could then be investigated and verified or rejected by the scientific method. It would therefore be apparent that the creationist account of origins, as well as other statements within Genesis that have biological implications, must come under the scrutiny of scientific examination

if it is to be included within the framework of science. Until this is done, it is not rationally possible to present creationism within a science class. If scientific creationism is presented honestly it becomes a religion. If it is presented in the light of its biblical origin then it becomes historically and scholastically fallible. Creationism is a concept whose origin is in a philosophical belief system that has no possibility of empirical examination. Evolutionary biology, on the other hand, is a concept born out of scientific data, whose origin was within the context of the scientific method. The scientific method is a process which sets the limits within scientific investigation. If evolutionary theory is wrong, it will be ultimately be lost to science through the integrity of the constraints of the scientific method.

The creationists want a two model system, i.e., evolution and creationism in science classes. They declare, "it is not the introduction of the Bible or biblical stories about creation into the science books or classroom." and "It is a fair and balanced presentation of the evidence and arguments both pro and con relative to both models and origins." In addition to this emotional approach to the inclusion of scientific creationism in science classes they also have a series of textbooks and pamphlets put out by the Creation Science Research Center. Examples of such books entitled, *Scientific Creationism*, and *Evolution? The Fossils say 'No'*, are nothing more than polemical attacks on evidences for evolution; the Center wants these textbooks as reference texts for creationism within the classroom. A book recently written by Moore and Schlusher, two creationists, is an example of a text reported to be objective, scientific and non-sectarian, entitled, *Biology—A Search for Order and Complexity*. It is permeated with statements advancing the notion that, in fact, scientific creationism and Biblical Creationism are, in fact, one and the same. The book was recently rejected for use in the school system in Indiana by the Indiana Superior Court. The court's verdict was an embarrassing judicial expose of the thrust of modern day creationism. The court declared, "clearly the purpose of a *Search for Order and Complexity* is the promotion and inclusion of fundamentalist Christian doctrine in the public schools. Any doubt to the text's fairness is dispelled by the demand for correct Christian answers as instructed in the Teachers' Guide. The prospect of biology teachers and students alike forced to answer and respond to correct fundamentalist Christian doctrines has no place in the public schools." If one examines the creationists' literature, it becomes clear that what they really want to do is critique evolution. Science, by the way, already does that.

In fact, the creationists have no scientific model. Should the basic tenets of fundamentalist creation hypothesis be taught in public schools? Why not? But not as science, not as a mandated curriculum, but within a framework of elective courses dealing with comparative religious thought about origins. There is no reason to curtail the various biblical and religious accounts of creation of creationism if they are approached within a proper theological and epistemological system. Such a course would be theologically sound and be presented within an academically honest environment.

It is apparent, though, that the fundamental philosophical issue of this whole question is still the argument of evolution versus creation despite the appeal for democratic fairness, that is, equal time for the creationist point of view. In summary, there are at least six main reasons why Biblical Creationism, which is in effect, scientific creationism, should not be taught in science classes: (1) creationism is unscientific; (2) creationism forces the rejection of observations and data that contradict it. . .data ranging from molecular genetics to geology; (3) creationism constitutes a religiously mandated minority position; (4) scientific creationism is deceptive in the sense that no scientific research has been published supporting a creationist model, that is, there is no creationist model, only a restatement of biblical creation; (5) teacher training in the sciences does not prepare them for the presentation of theological materials; and (6) the teaching of creationism is illegal.

I would like to close with an idea that has been recognized within the philosophical framework of many Christians: when our faith becomes dependent upon scientific proof, we can never be sure and secure, and therefore we will always need more proof. We will always be afraid of every unknown or unfamiliar situation, including the advances brought on by expanding scientific knowledge, because we will always feel the need to defend such faith by finding fault with the expanding science. It is the difference between believing facts about God and his world and trusting in God and his world. The first kind of belief requires tangible empirical evidence, while the other involves a trust coming from the Holy Spirit working within our hearts.

Astronomical Distances, the Speed of Light, and the Age of the Universe

At the beginning of the 19th century a powerful new argument for the great age of the universe was provided by the convergence of two seemingly unrelated earlier lines of scientific investigation. The first was the discovery that light has a finite, definite velocity. Whether light propagated instantaneously or with an exceedingly high but nevertheless finite velocity was a long debated question. Kepler and Descartes, for example, still supported the concept of instantaneous propagation. However, about 1676 Roemer, through analysis of the eclipse times of the satellites of Jupiter, laid the foundation for the first reasonable estimate of light's velocity, and the discovery of the abberation of starlight by Bradley in 1727 allowed the velocity to be determined as about 192,000 miles per second.[1] The second major discovery was that some astronomical objects were located at very great distances from us. Through much of the 18th century many astronomers retained the ancient belief that all stars were located about the same distance away, on the surface of a sphere centered on the solar system, but by 1800 William Herschel, using his famous large telescopes, concluded that some of the stars and nebulous objects he saw were as far as 12 million million million miles. In 1802 he then explicitly combined the finite velocity of light and these great astronomical distances to produce what is perhaps the simplest, most obvious, and most direct evidence that the age of the universe must greatly exceed a few thousand years.

> "I shall take notice of an evident consequence attending the result of the computation; which is, that a telescope with a power of penetrating into space, like my 40 feet one, has also, as it may be called, a power of penetrating into time past. To explain this, we must consider that, from the known velocity of light, it may be proved, that when we look at Sirius, the rays which enter the eye cannot have been less than 6 years and 4½ months coming from that star to the observer. Hence it follows, that when we see an object

> of the calculated distance at which one of these very remote nebulae may still be perceived, the rays of light which convey its image to the eye, must have been more than nineteen hundred and ten thousand, that is, almost two millions of years on their way; and that, consequently, so many years ago, this object must already have had an existence in the sidereal heavens, in order to send out those rays by which we now perceive it."[2]

The response of several individuals to this evidence indicates that the implications for a vast age of the universe were clearly understood in the 19th century. For example, Thomas Campbell wrote of a conversation he had with Herschel in 1813:

> "Then, speaking of himself, he said, with a modesty of manner which quite overcame me, when taken together with the greatness of the assertion: 'I have looked *further into space than ever human being did before me*. I have observed stars of which the light, it can be proved, must take two millions of years to reach the earth.' I really and unfeignedly felt at this moment as if I had been conversing with a supernatural intelligence. 'Nay, more,' said he, 'if those distant bodies had ceased to exist two millions of years ago, we should still see them, as the light would travel after the body was gone.' "[3]

In discussing this astronomical work of Herschel, Alexander von Humboldt observed in 1846:

> "Such events or occurrences—reach us as voices of the past.—We penetrate at once into space and time.—It is more than probable that the light of the most distant cosmical bodies offers us the oldest sensible evidence of the existence of matter."[4]

This astronomical evidence for great age was particularly impressive in that it independently provided confirmation for similar conclusions regarding the age of the earth that were emerging from geological investigations. Writing at the middle of the last century John Pye Smith specifically commented on the convergence of the astronomical and geological evidences as he attempted to formulate a consistent interpretation of Scripture based on the new scientific conclusions.

> "But there are two sciences, Astronomy and Geology, which bring us into an acquaintance with facts of amazing grandeur and interest, concerning the Extent and the Antiquity of the created Universe."[5]

After carefully discussing Herschel's work based on the travel time of light, using several illustrative examples, Smith concluded:

> "These views of the antiquity of that vast portion of the Creator's works which Astronomy discloses, may well abate our reluctance to admit the deductions of Geology, concerning the past ages of our planet's existence."[6]

In succeeding years the concept of an earth and universe of great age became thoroughly integrated into the scientific world view. Refined in this century by the discovery of radioactivity and numerous other dating methods and by the discovery of ever more distant astronomical objects, present scientific evidences are, of course, generally held to be consistent with an age of some 5 billion years for the earth and some 10-20 billion years for the universe as a whole.

Recent Alternative Views

Within the last 20 years, however, and particularly since the publication of *The Genesis Flood* by Whitcomb and Morris in 1961, there has been an active attempt by some to revive the idea that the age of the earth and universe is to be measured in a relatively few thousand years. This belief is, of course, not new, but of particular interest is the claim that this conclusion now has the support of the bulk of the scientific evidence. Henry Morris, for example, has said:

> "Contrary to popular opinion, the actual *facts* of science do correlate better and more directly with a young age for the earth than with the old evolutionary belief that the world must be billions of years in age."[7]

Similarly, but more specifically, Harold Slusher has written:

> "However, the scientific evidence continues to accumulate labelling the huge ages of the universe, the solar system, and the earth as a fable, not a conclusion reached by an adherence to scientific proof. The actual data interpreted in terms of the basic physical laws would seem to point toward a young age for the cosmos. . .The evidence seems to indicate that the alledged $4.5\text{-}5 \times 10^9$-year-old earth. . .should be replaced by about 10^4 years. I believe the cosmos was created at some time between 6 and 10 millenia ago."[8]

Unfortunately, support for such claims frequently produces analyses whose exact implications are not always clear or of convincing validity, partly, at least, because the issues are very complex. The evidence for great age based on the travel time of light is quite direct, however, and involves relatively few basic assumptions. Below I attempt to evaluate the response of some who advocate a "short" time scale for the universe to this simple astronomical evidence, and particularly examine the claim that their arguments have a scientific basis.

Reduced to its simplest form, the astronomical argument for the great age of the universe can be expressed by the equation $T = D/c$: T, the time required for the light from a distant object to reach the earth (and, hence, its minimum age) equals D, its distance from the earth divided by c, the speed of light. As c is a constant of about 186,000 miles per second, and astronomical evidence indicates that even the nearest galaxies are some 10^{19} miles distant and the farthest detectable objects some 10^{23} miles away, it immediately follows that the light from these objects must have been traveling for millions to billions of years in order to get here. For those who take the position that the scientific evidence favors an age of a few thousand years for the universe, how is the force of this conclusion to be avoided? Possibilities would seem to be few. In the above equation the only way T could be greatly reduced is either if c, the speed of light, is much higher than the accepted value or if D, the distances of the objects are far smaller than is generally thought. All evidence, however, seems to indicate that c is indeed a constant, and the equality of abberation effects for all astronomical objects further indicates that it has not varied significantly during the various times required for their light to reach us.[9] The other possibility is that the various stars and galaxies being observed are not nearly as far as thought by astronomers. However, in order for the light from all objects in the universe to reach the earth since a creation some 10,000 years ago, none could, of course, be more than 10,000 light-years away. This would require modern distance determination methods to be in error by factors ranging up to a million, which seem unlikely indeed. Slusher, for example, while strongly arguing for a 6 to 10 thousand year age for the universe, nevertheless in his analysis of astronomical data does not suggest that modern distance estimates are seriously in error, and apparently accepts the great distances involved as essentially correct.[10]

What, then, of the original question? How is the astronomical implication of great age to be avoided? Surprisingly, while other

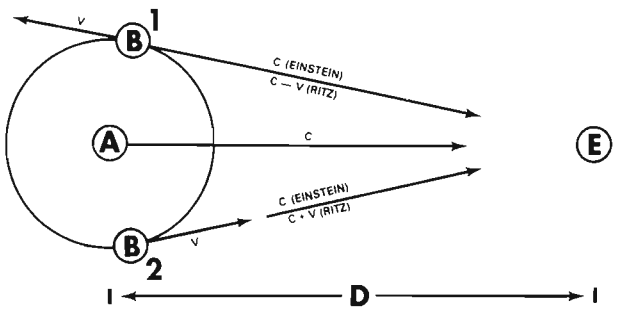
technical issues such as radioactive dating, the age of the earth's magnetic field, and terrestrial cooling have received detailed comment from short-time-scale advocates,[11] the astronomical evidence based on the travel time of light has received much less attention, in spite of its clarity and directness. Sometimes the issue is simply not discussed, even though the context would seem to require it.[12] On those occasions when the issue has been faced, however, the proposed solution, from Whitcomb and Morris in 1961 to Slusher in 1980, seems to have taken a characteristic form:

> "In connection with the time it takes for light to get here from the stars, a very important work was done by Parry Moon of the Massachusetts Institute of Technology and Domina E. Spencer of the University of Connecticut. This work was published in the *Journal of the Optical Society of America*, August 1953. This work is significant particularly in the matter of the age of the universe. . . ."[13]

The Moon and Spencer Hypothesis

The "Moon and Spencer hypothesis" has on numerous occasions been cited by those supporting a short time scale for the universe as a possible (and evidently, the only) scientific reason for rejecting the great age implied by the astronomical data.[14] This hypothesis will therefore be examined here with particular reference to the reasons it has become a standard reference to those arguing for a "young" universe.

The Moon and Spencer paper of 1953 contains seven parts.[15] The first five constitute a straightforward, detailed analysis of a specific scientific problem, but the last two contain far-reaching, unsupported speculations. The earlier parts analyze an alleged proof of one of the postulates of special relativity. Einstein postulated, in the early years of this century, that the velocity of light is a constant which, contrary to ordinary velocities, is independent of the motion of the source or of the observer. About the same time Ritz proposed, alternatively, that the velocity of light is constant only with respect to the source (thereby rejecting special relativity), and that its velocity relative to an observer would depend on whether the source is moving toward or away from the observer, as with ordinary velocities. DeSitter suggested that a pair of orbiting stars would resolve the issue. Greatly simplified, the situation would be as in the figure. Star B orbits star



A with a velocity v, being first at point 1, where it is moving away from the earth, E, and then at point 2, where it is moving toward the earth. If Einstein is correct, the light from star B at *both* positions 1 and 2 travels toward the earth with velocity c, and we would simply see B orbiting A in a normal manner, with a time lag due to the distance D that the light had to travel. If Ritz is correct, however, the light from point 1 will travel toward the earth with a velocity *slower* than c, $(c\text{-}v)$, while the light from point 2 would travel *faster* than c, (with velocity $c+v$), so that if the stars were far enough away the light from point 2, even though it started toward the earth after that from 1, could actually "catch up" and get to the earth at the same time, raising the possibility that the same star could be seen simultaneously in two different places! A number of other odd effects should also be detectable if the Ritz theory is correct. Since, as DeSitter pointed out, none of these anomalous effects is in fact seen in orbiting stars, this clearly supports Einstein and special relativity.

In considering this issue, Moon and Spencer were able to demonstrate that the visual binary stars which, according to DeSitter, favored Einstein over Ritz do *not* in reality allow a choice to be made; the predicted effects are too small to be measured. They therefore clearly show that DeSitter's claim of support for special relativity on the basis of the evidence of visual binaries is invalid. Moon and Spencer did demonstrate further, however, that for other classes of stars, particularly the spectroscopic binaries and the Cepheids, the anomalous effects *would* be detectable by direct observation, and therefore the total lack of such effects in these stars does indeed indicate that Einstein, rather than Ritz, is correct, and that special relativity is supported.

> ". . .the Cepheids provide a proof even more decisive than that given by the spectroscopic binaries, a proof that the velocity of light does not partake of the velocity of the source."[16]

To this point everything is straightforward. Moon and Spencer have demonstrated a significant historical point, but there are no implications for a short time scale for the universe. Having just provided "a proof", however, they suddenly reverse themselves and ask if there is any way that Ritz might still be right in spite of the evidence just cited that he is not. They then point out that if no star were farther from the earth than about 15 light years, there would not be enough travel time for the anomalous effects to build up to a detectable level, even if the light from opposite sides of the star's orbit was traveling with different velocities, as Ritz suggested. But, they agree, astronomical distances are measured as vastly greater than 15 light years. They therefore make the highly unusual suggestion that there are two kinds of space; "astronomical space", in which the various stars and galaxies are actually located at the distances indicated by the usual astronomical measuring techniques, and "Reimannian space", through which the light from these objects somehow moves in traveling to the earth.

> "The usual distance r employed by astronomers is unchanged as regards material bodies; but for light, it is replaced by the corresponding Riemannian distance s. . . . In essence, therefore, the method of this paper leaves astronomical space unchanged but reduces the time required for light to travel from a star to the earth."[17]

This, then is the hypothesis seized upon by advocates of a "young" universe in order to avoid the implications from astronomy for great age.

> "You can leave the stars at their astronomical locations, in Euclidean space, but the light from these stars can get to us in very small periods of time—at the most 15.71 years."[18]

Discussion

It is important to note that this Moon and Spencer hypothesis is entirely *ad hoc*, and is not either required or supported by any observational data whatever. Quite the contrary. It was offered solely to explain why certain effects that must be observed if Ritz is correct are not actually seen. In fact this hypothesis has the further interesting property in that the more evidence there is that Ritz is

incorrect, the closer the astronomical bodies would have to be in "Riemannian space", and therefore even less time would be required for their light to reach the earth. Unfortunately, how space could be curved so as to accomplish this and yet leave "astronomical space unchanged" is left totally unexplained. There is one difficulty facing this hypothesis, however. If the astronomical objects are brought too close to us (in "Riemannian", but not in "astronomical" space), then space would be curved to such extent that the motions of objects within our solar system would be affected. Since all are agreed that there are absolutely no such effects, Moon and Spencer originally required all astronomical bodies to be far enough from the earth to explain why the expected curvature effects could not be found, but no farther from the earth than about 15 light years to explain why the effects that should be visible if Ritz is correct are not seen either. More recent work, however has demonstrated that this simply cannot be. In 1977 Brecher published the results of a study in which, by analyzing observations of X-ray sources in binary star systems, he was able to demonstrate that the velocity of electromagnetic radiation is independent of the velocity of the source to within, on a conservative estimate, one part in 500 million, a degree of accuracy far greater than any previously available.[19] This in turn means that if Moon and Spencer are right, space must be curved to such an extent that such a binary star system must be 500 million times closer in "Riemannian space" than in "astronomical space", in order to explain why the anomalous effects expected if Ritz is correct are not seen. Since the binary system considered has a measured astronomical distance of about 6 kiloparsecs, in Riemannian space it would have to be 500 million times closer, or less than three times as far from the sun as the earth is. In other words, if the Moon and Spencer hypothesis is correct this orbiting pair of stars must be located within our solar system, between the orbits of the planets Mars and Jupiter! That this is contrary to fact is, to put it mildly, rather obvious, and therefore the Moon and Spencer and Ritz hypotheses are invalidated, and Einstein and special relativity are strongly supported.

Although Slusher has characterized his own work as having "as little dependence on assumptions and guesswork as possible" and has stated that "it is tremendously important to keep actual observations separate from speculative inferences"[20] he continues to advocate these hypotheses, which are nothing if not speculative, in spite of the evidence against them. It seems clear, however, that they are without basis.

The Apparent Age Hypothesis

Other advocates of a short time scale may well remain equally unperturbed at the demise of the work of Moon and Spencer. Whitcomb and Morris, for example, have repeatedly demonstrated their willingness to utilize the "apparent age" hypothesis, the sole purpose of which is to avoid recognizing the implications of any scientific evidence for great age, when faced with evidence that cannot be explained away in any other manner. They argue, in this case, that the light rays we see never actually came from the objects in question, but were directly created carrying an "apparent" earlier history of events which never actually occurred.[21] To their credit, some other supporters of a short time scale have recognized the difficulties inherent in this concept,[22] but Morris has advanced an even more extreme position, suggesting that some astronomical bodies may have been visible even before they existed.[23] He evidently sees nothing unscientific or antiscientific about these conclusions. However, in a somewhat different context, Stanley Jaki has demonstrated the destructive nature of such reasoning on any attempt to formulate a consistent Christian and scientific world view. In one of his monumental studies of the relationship of science to Christianity he points out that already in the 14th century William of Ockham, in his move toward nominalism, had drawn certain conclusions that are remarkably similar to those of Morris and Whitcomb mentioned above. In driving a wedge between faith and reason, Ockham specifically divorced the stars from the light by which we see them.

> "As Ockham illustrated this all-important point, since the light of the stars and the stars themselves could be conceived as existing independently of one another, reason was powerless to decide whether the light of stars had a real connection with the stars themselves. ...In Ockham's account of the intellect, the light diffusing in the world was not necessarily coherent with the stars, nor did the same light bespeak a universe in which all stars and material units, small and big, were intrinsically interconnected. ...For the purposes of science the starry sky could not have been enveloped in a deeper darkness. ...This was the logic of Ockham, but not the logic of the Bible and of science."[24]

Rather than representing a major step toward modern science, Jaki believes that Ockham in fact "...not only banished the soul of science, which always implies generalization in terms of universals, he also excised its very heart, the search for causes embedded in a layer beneath the immediately experienced surface,"[25] remarks that perhaps also would apply to those who continue to take refuge in an "apparent" universe. Whatever other merits this type of theorizing might possess, I believe one thing is clear. Any system of thought that incorporates such "apparent age" arguments cannot claim to be based upon or to be consistent with a scientific interpretation of the world.

Conclusion

The discovery that light has a finite velocity and that many astronomical bodies are at vast distances from the earth provided a simple, direct evidence that the universe must be very old. Some of those who hold the view that the age of the universe is only a few thousand years have attempted to avoid the force of this evidence by advocating the Moon and Spencer and the apparent age hypotheses. The first of these is demonstrably invalid, and the second is inconsistent with a scientific understanding of the world.

Scientific theories are not absolute, not graven in stone. They too change and metamorphose into new and different forms. However, if present evidence, scientifically interpreted, is to be our guide, the great distances of many astronomical objects combine with the finite value for the velocity of light to provide one of the clearest indicators that the age of this universe of which we are a part is to be measured in the many millions and even billions of years.

[1]J.H. Sanders, *The Velocity of Light*, (New York: Pergamon Press, 1965), ch. 1.

[2]*The Scientific Papers of Sir William Herschel* (London: The Royal Society and the Royal Astronomical Society, 1912), V-2, pp. 51, 213.

[3]Francis H. Haber, *The Age of the World: Moses to Darwin*, (Baltimore: The Johns Hopkins Press, 1959), p. 228, quoting from William Beattie, *Life and Letters of Thomas Campbell*, (London, 1849), V-2, p. 234.

[4]John Pye Smith, *On the Relation Between the Holy Scriptures and Some Parts of Geological Science*, from the fourth London edition (Philadelphia: Robert E. Peterson, 1850), p. 256, quoting from Alexander von Humboldt, *Cosmos*, tr. Mrs. Colonel Sabine, (London, 1846), V-1, pp. 145, 496.

[5]Smith, *On the Relation...* , p. 11.

[6]*Ibid.*, p. 254.

[7]Henry M. Morris, ed., *Scientific Creationism* (San Diego: Creation-Life Publishers, 1974), p. 160.

[8]Harold S. Slusher, *The Origin of the Universe* (San Diego: Institute for Creation Research, 1978), p. 47, and *Age of the Cosmos* (San Diego: Institute for Creation Research, 1980), p. 74.

[9]*Sky and Telescope*, V-50 (November 1975) p. 298.

[10]Slusher, *Age of the Cosmos*, ch. VI. Interestingly, Slusher evidently accepts as valid the use of some distance determination methods to distances far in excess of any actually measured to date (p. 32).

[11]Harold S. Slusher, *Critique of Radiometric Dating*, Thomas G. Barnes, *Origin and Destiny of the Earth's Magnetic Field* (San Diego: Creation-Life Publishers, 1973), and Harold S. Slusher and Thomas P. Gamwell, *The Age of the Earth* (San Diego: Institute for Creation Research, 1978).

[12]In *The Origin of the Universe*, for example, Slusher extensively discusses astronomical data he believes indicates a "young" age for the universe, but never addresses the question of the travel time of light.

[13]Slusher, *Age of the Cosmos*, p. 33. See also John C. Whitcomb, Jr. and Henry M. Morris, *The Genesis Flood* (Grand Rapids, Michigan: Baker Book House, 1961).

[14]In *Age of the Cosmos*, after discussing the work of Moon and Spencer (p. 37), Slusher makes a rather vague reference to "a number of other suggested solutions to this problem", but unfortunately provides no further details.

[15]Parry Moon and Domina Eberle Spencer, "Binary Stars and the Velocity of Light", *Journal of the Optical Society of America* (1953) V-43, pp. 635-41. I thank Professor John N. Moore, Department of Natural Science, Michigan State University, for bringing this article to my attention.

[16]*Ibid.*, p. 639.

[17]*Ibid.*

[18]Slusher, *Age of the Cosmos*, p. 37.

[19]Kenneth Brecher, "Is the Speed of Light Independent of the Velocity of the Source?", *Physical Review Letters* (1977) V-39, pp. 1051-4.

[20]Slusher, *Age of the Cosmos*, ch. 1.

[21]Whitcomb and Morris, *The Genesis Flood*, p. 369. For a historical perspective of the apparent age doctrine, see my paper "Apparent Age and its Reception in the 19th Century", *Journal of the American Scientific Affiliation* (1980) V-32, pp. 146-50.

[22]For example, Robert E. Kofahl and Kelly L. Segraves, The *Creation Explanation* (Wheaton: Harold Shaw Publishers, 1975), p. 154.

[23]Morris, *Scientific Creationism*, p. 210. Further questions immediately arise. If it is true that all astronomical bodies are surrounded by a "shell" or "sphere" of light, millions of light-years in extent, which carries the message of apparent events that never actually occurred, what scientific reason do we have for believing that these objects "really" exist even today. More intriguing, what apparent earthly events are being witnessed to by the light from the earth that is just now reaching distant galaxies? Do the earth and the sun also have an "apparent history" extending millions of light-years out into space? What does this history record?

[24]Stanley L. Jaki, *The Road of Science and the Ways to God*, (Chicago: The University of Chicago Press, 1978), pp. 41, 2.

[25]*Ibid.*

David J. Krause
Science Division
Henry Ford Community College
Dearborn, Michigan 48128

Anthropology, Theology, and Human Origins

The aim of this article is to briefly sketch the views of anthropology and conservative Christian theology regarding human origins, and then suggest a "liberal" and a "conservative" view, each view taking into consideration the theologian's demands for biblical authority, and also trying to be faithful to firmly established scientific evidence.

A modern example of a conservative Christian position on human origins is that of the Creation Research Institute of San Diego, the research division of Heritage College. The Institute's activities include debating evolutionists on college campuses, and reviewing textbooks for their suitability for use in public schools. In another instance, Sen. Robert Mitchler has submitted a bill to the Illinois State Legislature that would require public schools to teach creationism side by side with the evolutionary theory they now teach. "The theory in the bill is. . .in support of an absolutely literal interpretation of the Book of Genesis" (Moody Monthly, May 1980:96), including a 12,000 year-old earth, and the theory that all animals were created fully developed, and humans did not evolve from lower forms. President Reagan has also gone on record as favoring creationism as opposed to evolutionism, and reportedly supported an unsuccessful suit in 1972 brought by the California State Board of Education to bring the teaching of Creationism into the public schools (*Science*, 1980).

There has been a reaction to all this activity. R.D. Alexander, an evolutionary biologist, who calls the efforts to mandate the teaching of creation in the public schools in Michigan "a step towards totalitarianism", summarizes the evolutionary and creationist arguments, and argues that we should not make the teaching of any theory mandatory in the public schools (Alexander, 1978).

The Position of Anthropology

There is no one anthropological theory of human origins. Anthropologists differ as to the period, location, and circumstances surrounding the first appearance of *Homo sapiens* on earth. However, almost all anthropologists agree that the best explanation for the unity and diversity they have observed among all life forms that have existed in the present and the past is the theory of biological evolution.

Evolution, in its simplest definition, means "descent with modification." Evolution occurs when the frequency of genetically-related traits in a species changes in successive generations. The mechanism that makes these changes systematic and cumulative is *natural selection*, the cornerstone of evolutionary theory. The best illustration of natural selection is artifical selection, where humans breed plants or animals to produce certain desired traits. In the process of natural selection, it is not human intervention, but Darwin's "hostile forces of nature" that force the selection of traits that allow some individuals to produce a greater number of offspring in a given environment than do others.

Evidence for human evolution. There are two main lines of evidence supporting the idea of human evolution.

The first is the similarity between *Homo sapiens* and other primates. The species of the order Primate (prosimians, monkeys, apes, and humans) are most closely related to humans genetically, anatomically, and behaviorally. No anthropologist believes humans descended from present-day species of monkeys or apes. Almost all anthropologists believe that humans and other primates share a common *ancestor*. Clark (1959) makes a careful, but not exhaustive, comparison between the physical makeup of humans and other primates, pointing out how only small, successive

changes would have been necessary to produce the physical differences we observe in various species of primates today in the hand, foot, spinal column, pelvis, leg, arm, skull, and dental structures. Analogous structures of each species can be seen as a "variation on a theme" from a common ancestral form.

The second line of evidence for human evolution is the fossil record. Culture-bearing creatures existed in the distant past that were physically quite distinct from present-day *Homo sapiens.* In an article in *Christianity Today*, Kornfield details the complex cultural traits of Neanderthal, including use of fire, and burial practices that are mirrored today in many cultures, and strongly suggest religious ceremony. Kornfield accepts Neanderthal's date at about 40-70,000 years ago (Kornfield, 1973). Earlier fossil remains found in China (loosly termed *Homo erectus* fossils) have been dated at about 200,000-400,000 years ago (Oakley 1964:238ff), and are in association with evidence of cultural achievements such as the use of fire, stone tools, and the dubious practice of cannibalism (Hoebel, 1958:154-155).

Position of Theology

Definition. For purposes of this paper we define theology as a human endeavor, explaining and ordaining facts about God and the supernatural. As Findlayson says, "There has been a gradual unfolding and formulation of the doctrine in the New Testament as the human mind applied itself to the material furnished in the divine revelation (Finlayson, 1963:9)."

Theology is concerned not only with the nature of God, but also with the nature of humans. The two great facts about humans in theology, the two facts that impinge upon scientific theory as well, are that humans are created by God, and that they are made in the image of God (and hence by implication are different from the animals). This uniqueness includes the fact that humans are spiritual beings, capable of responding to God. Certainly these two doctrines are central to the biblical view of humanness.

Theology and human origins. One traditional theological position treats creation, and especially the creation of human life, as a unique supernatural event. The creation cannot and must not be explained by recourse to known natural laws: God performed a miracle by *fiat.* Genesis is read as an account of creation as if seen through the eyes of a newspaper reporter present at the time. There is no need nor thought of naturalistic explanations. The Bible says God did it, and thus it is assumed the event had no relationship to "natural laws," nor could it be explained by them.

A second group of theologians would posit an "economy of miracles (Ramm, 1954)." If natural laws can provide an adequate explanation for an event, the hand of God is seen working through natural law, fortuitously bringing a coincidence of events together in one point of time. Only if no "natural" explanation appears possible or probable, would these theologians label an event a miracle.

Conflict between theology and science. Some scientists have given the theory of evolution the status of a sufficient explanation for the *meaning* of all life. Sir Julian Huxley, a biologist, argued at one point that instead of understanding human beings as related to God, we must now seek human meanings in reference to the theory of evolution. Of course this idea is not a scientific one, but a philosophical one, and theologians rightly reject this view because it elevates the theory of evolution to the status of an all-encompassing philosophy of the meaning of life.

When theologians make statements about the *natural* world (e.g. the nature of humankind), statements that may be amenable to falsification through observation or experiment, they may come into conflict with anthropologists who hold scientific theories incompatible with these views.

Basic Tenets to be Accepted

We may begin by specifying the elements that we can consider to be "non-negotiable" in our view of human origins.

1. The antiquity of humankind. Archaeological and fossil evidence, plus the method of radioactive dating, all lend evidence to support the fact that humans were on this planet in ancient times. Carbon 14 dating has been used to directly date samples of bone. The potassium-argon method has been used to date volcanic materials in the beds where human skeletal remains were found (Oakley, 1964:7). The ancient dates that these methods yield could be 10%, even 50% in error, and yet still place human origins well beyond the range of the 10-20,000 years suggested by the proponents of the theory of recent human origins.

2. The fossils themselves exist. Also, most of the cultural remains purported to be in close association with these human fossils were indeed part of the repertoire of these fossil men. We can reject some of the interpretations and reconstructions of past events, but the fossils and their associated cultural remains are to be accepted, including their approximate age.

The difficulty faced by theologians who believe that humans were created substantially identical to their present physical form, is that the fossil record has produced many forms that are substantially *unlike* present-day humans with respect to stature, characteristics of the teeth, and average brain case size, and yet thse same forms are associated with *cultural* traits that must be labeled uniquely and undeniably human (the use of firepits, stone tools, ceremonial burial).

3. We must accept the Bible as authoritative. To assert that the Bible is an unreliable communication is also to cast doubt upon the central themes of Scripture: namely the person and work of Jesus Christ himself, and the meaning of his death and resurrection.

Two Possible Christian Positions

With these three tenets in mind, what is a valid position with regard to human origins?

A first position. The Genesis account is an historical narrative, as if a newspaper reporter were viewing the event. This entails a belief that the creative events in Genesis describe God creating by *fiat.* This would not allow for far-reaching changes over time, but rather would demand that God created the world, and much later humans, in an instant. Humankind is truly ancient, but the changes we see in the fossil record are all natural changes that took place after the initial creation. The genealogies in Genesis are not sequential, but are only selected points in the unbroken line from Adam to Abraham.

In this view, the creative act of God spanned millions of years. The appearance of the earth and living forms happened or could have happened, in the range of time that geologists and paleontologists propose. However, these forms were not the result of gradual evolutionary development, but rather each was created in an instant by God.

Most theologians who reject evolution as a general explanation do accept the idea of micro-evolution—the idea that evolution accounts for small variations in closely-related life-forms, but cannot account for the great variation that exists among broad families of life-forms.

There are several problems with this view:

1. While anthropologists have emphasized the *continuity* in the fossil record, one holding this view is obliged to point out the abrupt *discontinuities*. With respect to human origins, one would be obliged to assert, for example, that *Australopithicine* fossils are only some extinct form of ape, while *Homo erectus* fossils are completely and wholly human. "Primitive" physical features of *Homo erectus* must then be discounted, and also cultural remains of *Australopithicus* that were vastly more sophisticated than those of any living non-human primate.

2. There is no essential difference between micro- and macro-evolution. If one accepts that evolution occurs on a small scale, what observable evidence indicates that it cannot operate on a grander scale? What mechanisms set the upper limits on the operation of evolution?

3. Perhaps the most serious objection to this point of view is the biblical mention of Cain and Abel, sons of Adam and Eve, practicing plant and animal domestication. We have accepted the antiquity of man as a basic tenet, and yet the archaeological evidence of domestication stretches back to only about 10,000 B.C.

A second position. The Genesis record is not a strict "newspaper-reporting" chronology of events, but rather is meant to set humans in their proper place in the cosmos—to expose their ultimate meaning—to relate them, not to a mere string of naturalistic processes coinciding with known natural laws, but rather relate them to their creator.

According to this view, we learn the following from the Genesis account:

a. Humans were created by and are responsible to God.
b. Man and woman are essentially equal before God.
c. Humans are "stewards" of the rest of creation.
d. Human beings are unique in bearing the *Imago Dei*.

According to this view, Genesis does not force us to any particular scientific theory about human origins, but it does force us to a conclusion concerning the meaning of humanness, the relationship of humans to other humans, their corporate relationship to God, and their relationship to the cosmos. It does commit us to believing that humans are unique among the animals; specifically that they can disobey God, or respond to him in love and worship.

There is a possible objection to this view: If we cannot read Genesis 1-2 as chronological newspaper-reporting, it is argued, neither can we read other portions of Scripture as reliable historical accounts, and some great theological and doctrinal truths may be undermined. Significantly, St. Paul compares Christ to Adam, and if Adam disappears as an historical character, might not Christ also disappear, or "mythologize" before our eyes?

However, even the most literal interpreters of the biblical text are forced to draw a line between *history* and *allegory*; between enduring biblical principles and culturally or temporally limited teachings. As an example, how many fundamentalists practice footwashing in their churches today? Any biblical hermeneutic must deal with metaphors, similes, and figures of speech. Symbolism in Genesis need not detract from biblical authority (a parallel may be the American symbols of our country's founders, flag, and constitution). In this view, Genesis allows for any one of several scientific theories of human origins. It does not allow for pseudo-scientific meanings for humankind that reject our grounding in God himself.

In conclusion, any valid theory of human origins cannot be piecemeal: it must adequately speak to the findings in the fossil record, the archaeological record, to the observable facts concerning human and non-human life-forms today, and to the question of biblical truths.

Alexander, R.D. 1978. Evolution, Creation, and Biology Teaching. *The American Biology Teacher*. Vol. 40, No. 2, February, 1978.

Clark, W.E. LeGros. 1959. *The Antecedents of Man*. Harper and Row: New York.

Crimmins, Jerry. 1980. Illinois Bill Gives Bible Equal Time With Darwin Theories. *Moody Monthly*. May, 1980.

Finlayson, R.A. 1963. *The Story of Theology*. The Tyndale Press: London.

Hoebel, E. Adamson. 1958. *Anthropology: The Study of Man*. McGraw-Hill: New York.

Kornfield, William J. 1973. The Early-Date Genesis Man. *Christianity Today*. June 8, 1973.

Krause, David J. 1980. Apparent Age and Its Reception in the 19th Century. *Journal of the American Scientific Affiliation*. Vol 32, No. 3. September.

Lewis, C.S. 1967 (orig. 1947). *Miracles*. Fontana Books: London.

Oakley, Kenneth P. 1964. *Frameworks for Dating Fossil Man*. Aldine: Chicago.

Ramm, Bernard. 1954. *The Christian View of Science and Scripture*. Erdmans: Grand Rapids, Michigan.

Republican Candidate Picks Fight with Darwin. 1980 *Science*. Vol. 209. September.

Schaeffer, Francis A. 1972. *Genesis in Space and Time*. Intervarsity Press: Downers Grove, Illinois.

The Quest for Human Origins. 1977. *Christianity Today*. Vol. 34, p. 360.

Whitcomb, John C. Jr., Henry M. Morris, and John C. McCampbell. 1961. *The Genesis Flood*. Baker Book House: Grand Rapids, Michigan.

White, Andrew D. 1898. *A History of the Warfare of Science With Theology in Christendom*. George Braziller: New York. 1955 (orig. 1895).

James Hurd
367 Reynolds Ave.
Bellefonte, Pennsylvania 16823

Repository for Germinal Choice: A Christian Option?

"A unique facility has been brought into existence in San Marcos, California, for the purpose of increasing the number of offspring of the most creative scientists of our time. Donors of germinal material are limited to Nobel Laureates in science who are free of known impairment.

"The Repository for Germinal Choice functions in the same way as Artificial Insemination, Donor (A.I.D.) as commonly practiced except that, in accordance with the concept of Dr. Muller:

"1). The Donors are unpaid and contribute solely out of willingness to increase the distribution of genes which helped to make them outstanding in their lifetime.

"2). The germinal donations (semen) are sealed in ampules and kept under liquid nitrogen (—192°C.) in a cryogenic vessel which is sheathed in lead and kept in a subterranean chamber. Donations to the Repository are thus preserved and protected from mutagenic radiation.

"3.) The Recipients are genetically selected by a medical panel. They are young women whose husbands are infertile but do not wish their wives to be denied motherhood. Recipients may choose from written descriptions of two or more donors the one whose characteristics they would most like to have in the father of their child. Thus it offers to qualified couples a new resource—the opportunity to choose the specific father of their child or children, and to do so from among the most creative scientists of our time. The great geneticist Hermann J. Muller often said that his concept of Repositories for Germinal Choice was "the most significant contribution of my life". He ranked this even ahead of the accomplishments for which he received a Nobel prize.

"It was Robert Graham's (Secretary, RGC) privilege to have joined with Dr. Muller in organizing the first Repository to carry out his concept and it is his privilege to carry it forward in his name.

"Semen donations are categorized by every knowable heritable characteristic, but not by name or identity of donor. Hence Recipients know the most significant characteristics of the germinal father, but never his identity. Donors never know the identity of the Recipients. Complete anonymity is maintained.

"The chosen donations are shipped to Recipients, or their gynecologist, under liquid nitrogen to arrive at the appropriate time in her fertility cycle. The shipping Dewar will hold sperm in viable condition for about 10 days. There is no charge for this service except for expenses incidental to shipping. There is a deposit of $250 on the Dewar, which is refunded upon its return."

Response by Donald and Valerie MacKay

One's first gut reaction to a proposal of this sort is negative. It feels indecent. It seems to suggest that intelligence (of the kind that makes Nobel prizewinners) should be valued above other inheritable human characteristics. It reminds some of us older ones of Hitlerian talk of *Herrenvolk*. . .But the question we are asked is whether, from a Christian perspective, such a program is *ethical*. This breaks down into two:

(1) Is A.I.D., in any form, ethical?

(2) If so, is it ethical to offer the recipient the kind of choice offered by this program?

1. *Is A.I.D. ethical?*

A Christian's answer to this question depends largely on his understanding of what counts as adultery. Is it the physical insemination of a wife by another than her husband that matters, or is the sin of adultery essentially one of breach of faith? If the first, then any form of A.I.D. is adultery. If the second, then provided that the arrangement is desired and agreed by both husband and wife it can hardly be called adulterous. There may well be pragmatic objections on psychological or other grounds; but there would be no biblical basis for condemning the practice as *unethical*. Since in the Bible adultery is practically synonymous with marital unfaithfulness (being often used as a metaphor for unfaithfulness in general), we feel that the second interpretation accords better with the evidence than the first.

2. *Is "germinal choice" ethical?*

Even if fertilization of an ovum by A.I.D. is not in principle unethical, it might well still be argued that the introduction of "germinal choice" violates the sanctity of the marital bond by personifying the donor as an intrusive "third party." As long as fertilization can be carried through as a completely impersonal operation, like having an injection, all may be well and good. If however we imagine a case at the opposite extreme, where the donor was personally known to the recipient, it might be less obvious that no harm would be done by the powerful emotional associations involved. True, there are biblical precedents for the idea that a man might "raise up seed to his brother" by inseminating the latter's widow; but if we want to argue on these lines there are also biblical precedents for polygamy! Our feeling is that A.I.D. from a *known* donor could hardly avoid doing unethical damage to the delicate fabric of a marital relationship.

We do not feel that this objection is removed if the recipient is only allowed a photograph or a written description of the donor. What the would-be parents may ethically want to know is the likely genetic make-up of their *child*. Only if information derived from knowledge of the donor was transformed into these terms (by some intermediary party) would we think it ethical to pass it on to them.

Christians of some traditions might be tempted to feel that to exercise "germinal choice" is somehow to "usurp a divine prerogative." This however would surely be a misunderstanding. The degree of effective choice offered would be no greater (and probably much less) than that available before marriage to every girl who scans her suitors and wonders what kind of children they would sire. If God has revealed no objections in principle to A.I.D., we have no reason to suppose that he would begrudge us whatever freedom of choice can be gained by intelligent use of ethically derived information.

In summary, although we doubt that Nobel prizewinners have much claim to superiority for the purpose, and there are obvious dangers in choosing a donor with a much higher I.Q. than the recipient's husband, we can see nothing *unethical* from a biblical standpoint in the idea of offering A.I.D. from a sperm bank as well stocked and fully documented as responsible stewardship can make it.

Response by D. Gareth Jones

The elevated status according to scientists by the "Repository for Germinal Choice" is symptomatic of the arbitrary élitism of the whole endeavor. Creative scientists and their genes are being worshipped, rather than the God who brought both into existence. Quite apart from the major question mark of the genetic value of the whole enterprise, we are confronted with the quasi-religious pomposity of the exercise.

This, in turn, is made possible only by a willingness to worship the impersonal. The promise to maintain complete anonymity is no virtue of medical ethics; rather, it is an integral facet of the "impersonal" syndrome. In this, genes reign supreme and those possessing the genes are honored for the sake of the genes rather than for their own sakes. In this sad new world, there is no longer room for human beings in their wholeness and frailty; only for acceptable genes and approved characteristics.

Underlying the endeavours of Robert Graham is the postulate that biological solutions are the only acceptable ones for mankind's future. All questions are reduced to biological parameters, as human beings are motley amalgams of the biological—and nothing else. This *reductio ad absurdum* is all-too-

common today, and here we have an example of it in all its starkness. Human beings are nothing without the right combination of genes, and the family unit is a hindrance if it obstructs the coming-together of appropriate genes. No longer is there any place in society for the weak and disadvantaged, for the ill and retarded; all that matters is biological perfection.

Of course, there is no such state as biological perfection; there is not even any assurance that these procedures will produce their desired goal. "Repository for Germinal Choice" is, almost without doubt, the aberrant fancy of misguided individuals. Nevertheless, it reflects far more numerous and much more subtle examples of biological reductionism in contemporary society.

Human beings are not just an assorted array of genes; they are people with choices, hopes, fears, responsibilities, goals, and even defects. They have a dignity because of who they are in the sight of God. They are loved and cared for by Him, however many deleterious genes they possess. This is not to argue that medical science should not strive to eliminate bad genes, or help people cope with their expression. But it is to argue that people are people, not just an assembly of genes and their expression.

One wonders why, in these proposals, the wife's genes are acceptable but not the husband's. Where is the biological rationale in this? Probably there is none; it is just another aberration in a woefully aberrant enterprise. But it does call in question the scientific integrity of the exercise.

And then, there is the promise that exceptionally gifted individuals—if they were born by these proposals—will change mankind for the good. They may affect mankind, but it may be for evil. The idealism of the proposals again comes to the fore, revealing the humanistic incredulity of its base.

Comments by Jerry D. Albert

The response of the MacKays exactly and thoroughly describes my own position. They begin by identifying a negative gut reaction and initial feeling of indecency. But these and the side issue of super-racism through eugenics are brushed aside by plunging into ethical evaluations of artificial insemination, its relationship to adultery, and "germinal choice." Christian and biblical perspectives are considered and taken into account.

Although donor anonymity is important to the MacKays, Jones claims that "complete anonymity is no virtue of medical ethics." Both responses question the wisdom of valuing and choosing intelligence of Nobel Prize winners over other inheritable human characteristics. Jones, however, goes farther in charging that idolatry of these creative scientists and their genes is involved. He raises some interesting points, which may be summed up in the statement that humans are more than expressions of their genes. Jones is also critical of the humanistic idealism espoused by Graham, the spokesman of the Repository.

To correct a misconception in Jones' response: The recipient's (wife's) genes *do* have to be acceptable. "The recipients are genetically selected by a medical panel." The requirement is for the "recipient to be of superior health and intellect, to be under 35 years of age, and—preferably—to have a sterile husband who agrees to the process of insemination."

The Watchmaker

In the 18th century the English theologian William Paley likened the Creation to an intricate watch and the Creator to the watchmaker. Here is a 20th century version of that analogy.

The watch was a very fine instrument indeed. At least that's what John tried to reassure himself after buying it on impulse that morning. It was not that he really questioned its quality, but for a poor college student, any purchase of that magnitude was hard to justify. His father nodded his head approvingly as he handed it back to John.

"It's the most beautiful watch I've ever seen," his father said.

The only inscription on the watch face was "Made by Wort," but in the box was a brochure that gave more information and which was signed, "Herr Wort." In the brochure Wort explained how he loved to make watches and how he loved people. He hoped that people everywhere would enjoy, appreciate, and take good care of his watches. He also mentioned that all the watches were made by him with very special care.

During the next several weeks, John's appreciation of the watch increased, for it was not only beautiful, but also ran with the highest precision and was very durable. Many other people in the city purchased Wort watches and a good number of them along with John and his father began to regard Wort as a very special person. Their admiration of Wort was based on more than just his ability to make fine watches, for in the brochure he presented a view of life that gave it deep meaning and purpose. Soon those committed to his teachings began to call themselves Wortists and meet together periodically in Wort Clubs.

One day the following article appeared in the *New York Times:*

> MYSTERY WATCHMAKER
> GAINS UNPRECEDENTED FOLLOWING
>
> Last month a shipment of watches arrived in New York City from Switzerland. Since then, the watches have been praised for their excellence, and the watchmaker-philosopher known as Wort has received a surprising degree of popular support. Wort himself remains quite a mystery, however. No one in the International Association of Watchmakers seems to know who he is, where in Switzerland he works, or how he is able to make watches of such superior quality.

On campus several weeks later a friend tossed on John's desk an issue of *Newsweek* open to the science section. "Take a look at this," He said. "Your Mr. Wort is amazing!"

The article read as follows:

> The location of the master watchmaker Wort has finally been discovered in an alpine valley in Switzerland. For the past few months the watches and teachings of Wort have captured the admiration of people throughout the country. This report will do little to diminish the interest in this remarkable man.
>
> The watchmaker's shop was closed tightly when I arrived, but from inside came the unmistakable sound of machinery. Since no one would answer the door, I climbed onto some boxes to look through the only window in the building. In the room was a large machine, and Wort could be seen maintaining it and checking the dials. On the top were cone-shaped hoppers, along one side were a series of conveyer belts carrying various watch parts, and on one end

> complete watches would periodically leave the machine for packaging. Apparently Wort had built a machine that can take the individual watch parts and assemble them into a watch of very high quality.

John quickly called his father and read him the article. They could hardly believe it; Wort clearly had a greater creative intellect than they had ever imagined. But before they could fully comprehend the meaning of this latest discovery, the following article appeared in *Time* the next week.

> The recent discovery of the watchmaker shop of Herr Wort has further increased the public fascination with this brilliant man. During the past week, I apparently became the first reporter to meet Wort in person. As he was leaving the shop, I asked him who he was and why he made the watches. Without looking up he handed me the brochure that comes with the watches. When I pressed him further for some information on how the watches were made, he gave me a wry smile and glanced over his shoulder at his shop. It was clear that he was not going to answer that question directly, but he seemed almost to invite me to enter the shop for a closer look.
>
> Inside the shop the watchmaking machine was truly awesome. It filled nearly the whole room and contained a multitude of moving parts and dials. Probably more out of frustration than curiosity, I climbed onto a chair to peer into the hoppers. Incredibly, the hoppers did not contain the assorted wheels and screws of a watch but a range of various pulverized metals and minerals. As I left the shop, I realized that I had witnessed one of the greatest engineering achievements in history.

When John and his father read the latest account, they laughed with delight. "It seems there is no end to the accomplishments of this man," John's father said.

Returning to campus on the bus later that day, John happened to sit among a group of particularly vocal non-wortists, who were discussing the recent news reports about the watches.

"I knew there had to be a machine making those watches," one said.

"Yes," laughed another, "just a machine—it's probably been there all along. I guess we can finally throw out the myth of Wort once and for all."

"I wonder who the guy was that the reporter spoke to."

"Probably just the delivery man," joked one. "Maybe the nice one who is sending us all the watches. He sure fooled that reporter."

When John got home that evening and related this occurrence, his father shook his head sadly. "It's very unfortunate, but hardly surprising."

"But how can they possibly believe that such a complex machine was not made by a person of superior intellegence?" said John.

"I'm sure I don't know. Sometimes I wonder if they really believe what they're saying. Anyway," continued his father, "tomorrow night we can forget about the incident and recognize Wort's accomplishment properly. Our Wort Club has called a special meeting to discuss the recent events. It should be a wonderful time."

The next evening, of all times, John's father had to work late. By the time they got to the meeting, it had already started. As soon as they entered, they realized something was wrong as they found an attitude of bitterness and antagonism.

"There can be no machine," someone said. "I think we should protest this outrage by cancelling all subscriptions to *Time* and *Newsweek*."

"That's right," said another. "It's clear that those reporters are allies of the non-wortists. It's a scandalous job of biased and subjective reporting."

"Even if there was something that looked like a machine, the reporters did not see the watches actually being made. Wort could have assembled the various parts by hand some place else."

"Whatever the reporters claimed to see," said the leader, "we know the machine did not make the watches. After all Wort stated in the Brochure that he made the watches. There obviously could be no machine."

It was hard for John and his father to believe what was taking place. It wasn't long before the group had branded all people who looked favorably on the machine as Machinists, and soon someone stated that no good Wortist could possibly be a Machinist. Finally John's father could remain silent no longer.

"Why are we talking like this?" he said. "Why do you find the machine so threatening? I thought we would all be thrilled at this new and even greater evidence of Wort's creative ability. How can this discovery possibly lessen someone's esteem of Wort? Furthermore, I find no conflict whatever in the machine and Wort's statement in the Brochure."

"What's wrong," someone shouted, "don't you believe Wort could have made the watches without the machine?"

"But if he made the machine, of course he. . ." John's father was interrupted by someone in the next row.

"No Wortist should believe in the machine! Those that do are compromising the truth stated by Wort. They are collaborating with the enemy."

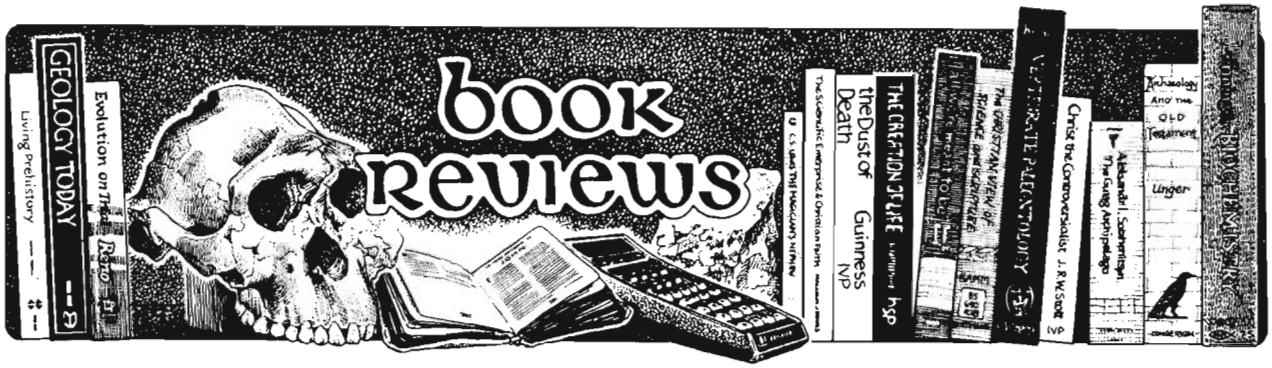
The ride home was the saddest of trips for John and his father, especially when they realized what a joyous meeting it could have been.

"I never would have guessed the degree of hostility that our Wortist friends have for the machine," the father said. "I particularly don't understand why the machine issue should be made a matter of such importance—the watches were made by Wort in either case. Why can't we unite and concentrate on the really important issues in the Brochure?"

They rode the rest of the way in silence. As they reached their home, John said, "You know, I've been thinking. In the Brochure where Wort says that we should appreciate his watches, doesn't that also imply that we should appreciate his machine that made the watches."

"It would seem that way to me," his father answered. "the most amazing part of this whole sad event is how some people can see the beauty and wonder of his watches but not of his machine."

Paul Adams
Biology Department
The University of Michigan - Flint
Flint, Michigan 48503



THE SCIENTIFIC IMAGINATION: CASE STUDIES, by Gerald Holton, Cambridge: Cambridge University Press, 1978, xvi + 382pp. $27.50; paper $8.95.

This is a collection of eleven previously published essays by a well-known professor of Physics and of the History of Science at Harvard University. While the book is intended to be a continuation of the author's *Thematic Origins of Scientific Thought: Kepler to Einstein* (Harvard University Press, 1973), it does not display any unifying purpose beyond that of bringing together a number of papers published since the appearance of the earlier volume. Two long essays, one on the Millikan-Ehrenhaft dispute over the electron,[1] the other on the impact of Enrico Fermi's discoveries on the growth of Italian physics, account for a third of the text and are the only real "case histories" in the traditional historical sense. The other pieces include book reviews, a discussion of the (Harvard) Project Physics Course, and a few essays on topics in the sociology of science. Of these the best is "Dionysians, Appollonians, and the Scientific Imagination" (expanded from an article in *Daedalus*, Summer, 1974) which discusses the role of the rational and irrational in scientific method.

In the opening chapter and at various points throughout the text, Holton advocates his theory of "thematic analysis"—the treatment of an additional component in the examination of scientific work beyond the standard historical, social, psychological, cultural, logical, empirical, and theoretical components (p.3-8). Themata are quasi-structuralist conceptions, in many ways akin to A.O. Lovejoy's "unit ideas" which are to explain or establish in some way the continuity of the scientific endeavor as well as the often irrational convictions of individual scientists. They include a limited number of conceptions such as continuum, hierarchy, isotropy, synthesis, discreteness, and family—Holton holds that there are probably less than 100 in all—which are present in a variety of combinations and sequences. Apparently deeply imbedded in the psyche and mainly acquired in childhood (p. 23), they are almost all of ancient origin and all will continue to find proponents in the future (p. 10). Scientists may embrace any thema at any time, as well as its opposite (p. 23), each in a different area of thoughts, and they may change themata, apparently even by rationally considering alternative themata (p. 22).

Thematic analysis is apparently more a descriptive than an analytical tool, however: in Holton's principal example he picks a dozen or so themata from one page of a *Scientific American* article without giving any indication as to how such a list is supposed to help in understanding or explaining what is going on (p. 11ff). While Holton insists that his notion of themata is to be distinguished from theories of archetypes, paradigms, or metaphysical presuppositions, there are many similarities and it is hard to find any advantages in Holton's view. His general theory is too vague—there is no explanation of the genesis or

Books Received and Available for Review

(Please contact the Book Review Editor if you would like to review one of these books.)

Bloesch, D.G., *Faith and Its Counterfeits*, IVP.

Boadt, Croner and Klenicki (eds.), *Biblical Studies: Meeting Ground of Jews and Christians*, Paulist.

Cavalieri, L.F., *The Double-Edged Helix: Science In the Real World*, Columbia.

Elsdon, R., *Bent World: A Christian Response to the Environment Crisis*, IVP.

Gleason, J.J. *Consciousness and the Ultimate*, Abingdon.

Hart, T.N., *The Art of Christian Listening*, Paulist.

Hustad, D.P., *Jubilate! Church Music in the Evangelical Tradition*, Hope.

Jocz, J., *The Jewish People and Jesus Christ after Auschwitz*, Baker.

Main, J., *Word Into Silence*, Paulist.

Merton, T., *The New Man*, Bantam.

Meyers, D.G., *The Inflated Self: Human Illusions and the Biblical Call to Hope*, Seabury.

Meyers, E.M. & Strange, J.F., *Archaeology, The Rabbis & Early Christianity*, Abingdon.

Newbigin, L., *Sign of the Kingdom*, Eerdmans.

Prime, D., *Created to Praise: Giving God Glory in All of Life*, IVP.

Read, D.H.C., *The Faith is Still There*, Abingdon.

Schemmer, K. E., *Between Faith and Tears* (A physician tells how to face suffering and win), Thomas Nelson.

Steiger, B., *Unknown Powers*, Berkley.

Stub, H., *Theological Reflections*, Eerdmans.

dynamics of themata, nor any standards for thematic evaluation. At the same time the themata themselves are too rigid and unchanging. The claim that Democritus embraced the thema of "discreteness" along with such later scientists as Planck and Bohr surely obscures more than clarifies; such concepts develop and evolve over time. The conflicts between Einstein and Heisenberg over quantum mechanics, Cartesians and Newtonians over vortices, and Aristotle and the atomists over the plenum are distantly related if at all, but Holton finds in them all the antithetical themata "discreteness" and "continuum."

Whatever problems beset the theory of thematic analysis do not, however, seriously detract from the rest of Holton's work, nor for that matter does thematic analysis noticably contribute anything. The author admits that his study of Fermi, one of the two long historical essays in this book, makes no use of themata, while elsewhere the occasional interjection of "thema-talk" can be dropped with no apparent loss. This raises the question implicit in my opening comments above, "What is the purpose of this volume?" If it is to establish the theory of thematic analysis, it is unsuccessful; if it is in a broad sense to investigate the scientific imagination, it does include some illustrative case studies, as well as material only tangentially related. As a volume of collected essays, the paperback edition is a comparatively inexpensive way of acquiring some of the papers which are otherwise found only in expensive editions and symposia, and so it is a useful source-book for those interested in its contents.

[1]Appearing in *Historical Studies in the Physical Sciences*. 9(1978), pp. 161-224, after the publication of the volume under review.

Reviewed by Charles D. Kay, Department of History and Philosophy of Science, University of Pittsburgh, Pittsburgh, Pennsylvania.

GROWTH WITH EQUITY, edited by Mary Evelyn Jegen and Charles K. Wilber, 1979, vii & 241 pages, $4.95 (paperback)

The obligation to feed the hungry is a moral imperative most human beings recognize. The evangelist Matthew makes it one of the criteria by which all will be judged (Mt. 24:35). The contributors to this book are attempting to uncover how the hungry may be fed without prejudice to human development on an international scale. The traditional answers of religion (charitable assistance) and business and government (more resources) are not only inadequate but even harmful.

It would have been better to participate in February, 1978 in the give and take of the seminar put together by the Bread for the World Educational Fund and the Economics Department at the University of Notre Dame. This book is an opportunity to listen in on the discussions after the fact.

That the issues are still lively is evident from World Bank President Robert McNamara's plea for increased financial assistance from the United States, Russia, Great Britain and Japan for Third World Countries. Oxfam's Tony Jackson believes the money now being spent is too often only helping the rich get richer. David Kinley of the Institute for Food and Development Policy of San Francisco would rather see United States foreign aid moneys spent to alleviate the debts of poor countries. This book will help thoughtful readers understand these disagreements and begin to formulate their own conclusions.

One of the contributors, Paul Schervish argues that more money going from richer countries to poorer ones only exacerbates the latter countries' problems of poverty, unemployment, and hunger. The powerful in our own country appreciate how difficult it is to ensure that moneys intended to aid the most impoverished reach the target population. It is naive to imagine the task is easier across national boundaries.

Denis Goulet contends that "the many can only have enough if societies so organize themselves that the few cannot have too much." When Goulet writes that "deep mutation" will be necessary, this reviewer suspects the more precise term would be revolution.

Richard Barnet focuses on the significance of changing values if one would alter the social and economic conditions of the poor and oppressed. The values which "undergird the global shopping center" are not now adequate. One may well suspect they never were.

Paul Streeten writes that Transnational Corporations could make contributions to meeting the "basic human needs of the absolute poor." Further he is able to specify what those needs are, namely, adequate personal incomes, basic public services and participation. James Weaver also makes a list of basic human needs but his list differs from Streeten's. Weaver includes food, potable water, clothing, shelter, medical care and education. Goulet disagrees with both of them. He believes only the poor themselves can define their needs and then only in reference to what is of value to them. His examples indicate that the poor are more likely to list a meaningful existence and a sense of self-esteem as basic human needs. This sort of difference indicates that the difficulty of satisfying human needs is more basic than delivering goods and services.

This book is technical to the point of being difficult for the interested non-professional. But the easy solutions have been and are being tried again. When charity becomes big business, often under government control, something needs doing. These authors suggest a variety of ways to perceive the problems and seek solutions.

Reviewed by William J. Sullivan, S.T.D., Associate Professor, Religious Studies, St. John Fisher College, Rochester, New York 14618.

THE MASTER OF LIGHT: ***A Biography of Albert A. Michelson*** by Dorothy Michelson Livingston, The University of Chicago Press (1979). 376 pages. $6.95.

The decades spanning the turn of the century were times of great turmoil for physics. In what Thomas Kuhn calls "a shifting of paradigms," classical Newtonian physics was grudgingly giving way to Quantum, or Modern physics. More was involved than a simple change of equations: one world view was discarded and another, full of unsettling implications, was instituted in its place. Determinability and continuity were replaced by uncertainty, probability, and quantized energy levels. Though one of the movers of this revolution, Albert Abraham Michelson nevertheless struggled to accept that which he had helped bring about.

Born in 1852 in Strzelno, Poland, Michelson emigrated with his family three years later to the United States. They settled in the Sierra Gold Rush town of Murphy's Camp, and his father eventually sent him to high school in San Francisco. His potential attracted the notice of a local congressman, and after some difficulties he won in 1869 an appointment to the U.S. Naval Academy. The direction his career would take was already apparent by the time of his graduation four years later. A superior student overall, he led the class in optics, and the study of light was fast becoming a passion with him.

More an experimenter than a theorist, Michelson had ample work to occupy his interests and challenge his abilities. He eagerly embraced Maxwell's newly formulated wave theory of light, and his skill with mirrors and lenses served him well. Though Foucault and several others had previously attempted to measure the velocity of light, Michelson while still in his twenties obtained more accurate results in a long-running series of tests with simple but ingenious changes in technique. His reputation on both sides of the Atlantic was solidly established when he, with the chemist Edward Morley, performed an experiment that was to be pivotal in the rise of modern physics: the attempt to measure the ether-drift.

The notion of a physical ether permeating the universe strikes many today as absurd and somehow pathetic, akin to the epicycles devised in astronomy to explain the motions of the planets in a geocentric universe. But the wave theory of light at the time seemed to demand such a substance. After all, light waves must have some medium through which to propagate, and the concept of an enormously tenuous yet rigid ether was no more superstitious than modern physicists' first inklings of antimatter or virtual photons. A contemporary scientific journal wrote concerning the ether, that "Of its reality most [scientific men] are as convinced as they are of the existence of the sun and moon."

After having measured the speed of light, the logical next step for Michelson was to measure the effects on light caused by motion of the ether. Since the earth orbited the sun at eighteen miles per second, an ether wind of that velocity should be streaming through the planet and everything on it, and should influence the propagation of light waves. Called the ether-drift, this effect was expected to be analogous to the behavior of ripples on moving water. The speed of the wave relative to the medium would remain constant, but the speed relative to an observer should vary. The Michelson-Morley experiment in 1887 failed to show an ether-drift.

As most revolutionaries discover, once the dismantling of the old order is irreversibly under way, events tend to get out of hand. Michelson did not set out to disprove the existence of the ether. On the contrary, he wanted to study it. The negative result was devastating. It threw the theories of the time into confusion. Though a few scientists seized upon his results and began restructuring physics, Michelson and the majority of physicists long held to ideas such as ether drag by the earth, or the Lorentz contraction of matter in the direction of motion, in order to keep the necessary ether and still explain the observations.

Michelson's human nature showed itself in other ways, too. A vigorous proponent of the wave theory of light, he found it difficult to accept the mounting evidence of the wave-particle duality of electromagnetic radiation. Once during a visit to a German university, he realized as he walked into the dining area that the physics students had divided into two groups: classicists and relativists. With the attention of both groups upon him, he walked over and sat with the classicists.

Still, Michelson was not alone in being unwilling to accept all the conclusions of the new theories. Like Einstein after him, a few rough theoretical and philosophical edges did not impair his work or standing. For years he was the premier maker of ruled glass diffaction gratings in the world. He also made great advances in interferometry and furthered its use in many fields. Much in demand as a lecturer and researcher, at his death in 1931 the scientific community mourned the loss of "the Master."

Dorothy Michelson Livingston is by her own admission "not a writer." Yet, in an age when biography is too often neglected, she has written an informative, readable, and above all enjoyable book. As the youngest of Michelson's three daughters by his second marriage, she is in a privileged position to comment on her father. She draws upon her own memories as well as those of Michelson's associates to produce a rounded picture of both his personal life as a husband and father, and his academic life of colleagues, students, and occasional quarrels. Through the book runs Michelson's love affair with light, a pursuit he justified to a friend by explaining "Because it's of much fun."

Perhaps a more fundamental characteristic of Albert Michelson was revealed in a conversation with his young daughter, Dorothy. She had innocently asked him why the sky was blue, and had soon become bored during Michelson's long and detailed answer. As she sat in his lap, he gently told her "It doesn't matter if you don't understand it now, as long as your realize the wonder of it."

Reviewed by Robert Schier, Office of Student Affairs, University of California at Irvine Medical Center, Anaheim, California

THE EIGHTH DAY OF CREATION: THE MAKERS OF THE REVOLUTION IN BIOLOGY, by Horace Freeland Judson, Simon & Schuster, New York, 1979, 686 p. $15.95.

In *The Silver Chair*, Aslan, C.S. Lewis' representation of Christ, said "There *are* no accidents." By design, then, I finished S.L. Jaki's *The Road of Science and the Ways to God* just before tackling the book under review. Jaki's book is explicitly about how the great advances in physics were made by believers, because of their belief; Judson's can implicitly be read as being about how the great advances made in molecular biology were made by atheists, because of their atheism. For that reason, and the title, I suppose a review of it merits inclusion in these pages.

Explicitly, *Eighth Day* is about the history of the development of molecular biology. Unlike other treatments of that subject, which deal mostly with DNA, Judson is also interested in protein structure and crystallography for their own sakes, so they, too, are covered.

The book is well written, and attempts to set who did what, when, in "why and how" context. It is based on a staggering number of interviews with prominent and non-prominent participants over several years. I found the treatment compelling. The closest comparison I can make is not Gamow's *A Biography of Physics* or Watson's *The Double Helix*, but reading about, listening to, and watching the history of Watergate unfold. This, of course, is consistent with Judson's career as a professional journalist, with the partial publication of the book in *The New Yorker*, and with its length. *Eighth Day*, because of its perspectives on the scientists who developed it, belongs in every academic library, and, for the matter, in public libraries.

Jaki, if I understand him correctly, warns that science, to be productive, must have a view of nature squarely consistent with Judaeo-Christian tradition. That is, it must navigate between the Scylla of rationalism and the Charybdis of empiricism, or it develops either elaborate structures with no relationship to reality, or masses of meaningless data. The material world exists, but it has a planner back of it.

Judson's atheists are apparently not as well informed as were Jaki's empiricists or rationalists. Francis Crick, co-discoverer of the Double Helix, who continues active in the field, is described as changing from physics to biology because as an atheist he felt compelled to challenge vitalism. Jacques Monod, author of *Chance and Necessity*, an existentialist tract, figures prominently in *Eighth Day*, but Max Perutz, who is more than any other person the source of *Eighth Day's* material, says of him that he was a better scientist than philosopher. (See "Tributes to Jacques Monod" *Quarterly Review of Biology* 55:167-168, 1980) (Although Judson mentions the anti-religious views of several prominent scientists of recent times, he does not mention those of Perutz. This leads me, though lacking other evidence, to guess that Perutz is a Christian!)

Somebody said that, rather than DNA being the secret of life, life is the secret of DNA. Even if DNA is the secret of life, Crick's attempt at disposing of vitalism poses no threat to the believer. Regardless of the late Monod, or anyone else, we are the products of design, not chance.

It seems appropriate, in closing, to refer to the remarkable April 26, 1974, issue of *Nature*, which celebrates the twenty-first anniversary of the publication of Watson and Crick's "A Structure for Deoxyribose Nucleic Acid." The issue contains nine articles, several of which are of lasting value. I quote from two, those by Sydney Brenner and Gunther Stent, both participants in *Eighth Day*.

Vitalism is dead, says Brenner:

> Much has been written about the philosophical consequences of molecular biology. I think it is quite clear what the enterprise is about. We are looking at a rather special part of the physical universe which contains special mechanisms none of which conflict at all with the laws of physics. That there would be new laws of Nature to be found in biological systems was a misjudged view and that hope or fear has just vanished.

Belief in God is alive, says Stent, who is clearly *not* defending Judaeo-Christian traditions:

> "And now the announcement of Watson and Crick about DNA. This is for me the real proof of the existence of God." (Salvador Dali, 1964) . . .my friend Crick finds Dali's statement a tremendous joke. . .now that molecular biology has shown how life can be explained in terms of ordinary physics and chemistry, further proof has been delivered that God designed the world and saw to it that His plans are comprehensible to man.

Whether the achievements detailed in *The Eighth Day of Creation* have delivered a convincing proof of God's existence is a question more controversial than Stent puts it, I'm sure. Regardless, God is not worried over them, and we surely have no reason to be. That these achievements, like many before them, have raised philosophical and theological questions, is, ultimately, to our good. The Road of Science remains one of the Ways of God.

Reviewed by Martin LaBar, Central Wesleyan College Central, South Carolina 29630.

THE BIRTH OF CHRIST RECALCULATED by Ernest L. Martin, Foundation for Biblical Research, Pasadena, California (1978). Paperback, 126 pp.

This treatise is an extension of an article published in *Christianity Today* in December of 1976. Its purpose is to substantiate further the thesis that the birth of Christ occurred in the year 2/3 B. C. rather than an earlier date, 5/6 or even 7 B.C.

As to the evidence from heavenly phenomena which took place at the birth of Christ, it is recorded that there was triangulation of the planets, Jupiter, Saturn and Mars in the year 7/6 B.C. However, Jupiter and Saturn in their three conjunctions were at least two diameters of the moon away from each other. They could not be imagined as a single "star". There were, however, unusual positionings placed at 3/2 B.C.

The real star of Bethlehem was probably a morning star which rose in the East. Christ said of himself, "I am the root and offspring of David, and the bright and morning star." (Rev. 22:16) Peter also mentioned that Christ was symbolically associated with "the day star." (II Pet. 1:19) Jupiter was known to rise as a morning star in conjunction with Venus. Later, Mercury left its position with the sun and came close to Venus. These, and other outstanding happenings in the heavens would signify to those searching the stars, an extraordinary event on earth—the birth of a king.

In relating visible astronomical events with historical documents, other conclusions can be assumed. The life and records concerning Herod can be drawn upon. The slaughter of the innocents and death of Herod, who according to his own wishes was to have the greatest funeral in history, seem again to point toward the year 2 B.C.

There is also evidence from the Evangelists. Luke (1:26,36) leads us to believe that John the Baptist was born March 25, 2 B.C. Then Christ's birth would work out somewhere near the month of September, 2 B.C. (The time of census was between August and October).

When the Wise Men came, the child was already living in a house. Considering corollary events, close calculations place their visit at December 25, 2 B.C.

The reading of the book itself is intriguing. It explores the peripheral historical as well as pertinent astronomical events. It is a well documented and substantiated treatise, so that at the end, the reader is inclined to bow his head and say, "I believe."

Reviewed by Dr. Loretta Koechel O.P., Chemistry Department, Molloy College, Rockville Centre, New York.

THE MOON: ITS CREATION, FORM AND SIGNIFICANCE, by J. C. Whitcomb and D.B. De Young, BMH Books, Winona Lake, 1978.

I would heartily agree with the authors of this book in their assertion that there is no ultimate contradiction between Scripture and natural science. Yet, I must question the manner in which they apply this concept in *The Moon: Its Creation, Form, and Significance.*

The Moon is written from a strict, recent-creationist viewpoint, and all relevant issues in the book are seen from this perspective. It basically expands and extends the works of other creationists such as *The Genesis Flood*, by Whitcomb and Morris. As a result, many of this book's arguments and discussions will be familiar to those who have studied the question of origins and creation. I personally do not ascribe to Whitcomb and De Young's interpretation of Genesis (particularly Genesis 1), and I feel that this book has many problems both in its approach and analysis. For example, many issues that are debatable at best are treated as if they are totally supportive of the recent-creation position; the question of moon dust layering and the reversal of the polarity of the Earth's magnetic fields are two such topics. (These questions, and others discussed in this book, have been addressed far more successfully in the *Journal ASA* and other places.)

Occasionally, Whitcomb and De Young's analysis of a question is incomplete, such as their discussion of transient lunar phenomena (TLP). They do not mention the fact that extensive, close-up lunar surveys have not unambiguously detected or photographed any TLP. Possibly, TLP are observing anomalies, not true lunar features. The results of Apollo, Surveyor, etc., are discussed in detail when they seem to support recent-creation, but results are ignored which might refute this position. More important, though, is the manner in which the authors handle problems in present lunar theory. It is true that all of the present explanations of lunar origin have major flaws. However, this does not mean that we must accept the authors' interpretation of the Genesis account. We are looking at a "God of the gaps" philosophy, in which anything that we can't at present explain with scientific accuracy must therefore have been accomplished by God in some magical or mysterious way. The problem with this approach is that when a satisfactory theory of lunar origin (or other "God of the gaps" problems) arises, God is somehow relegated to the background once again. The primary weakness here is that stating that God indeed *caused* something, such as in Genesis, is very different from giving *information* about the *details* of the event, which is the purpose of science.

Further, I feel that another weakness in this book is the inconsistent manner of scriptural interpretation employed. The authors state, as a principle, that Scripture uses the language of appearance. Yet, they say it is "obvious" that Psalm 93:1 is *alluding* to the immutability of God-ordained functions. It was not "obvious" at all to Jews and Christians for thousands of years! It was the observations of science that changed the traditional understanding of this verse. Here is a clear case where science contributed to a proper understanding of Scripture. There is no reason why a similar situation might not exist with conflicts between the traditional interpretation of Genesis and present scientific discoveries as to the age of the solar system, origin of the moon, etc. Throughout the book Whitcomb and De Young criticize Christian scholars who believe that science aids us in understanding Scripture. They refer to the "double-revelationists" and include in their ranks such scholars as Robert Newman, Bernard Ramm, Richard Bube, and D. Gareth Jones, who the authors claim to be in grave error. These men all hold Scripture in the highest esteem and hold to the historicity and authority of Scripture. They simply contend that valid science is consistent with accurate interpretation of Scripture. The author's listing of "double-revelation" vs. "recent-creation" authors only serves to increase the "us vs. them" attitude that is so detrimental to the Body of Christ and the search for understanding.

Finally, the authors contend that a sudden creation of the universe, man, etc., demonstrates God's power and wisdom. They imply that there would be no such awe due a Creator who used natural orders taking long periods of time. This is a question of perspective, not biblical theology. To me, a long or natural process of origins in no way weakens my respect for my Creator any more that my understanding of the natural process of precipitation does.

Generally, I would not recommend this book alone for a person seeking to understand lunar origins and functions. It is, however, a good work for one who is trying to learn the position of the recent-creationists on this subject. It would also be a handy reference work for those involved on either side of the controversy, keeping in mind the extreme one-sidedness of their presentation and analysis.

Reviewed by Joseph P. Bassi, Captain, US Air Force, Learmonth Solar Observatory, Box 100 NAVCOMSTA Holt, FPO San Francisco, California 96690.

MEDICINE, SCIENCE AND LIFE by V. S. Yanovsky, Paulist Press, New York, 1978. 151 pages. $10.00.

Yanovsky's title and stated purpose carve out a huge territory for discussion: to understand and harmonize medicine, science, religion and art. Just as religion speaks of eternal life and resurrection, and art the prevention of the decay of beauty, science attempts reversibility. In physics, the goal is overcoming entropy; in medicine: well being, rejuvenation and growth. The first three chapters discuss anesthesia, "reversibility par excellence;" surgery, "being irreversible. . .the antagonist of anesthesia;" and general medicine, "the basis of our profession."

He reflects on the practice of anesthesia, the foibles of patients and their surgeons, the degeneration of society to pleasure seeking and pain avoidance, and the pitfalls of statistics and research. He reminds us of the origin of the surgeon as a barber, only recently having been accorded the title doctor or being allowed to "steal the show." He deplores the trend toward more radical surgeries, noting that surgery is palliation and should not endanger or shorten the patient's life. "Playing it safe" by performing the more radical procedure assumes a degree of knowledge of risks and consequences which is not even possible.

He relates the philosophy of medicine to his view of the basic conflict: causality vs. indeterminism. The notion of cause and effect heralded the beginning of the scientific era and the demise of metaphysics and the church. But modern physics renders the deterministic philosophies of classical astronomy, Darwinism and Marxism naive. The answer may be on the nuclear level where indeterminism reigns and freedom of choice is reality. The forces of nature seem to be imbued with a sense of direction: toward perfection, which overrides even the more rudimentary forces toward survival and reproduction. The arts, religion, amnesty, and even gambling all strive toward a reversal to previous perfection. "Culture is defined by the body of reversible processes known to a given society." An ideal society would have privileges of social and biological reversibility and restoration available to all.

The last chapters explore the implications of the physics of complementarity and indeterminism. The "old science" is obsolete. Gravitation is observer and velocity related. Cause and effect is based on an outmoded view of time. In thermodynamics, conservation of energy assumes a closed system and therefore cannot be applied to the universe as a whole. The notion of entropy contrasts with a universe characterized by the creation of highly ordered material structures. Both consciously and unconsciously humanity challenges irreversibility and disorder.

> If our organic and cultural life is only a lately added small appendix to the dying-out universe, it is possible to accept such a point of view (heat death). But if the organic world and our western civilization, marked miraculously by a concept of love and light, is not a small added after thought, not a simple episode but an immense, infinite phenomenon, then the entire elaboration of the second law of thermodynamics appears as a contradiction: A greater part cannot feed on a smaller!

The classical interpretations of evolution relied primarily on chance changes in association with the principle of survival of the fittest. Mutual aid and cooperation are also fundamental and widespread in nature, but the social sciences reflect on the value of competition rather than cooperation. The simplest explanation for this constant direction of life toward complexity, the ultimately human, and perfection is a universal force.

The most striking but ignored trait of probability is that it has no reference to the particular case. "Statistics is the negation of the medical ideal." If biology proceeds at the molecular level, and if atoms have preference, we must not "naively" apply probabilities, especially when our information and theories are both incomplete. "To tell a couple with an abnormal gene that their child has *n* percent chances of being a cripple is a crime and/or madness."

The new physics provides a new understanding of the justification of God, the theodicy, The need to reconcile the cruelties of the natural order, omnibenevolence and omnipotence is a prenuclear problem. Love and omnipotence can be considered complementarily, not simultaneously. Finally the possibility of breaking the causal chain, giving good for bad, establishing a new, free, undeterministic order is apparent. The freedom of the photon and the electron make personal freedom possible.

I found Yanovsky's style exasperating. The cover leaf states that as a novelist he "has published ten works of fiction to wide critical acclaim." He has organized this book much like a novel, subdividing each of the chapters into as many as fourteen divisions. There is little continuity between these small sections, or at times, even within them. While this may serve the many subplots of a novel, it guarantees a frustrating lack of continuity and clarity in the development of Yanovsky's complex arguments. In addi-

tion, Yanovsky allows himself great latitude in overstatement and exaggeration. While he occasionally justifies this, it serves only to emphasize the looseness of his deductive organization.

This is especially apparent in his discussion of probability and statistics. While probability statements do not admittedly predict the outcome of the individual case, it is not practical or fair to assume that the individual case is unrelated to the series of which it is a part. His example of genetic counselling is indeed a case in point. We are shackled by a lack of predictive tests, especially in the preconception period. But to deny relevant statistical information to prospective parents is unfair and presumptive in itself.

These criticisms may be minimized if one accepts this wide ranging, contemplative and theoretical work as a quite personal, rather than strictly scholarly enterprise. Again according to the cover-leaf, Yanovsky was born in Russia in 1906, obtained his medical degree from the Sorbonne in 1937, and trained in anesthesiology in New York, where he practiced and wrote. Yanovsky's frustrations as a theist in the secular medical and scientific world are very familiar. While stopping short of calling for a transcendent reality, he argues strongly that the most important and fundamental human characteristics cannot be ignored on the presumption of an arrogant, narrow and now dismembered determinism. The notion that consciousness and free will may be rooted in the fundamental properties of the material of the universe is not new, and contrasts with metaphysical dualism as most recently argued by Popper and Eccles. But Yanovsky's restatement of the case and of its implications in terms of medical practice and science is stimulating and welcomed. His reflections on medical philosophy and practice, and his unique parallel interpretations of culture, the arts and theology provide many interesting personal insights.

Reviewed by Jonathan H. Woodcock, Neurology Resident, Harvard Medical School, Massachusetts General Hospital, Boston, Massachusetts 02114.

LIVING MORE SIMPLY: BIBLICAL PRINCIPLES AND PRACTICAL MODELS edited by Ronald J. Sider, Downer's Grove, IL: Intervarsity Press, 1980. 206 pp., $4.95.

At the Lausanne Congress for World Evangelism in 1974, a covenant signed by thousands of Christians from all parts of the world stated, in part:

> All of us are shocked by the poverty of millions and disturbed by the injustices which cause it. Those of us who live in affluent circumstances accept our duty to develop a simple lifestyle in order to contribute generously to both relief and evangelism.

John Stott later proposed an International Consultation on Simple Lifestyle to be held in London in March 1980. Ronald Sider convened the U.S. Consultation on Simple Lifestyle in April 1979, in order to collect, study, and publish personal examples and practical models for individuals, families, professional persons, and churches to live more simply. This book is a collection of the 27 papers presented at the U.S. Consultation.

Frank Gaebelein, in discussing the Old Testament foundations for living more simply, concludes that while the Old Testament does not specify what our lifestyle should be, it does give us principles by which we can measure it. He also emphasizes the difference between God's ownership of everything we have and our stewardship of it, citing Deut. 8:17-18 as a precaution. New Testament foundations for living more simply were discussed by Peter Davids, who pointed out that the Holy Spirit produced evangelism, miracles, and sharing of goods by a change from within, and not from a legalism, guilt trip, or ideology imposed from without. Jesus was an example of how to trust God, instead of earthly treasures, for our daily needs. Paul is cited as an example of one who neither glorified poverty nor abstained from "abounding." Yet, he had no attachments to such comforts and was suspicious of wealth unless it was used for good works.

Ron Sider makes a common mistake of comparing only the annual incomes of the average person in India with U. S. middle-class people without also considering the great differences in living costs necessary to live at the same level. This omission is unnecessary because significant differences in economic states can still be established when making a proper comparison.

Most of the examples do not demonstrate the "proper motivation" of the consultation, i.e., of living simply in order to contribute generously to relief and evangelism. The family examples are concerned mainly with living more simply as a way to avoid "the idolatry of materialism," participate in small-group communal living, avoid tax payment to support war, or retreat from an increasingly hectic, consumption-oriented technological society. However, most of these examples are valuable because of their good, ecologically sound consumer economics, which many of us had to practice while growing up during the depression and drought of the 1930's. Many of us still drive smaller cars, drive less, recycle materials, and lower our thermostats in winter, but are now motivated to be living examples of good Christian stewardship with an ecologically sound lifestyle. This, too, needs to be more widespread in our Christian witness.

Most of the families seem to identify with the poor by joining them rather than maintaining existing income levels and using the "surplus" created by the simpler lifestyle to help the poor as called for by the Lausanne Covenant. Walter and Virginia Hearn present 10 arguments for voluntary poverty as a radical Christian way of life. Their account of why Walter left biomedical research for a new career in full-time writing and evangelism is also a good model for others who may be considering a change from their present career. They also caution against reverse snobbery.

One of the best examples of church response to the Lausanne Covenant was a church in Wichita, Kans., which reduced its $525,000 construction program to $180,000 and built 26 churches and 28 pastors' homes in Guatemala with the difference. With the exception of the National Presbyterian Church (Washington, D.C.) which sent half of its Hunger Covenant money to a village in India, the other churches were mainly examples of closer fellowship and greater mutual support within their own congregations and communities. They were of little help to the needy in other nations.

The section on professionals exemplifying the Lausanne Covenant is probably the best. Howard Dahl used his professional expertise to develop a small, low-cost tractor for poor nations. David Pullen, a lawyer, maintains just enough paying practice to live simply and donates the rest of his time to a legal clinic for the poor. Dennis Wood, with degrees in law and international development, uses his talents to help the poor by consulting on U.S.-aid programs to poor nations.

Gladys Hunt's careful, balanced analysis of evangelism and simple lifestyle was very good. She cautions against legalism (that leads to pride), faddism, and "group-think subcultures" that miss the Christian purpose of simple lifestyles. She believes in a primary commitment to the Lord, not to a simple lifestyle, even though our walk as Christians involves a new lifestyle. She also states that churches should be looking for missionaries to support rather than have missionaries spend so much time and energy raising their own funds.

In summary, this book has something for everybody. Although few of the accounts exemplify the Lausanne Covenant, the many examples of ecologically sound, common-sense consumer practices will be welcomed by many Christians. By adopting these practices and maintaining our current incomes, much more money is made available to others who desperately need our help. This book should be read and seriously considered by every Christian.

Reviewed by L. Duane Thurman, Department of Natural Sciences, Oral Roberts University, Tulsa, Oklahoma 74171.

CREATION/EVOLUTION, *Issue II*, Fall 1980, 45 pp., $2.50 quarterly, $8.00 annual, Frederick Edwords, Editor, 953 Eighth Ave., Suite 209, San Diego, CA 92101.

In this second issue interesting first-hand reports are given on "Reactions to Creationism in Iowa" by Stanley L. Weinberg and on "The New York Creation Battle" by David Kraus. Even though intense legislative initiatives by creationists have failed in various states, community pressure has suppressed the teaching of evolution in about half the high schools in this country. After analyzing the Iowa Creation Bills (various two-model approaches) and the National Impact, Dr. Weinberg, a college science teacher, recommends what scientists can do most effectively to defend evolution by educating the public and becoming involved in political activity. Local scientists need to be persistent in writing letters and articles to their newspapers, appearing on talk shows, addressing local groups, and submitting to interviews. Weinberg encourages evolutionists to carry out locally the same kind of political activities that creationists use, but he emphasizes activity by concerned individuals and ad hoc groups. If other scientists correspond with him in care of this new journal, he offers to send names of concerned scientists in their states and to help autonomous groups to organize. He recommends communication among the states through existing newsletters and journals.

Kraus, a "re-treaded" high school science teacher, reports on the efforts of a federation of the nine science teachers' organizations in New York City to educate the public and members of the state legislature of the need to keep non-science out of science and to separate religion from government (by omitting the proposed two-model approach from the new state biology syllabus). In spite of these successes, this Journal reports a possible future threat in the form of President Reagan's statement when he was a candidate: "Reagan Favors Creationism in the Public Schools." Candidate Reagan questioned the scientific validity of evolution and favored "the teaching of the biblical version of the origin of human life in public schools if the theory of evolution is to be taught" (the two-model approach).

Consulting Editor Chris Weber answers "Common Creationist Attacks on Geology" in a lively question/answer format. He meets head on the arguments relating to fossilization, sedimentary facies, and overthrusts, arguing that creationists have misunderstood, misinterpreted, or quoted the literature out of context.

Robert Price shows how Philip Gosse's hypothesis of apparent age underlies much of the polemic of creationists in "The Return of the Navel, the 'Omphalos' Argument in Contemporary Creationism." He has an M.T.S. in New Testament studies, teaches college ethics and philosophy, and is working on a Ph.D. in systematic theology. He examines creationist polemical literature to indicate the unacknowledged debt of "scientific" creationists to Gosse's hypothesis. Examples given are creationist views on (1) astronomy and its implications for the age of the universe, (2) the geographical distribution of animals, such as marsupials isolated in Australia, (3) comparative anatomy and physiology, and (4) human evolution. Price shows how Henry Morris admits the evolutionist's criterion of environmental "fitness" i.e., "recognizes the validity of the processes of evolution," but then appeals to the prescientific notion of teleology. Morris grants that creatures are fitted to survive in certain environments, because God arbitrarily wanted it that way (*fiat*). Transitional forms are discounted by creationists, because these life forms were independent and just happen to look like they fall somewhere between monkey and man, between bird and reptile. Price hastens to point out that creationists do not explain the rationale of the omphalos argument as Gosse did, since they may not be aware of it themselves. But their "implicit logic

is the same—the evidence points in the direction of evolution, but that is because (for whatever reason) God simply wanted it that way. This is a throwback, not only to Gosse's esoteric argument, but also to the pre-scientific shrugging off of such questions by the catch-all appeal to teleology," which is inimical to scientific inquiry. Price then shows how the "scientific" creation model falls short of being scientific in three ways and concludes that it is religious propaganda, not scientific theory.

Stanley Freske, an industrial R & D physicist, presents four lines of "Evidence Supporting a Great Age for the Universe:" the size and outward radial velocity of the expanding gas clouds of supernovae; the uneven distribution of main-sequence star types in star clusters is a function of age measured in billions of years; the speed of light independent of the motion of the source, enabling us to see stars many light years away as they appeared millions of years ago; the uneven distribution of nuclides, 40 with half-lives between 1,000 and 50 million years are missing (10,000 years is not enough time for them to decay totally). All 17 nuclides with half-lives longer than 50 million years *are* found in nature. The probability of the earth being only 10,000 years old is calculated to be 7×10^{-15}, the probability of the 40 short-lived nuclides being absent and the 17 long-lived ones being present, as opposed to some random distribution between absence and presence which would then be possible. The first three arguments do not in any way depend on evolutionary theory for their validity, but are based upon direct observations. At least the first two arguments give strong support to the theory of stellar evolution.

Frank Awbrey, biology professor, presents "Evidence of the Quality of Creation Science Research" in four radio transcripts by the Institute for Creation Research on the weekly radio program, "Science, Scripture, and Salvation." Point-by-point he shows how statements made are inconsistent with the published data on immunological distances between humans and other primates. "Other statements demonstrated a gross misunderstanding" of genetic terms. . .unscholarly superficiality and errors. "It certainly does not lend any credibility to the creationist claim that the scientific literature is 'chock full of evidence for creation.'"

"Another Favorite Creationist Argument: 'The Genes For Homologous Structures Are Not Homologous'" is discussed by genetics professor William Thwaites. A non-paradoxical explanation based upon suppressor genes is given to counter this argument.

Reviewed by Jerry D. Albert, Research Biochemist, Mercy Hospital Medical Research Facility, San Diego, CA 92103.

BELIEF IN SCIENCE AND CHRISTIAN LIFE: *The Relevance of Michael Polanyi's Thought for Christian Faith and Life* by Thomas F. Torrance, ed. Edinburgh, Great Britain: The Handsel Press, Ltd., 1980. xvii + 150 pp., $12.00.

Michael Polanyi (1891-1976) was a Hungarian-born, German-educated chemist and X-ray crystallographer who, after moving to England, studied the philosophy of science. A confessing Christian, Polanyi noted various parallels between his philosophy and orthodox Christian theology. In this volume, a collection of essays presented at a 1978 conference on Polanyi's thought, various of these parallels are noted and developed.

There are six contributors: one Reformed and five Anglican theologians. Three of the contributors are also practicing scientists.

Included are discussions and theological applications of such Polanyian concepts as indwelling, conversion, intuition, focal and subsidiary awareness, and hierarchical analysis of reality. These concepts are then applied to analyze the rationality of Christian faith, the Church's understanding of scriptural revelation, conversion and penitence, the nature of the "person", Christology, and providence and prayer.

The book's dustjacket describes it as "designed for a wider public untrained in theology or science who seek a deeper understanding of the Christian faith." However, both the book's price and use of technical philosophical vocabulary move it beyond the reach of both student budgets and a "wider public" untrained in critical philosophical analysis. Also, in discussing the rationality of Christian faith the authors use closely detailed philosophical and theological discussion in contrast to a rational but intuitive and experiential apologetic which might appeal to the "wider public", e.g. C.S. Lewis' *Mere Christianity*.

In a positive light this book serves as a good introduction to Michael Polanyi's thought and its application. I recommend it especially to those scientists, theologians, philosophers, and laymen interested in the relationships of science and theology and the rational basis for Christian belief. Certainly, most of the readership of *Journal ASA* will find this book of interest.

Also, there is a glossary of Polanyi's philosophical terminology which partially clarifies the densities of the book's more complex or prolix passages for the lay reader.

Reviewed by Lynn Allan Kauppi, 5526 W. Monte Cristo, Glendale, Arizona 85306.

Letters

Apparent Age Arguments

I have just started receiving *Journal ASA* and I must say I enjoy it and am encouraged by it. However, I must say a few things about D. J. Krause's article on apparent age in the 19th century (September, 1980). He seems to think that the resurgence of apparent age arguments are "characteristic of periods when the tension" of science and a *literal* interpretation of Genesis is "perceived by some as being especially acute." Is he trying to tell us that before Morris and Whitcomb's *Genesis Flood* there was no such tension—at least earlier in this century? I would hope we should not be so naive. I cannot, therefore, agree with his misconstrued analysis. Yet I must say I am glad to see an article which has done such historical work about the roots of apparent age arguments; but, once again, I am not convinced that Morris *et al* use it to the same extent that Chateaubriand, Gosse etc. used it. Krause is right in seeing a historical connection between these two groups—but it seems to me that he does so at the expense of the quite fundamental differences between them. Much of what Gosse claims to represent as apparent age is never, to my knowledge, used as such by creationists.

It seems to me that folks in the 19th century used the appearance of age to explain away fossil tracks, glacier scratches (striations?), fossils and practically all geomorphic features. This, however, is not something young earth advocates are saying today. A century ago people looked at scoured valleys and rugged cliffs in amazement and assumed this was, like the wrinkled face of an old man—evidence of an old earth (it would seem a young earth should not have such "wrinkles"!)—e.g. some of Lyell's statements are typical of such sentiment during the 19th century. Yet, young earth advocates today do not (a) explain away geomorphic and paleontologic features as mere created illusions, and (b) they thus do explain such features in scientific (empirical) terms. While Gosse *et al* would have us believe such things are God's created illusions, Whitcomb, Morris etc. do not propose such an idea; the present geomorphic, paleontologic etc. features of the earth's crust are not illusions but results of the recent, catastrophic, geophysical dynamic processes of the Noachian flood. Whereas one group sees such wrinkles as developing slowly or sporadically over millions of years, another group says it is the result of a more condensed, intensified form of process. Anyway, the above is just one vital difference between Gosse, Morris etc., one which Krause ignores completely. The belief that fossils are fakes, glaciers an illusion and rugged crags are just a cosmic put-on violates the very tenets upon which science was founded—it was right to censor Gosse for such behavior, but I do not think creationists are guilty of such rashness.

Again, though creationists say animals were possibly created in mature form, I do not think they could agree this means these animals were created with masticated food in their stomachs! Krause must realize, for once, that such crudities are not the result of believing in a young earth—let us not be so narrow-minded; such crudities rather, are indications of the immaturity of the sciences in that century; even old-earth advocates made some rash suggestions then. I give all these people the benefit of the doubt, however, and attribute such rashness to the juvenile character of science at the time and not to their own ineptitude. Nonetheless, I do not find creationists making such unfounded assertions.

Gosse founds his whole worldview upon the assumptions of an appearance of age—his whole case revolves around this absurd basis. But I do not find creationists putting nearly such emphasis on the apparent age argument—and they certainly do not fly off to the unscientific extremes of Gosse. Indeed, there is some truth to the adage that things are not simply as they seem to appear—science has shown this. Some formations of rx. do indeed appear older than others (whether one is a uniformitarian or not), and yet the case is the younger-appearing one is actually the older stratum. I have read, some time ago in a college textbook, just such an assertion—that some preCambrian rx look younger than some Cambrian rx or what have you: the author of that text to my knowledge was neither Christian nor creationist.

Now, I do believe that an initial creation entails the creation of mature animals so they may survive and breed (Genesis 20:22). Certainly Adam and Eve seem to have been created as adults—any other suggestion about our parents is simply ad hoc or, like Gosse was guilty of, a mere plea to believe in illusions. This brings me to my last point.

If Krause finds it laudable to criticise Gosse for being (as I believe he was) too "simple-minded" by asserting one should believe in illusions—must we not assert the same thing of those who think evolution is compatible with Genesis? If we go about crying God is not obscure in His geology, are not we being inconsistent when we say God is obscure in Genesis? If Genesis should not be taken literally, what prevents one from not logically assuming that the Creator would also play tricks with geology? And that, here too, one need not exercise any form of discipline? Are we claiming that Yahweh would never create false fossils while we ourselves dig up our own false bones by suggesting that Genesis should not be taken too literally? (cf Krause p. 146) Is God quite clear in His geology and the natural world—while He remains not so clear in His revealed Word!

Is it not far more consistent to suppose there are no tricks in nature—and none in the early chapters of Genesis too? Are we trying to pull non-existent rabbits out of a hat which no one owns, by saying Gosse was absurd with his belief in illusions while we create our own illusions by suggesting that Genesis should not—God forbid—be interpreted too literally? From whence cometh such logic? I believe one must not confuse science and theology (though both are compatible), I also believe one must not substitute theology for science *or* science for theology. If Genesis cannot be taken literally—what in our universe should be?

D.M. D'Aria
8510 Briarcroft Lane
Laurel, Maryland 20811

Gödels Theorem Misunderstood

Even though the article "A Positive Approach to Creation" in the December 1980 issue of the *Journal ASA* was exceedingly beneficial and useful to our understanding of certain cosmological concepts, the statements made by the author relative to Gödel's incompleteness theorem are incorrect. This misunderstanding of Gödel's results is widely held by numerous individuals and has unfortunately permeated much modern literature.

This misunderstanding revolves around the distinct differences between the procedures employed within the discipline of mathematical logic: procedures which mathematically study numerous concepts associated with logical syntactics and the internal logical syntactics itself. Gödel's incompleteness theorem, among others, states in generalization that if we employ a "formally expressible" set of axioms for an (informally) conceived mathematical structure N of a certain complexity *and* the Gödel numbers for this axiom system form a recursive set, among other possible recursive characterizations, then the set of formally obtainable propositions does not include all of the formal propositions which *semantically* hold true in N. This simply implies that under the "recursive" characteristic state above that the semantical procedures common to most mathematics do not correspond to the syntactical concepts of deduction. Of course, Gödel used a weak form of semantics to establish this result, a form that was acceptable to Hilbert.

There is, however, a small contingent of mathematicians who would lead us to believe that the only concepts that should be considered within the mathematical arena are those results which are "recursively" obtainable and thus always meaningful to the workers in "artificial intelligence." A 1980 Pulitzer Prize was awarded to Douglas R. Hofstadter for his highly erudite attempt to philosophically show that the human mind = the biological object known as the human brain = artificial intelligence. Of course, if mathematicians followed such precepts, then there would be no Gödel incompleteness theorem. Fortunately, at least at present, the vast majority of mathematicians do not adhere to these restrictions.

Consequently, for the majority of mathematicians the set S of all formally expressible statements which semantically hold true in N forms a complete system of axioms for N. However, the set S does not have the appropriate "recursive" property required for such incompleteness results. If N were a model of set-theory, then it could indeed contain a mathematical model of the universe, which could answer all mathematically expressible questions that are humanly understandable.

Robert A. Herrmann
Mathematics Department
United States Naval Academy
Annapolis, Maryland 21402

An Open Letter to Ancient Creationists and Theistic Evolutionists

I have been reading in the ASA publications a general disdain for the Recent Creation position, references to which are usually accompanied with snide remarks like "The creationist argument is a bit like claiming that because some of the trains are cancelled or run way off schedule, the basic timetable is totally inaccurate" and "Creationism is a slogan seeking to dress itself as a science."

Now I work very hard to believe true facts and to reject errors. I am a Christian (partly) because I find the historical basis of the resurrection to be irrefutable. On the reliable testimony of my Lord Jesus Christ, I accept the Bible as God's Truth to man.

So when the Creationists adduce scientific facts to support their position and their opponents respond only with ridicule and broad, unsupported generalizations, the scientist in me has little choice but to accept the facts, however unpopular that may be.

The Creationists do indeed claim that the dating methods used by the evolutionists are unreliable and based on circular reasoning. Their arguments cover all of the dating methods I knew about, and many I had never heard of. This is not "some of the trains," it is all of them! What am I to believe? If the creationists are only finding the small minority of problems and ignoring the vast majority of valid datings, then let's see a statistically valid sample that documents that fact. The longer you put off documenting your counter-claims and lean on unscientific ridicule, the more thinking scientists are going to migrate over to where the facts seem to be.

But besides being a scientist, I am a Christian under the authority of the Christ of Scriptures. Many ASA members argue that Christianity does not requires a belief in recent creation (i.e. six 24-hour days). I think I understand two varieties to this argument:

1. The Bible is not a scientific textbook, and any conflicts with accepted science are to be resolved in favor of science. This is the issue in the Inerrancy debate, and I will not press the matter here.

2. The Genesis account, though true and accurate in all that it teaches, does not teach a 144-hour creation period. I do not see how this position can be derived from the Biblical text. For the assertion to have meaning, it must be falsifiable. That is, if I claim the Genesis account is not intended to specify 144 hours of creation, then I should demonstrate how it might have been stated, had the author so intended, and show that the actual text is different from that. Try as I may, I cannot come up with any wording in the language available to the author of Genesis that more specifically limits the creation period to 144 hours than the way it is stated, though I can find many ways to make it less specific. Perhaps philologists or Hebrew scholars among ASA members and friends can help me out here. Failing that, I must conclude that the author did indeed intend to teach a 144-hour creation.

I eagerly await any published or private reply to these two issues.

Tom Pittman
P.O. 6539
San Jose, California 95150

Second Opinion on Rifkin's *The Emerging Order*

Rev. Ray Joseph's thoughtful review of Rifkin's *The Emerging Order* (June, 1981) has roused me enough to respond as follows.

Rev. Joseph's major complaint is that the book is badly flawed, yet it touches on very important issues regarding "Christian futurology." Due to the importance of the issues, the flaws reach tragic dimensions. I agree that the book is flawed (then again, which book isn't?) but I don't always agree with Rev. Joseph's appraisal of them.

First, he takes issue with Rifkin over Rifkin's interpretation of Calvin's *Institutes* regarding the issue of work. The criticism may be correct but it still misses the point; Rifkin is appraising American (indeed Western) culture—not Calvin's theology. It is not so important *what* Calvin wrote but what people *thought* he wrote (or, more importantly, how early Calvinists led their lives as a result). Whether one is a Marxist or a Weberian enthusiast, I think all would agree that the inheritors of the "Puritan Ethic" were the kind of folks Rifkin describes them as. . .for whatever reason. A proper recognition of the central analytical role of unintended consequences (or "latent effects") should relieve a minister of the reformed church from having to defend the founder on this point.

Secondly, later on in his review, Joseph writes ". . .it is a high priority with industrial engineers to deal with the productive worker as a human being, attempting to learn what it is that motivates him, satisfies him, and keeps him happy." As a blanket statement covering all of American industry, this one leaves a lot to be desired. Perhaps companies like Polaroid and Ralston-Purina have enlightened policies toward the work place, but it is safe to say that most major industries (auto, steel, textiles) do not. Research consistently shows very high rates of worker alienation in low and semi-skilled jobs—a category which comprises 40% of the work force. Nor is alienation (i.e., the perception of work as being irrelevant to one's life interests) limited only to these "careers." In all but the most technologically sophisticated industries, the major motivation is profit at the expense of worker alienation—even though this policy is extremely short sighted. The attention that Rev. Joseph, says is given the Hawthorne studies is unfortunately a good deal less than he suggests. William Faunce, author of the classic *Problems of An Industrial Society* concludes that the main reason why a more enlightened work policy is not adopted in the U.S. is because management still believes that "*a committed (i.e., non-alienated work force is not a condition for success of bureaucratically ordered organizations*" (p. 153, emphasis in original). Maybe the Japanese have caught on to what sociologists have been saying for years, but American management has not. Rifkin is right—what we need is a revolution in consciousness around here.

In short, I agree with Rev. Joseph that Rifkin's book is important, and I agree that it is flawed, but I don't agree with all the flaws Rev. Joseph points out in his review.

Let me add this unrelated point: if we can agree that an indication of the degree of intellectual vitality present in a scholastic society is the degree of controversy demonstrated in the letters to the editor section of their journal, then the ASA is in desperate need of resuscitation. If judged by this standard, the membership of ASA can be evaluated as placid—which in this case, is not a compliment. My request: read the articles, reviews, etc.—and respond. As a representative example, I have written a number of articles for this journal, often expressing views which are controvertial (I'm not sure I even agree with me), yet never has there been any personal or public response. Responsible debate isn't an act of unkindness; it shows that we are alive and that we take our jobs seriously.

Richard Perkins
Department of Sociology
Houghton College
Houghton, New York 14744

The kinds of statements that I heard at CONAES (Committee on Nuclear and Alternative Energy Systems) might not seem strange to you, but I want to repeat them because they are very strange. In the Risk Panel, a well-known risk specialist, in reporting his conclusions, said, "Fifty thousand people die in car accidents every year. We know how to build cars so that doesn't happen. There are X number of people who die in dam breaks, from household accidents, and from various other accidents. We know how to prevent those deaths. If we prevented those deaths, then we could afford to have a nuclear disaster." I understood why, when I came home from this work, I would head for the shower before I would greet my children. That kind of thinking is truly polluting.

Laura Nader, Professor of Anthropology, University of California, Berkeley, "Barriers to Thinking New About Energy," *Physics Today*, February 1981, p. 100.

Founded in 1941 out of a concern for the relationship between science and Christian faith, the **American Scientific Affiliation** is an association of men and women who have made a personal commitment of themselves and their lives to Jesus Christ as Lord and Savior, and who have made a personal commitment of themselves and their lives to a scientific description of the world. The purpose of the Affiliation is to explore any and every area relating Christian faith and science. The *Journal ASA* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community.

A closely affiliated organization, the **Canadian Christian and Scientific Affiliation,** was formed in 1973 with a distinctively Canadian orientation. The **CSCA** and the **ASA** share sponsorship of the publication. **CSCA** subscribes to the same statement of faith as the **ASA** and has the same general structure. However, it has its own governing body with a separate annual meeting in Canada.

Members of both organizations endorse the following statement of faith: (1) *The Holy Scriptures are the inspired Word of God, the only unerring guide of faith and conduct.* (2) *Jesus Christ is the Son of God and through His Atonement is the one and only Mediator between God and man.* (3) *God is the Creator of the physical universe. Certain laws are discernible in the manner in which God upholds the universe. The scientific approach is capable of giving reliable information about the natural world.*

Associate Membership is open to anyone with an active interest in their purposes. *Members* hold a degree from a university or college in one of the natural or social sciences, and are currently engaged in scientific work. *Fellows* have a doctoral degree in one of the natural or social sciences, are currently engaged in scientific work, and are elected by the membership. *Dues:* Associate $18.00, Member $24.00, and Fellow $32 per year. A member in any of these three categories can take the *special student rate* of $8.00 per year as long as he is a full time student.

EXECUTIVE DIRECTOR:
ROBERT L. HERRMANN, P.O. Box J, Ipswich, Massachusetts 01938.

EDITOR, AMERICAN SCIENTIFIC AFFILIATION NEWS:
WALTER R. HEARN, 762 Arlington Ave., Berkeley, California 94707.

INDICES to back issues of the *Journal ASA* are published as follows: Vol. 1-15 (1949-1963), *Journal ASA* 15, 126-132 (1963); Vol. 16-19 (1964-1967), *Journal ASA* 19, 126-128 (1967); Vol. 20-22 (1968-1970), *Journal ASA* 22, 157-160 (1970); Vol. 23-25 (1971-1973), *Journal ASA* 25, 173-176 (1973); Vol. 26-28 (1974-1976), *Journal ASA* 28, 189-192 (1976); Vol. 29-32 (1977-1980), *Journal ASA* 32, 250-255 (1980). Articles appearing in the *Journal ASA* are abstracted and indexed in the CHRISTIAN PERIODICAL INDEX and in RELIGIOUS AND THEOLOGICAL ABSTRACTS. Present and past issues of the *Journal ASA* are available in microfilm at nominal cost. For information write University Microfilms, Inc., 300 North Zeeb Road, Ann Arbor, Michigan 48106.

LOCAL SECTIONS of the American Scientific Affiliation and the Canadian Christian and Scientific Affiliation have been organized to hold meetings and provide an interchange of ideas at the regional level. Membership application forms, publications and other information may be obtained by writing to: AMERICAN SCIENTIFIC AFFILIATION, P.O. Box J, Ipswich, Massachusetts 01938, or CANADIAN CHRISTIAN AND SCIENTIFIC AFFILIATION, P.O. Box 386, Fergus, Ontario, N1M, 3E2.

CENTRAL CALIFORNIA
CHICAGO
DELAWARE VALLEY
GUELPH, ONTARIO
GULF-SOUTHWEST
INDIANA
NEW ENGLAND
NEW YORK CITY AREA
NORTH CENTRAL (Minnesota)
OREGON
SAN DIEGO
SAN FRANCISCO BAY
SOUTHERN CALIFORNIA
TORONTO
WASHINGTON-BALTIMORE
WESTERN MICHIGAN
WESTERN NEW YORK

"Upholding the Universe by His Word of Power" Hebrews 1:3

VOLUME 33 NUMBER 4 DECEMBER 1981