

# PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

In this issue . . .

Scientific Truth

Biblical Humanism

So, You Want to Be a Science Professor!

21 Years After "The Historical Roots of  
Our Ecologic Crisis"

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

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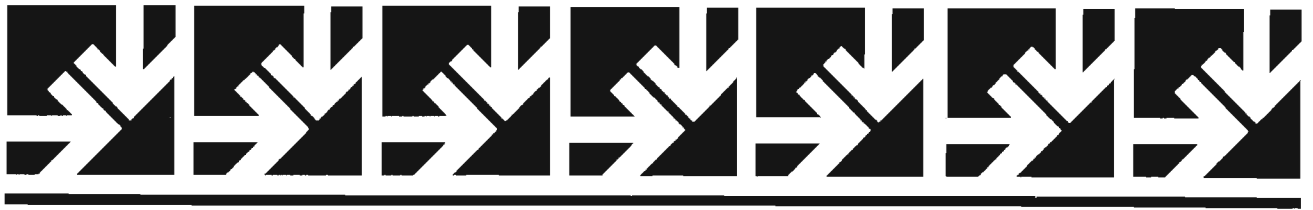
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## *Putting Things in Perspective*

It is not certain whether, in his interrogation of Jesus, Pilate was serious or jesting when he asked: "What is truth?" (John 18:38). We do know that down through the ages human beings have asked that question in jest and ridicule as well as with serious concern about the true nature of things. Certainly, as we wrestle with the meaning of "truth" in the realm of science and Christian faith, it is obvious that the concepts of both scientific truth and biblical truth are all too often oversimplified and distorted in many subtle ways. In the lead paper in this issue, Robert Fischer analyzes "the concept of truth as it is encountered in everyday communication and in its philosophical significance." He examines how the several aspects of truth relate to science and to the biblical Christian world view.

Many Christians today are rightly concerned with "secular humanism" which raises humans to the level of God and essentially eliminates God from human life. Such a "humanism" is unbiblical and reflects a serious ungodly arrogance. W. Jim Neidhardt reminds us, however, that there is a biblical humanism which recognizes the sovereignty of God *and* the special place God has granted to human beings in His creation. Using James Clerk Maxwell as his model, he discusses biblical humanism and suggests how it "can be modified to meet the more complex, societal needs of our time."

In addition to our need to learn more about subjects such as truth, humanism, and a variety of science/faith issues, we also need to come to grips with some of the frustrating problems of the real world of everyday life. This is true whether we are in academia, government,

or industry. It is particularly true when we are counseling young people, whether in school, church, or family. We in ASA, as well as people in campus Christian ministries, recognize the validity of encouraging some of our youth to become "science professors," but we need to do this in an honest manner, to indicate the frustrations as well as the glamor. Richard Bube, a long-time researcher and college professor, describes some of the not-so-pleasant aspects of academia today. However, he concludes that "participation in a major research university can be an exciting and rewarding activity," even though as Christians we need to periodically reassess our professional careers as to God's will for our lives.

In 1967, historian Lynn White published his much-quoted paper on "The Historical Roots of our Ecologic Crisis," in which he attributed the basic cause of environmental deterioration to "orthodox Christian arrogance toward nature." Christians have responded in various ways: by denying Christian guilt, by pointing out the culpability of other religions, or by the admission that there is some truth to White's charges. Some, unfortunately, have responded by denying that there are environmental problems and attributing the whole situation to an imagined neo-Malthusian plot. Joe Sheldon gives us a chronological analysis of Christian attitudes, both before and after White (1967). He emphasizes the need for Christians to show concern for God's handiwork and how many have done so.

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# Scientific Truth: A Case Study Within the Biblical Christian World View

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*The meaning of truth is considered, as the term is used in common discourse, in philosophical analysis and in the processes of science. Within the biblical Christian world view, God Himself is truth. Our awareness and understanding of biblical truth and of scientific truth are based upon our study of His special and general revelations to mankind. All truth, including all valid biblical and scientific truth, is coherent because it is rooted and grounded in the God of the Bible.*

The intent of this paper is to attempt to contribute to a clarification of the identity of the biblical Christian world view, and thereby to expand our comprehension of its awesome greatness. The plan of this paper is to consider the meaning of the concept of truth as it is encountered in everyday communication and in its philosophical significance, to list several aspects of truth as it is encountered in the methodology and content of science, and to identify the significance within the biblical Christian world view of truth in general and of scientific truth in particular.

## The Meaning of "Truth"

### *In Common Discourse*

"Truth" is one of many words that are used frequently in everyday thinking and communication that have meaning but are hard to define. Dictionary definitions are helpful but not fully satisfying. They

include, for example, "the body of real things, events and facts," "agreement with facts," "conformity to fact or actuality," "correspondence with facts or with what actually occurred." All four of these expressions include the word "fact," a concept which is equally hard to define as are the concepts of realness and actuality.

Fortunately, even though it is difficult to define truth rigorously, there is a common understanding of what the term signifies. Somehow, a principle which is true is one that has rightness rather than wrongness. Somehow, a truth is consistent with other truths rather than being contradictory to them. Somehow, that which is true is not false; it is somehow correct and not erroneous. To be sure, the word truth is at times used loosely and even inconsistently in everyday discourse. Nevertheless, it represents a concept that is useful and meaningful when interpreted and understood in the context in which it is used.



*In Philosophical Analysis*

The meaning of the concept of truth has been the subject of philosophical analysis for hundreds of years, even for thousands of years. Shils has brought a historical perspective to bear on this point: "Over 2,000 years ago, of course, Plato already found it necessary to defend the concept of truth against the Sophists; at the purely philosophical level, the new sceptics are still employing the arguments of their Greek predecessors. . . . Yet whatever view we finally take about that still-controverted question of what truth consists in and how it is to be recognized, it takes a hardy sceptic to deny that over the centuries human beings have built up a body of reliable information."<sup>1</sup>

In further comment on the situation over the centuries and up to our own era, Clark has summarized the continuing difficulty encountered in philosophical analysis of the meaning of truth in these words: "And of all people the philosophers, who have paid the most attention to these enigmas, are in greatest disagreement . . . perhaps a source of truth does not even exist . . . or at least no one knows where it is."<sup>2</sup>

O'Connor expressed a similar conclusion in discussing the concept of "fact" by stating that very few philosophers would even attempt a definition. He then proceeded to note the other side of the coin, so to speak, by suggesting that there is no need to do so. "It might be said that we all know what a fact is," or at least we think we do, and may be entirely justified in accepting a "vague, pre-analytic notion of it."<sup>3</sup>

The meaningful usefulness of the concept of truth, even without a generally accepted precise definition, is further elaborated upon by Polanyi and Prosch: "Ideals as scientific truth, justice under the law, and good art cannot be given concrete definition . . . what they are is simply what all members of each relevant group are striving together to delineate. Truth, for instance, is given specific form only as the community of scientists

is free to work out what its form is, and this task is never finished."<sup>4</sup>

It may appear to be a bit paradoxical to claim, on the one hand, that it is not possible to define truth in a way that is precise and satisfying and, on the other hand, that the term may be used meaningfully in everyday communication and in scholarly discourse. In an effort to resolve this seeming paradox, let us turn our attention to some general criteria for assessing truthfulness, within the "vague, pre-analytic notion" of what truth is.

*General Criteria of Truth*

Without some general criteria for truth, we would be engulfed in an anarchy of claim and counterclaim, and the very concept of truth would be meaningless. Fortunately, an analysis of the scholarly literature on this subject, and observation of how the concept is used in common discourse as well, indicate that there indeed are some criteria that make the concept of truth meaningful and useful.

So let us note briefly two general, alternative criteria for truth, which we will then use in subsequent sections of this paper as we make more specific comments upon scientific truth and upon truth within the biblical Christian world view. We will take both of these criteria from a summary of the scholarly literature, as reported by Frank.<sup>5</sup> He listed two general criteria for truth, either one of which is generally sufficient to cause persons to accept a principle or a statement:

1. It is logically derivable from self-evident, clear, intelligible principles.
2. It can be used to derive results which can be checked by observation.

It may be noted right away that the two are opposites of each other, in the sense that truth is based in one upon its origin and in the other upon its consequences.



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Within criterion (1), the authority is to be found in the identity of the principles and in the logic of the derivation from the principles. With respect to the principles, controversies have raged for centuries as to whether or not there really are principles which are clear, self-evident and intelligible—in brief, over whether there is any ultimate structure or coherence to the universe. If there is no such coherence, criterion (1) is surely not valid. To state it differently, if a principle is not true itself, there would be no reason to assume that anything derived from it would be true.

With respect to the logic of derivation, there has been controversy as well. There are varied systems of logic, although essentially all of them agree on the meaning of such basic concepts as consistency and contradiction. Therefore, it would appear that criterion (1) falls short of being totally valid as a means of assessing truth. Nevertheless, imperfect as it may be, it is of some significance and is unavoidable as a working tool as people live out their lives individually and collectively.

The authority within criterion (2) is to be found in the testing, in the observation, and in the necessity of interpretation of that which is observed. There are basic weaknesses or uncertainties in all three of these areas. Even more basic, however, is an inherent weakness pointed out in the thirteenth century AD by Thomas Aquinas in his *Summa Theologica* and by others both before and since that time: this criterion can never be absolute, never totally convincing, simply because a positive confirmation indicates only that the postulated truth *may* be right, not that it *must* be right. Or, to state it differently, the more the tests and observations that have been made, and the more convincingly the consequences of each one appear to corroborate the postulated truth, the more strongly we believe it to be true, but we can never totally prove it.

With either or both criteria, the truth is necessarily formulated and stated in words, in numbers, and/or in other technical indicators, and this adds another dimension of vagueness to any truth-statement. Words are symbols and thus have no absolute meaning within themselves. The significance and meaning are to be found in that which the words represent, not in the symbols *per se*. Thus, words must be interpreted if they are to be meaningful, so any word-statement of truth is a symbol of truth and not the truth itself. Numbers, too, can be an additional source of uncertainty in any statement of truth. Apart from the counting of discrete objects, all numbers represent comparisons to some defined standards (length, weight, time, *etc.*), so there is at least some plus or minus uncertainty in any numerical statement of a truth.

In summary, there are general criteria for truth.

They may not lead clearly and unequivocally to absolute truth, but even so they do lead to conclusions that may be accepted with confidence as truth, and which may be useful and meaningful in the minds of people.

## Scientific Truth

### *Methodology and Content of Science*

The methodology and the content of science are described, of course, in considerable detail in many places and by many authors. So a few brief comments will suffice as we begin our consideration of scientific truth.

Science may be defined as “the body of knowledge obtained by methods based upon observation.”<sup>6</sup> Four implications of this definition are important in ascertaining the meaning of the concept of scientific truth.

First, the practice of science is a human activity. It is human beings who do the observing, employ the methods, and gain the knowledge. Second, there is an authority in science that is external to the scientists. This authority is, in effect, the realm of nature, of matter and energy, for it is in that realm that their human senses enable human beings to make observations. (This is basically valid in the social and behavioral sciences as well as in the physical and biological sciences, although this point will not be discussed further in this paper.) Third, there is an inherent limitation to science. Anything that is outside of or beyond that realm is, in principle, outside of or beyond the bounds of science. Fourth, there is a building upon the authority of science. The methods are based upon, not limited to, observation.

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*If a principle is not true itself, there would be no reason to assume that anything derived from it would be true.*

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As human beings engage in the practice of science and come to the realm of matter and energy, they bring with them a theory or concept to be tested. It may already be quite specific and refined, or it may be little more than a mere hunch or a wild guess or an expression of curiosity. It may have arisen from any conceivable source. These human beings also bring with them a composite of mindsets and presuppositions, which may have been developed consciously and with considerable confidence, or which may be very vague and perhaps

even outside the awareness of the person involved. Human beings then gain impressions of what has been observed. They give expression to these impressions in the data that have been collected, and in statements expressed in words and numbers and other symbols.

The impressions and expressions and data are interpreted in the form of scientific explanation. Scientific explanation consists essentially of cause-and-effect relationships within the realm of matter and energy. This interpretation includes assessment of whether the "theory" that entered into the process is corroborated or contradicted. If corroborated, it can be believed and accepted with even greater confidence. If contradicted, it is thereby made subject to possible modification or even rejection. If neither corroborated nor denied, the test has not been fruitful, at least not with respect to the goal to do so. Most frequently, this assessment does not result strictly in corroboration, contradiction, or in complete irrelevance, but rather in some partial combination of these alternatives. Accordingly, the process is repetitive and cyclical, as the human beings go back and forth among postulated theory, observation, and interpretation.

## Truth in Science

Let us now consider the meaning of truth in science by suggesting several of its characteristics, all of which flow from the two general criteria for truth as they relate to the methodology of science.

(1.) In an ultimate sense, the authority within science, and thus truth in science, lies in the realm of matter and energy and not in any human interpretation of what is there. As stated by Polanyi: "Scientific discoveries are made in the search for reality . . . of a reality that is there, whether we know it or not. The search is of our own making, but reality is not. . . . For the scientist's quest presupposes the existence of an external reality."<sup>7</sup> Einstein is quoted as having stated: "The belief in an external world independent of the perceiving subject is the basis of all the natural sciences."<sup>8</sup> Bube has stated succinctly: "Truth (is) that which conforms exactly to ultimate reality, to that which is."<sup>9</sup> Thus, scientific truth is that which conforms to the reality of the realm of matter and energy, and science *per se* is limited to that which is there in this realm.

(2.) In a sense which is pragmatic and less than ultimate, scientific truth is to be found in the content of scientific knowledge. There is a sense in which scientific explanation, the generalizations and the scientific laws developed in the building of scientific knowledge, may be considered to be true. In this way, something is scientifically true if it produces order in past observa-

tions and has been found to predict correctly the results of further observations. This is the second of the two general philosophical criteria for truth listed above, and it is the usual meaning of the term "scientific truth." Thus, the term scientific truth often is very significant and meaningful, even though it is never absolute in the sense of being ultimate truth. Even a statement of scientific explanation that has been positively corroborated by many observational tests is subject to refinement and/or to other change. We should note here that some philosophers of science raise objection to using the word truth for anything other than ultimate or absolute truth. For example, Popper stated his preference to simply avoid the use of the concept of truth in scientific work, preferring rather to use such expressions as "logical consideration of derivability relations" and "corroboration or contradiction of accepted basic statements" in place of what others refer to as scientific truth.<sup>10</sup> Nevertheless, there is no disagreement with the significance of the concept represented, only with the choice of words to represent it.

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*Words must be interpreted if they are to be meaningful, so any word-statement of truth is a symbol of truth and not the truth itself.*

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(3.) Scientific truth is necessarily relational in its scientific content and its application. There is a coherence to scientific truth in that one scientific truth cannot contradict another. To be sure, there may be at any point in time apparent contradiction between two understandings or expressions of scientific truth, but that is only because of their imperfection.

(4.) Scientific truth deals with ranges of magnitudes of size, time, *etc.*, that extend far beyond the ranges of human perceptions and normal mindsets. This means that tools of observation must be used, and this introduces additional factors into the interpretation of observations. It also means that "model-building" is useful, at times even essential, in the thought processes of scientists and in their statements of scientific explanation. This introduces the need to recognize continually that the model is not the real thing.

(5.) In the pragmatic meaning of truth in science, it is often necessary to oversimplify a complex reality in nature in order to express it with meaningful understanding. An approximation is not untrue simply because it is not precise, as long as it is clearly identified as being an approximation.

(6.) As with other truths, a statement of scientific truth is in words, numbers, and other specialized symbols. Thus, there is always a danger that it may be interpreted differently by persons who try to communicate with each other. Indeed, the use of technical terminology often makes it difficult, even virtually impossible, to communicate that which is scientifically true within a specialized area of subject matter to persons who are not experts in the terminology of that area.

(7.) Scientific truth is not necessarily the totality of truth as it relates to any particular item of subject matter. There are, conceivably at least, alternative ways of looking at anything, even at things and events within the realm of matter and energy. For example, a physical scientist, an artist, a philosopher, a theologian, and a lay person who is none of these, can look at the same sunset over the ocean, and see it and describe it very differently without any of them being untruthful in doing so.

## Truth in the Biblical Christian World View

### *Identity of the Biblical Christian World View*

The biblical Christian world view may be defined as the "overall comprehensive view of all reality based upon the transcendent and immanent God of the Bible as the one primary, independent fact." The words "all reality" signify that this view includes all time past and present and future, all space, all of the realm of nature and all matter and energy of which it consists, all of the realm of the supernatural to whatever extent it exists, all people, all else that exists or ever has existed or ever will exist. The designation of the God of the Bible as the one primary, independent fact signifies that all else is secondary and dependent. It further signifies that nothing that is secondary and dependent can be viewed correctly unless it is viewed in consistency with that which is primary and independent.

How is it possible, if it is possible at all, for human beings who are secondary and dependent to have any knowledge of the God who is primary and independent? It would seem that there is no possible way, apart from whatever God has revealed of Himself to human beings. Those of us who accept the biblical Christian world view as valid believe that this is precisely what God has done, and that the methods and timing have been of His own choosing and at His own volition.

We further believe that He has chosen two means of doing so, commonly referred to as "special revelation" and "general revelation." Special revelation consists of the Bible. God Himself is the primary author, having worked through the intermediary of several human authors whom He has chosen and moved to accomplish

this purpose. General revelation consists of the realm of nature, created and sustained by God and observable by human beings within it. Within the biblical Christian world view, both the Bible and the realm of nature exist with a reality that is not rightly explainable apart from God Himself. The Bible refers in many places to these two means whereby God has revealed Himself to mankind, for example: Psalm 19, Romans 1, Hebrews 1:1, II Timothy 3:16, and II Peter 1:21.

### *Ultimate Truth*

What is the meaning of truth in the biblical Christian world view? Where is truth to be found? Where and how do human beings have access to this truth? The answer is both simple and deeply meaningful—God Himself is truth. He is ultimate truth, absolute truth. God is the source of truth, and He Himself is truth.

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*"Model-building" is useful, at times even essential, in the thought processes of scientists and in their statements of scientific explanation.*

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We know this because God, the one primary and independent fact, has revealed it to us. He has revealed it to us in the Bible. Christ, who was the eternal God incarnate in time and place, repeatedly referred to Himself as truth; for example, in John 14:16, "I am the way, the truth and the life," in John 8:32 with reference to others knowing Him, "You shall know the truth; and the truth shall make you free," and John 1:14 identifies Christ as "the Lord . . . full of grace and truth." In II Timothy 2:15, the word of God is referred to as "the word of truth." The concept that God is ultimate and absolute truth is not based merely upon these and other isolated biblical statements. Rather, it is fully consistent with, and basic to, the overall thrust of all that God has revealed of Himself to human beings, including both special and general revelation. The assemblers of the historic Westminster Confession have expressed the overall concept that God is truth in this way: "God is infinite, eternal and unchanging in His . . . truth." God, unlike any lesser authority, is fully omnipotent, omniscient, omnipresent, and eternal—He is truth.

### *Biblical Truth and Scientific Truth*

Now, if God Himself is truth, and if He has revealed Himself to mankind in both special and general revelation, it follows that human beings have access to truth through reading, observing, and interpreting that



which is contained in these revelations. In so doing, it is important to recognize the distinction between God as absolute and ultimate truth and human understandings of that truth.

We have already emphasized the need for interpretation as scientists observe in the realm of nature and seek to gain understanding of scientific truth. It is also essential that the written Bible be read and interpreted if one is to gain an understanding of biblical truth. To make this statement is not to downgrade or to cast doubt upon biblical truth. Rather, it is to recognize the nature of biblical truth. Truth is to be found in the Bible, not necessarily in any one interpretation of it, even though interpretations are needed for us to gain understanding of its truths. Geisler and Nix have stated the distinction in this way: "In the ultimate sense, only God can give a revelation or disclosure of truth," and "The truth of Scripture is not to be found in what the Bible *says*, but in what it *means*, in other words, in what it *reveals*, not in what it *records*."<sup>11</sup>

An additional comment may be in order here as to the place of the realm of nature and scientific truth within the biblical Christian world view. God is both the creator of the realm of nature and the sustainer of that which He created. Our human understanding and statements of scientific truth, with all their limitations and imperfections, represent our best explanations of how He provides for and sustains that which He has created.

It is fully possible for human beings to engage in scientific work and to gain scientific knowledge, all without any recognition of the relationship of the realm of nature to the God of the Bible. There is a close parallel in biblical study and theology, because a person can study the Bible and gain theological knowledge, all without any acceptance of the concept that the Bible is anything other than a book of strictly human origins. Indeed, one person can approach the study of either the Bible or the realm of nature with a strictly humanistic mindset and presuppositions, while another may approach either one with a strictly biblical theological mindset, and both may interpret that which they study as confirming their initial mindsets.

## *The Coherence of All Truth*

Both of the general criteria of truth which we noted above involve some measure of consistency of one truth with another truth. In criterion (1), it would only be faulty logic if two or more "truths" derived from the same self-evident principles were to fail to be consistent with each other. In criterion (2), the whole concept of multiple testing with repeated corroboration signifies that a truth must be consistent with other truth.

Within the biblical Christian world view, the unity and coherence of all truth is assured by the reality that God Himself is ultimate and absolute truth. As noted earlier, all but God is secondary and dependent, and so cannot be viewed rightly apart from consistency with God who is primary and independent. Therefore, the biblical Christian world view provides a basis for the concept of the coherence of all truth. All truth, including all valid biblical and scientific truth, is rooted and grounded in the God of the Bible who is absolute truth.

Early church fathers recognized these relationships. Their writings, as reviewed by Holmes, indicated their convictions that all truth is God's truth wherever it may be found, also that all truth is not necessarily contained in the Bible.<sup>12,13</sup> However, it is of extreme importance to keep the right perspective in identifying scientific truth as God's truth. It is not that a scientific truth exists, so it must be God's truth. Rather, it is that God exists, so scientific explanation is true to the extent that it accurately describes relationships within the realm of nature which God has created and which He sustains.

In pressing this point further, it may be noted that this concept does not refer merely to the unity of isolated bits of truth. Much more than that, it refers to coherence within the overall body of established truth. When one wishes to assess the truth of a postulated bit of truth, one looks not only for isolated bits of truth with which there may be agreement or disagreement but also at the overall thrust of the totality of established truth. Clark referred to this point by writing of "divine omniscience, the emphasis on the systematic unity of all truths, and the supposition that a particular truth derives its meaning or significance from the system as a whole."<sup>14</sup> Schaeffer has pointed out that there is a unity of methodology of all truth as well as of its content, by noting that "scientific proof, philosophical proof and religious proof follow the same rules," and then identifying the first of these rules as "the theory must be non-contradictory and must give an answer to the phenomenon in question."<sup>14</sup>

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*All truth, including all valid biblical and scientific truth, is rooted and grounded in the God of the Bible who is absolute truth.*

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In keeping with the purpose of this paper, we have been addressing the subject of truth *in* the biblical Christian world view, and not that of the truth *of* this

world view. However, let me add two brief comments on the latter topic. First, the assessment of the truth of this world view can follow essentially the same path as we have been discussing for assessment of truth *in* it. Second, there is no philosophical, scientific, or theological means of proving unequivocally that this world view is true, nor even that the God of the Bible really does or does not exist. It would appear from what God has revealed that this is intentional on His part, as indicated for example in Hebrews 11:6 "And without *faith* it is impossible to please Him, for he who comes to God must *believe* that He *is* and that He is a rewarder of those who seek Him" (emphasis added—note that the words are faith and believe, not proof and prove). This does not mean at all that faith is a blind guess or wishful thinking, nor that it necessitates proceeding

contrary to evidence. Indeed, many scholars and others have and do conclude that the biblical Christian world view is corroborated, not contradicted, by the totality of the evidence in both special and general revelation. In addition, it is substantiated by the indwelling Holy Spirit, as noted, for example, in I Corinthians 2:10–16.

The plan and the intent of this paper were noted at the beginning. I have endeavored to follow the plan, and I trust that the intent has been accomplished. From a very personal standpoint, I can testify that my own years of study and work as a physical scientist, along with concurrent study and involvement in the biblical Christian world view, have contributed tremendously to my own awareness and appreciation of the greatness of God.

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*We shall not cease from exploration  
And the end of all our exploring  
Will be to arrive where we started  
And know the place for the first time . . .*

*And all shall be well and  
All manner of things shall be well  
When the tongues of flame are in-folded  
Into the crowned knot of fire  
And the fire and the rose are one.*

T.S. Eliot, *Little Gidding*.

# Biblical Humanism: The Tacit Grounding of James Clerk Maxwell's Creativity

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*Secular humanism, in its insistence that the proper focus of study is humankind alone, has denied a vital dimension of human experience that provides the motivating and integrating drives necessary to inspire genuine scientific and artistic creativity. Biblical humanism restores what is missing in secular humanism by its insistence that true humanism is always defined in a realist context as openness to the totality and richness of all human experience including the religious dimension. It points humankind not only to what is beyond itself but to the full exploration of external reality, thus bringing into being science, technology and art. A four-stage developmental model of biblical humanism is discussed and illustrated by an extended discussion of a great biblical humanist, James Clerk Maxwell. Some suggestions are made as to how Clerk Maxwell's biblical humanism can be modified to meet the more complex, societal needs of our time.*

## Introduction

Secular humanism, in its insistence that the proper focus of study is humankind alone, has denied a vital dimension of human experience that provides the motivating and integrating drives necessary to inspire genuine scientific and artistic creativity. If, as in Orwell's 1984, reality is defined by men (leaders of the state), then science can no longer hope to discover limited but real truth with respect to an external reality that exists in some sense independent of human observers. Instead, science becomes merely the formulation of

clever "game plans" about man-made arbitrary, hypothetical structures. Such a notion of "science" is no longer a true exploratory activity embedded in curiosity and wonder. Yet, without these latter aspects true human motivation is lacking and, although some minor discoveries may be made because of utilitarian considerations, science as truly creative exploration will eventually die out. Science is above all a human enterprise, concerned with far more than the creation of useful devices; it is a search for truth, a search which such

innovative pioneers as Einstein recognized to be an essential aspect of what it means to be truly human.

Biblical humanism<sup>1</sup> restores what is missing in secular humanism by its insistence that true humanism is always defined in a realist context as openness to the rich totality of all human experience including its religious dimension. It points humankind not only to what is within the human self but to the full exploration of what lies beyond in external reality. Such an exploration of external reality humbles any honest scientist or artist, for it awakens a sense of awe with respect to external reality's stability of structure and pattern which has the capacity to reveal itself in always new and unexpected ways that are inexhaustible in scope. Through encounter with external reality, including relationships with other people, a person becomes receptive to the biblical insight that the variety, richness, rationality, and unity of human experience points beyond itself to a transcendent, personal dimensionality which is its ground and guide. The Bible reveals that this transcendent, personal grounding of human experience has as its source the creative activity of the Triune God—Father, Son, and Holy Spirit. This living God, a unitary community of divine personal love, is the creator and sustainer of the universe and each person in it. Perceived through the "ears and eyes of faith," the Creation is not God but has imprinted in it the trace of His personal nature. God's personal nature as divine, intelligible love thereby becomes the ground for the form, being, and ultimate meaning of the universe and its creatures. The rationality intrinsic to that form and being is revealed in the biblical insistence that God created and maintains pattern and consistency in the universe with its diversity of form and materials. Thus science, technology, and art are made possible. From this perspective human creativity is seen to be subcreativity; i.e., creativity under God, a creativity within the realm of nature using the potentiality in nature to create new entities. Humankind, made in God's image, uses God-given rational and intuitive abilities to discover hidden likeness in created reality

and to bring into being possibilities that reside in what God has already made.

### A Developmental Model of Biblical Humanism

A developmental model of biblical humanism is illustrated in Figure 1. By development is meant the unfolding and the re-enfolding of human resources and potentials so that *qualitative* changes occur in the way that humankind perceives, understands, shapes, and modifies the universe being encountered. Development should be contrasted with growth, which is merely a change in quantity as in an expansion; i.e., humankind is aware of more facts as time passes. It should be noted that growth and development are sometimes used interchangeably in scientific and educational literature.

Some developmental structure is necessary for any model of a healthy biblical humanism in order for it to faithfully represent the richness of human experience as it encounters the inexhaustibility of God's Creation. Biblical humanism encounters reality in a dynamically responsive and adaptive fashion; in such encounters reality can even be modified within the bounds of its own invariant law structures. It is this developmental structure inherent to any biblical humanism that gives it its progressive character. From a Judeo-Christian perspective, God's creative activity toward all Creation is dynamic and purposeful. Biblical humanism's developmental structure, grounded in humankind bearing God's image, reflects this key attribute of divine-personal agency: God's purposeful dynamism. Thus, biblical humanism's developmental structure is, in an ultimate sense, sustained by God's creativity.

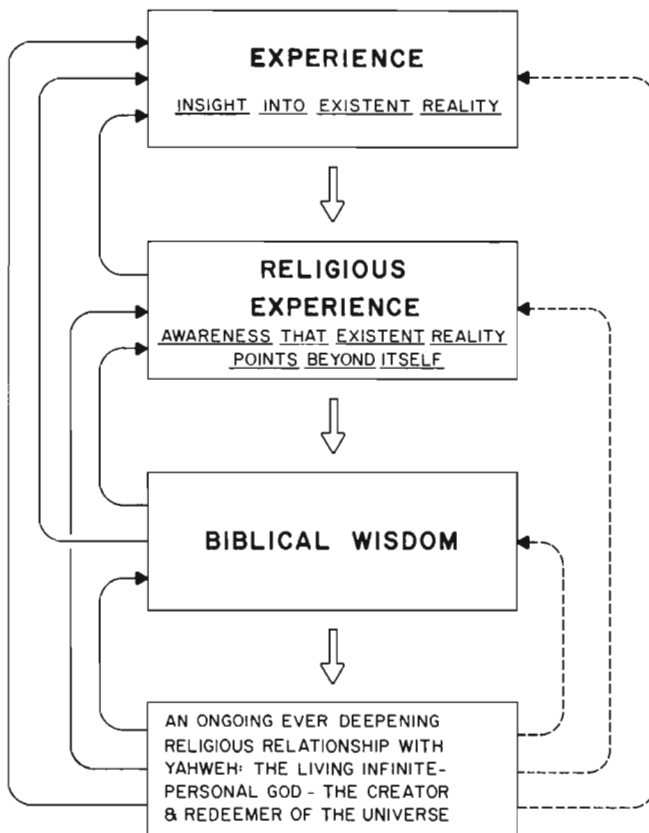
This model emphasizes that as a person is open to and reflects upon experience (level 1) one develops in knowledge and understanding, and thereby becomes open to religious experience (level 2) as it is recognized that existent reality has a transcendent dimension; it always "points" beyond itself. Such religious experi-



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ence, grounded in and a consequence of God's grace, leads to an acceptance of biblical wisdom (level 3) and this biblical insight guides a person into a full, ever-deepening, ongoing dialogue with God (level 4). Further, the religious and higher stages can feed back to the lower stages thereby maintaining a healthy biblical humanism that can continue to develop. In particular a deep relationship with God and the biblical insights that led to that understanding can provide motivating concepts that when fed back will broaden one's exploration of external reality at all experience levels. A specific example of how biblical insights have enriched and can enrich scientific exploration by natural scientists is provided next to illustrate the fruitfulness of this approach. It is particularly striking to me that the physicist, James Clerk Maxwell—a true biblical humanist in every sense of the word—was one of the first scientific investigators of feedback mechanism as a means of controlling system behavior. For it was the feedback of his deeply held, Christian convictions in all areas of his life that, in particular, motivated Clerk Maxwell to incorporate heuristic analogies of a theological nature as vital components of his far-ranging explorations of physical reality. Thus, Clerk Maxwell's scientific creativity exemplifies the feedback model of biblical humanism proposed in Figure 1.

Before continuing, it may be helpful to state why I



believe that feedback mechanisms are a necessary component of any model of biblical humanism's developmental structure. If biblical humanism is a viable, creative response to God-given reality it should be progressive, that is, always characterized by stable development. Indeed, one well-known system theorist has put this point well in the title of his book describing the nature of all living, adaptive systems: *Grow or Die*.<sup>2</sup> And, as this book points out in great detail, all healthy biological systems develop due to the establishment of a unique combination of positive and negative feedback with information storage. Positive feedback plays an enhancing, nurturing role in the emergence of more complex, information-laden, living structures; negative feedback provides much needed stability so that the developmental process does not grow out of control in an explosive fashion.<sup>3</sup>

#### An Example of Biblical Humanism: The Life and Work of James Clerk Maxwell—Relational Concepts in Christian Theology and Natural Science

A classic example of biblical humanism is found in the life and work James Clerk Maxwell, the great Scottish physicist and Christian.<sup>4</sup> As a boy he roamed over the hills and fields of the beautiful Scottish countryside, and through these experiences he developed a

Figure 1. A four-stage developmental model of biblical humanism (with respect to a human knower—a personal knower). The feedback loops (solid arrows) maintain the healthy growth of biblical humanism in the personal knower. The feedback loops from God can also represent the grace of God "short circuiting," the developmental process by bringing about a sudden conversion to God at one of the earlier stages. Let me emphasize that God's freely given grace is *always* present as He continually, creatively, and dynamically holds in being all the structures of the developmental process. The dashed arrows represent this tender, fathering activity of God as He brings into being and maintains the health, stability, and progressiveness of the developmental structure intrinsic to biblical humanism (for a single person and larger societal groups).



passionate love of nature in all its richness and variety. Even as a boy he sought to discover modes of connection embedded in nature; as an example, he was deeply puzzled by the question of how an apple turned red under the impact of light.

His boyhood was also embedded in religious experience as his father and mother, who were evangelical, taught him to trust in Jesus Christ, in a very personal way, as God incarnate in a concrete human being who was intrinsically related to the natural order including other human beings—his disciples, strangers, even his enemies—and who continues to be related to us through the living presence of His Spirit.

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*From a Judeo-Christian perspective,  
God's creative activity toward all  
Creation is dynamic and purposeful.*

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These boyhood experiences of the unity and variety inherent to nature—physical and biological—coupled with the deeply personal Christian love his parents shared with him, motivated Clerk Maxwell to truly respect the biblical insights concerning the nature of created reality and humankind's place in it. This motivation caused him to search the Bible carefully in order to discover its profound wisdom which led to an ongoing relationship with the living God. This totality of experience was then *fed back* into all his further attempts to explore and penetrate more deeply into the rich variety of relationships of which nature is composed. In all aspects of his life, Clerk Maxwell linked together his understanding of the God he knew by faith in Jesus Christ with his experience of how created reality behaved. God in Jesus Christ created the world in his own wisdom; hence, the wisdom from which a Christian learns is the same kind of wisdom that one will find in all aspects of created reality, biological and physical. Thus, Clerk Maxwell's understanding of God the Creator as manifested in Jesus Christ came to exercise a regulating influence over all of his thought. This very biblical regulative insight became a reference from which he tested all of his scientific theories. He thus came to investigate the possibility that the created universe possesses a dynamic and relational rather than static order due to the dynamic, relational nature of its Creator—the Triune God: Father, Son, and Holy Spirit—whose ultimate being is grounded in an active, interpenetrating, interpersonal, loving relationship. It was this deeply held regulative conviction that motivated him to explore more fully dynamic rather than static ways of understanding nature's inherent order.

In particular he looked for a deeper way of interpreting nature that was not linked to the classical, Newtonian notions of mechanical necessity as manifested in isolated particles interacting causally with one another. This led Clerk Maxwell as a mature scientist to develop his theory of the electromagnetic field which brought about a seminal paradigm shift in scientific understanding. In this theory, the field concept was first formally articulated as a relational way of describing particles as never separable from their interactions. The relationships between particles as represented by the continuous, space-filling electromagnetic field were an *intrinsic part of what the particles really are*. Thus, this relational notion of fields of radiation and their structure became an independent reality in their own right. As Thomas F. Torrance puts it: "... the relations he (Clerk Maxwell) referred to were not just imaginary or putative but *real* relations, relations that belong to reality as much as things (particles) do, for the inter-relations of things are, in part at least, constitutive of what they are. Being-constitutive relations of this kind we may well speak of as 'onto-relations'."<sup>5</sup>

This field notion concerning physical reality introduced by Clerk Maxwell is heuristically analogous to the biblical concept of the *person* which was developed by the early Church Fathers in order to understand the biblical evidence pointing to the triune nature of God. Central to the biblical understanding of the person is the *reality of human relationships as an integral part of what persons really are*. You as a person are not an isolated individual, like the Newtonian particle separated from other autonomous particles. Rather, you as a person are interrelated with others, your parents, your friends, even people with whom you disagree. These *interrelationships constitute the very stuff of personal being*. Thomas F. Torrance suggests this Christian theological understanding was a possible motivating factor in creating Clerk Maxwell's deep appreciation for Michael Faraday's interpretive vision of charged particles or magnets being interrelated to one another by invisible lines of force which fill all of space.<sup>6</sup> If Torrance is correct, this deep appreciation led to Clerk Maxwell's development of the electromagnetic field in order to describe particles as never separable from their interactions.

Thus, insights Clerk Maxwell gained from his ongoing, personal relationship with God were *fed back* into all his experience with the rich complexity of physical reality. And the exploratory reflection that resulted from the feeding back of these biblical notions enabled Clerk Maxwell to make a great advance in humanity's basic understanding of created, physical reality thereby fulfilling a central goal of biblical humanism—the exploration and further elaboration of truth as revealed in God's created reality. Such biblical humanism as

expressed in Clerk Maxwell's life and work manifested itself in a wholeness which is refreshing even to modern critics deeply enmeshed in the impersonal self-centered and individualistic, yet strangely collectivist, strands of this post-Christian age.<sup>7</sup> Indeed, one modern biographer, Ivan Tolstoy, describes Clerk Maxwell's biblical humanism as follows:

Maxwell's letters, poems and essays show that his life had many strands, all important to him, all running deep—religion, philosophy, love of family, a sense of duty to his fellow men and women. But science provided the day-by-day *framework* within which he ordered his existence, and his thought evolved. All his activities were linked; he was strikingly *whole*. His life is full of interesting continuities. A childhood fascination with contrivances, with bell ringers, with the play of light—these grade into adolescent scientific experiments and musings and almost imperceptibly into serious, brilliant and ultimately revolutionary work in mechanics, color theory and electromagnetism. An early sense of wonder and love of nature never left him and broadening as the years went by, led to an appreciation of philosophy unique amongst his scientific contemporaries, which gave his work on electricity and magnetism its depth. The love of philosophy was linked to a streak of empiricism which found expression in what was, by virtue of his upbringing and early environment, the only avenue open to him—a traditional Christian faith. From this stem his social views, archaic as they seem to us; they are well meant and part of coherent *Weltanschauung*. It was all of one piece.<sup>8</sup>

Let me comment on Clerk Maxwell's "traditional" Christian faith and the "archaic" social involvements that flowed from it. The "archaic" social views to which Tolstoy alludes appear to be Clerk Maxwell's acceptance of traditional political systems; i.e., his refusal to become deeply involved in such things as radical socialist politics. I would affirm that Clerk Maxwell's Christian realism is still a timely (but not "trendy") reaction to the societal problems of his age. Of course these issues must be rethought in the context of today's much more complex social struggles. Clerk Maxwell's Christian realism, in my opinion, is far more revolutionary than anything proposed by either the most up-to-date political science department or, at the other extreme, the far Right. Clerk Maxwell was truly a deep and creative thinker, as any great physicist must be if he is able to penetrate into the inexhaustible core of physical reality in order to reveal the rich subtleties and inner harmony associated with even "mere" matter. (As Einstein put it, commenting on the God of nature: "God does not wear his heart on his sleeve," and "God is very deep but never devious."<sup>9</sup>) Clerk Maxwell's creativity may be looked upon as a profound personal *integration*, a bringing together of *tenacity*, the ability to hold on to basic convictions concerning reality, and *openness*, the ability to be receptive to new ideas concerning reality. Symbolically, this may be represented as {tenacity} ⇌ {openness}. This integration is a helpful model for gaining insight into all forms of human creativity.

Clerk Maxwell applied his God-given ability as a creative thinker to his understanding of how a Christian should relate to society in terms of Jesus's remark concerning all disciples in the Sermon on the Mount: "You are the salt of the earth, but if the salt has become tasteless how will it be made salty again?" As Clerk Maxwell realized from his own creativity in physics, thought and action are profoundly integrated. He loved and excelled in both experimental and theoretical physics where: {praxis} ⇌ {theory}. Accordingly, his Christian perspective motivated him to involve himself personally in teaching applied science to working class people in order that they could understand and work better with the new technologies of the day (in particular the new electricity-based industrialization). This personal involvement of a great scientist expressed as a willingness to give of his time may well have inspired some workers to study more seriously than if they were being taught by a teacher assigned this task by some collective agency, a teacher who saw this assignment as "just a job" with no personal commitment to those being taught. In his more scientific activities, Clerk Maxwell's personal sense of duty toward editing the work of other scientists could have inspired some of his colleagues to have greater dedication to science seen as a cooperative venture where each scientist builds upon and depends upon the work of others. Clerk Maxwell would have thought today's "star system" of research very odd. Is it not possible that Clerk Maxwell's taking valuable time from his own scientific creativity may have even *spurred* his creativity on by providing time for his mind to assimilate basic concepts (incubation

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*Clerk Maxwell realized from his own creativity in physics: thought and action are profoundly integrated.*

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periods of rest), also exposing him to the stimulus of novel and often practical problems which alerted his active mind to new concepts and analogies (cross-fertilization of ideas)? Thus, the apparent drudgery of routine academic assignments may actually have stimulated new ways of thinking in Clerk Maxwell's very holistic mind. In short, Clerk Maxwell's biblical humanism expressed as an openness to all reality manifested through service to others benefited his own scientific growth in understanding. At the same time, being a concrete human and exemplar of Christ's healing, mediating love, Clerk Maxwell applied such to the problems of the Victorian society in which he worked.

How do these notions of biblical humanism as expressed in the life and work of James Clerk Maxwell apply to today's much more complex post-Christian society? Let us clearly recognize that biblical humanism is fundamentally an openness to all of human experience. In Clerk Maxwell, this humanism expressed itself in a remarkable life of exploration and stewardship with respect to God's Creation coupled with a life of service to others. Today both scientists and biblical scholars have a better understanding of the structural evil inherent in all realities, including human societies. If these insights could be incorporated with Clerk Maxwell's insights as to appropriate person-based responses to the complexities of societal problems, a new kind of social activism embedded in Christian realism could emerge. Such a social concern would not be centered in an individualistic, self-centered collectivism but would be centered in a personal community approach to social problems. Such a person-centered community would be embedded in a Christian understanding of the uniqueness of each person as never separable from his or her intrinsic interrelatedness to others—family, friends, neighbors, or the larger society. It should be emphasized that this biblical humanism is truly "radical," as it points to a concept at the root of any understanding of what a human society really is—the biblical notion of personhood as a relational concept in which all relationships are embedded in love. This biblical understanding motivates humankind to concentrate their efforts on the establishment not of a society of isolated individuals but of a community of persons involved with one another and caring for one another. Christians, in particular, should prayerfully ask God to help in better reflecting this aspect of humankind as being made in the image of God. For God is truly a Triune community in unity: Father, Son, and Holy Spirit in eternal relationships of divine love toward one other.

Earlier in this paper I gave a long quote of Ivan Tolstoy, a secular biographer of Clerk Maxwell, who expressed great admiration and puzzlement with respect to the dynamic holism intrinsic to every aspect of Clerk Maxwell's active and productive life. Could it be that Clerk Maxwell, as a Christian layman, continually affirmed the dynamic presence of Jesus Christ in his life by allowing Christ's living presence to permeate and mediate into all aspects of his encounters with God-given reality—human and non-human alike? Indeed, Clerk Maxwell was very much in the tradition of Blaise Pascal, another great realist and scientist, who,

as a Christian layman, led a very rich and productive wholistic life properly understood in the context of the culture of his time.<sup>10</sup> It is interesting that this same wholism appears in the life and work of the recently deceased realist philosopher of science, Michael Polanyi, whose continual openness to the richness of human experience resulting from human encounters with reality led him to discover philosophical insights in substantial resonance with the Christian realism of Clerk Maxwell and Pascal. Such a biblical humanism as Clerk Maxwell's was responsive to the richness of human experience of reality in a manner that another great Christian realist, St. Paul, deemed very appropriate: "Finally brethren, whatever is true, whatever is honorable, whatever is right, whatever is pure, whatever is of good repute, if there be any excellence and anything worthy of praise, let your mind dwell on these things" (Philippians 4:8). Indeed, it would be very profitable and fitting to reread Tolstoy's quote on Clerk Maxwell's holistic life in light of the wisdom contained in Philippians 4:8.

## NOTES

1. A beautiful statement on Christian humanism is given in *Eternity*, January, 1982, pp. 15–22.
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3. *Ibid.*; and Parsegian, V.L., *This Cybernetic World of Men, Machines and Earth Systems*. (New York: Doubleday & Co., 1973).
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  - d. Tolstoy, Ivan, *James Clerk Maxwell—A Biography*. (Chicago: The University of Chicago Press, 1981).
5. Torrance, "Christian Faith and Physical Science in the Thought of James Clerk Maxwell."
6. *Ibid.*
7. Tolstoy, *op. cit.*
8. *Ibid.*, pp. 158–159.
9. Torrance, Thomas F., *The Ground and Grammar of Theology*. (Charlottesville: The University of Virginia Press, 1980), pp. 119–145.
10. Contrary to common opinion, it can be argued that Pascal became a truly integrated thinker after his deep religious conversion. He did leave scientific and mathematical pursuits for a short time after his conversion but returned to them even as he faced deteriorating health and the challenge to use his formidable writing skills for the defence of the Christian faith. This later effort culminated in his unfinished but masterful notes toward a Christian apologetic, *The Pensées*. For a full discussion of his complex yet deeply integrated Christian life see Mortimer, Ernest, *Blaise Pascal: The Life & Works of a Realist*, (New York: Harper & Brothers, 1959).

# “So, You Want to Be A Science Professor!” The Education Business: Things My Mother Never Told Me

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*A career as a science professor in one of today's major research universities holds many unique opportunities for meaningful and satisfying service, but such a career may be quite different from the popular conception of what such a position entails. In choosing a career, talented young Christians should be aware of the actual duties, limitations, and opportunities of various possible choices. My purpose in this paper is not to discourage Christians from entering into academic careers where their insights, inputs, and witness are indeed most valuable, but to give some perspective on what it means to be a research science professor today, so that Christians contemplating such careers will be better informed about them. It is also my desire to encourage them to develop and preserve patterns within such an academic career that allow a continuation of the most beneficial and significant relationships in the midst of changing situations.*

## Introduction

A career as a member of the science faculty of a major university carries with it a definite mystique that makes it especially appealing to many students as they contemplate the nature of the career toward which they should direct themselves and their plans. An academic career promises opportunities for professional and personal development without some of the pressures and limitations usually identified as characteristic of a career in the competitive business environment of industrial research and development. These opportunities are indeed still present, but changing

patterns driven by a mounting sense of worldwide competition are in the process of making major changes in university goals and living. As a consequence, many of the commonly accepted perspectives on academic life are now being challenged, and a new participant in the academic enterprise may be surprised at the distance between expectation and reality.

It is especially important that bright, young Christians trained in science be aware of the actual situations they are likely to encounter in different career choices,

rather than committing themselves to a particular choice solely on the basis of a romanticized or idealized perspective. With this awareness, hopefully they will be better informed and fortified to carry through to authentic success in all aspects of their lives as disciples of Jesus Christ.

To focus attention, we consider the fictitious personal history of one Jack Challenge, which epitomizes the common expectation of what it means to be a science professor in a major research university. (What is said of him is equally true, if not more so, of his colleague in graduate school, Jane Compete.)

### Jack Challenge, Professor of Science

*Handsome, young Jack Challenge is the typical Professor of Science at Numberone University. At age 27 he had earned his Ph.D. with a brilliant dissertation on a topic of great scientific and practical importance, and was promptly appointed an Assistant Professor with tenure, at Numberone University, one of the most famous research universities in the country.*

*Now his principal concern is the development of his research students, and his role in helping these bright young minds sharpen and mature through exciting teaching and research opportunities. He knows that his own success can be measured not only in the technical training of his students, but also in the personal qualities that they exhibit in their lives.*

*As a scientist, Prof. Jack Challenge rejoices to be a member of a community of scholars dedicated to the pursuit of those truths susceptible to scientific investigation, and his major activity in the carrying out of research is guided by his desire to pursue problems in areas and of types that he perceives to be of interest and importance, and that seem to be suitable for helping his students grow.*

*He is grateful that as an academic, a member of a university faculty, he enjoys the protection and seclu-*

*sion of "the Ivory Tower," while at the same time he takes care to be in touch with the world around him. He is grateful also that he has the time and opportunity for serious reflective thought, that he can give himself professionally to total absorption in the scholarly pursuits related to his academic activities, and that he has the unique opportunities to work one-on-one with students on projects that they have designed together.*

This fanciful scenario summarizes many of the most attractive aspects of a career as a science professor. When they can be achieved, few would deny that such a career is highly desirable.

When assessed against today's academic climate, however, it involves at least ten partial or total misconceptions of what it means to be a Professor of Science at a major university today. By examining each of these in turn, we are able to come to a more realistic assessment of what such a position means.

### 1. Get Tenure

In the real world no young person completes a Ph.D. Dissertation, no matter how well done, and then immediately receives a tenured appointment at a major university. Tenure, in those universities which continue this practice, means acceptance into a permanent position at the university, from which a faculty member cannot be removed except for gross neglect of duty or moral turpitude. It was designed to preserve a free scholarly atmosphere, so that scholars whose opinions differed from those of the university administration could not be summarily fired for political reasons. Once a faculty member has been employed continuously for more than 6 years—i.e., when he receives an appointment for the seventh and later years—he is considered to have received tenure.

In most cases today, tenure constitutes for the young faculty member a trial-by-fire, a 6-year indentured servanthood at the Assistant Professor level, with the



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carrot of a tenured permanent appointment at the end of the stick. Even this carrot is not always present, since some major universities hire many more Assistant Professors than to whom they could possibly give tenured permanent positions. This leads to an environment where several Assistant Professors scramble madly not only to satisfy the university system, but in competition with one another to secure the only tenured position really available.

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*Many of the other chores associated with teaching large classes or with the time-consuming tasks of laboratory development and management regularly fall to the young faculty member seeking tenure.*

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The effort to receive tenure is a difficult period indeed in the life of a young faculty member. He has to undertake a teaching load often heavier than that assigned to tenured faculty, perhaps teaching and developing courses for the first time, and at the same time rate highly on whatever method is used to evaluate teaching quality at that university. Although some major university science departments do make a real effort to have most of the introductory courses taught by distinguished, tenured faculty, many of the other chores associated with teaching large classes or with the time-consuming tasks of laboratory development and management regularly fall to the young faculty member seeking tenure.

The young faculty member also has the task of getting a research program started at the same time. Most of the financial support for research comes from the government, with some possibly coming from related industries, and this must be secured by the individual faculty member through proposals, personal contacts, and an assortment of other uncertain routes. The young faculty member just starting out, with a limited experience, is competing for many of these funds with senior faculty members with distinguished reputations and years of interaction with the funding agencies. In some cases the young faculty member may be fortunate enough to be taken on as a participant in an already existing research program of a senior faculty member, which relieves the immediate pressure to raise funds successfully. In such a case, however, it is essential for the young faculty member to disassociate himself as quickly as possible from the senior faculty member, if he wishes to avoid the doubt that he is

unable to carry out his own research and gain his own research support.

There are many other demands upon the young faculty member seeking tenure, who must prove himself to be a loyal and useful member of the department in which he is appointed. Some of these demands are discussed in more detail later in terms of the general duties that a science professor carries.

The young faculty member must also be assiduous in publishing papers, appearing at a variety of professional society meetings, presenting papers, getting to know and to interact with leaders in his field, and in general making certain that his name and career are recognized. For in order to obtain that final vote for tenure, it is essential at every major university that the faculty member be declared to be one of the very best people in the world in his field in the opinion of experts and well-known senior faculty around the world. The tenure test is not exhaustively described by "publish or perish," but a long publication list judged to be distinguished and valuable by other authorities is an essential ingredient.

## 2. Help Young Minds Develop

Of course, any serious science professor will have the development of his students as one of his highest priorities. The opportunity to watch students mature and develop is one of the great joys of an academic career, but the actual situation at a major research university may make the attainment of this ideal a little more difficult than anticipated. It is important to appreciate what frequently happens in the process of the brightest students becoming enrolled at a particular university.

We frequently hear that there is or will be a shortage of competent scientists or engineers. This is presumably because the number of bright American students who choose science or engineering for graduate education is not large enough. The number of universities competing for them, however, is large. One of the results is that many university departments today, in order to function and to have the enrollment required for their continuation, have research students drawn primarily from other countries in the world. Another is that competition for the available American students is very sharp.

Science or engineering professors do not simply welcome the bright students who choose to come to their university, but often they and others at the university are engaged in a major effort to recruit students using a variety of methods more commonly associated with corporate life than with universities.

Prospective graduate students come to interview the faculty at particular universities to see to which university they will choose to come.

University financial aid committees compete with their counterparts at other universities to see who can offer the most financially awarding fellowships or financial aid packages. The top students may receive several financial offers from different universities; they naturally tend to accept the most financially rewarding in the same way that an athlete will go to the university that offers the most promising scholarship. Larger departments have staff whose major job is to travel around the country recruiting the best students for that university, much like major industrial laboratories carry on active recruitment programs for their employment needs. In smaller departments individual faculty often carry all or part of this kind of activity.

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At the bottom of much of these machinations is the conviction that a Number One University can accept only Number One students. The desire of a faculty member to help underdeveloped or underprivileged students to develop into mature people and scientists or engineers, meets with great barriers in spite of sincere programs of Affirmative Action. A university that regards itself as great cannot afford to be held back by students who do not themselves deserve the attribute "great."

Frequently, therefore, students come to be regarded as a commodity. The university admits only the best students, because to admit others would be to downgrade the quality of the university. The best students are by definition those who by the date of their application have the best academic records, can score the highest scores on entrance examinations, and can command the most laudatory letters of recommendation.

Financial aid is reserved only for the best students, since the limited funds available cannot be used except to increase the potential greatness of the university through its student body. Individual faculty will accept into their research programs only the best students, because if they don't, their own personal greatness and their ability to obtain support for their research will

suffer. There is a temptation, resisted of course by the more conscientious faculty, to exploit students, with less concern for their personal and professional development and more concern for their publicly perceived impact on the professors, their departments, and the university.

### 3. Measure Personal Success by Maturation of Students

When are professors successful? Ideally, so goes the traditional response guiding our friend Jack Challenge, this happens as they watch the maturing of their students, not only in their technical skills but also in their personal understanding and evaluation of life. This is a goal that any Christian faculty member would seek after.

Again, there are a number of temptations and pitfalls in the real world that complicate the situation. The world always misunderstands "success." This is so universally true that a new definition of success for Christians is essential. In everyday life, a person is judged successful according to the number and financial value of the *things that he has*. In a Christian perspective, on the other hand, a person is judged successful in terms of *what kind of person he is*.

The science professor is commonly judged successful if his name appears on a large number of scientific publications that others believe to be significant, if he is able to obtain financial support for large research programs and for the purchase of major capital equipment, if his research group is large and includes a number of post-doctoral fellows, if he graduates large numbers of Ph.D.'s, if he and his name are recognized by his colleagues around the world as being a leader in his field, if he is the recipient of professional prizes and awards, if he is elected to prestigious professional honorary societies, and if his students replicate or exceed his record.

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## SO, YOU WANT TO BE A SCIENCE PROFESSOR!

These are indeed hallmarks of some aspects of success of the faculty member, but they make no specific mention whatsoever of the students involved, and the effects of their experience with the professor on their development and maturing. Do they have a sound understanding of their discipline, not only in the limited sense of the technical aspects themselves, but in the larger sense of their relationship to other dimensions of life? Are they better persons, as well as trained scientists or engineers, or are they committed to the same limited criteria of success that governs so much of human activity?

Common criteria for the success of a professor in "turning out" students once again follow the guidelines of business: how many jobs are offered to each of his graduates, and how large are their starting salaries? It is often said, with a somewhat different thrust in mind, to be sure, that "Students are our product." This can mean that students are little more than commodities to be recruited, refined, marketed, and merchandised. They enter as "raw material" and can command a larger salary when they leave because of the educational "value added."

It requires conscious and continued effort on the part of a Christian faculty member to avoid these kinds of extremes.

### 4. Participate in a Community Dedicated to Truth

There is admittedly a wide spectrum of approaches in the different branches of science and engineering. At one end of the spectrum is the search for descriptions of the natural world that are widely relevant and allow predictions of new properties not previously known or understood; this is what is commonly meant when speaking of the search for "scientific truth." At the other end of the spectrum is the attempt to derive short-term practical applications suitable for rapid commercialization. The trend with the passage of time seems to be to place more emphasis on the latter of these approaches and less on the former; we will say more about this aspect later.

Between the two extremes, however, lies the ordinary career world of scientists and engineers, in which personal success and recognition often dominate any considerations of "scientific truth." Any observant person engaged in science quickly recognizes the fiction of "total objectivity" which is often claimed for science and its practitioners. Scientists are human beings engaged in a human activity. All knowledge is partial and intimately related to fundamental faith commitments of the individual. Science provides us only with partial insights into part of physical reality.

What scientists are and what they do is characterized by the same attributes that mark all of human activity. When the best attributes dominate, scientists do engage in an exciting quest for understanding, and engineers do engage in a thrilling search for applications. But in the ordinary course of life, the young faculty member will almost certainly find himself immersed in personal rivalries, academic and professional politics, and viewpoints that are basically culturally determined and are not as open as is ideally held.

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He will find himself torn between the mad scramble for professional recognition on the one hand, and the equally mad scramble for practical results on the other. He will often be unable to pursue "the truth" in any other way than is defined by his own quest for career success and the demands of those supplying the funding for his research.

### 5. Do Research

Why else would a person become a research science professor except to actively participate in research?

It cannot fail to come as some kind of shock, therefore, to realize that a professor's time available for actual, hands-on, in-laboratory research is severely limited, usually shrinking from a few hours per week during the early stages of a growing research program to none within a few years. This does not mean that the professor stops being involved with research, but that the real demands on his time (assuming that he also has some life outside the university walls) force him to carry out this involvement in a vicarious way through review and advising sessions with his graduate students rather than in a direct way in the laboratory. This vicarious participation mode is hastened by the realization that the research equipment must become "the student's" and no longer be "the professor's," if the student is to mature in his scientific life.

Of perhaps even more importance, however, is the fact that the funding and paperwork associated with research is so time-consuming that, coupled with other obligations of the conscientious faculty member to his teaching, department and university committees, and

professional community beyond the university (not to mention the obligations of the faculty member as a member of a family, community, or church), virtually no time for direct research is left.

The doing of research requires money for graduate students' stipends, technical services, many miscellaneous expenses associated with the doing of the research, and the increasingly expensive capital equipment required to do modern research. The university itself provides *none* of this support. In most countries of the world, appointment to the rank of Professor (or its equivalent) carries with it a basic funding for research at a modest level; if the Professor desires a larger research program, then he must find support from government or industry.

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The United States is almost unique in having a university program in which senior rank faculty are provided with absolutely no research support of any kind. Faculty in the United States must find all their support from government agencies or interested industries.

The individual who commits himself to a career as a research professor is therefore committing himself to an unending effort to obtain, renew, and maintain financial support. While intending to have a career in the doing of science or engineering, the professor finds that he must become an in-house entrepreneur in order to carry out any research. The university does supply the buildings, the electricity, etc. needed for the research; but for this participation, the university charges the individual's research contract with an overhead percentage, which typically doubles the amount that the professor must obtain to carry out his research (i.e., if he needs \$100,000 per year for the actual expenses of research, he must obtain \$200,000 per year).

One way that this financial support is obtained by the individual professor (or small group of professors) is by writing and submitting proposals for research to

various government agencies or industrial companies. Often it is necessary to spend time travelling to the various agency or industry headquarters to meet personally with representatives and increase the probability of proposal acceptance. Such proposals usually experience a fairly small acceptance rate, which means that many proposals must be prepared and executed for each program that is actually funded.

Once a program has been funded, then regular reports must be written to describe the progress, regular meetings must be attended to report on the progress, and care must be taken that the funding agency receives due credit in all publications and public news items. The frequency of required written reports ranges from once a year to once a month.

Usually research funding by government agencies is directed toward long-term developments, although there are certainly striking examples of focus on near-future success by government agencies. But research funding by industrial companies is, almost by its very nature, focussed on the near-future solution of problems of concern to the company and to the development of prototype products suitable for commercialization. Failure to meet these short-term goals, even if the research is successful in providing insights into fundamental understanding, is usually cause for discontinuation by the industry.

In many ways, therefore, the young person aspiring to be a science professor must exchange a self-image as a white-coated experimenter with chemicals and electronics for one as an at least part-time business executive or fund-raiser.

## **6. Pursue Problems of Personal Interest and Importance**

*True or False:* Being a science professor provides the opportunity to carry out research programs in areas of personal interest and importance to the professor, chosen to provide the best framework within which to help his students to grow. *Not necessarily true.*

Once again, the fact of the matter is that research can be carried out only if financial funding for the research can be obtained. Government agencies and industrial companies have their own agenda of priorities. Science professors work in areas that the government agencies or industries are willing to support; by definition they do not work in other areas. In order to be successful they must follow the research dollar.

Now it is true that within the areas supported by government or industry there is a range of possible

problems, and science professors do have the freedom to submit proposals in areas they consider interesting and important, as well as being suitable for the developing of their graduate students, and to ignore others. The downside of the picture is that this freedom is often severely limited. In recent years the portion of the research budget funded for military applications has grown rapidly, while at the same time the budget for non-military applications has shrunk.

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*Far from being insulated from the practical world around, the professor is in daily interaction with that world and its demands in order to keep his program, department, school, and university competitive with others.*

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In no area of unquestioned vital importance for the future of this country and the whole world are the limitations imposed by funding agencies more obvious than in the area of alternative energy sources. Sources of support for research in these areas has decreased year by year as the temporary relief from apparent energy shortage misleads many into believing that there are no serious problems, even though environmental concerns daily grow in the background. Can a science or engineering professor today obtain major financial support for a research program in alternative energy sources? It is at best very difficult.

The development of students demands the kind of project in which they can explore the scientific and engineering dimensions of a problem over a several year span, asking and answering questions of a fairly fundamental nature. But if support for the research is obtained from an industrial source, it is much more likely that the program will be fashioned to deal with the solution of pressing problems, while relegating more fundamental investigations to a much lower priority. If a science professor has the opportunity to obtain industrial support for a project in which his students will essentially play the role of industrial technicians, should he accept the support? Even if the subject is important and the problem timely, will it provide the environment suitable for the growth in knowledge and experience of his students? If this is the only support available, dare a professor turn it down?

## 7. Enjoy the Seclusion of "The Ivory Tower"

Can the science or engineering professor at a major

research university still continue to think of the academic joys of release from the constraints of the immediately practical demands of the society around, or has that escape become almost a total fiction?

Someone sketching the ideal day of the ideal science professor might imagine that he spends his time in actual laboratory research, in reflection on scientific or engineering problems, on the analysis of such problems and the design of future experiments, on teaching his students both by lecture and by example through experience, and perhaps in some involvement with the academic aspects of university life in general.

The actual day of the science or engineering professor diverges further and further from this ideal. While some elements of the above picture of course persist, they must be carefully protected and preserved, or else they will be increasingly crowded out by the need to be absorbed in what can only be described as advertising, marketing, and public relations. Far from being insulated from the practical world around, the professor is in daily interaction with that world and its demands in order to keep his program, department, school, and university competitive with others.

The naive non-academic might conclude that the funds required to run a department and a program within a department (except for the funds needed for research as discussed above) come from the university with its resources derived from tuition, fees, endowments, and overhead charges. But increasing competition between universities, a growing administrative hierarchy, and the need to "build or perish," cause the university to put more and more financial burdens directly on the departments themselves.

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*Few departments are able to operate successfully as far as teaching and resources are concerned, not to mention the acquisition of capital equipment, on the funds supplied by the university.*

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Usually the university supplies faculty salaries (although in many institutions science and engineering faculty are required to pay a portion of their salary from research), a portion of the salaries for administrative support staff, and a small amount for daily operation of the department—but nothing else. Few departments are able to operate successfully as far as teaching



and resources are concerned, not to mention the acquisition of capital equipment, on the funds supplied by the university. They are forced to come up with money-raising schemes of their own through the participation of the faculty. Major efforts are made at enticing industries and occasionally individuals to give financial gifts to the department to meet its direct needs in competition with other departments at other universities around the country.

This is hardly the kind of environment that life in an "Ivory Tower" conjures up. Whether or not it is "bad" might be debated, but it is undebatable that it is different from the concept that most young people hold with regard to the duties and functions of a science or engineering professor.

### 8. Have Time to Think

Many view academic life as a quiet retreat, with many hours for reflection and thought, providing the opportunity for the development of creative ideas that demand this kind of uninterrupted cogitation. As a matter of fact, if a science professor requires "time to think" today, he is more likely to get as far off campus as possible.

While on campus he is likely to find himself spend a good deal of his time scrambling to meet administrative details imposed upon him: filling out and submitting forms, writing reports on his academic progress, responding to live or recorded telephone messages or to electronic mail, drafting documents for department use, attending administrative meetings of one type or another, meeting with visitors to the department, meeting with students who are on campus to see if they wish to apply for graduate study, etc. And all of these are in addition to the normal daily needs for the preparation of lectures, problem sets, examinations, problem set answer sheets, responding to the questions of students in his course(s), and keeping up with the exploding literature in his field.

### 9. Be Absorbed in Scholarly Pursuits

Certainly an academic might expect to be involved primarily or almost exclusively in academic pursuits, and a scholar in scholarly pursuits. But this is not

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*If a science professor requires "time to think" today, he is more likely to get as far off campus as possible.*

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necessarily the case for the research science professor in major universities today. As we have already mentioned above, the life of the science professor today is packed with committee meetings, management decisions, personnel problems, intradepartmental and interdepartmental politics, attention to the business aspects of running and maintaining a research program, involvement in the construction planning of new buildings and new laboratories and responding to an ever-increasing and time-consuming set of rules and regulations for experimental safety.

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*Typical of the growing administrative demands is that of laboratory safety.*

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We have said enough about most of these concerns already. Typical of the growing administrative demands is that of laboratory safety. No one would advocate unsafe experimental environments or careless attitudes toward safety issues, but few would be prepared for the explosion of safety issues and their demands on time today. Safety seems to be one of those issues that is extremely susceptible to bureaucratization once genuine needs are recognized and institutionalized methods of dealing with them are put into place. It is also true that a growing proportion of scientific research appears to involve greater and greater safety hazards, so that what would properly be handled previously on a local level with little more than common sense, now demands large financial inputs, elaborate records, defined protocols, and essentially daily attention. Safety Committees, safety courses, and Safety Officers have suddenly appeared on major campuses. All of these require the time of faculty in serving on committees, making sure that recommendations are followed, and overcoming the high hurdles toward research funding sometimes posed by institutionalized conscientious concern for safety.

### 10. One-on-One Student-Faculty Relationships

Of course faculty members can creatively make available opportunities for one-on-one personal interactions with those graduate students working directly with them. But trends in research are making this harder, as small groups of graduate students doing research under the direction of a particular faculty member are replaced by considerably larger groups of graduate students doing research as part of a group of several faculty members. In the not-too-distant past, published papers seldom carried the names of more than one or two authors, the student's and professor's in the case of academic research, but now it is not

uncommon to find papers with as many as twenty authors.

Several factors are driving this movement toward research by larger groups. One of them that has been active now for half a century is the growing complexity and expense of much research equipment. When each researcher could afford to build or buy, and to maintain his own equipment, then he could essentially operate independently if he so chose. But when "ordinary" equipment such as electron microscopes, molecular beam evaporators, and surface analysis systems cost upwards of a million dollars, not to mention the major installations of nuclear research that cost billions of dollars, individuals have to form large teams in order to be able to afford the equipment and its maintenance, and then to put the equipment to enough use to justify its acquisition in the first place.

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*Research funding by industrial companies is, almost by its very nature, focussed on the near-future solution of problems of concern to the company and to the development of prototype products suitable for commercialization.*

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It is also true that problems are becoming more complex, with aspects that require inputs from a number of the classical scientific disciplines. Research teams in industry have been common for many years, and today we see research teams being much more common in university research.

All of these developments have their advantages, but they also have the definite disadvantage of tending to turn the academic student-professor relationship into something more like that commonly encountered in large corporate or government laboratories. A professor who believes it important to retain dimensions of the one-on-one relationship needs to work at providing the special circumstances that will allow it.

### Conclusions

There is no doubt that being on the faculty at a major research university can be an exciting and rewarding

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activity. Most of those participating on science and engineering faculties would not willingly become involved in any other activity, in spite of the changing tempo and style of academic life. There are unique freedoms of time and effort that are usually not present in a non-academic environment. There are many opportunities for Christian faculty to witness through profession, lifestyle, and personal communication to a group of bright, young people who will play leading roles in tomorrow's society, to their colleagues, and to society in general.

The purpose of this paper, therefore, has not been to discourage those who are called by God to be involved in this kind of a career. Rather, it has been to provide insight into how different things may be from what has been ideally taught, and into what may be realistically expected as the characteristics of life on the science or engineering faculty of a major research university.

A second, and very important, purpose is to call those of us in science and engineering to become more aware of the roles we are playing in our professional careers, to reassess them periodically to see if we have the assurance of being in the center of God's will for us, and to help shape developments so that the truly beneficial and important relationships of academic life are preserved in the midst of changing patterns.

There are few greater challenges than for a Christian faculty member to stand gently firm for Christ in the midst of a secular campus. Among colleagues whose academic achievements are an almost impenetrable insulation against the message of the Gospel, he lives daily to be heard and known as a person of integrity and intellectual responsibility, who can be trusted in professional and personal matters, but who calls colleagues and students alike to a higher relationship and a more encompassing good. There are few greater challenges—but there are few greater opportunities.

# Twenty-One Years After “The Historical Roots of Our Ecologic Crisis”: How Has the Church Responded?

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*A study of Christian literature of the 20th century discloses a growing concern for the Creation, reflected by a sharp increase in the number of theological papers on the Creation and man's role as God's image bearer. Christian ethicists have joined the discussion, and, at the popular level, the literature spans the gamut of environmental concerns. The publication of “The Historical Roots of Our Ecologic Crisis” by Lynn White in 1967 implicated the Judeo-Christian tradition as the cause of the crisis. This accusation was a major factor responsible for the sudden increase in creation-related publications in the early 1970's.*

The world is about to enter another revolution. According to Dick Wright in *Biology Through the Eyes of Faith*, (Harper & Row, 1989), we have passed through the Darwinian and Biomedical Revolutions, are enmeshed in the Genetic Revolution, and face the onrushing Environmental Revolution. Our response to the last will shape the course of the future. The Church must play a strategic role in the transition years. Its task is one of restoration. The burden for the redemption of Creation rests on the shoulders of the redeemed in Christ (Romans 8:19–22). It is the purpose of this paper to assess our progress. The material presented here is part of an extensive bibliographical study of the Christian community's response to the environmental crisis. Its scope was limited to works published in English.

Christian literature reflects a broad concern for environmental matters. Common themes include species extinctions and the loss of genetic diversity, the crisis of expanding human population, the impact of modern technology, the use of our natural resources, pollution, and the need to apply the “discipline of simplicity” to our lives. On the theological side, the Church has struggled to determine humanity's intended relationship with Creation.

Several events of the past twenty-six years stand as milestones. Twenty-six years ago, Rachel Carson's *Silent Spring* was published. For the first time, ordinary people began to view nature as vulnerable to the effects of technology. In 1965, the Faith-Man-Nature

Group was formed to provide channels for basic scholarship and creative thought for building an explicit, sensitive Judeo-Christian approach to the environment. The group held several national conferences and published their proceedings. Twenty-two years ago, Lynn White, Jr. blamed the Church for the ecological crisis (White, 1967). Specifically, he felt that Scripture teaches a utilitarian and dominionistic attitude toward nature rather than a stewardly one. On April 22, 1970 we celebrated our first Earth Day. In 1979 Vincent Rossi formed the eleventh Commandment Fellowship based on the "commandment" that "The earth is the Lord's and the fullness thereof: thou shalt not despoil the earth, nor destroy the life thereon." According to an article in the 13 May 1987 issue of the *Christian Century*, there are now chapters in more than 20 cities which are actively encouraging the development of a personal and public environmental ethic. In 1983, Constance Cumbey and David Hunt published books addressing the "New Age" movement (Cumbey, 1983 and Hunt, 1983). In their attempt to deal with this critical challenge to the Church they labeled many Christians who had addressed environmental concerns as heretics, claiming that Scripture provides no justification for environmental involvement and that it places one in the camp of the New Age. In 1987, the North American Conference on Christianity and Ecology (NACCE) was convened to mobilize untapped strength in the local church for the task of creation redemption and restoration. In 1988, NACCE held several regional conferences.

### Review of Literature Prior to 1967

Nine works were located with publication dates before 1950. Many early papers were anthropocentric in outlook, but several had clear statements of what we presently refer to as "environmental stewardship" concerns. Some important theological papers appeared during this time which contributed significantly to the birth of our presently emerging theology of nature. A gradual trend of awareness by Christians of environmental, scientific, and technological matters is appar-

ent as the number of papers increases toward the end of the period (Figure 1).

One of the earliest significant works was by Bailey in 1915. This remarkable book, *The Holy Earth*, laid the groundwork for a loving, stewardly care of the Creation. Although utilitarian to a degree, protection was clearly urged. "We did not make the earth," wrote Bailey, "We have received it and its bounties. If it is beyond us, so it is divine. We have inescapable responsibilities. It is our privilege so to comprehend the use of the earth as to develop a spiritual stature. When the epoch of mere exploitation of the earth shall have worn itself out, we shall realize the heritage that remains and enter new realms of satisfaction" (Bailey, p. x). Bailey stated, "Merely to make the earth productive and to keep it clean and to bear a reverent regard for its products, is the special prerogative of a good agriculture and a good citizenry founded thereon; this may seem at the moment to be small and ineffective as against mad impersonal and limitless havoc, but it carries the final healing; and while the land worker will bear much of the burden on his back he will also redeem the earth" (Bailey, p. 83).

The 1953 publication of *Nature and Man in Biblical Thought* by E.C. Rust, was the first of his several significant works dealing with the biblical basis of the man-nature relationship. A high view of nature is evident throughout.

Joseph Sittler has been a major contributor in the developing theology of nature. His works include *A Theology for Earth* (1954), *Called to Unity* (1962) and *Nature and Grace* (1964). In *Nature and Grace*, Sittler wrote:

Man is not flung into nature as if nature were a neutral storehouse for his biological needs and intelligible operations. Man is placed in nature; and this nature is given a good and holy evaluation. And therefore man's relation to nature is not merely neutral, rational, supportive, or esthetic. It is moral—and absolutely so. The Command of God is not that he should simply utilize the given, but that he should care for it. And the



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suggestion is more than faint that if he does not rightly care he shall neither rightly enjoy nor sanely use. (Sittler, 1964, p. 255).

W.D. Stacey, near the end of a paper titled *Christian View of Nature*, clearly defined the redemption of humanity as the key to the release of nature from the bondage of the Fall. He addressed Romans 8:9-22 and concluded by stating: "This brings us to the last point in the enquiry. Because the creation waits for 'the revealing of the sons of God,' the redemption of man will be the *means* of the redemption of Nature" (Stacey, 1956, p. 366).

G.H. Williams, in *Wilderness and Paradise in Christian Thought*, presented a clear discussion of humanity's role as steward of Creation. He stated that:

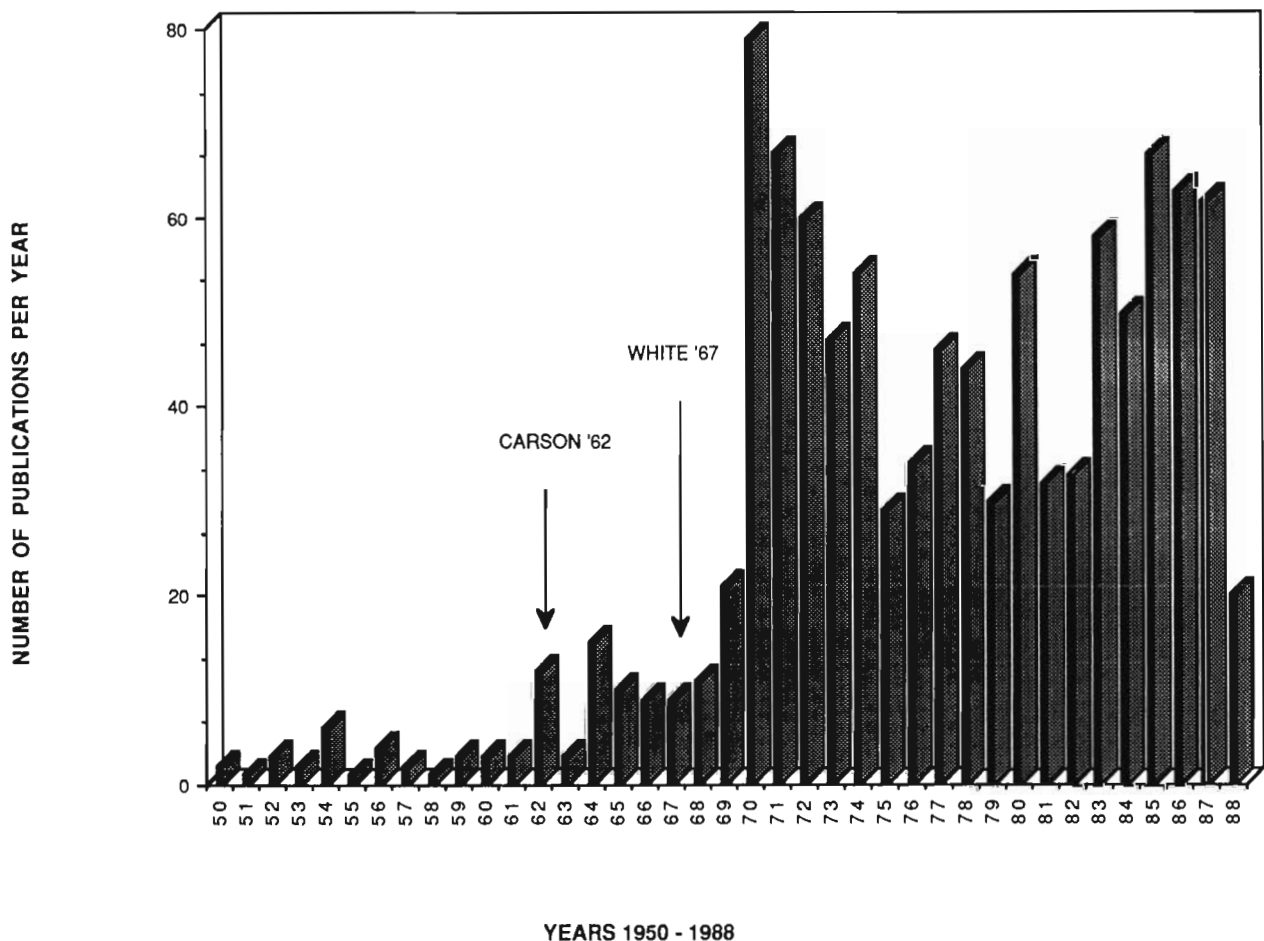
Truly the stewardship of Adam for all creatures in the Park of the Great King and the redemptive assignment laid upon Noah before the Deluge is literally in man's keeping today. . . . Wherever we live and work, we must have in our being or refresh within us the awareness of a real wilderness, which now we are called upon not only to contemplate periodically as did the desert Fathers, but also to conserve for ourselves and our

posterity as well as in the interest of the myriad creaturely forms themselves. (Williams, 1962, pp. 136-137).

Others who also emphasized a stewardly care of the cosmos included Brattgard (1963) *God's Stewards*, Bring (1964) *The Gospel and the New Creation*, and Margaret Mead, in the introduction to White (1964) *Christians in a Technological Era*. Mead described this responsibility as a burden that is "perhaps even greater than that laid on humanity when our primal parents first ate of the fruit of the tree of knowledge of good and evil—the burden of responsibility for the survival of life on earth" (H. White, p. 11). Baer (1966) in *Land Misuse: A Theological Concern*, called for immediate action. He stated that:

If the church is to take the incarnation seriously, she can no longer evade the problems of man's relation to the land. She must learn to recognize the crucial issues and contribute her support to progressive and far-sighted policies. Hopefully, she will encourage the development of new technology. But the more immediate need is to help out in efforts to combat public apathy and to resist business and political interests that stand to profit from the status quo. (Baer, p. 1241)

FIGURE 1. Publications relating the Judeo-Christian tradition and the Creation (1950-1988).





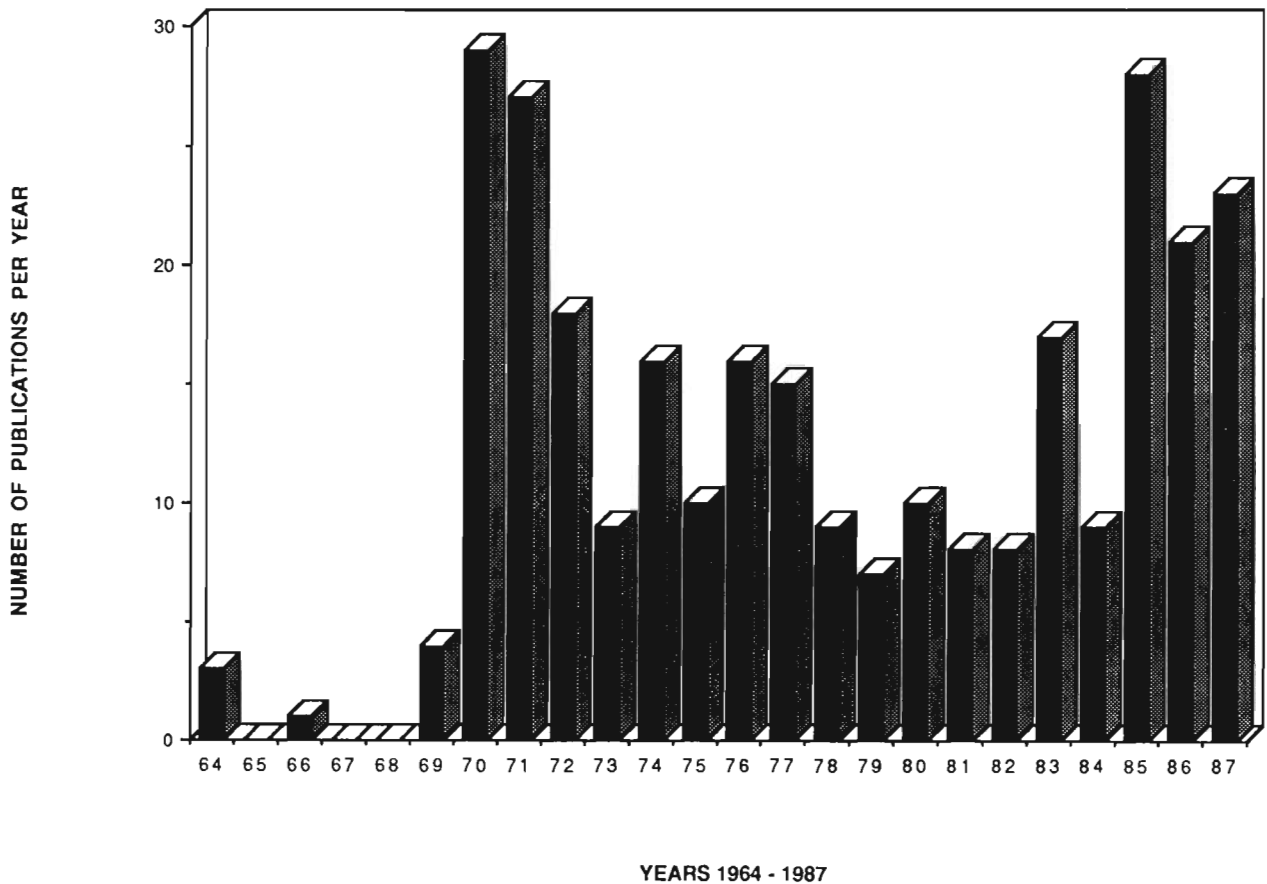


FIGURE 2. Articles and editorials for a general audience which encourage care for the Creation (1964–1987).

The quotations above all have come from traditional Western Christianity. It is obvious that an environmental awareness was present and continues to be among some in the Church. However, a distinct theology of nature has yet to be formulated. This apparently is not the case in the Eastern Christian tradition where nature has not been so desacralized and remains a part of the theological framework. The following statement of man's responsibility for the nurture and redemption of the non-human Creation by Clement, a French Orthodox theologian, in 1958 has been cited as an example of the theological position of the Christian East:

If the spiritual destiny of man is inseparable from that of humanity as a whole, it is also inseparable from that of the terrestrial cosmos. The sensible universe as a whole constitutes, in fact, a prolongation of our bodies. Or rather, what is our body, if it is not the form imprinted by our living soul on the universal 'dust' which unceasingly penetrates and traverses us? There is no discontinuity between the flesh of the world and human flesh; the universe participates in human nature, as it constitutes the body of humanity. . . . Man is the personality of the cosmos, its conscious and personal self-expression, it is he

who gives meaning to things and who has to transfigure them. (Rigdon, 1983, pp. 51–52)

### 1967 And "The Historical Roots"

The publication of "The Historical Roots of Our Ecologic Crisis" (White, 1967) was significant in raising the care of the Creation as an issue in the Church. In White's view, Western Christian theology is "the most anthropocentric religion the world has seen" (L. White, p. 1205). He believes that the Creation is portrayed in Scripture only as a backdrop to serve human needs, and that Christianity has taught that "it is God's will that man exploit nature for his proper ends" (p. 1205). He goes on to say that: "Both our present science and our present technology are so tinctured with orthodox Christian arrogance toward nature that no solution for our ecologic crisis can be expected from them alone. Since the roots of our trouble are so largely religious, the remedy must also be essentially religious" (p. 1207). Many in the Church felt that White's scriptural interpretations were in error. The result was two-fold: a re-examination of the Church's theology of nature, and

a resounding denial that Scripture teaches a dominionistic, utilitarian attitude toward the Creation rather than one based on loving, nurturing care.

An increase in Christian literature addressing environmental concerns in general and Lynn White's charges in particular was noticeable by 1969 (Figure 1). Apparently, two to three years were required for Christians to realize, digest, and respond to White's charges. Numerous papers since 1969 have been direct responses to White's accusations. White's paper, perhaps more than any other single factor, was responsible for making the Creation and the need for its stewardly care an issue in the Christian press.

### Post 1967 Publications

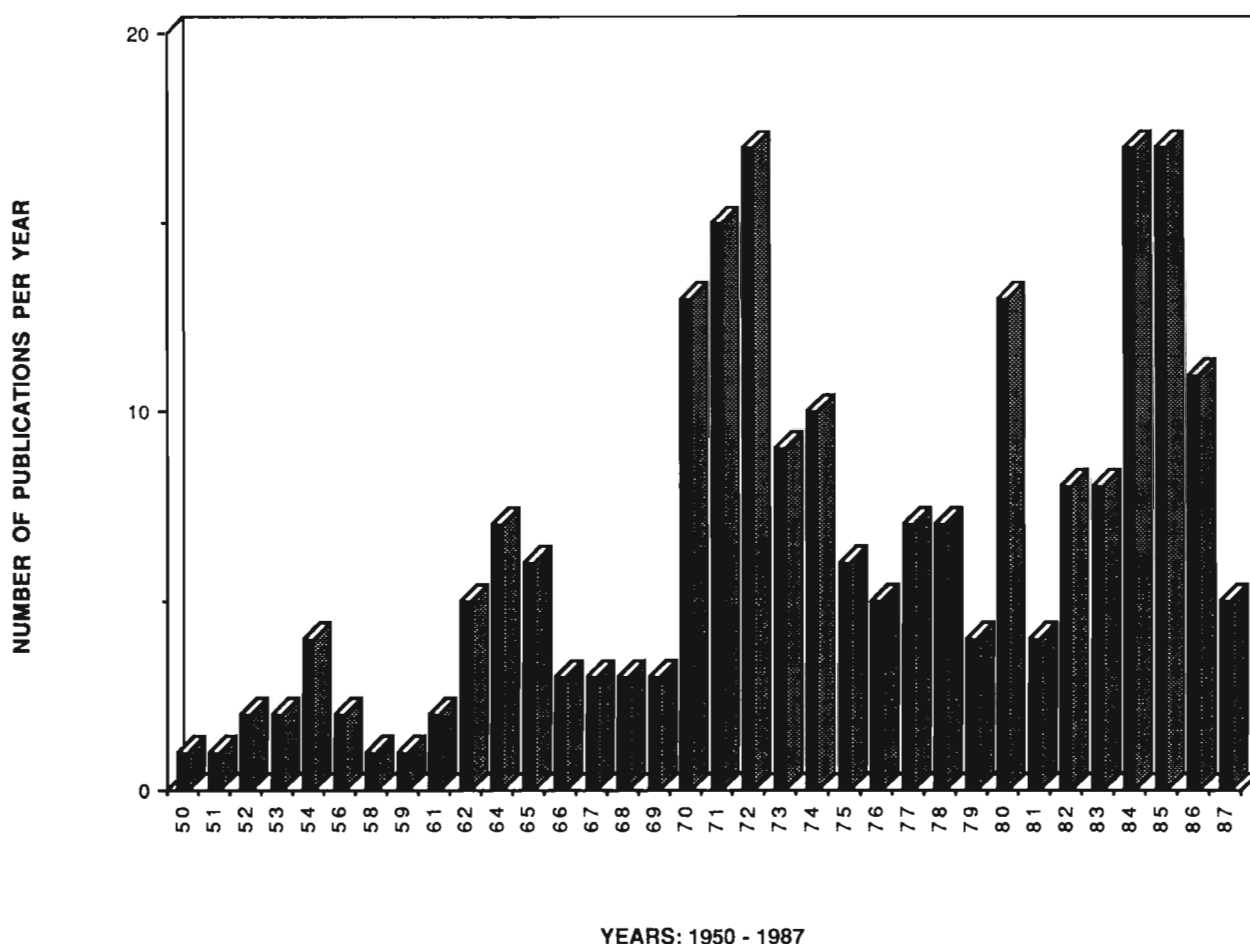
Figure 1 displays the number of publications by year on all subjects relating the Judeo-Christian tradition with the environment. The influence of Lynn White's paper is evident. Following a rush of papers in the early 1970's, the total number of publications rapidly

dropped. Fluctuations were often due to a single thematic issue in a journal dealing with the environment. For example, the fall 1985 issue of *Epiphany* had 13 citations. During the past few years, an upward trend is again evident.

The distribution of non-technical papers—editorials and relatively short articles intended to prick the environmental conscience of lay Christians—is illustrated in Figure 2. Again, the impact of White in 1967 is evident. The number of publications declined rapidly following 1970 and then reached a plateau of 10 to 15 papers per year. This persisted until 1985 when another upturn began. Considering the large number of Christian journals today, the average reader has little exposure to such material, and most have probably never heard of a "theology of nature."

The status of the more technical theological literature is seen in Figure 3. Some significant publications appeared before 1970, but they were scattered and few in number. The publications peaked in the early 1970's

FIGURE 3. Technical theological publications on the theology of nature (1950 to 1987).



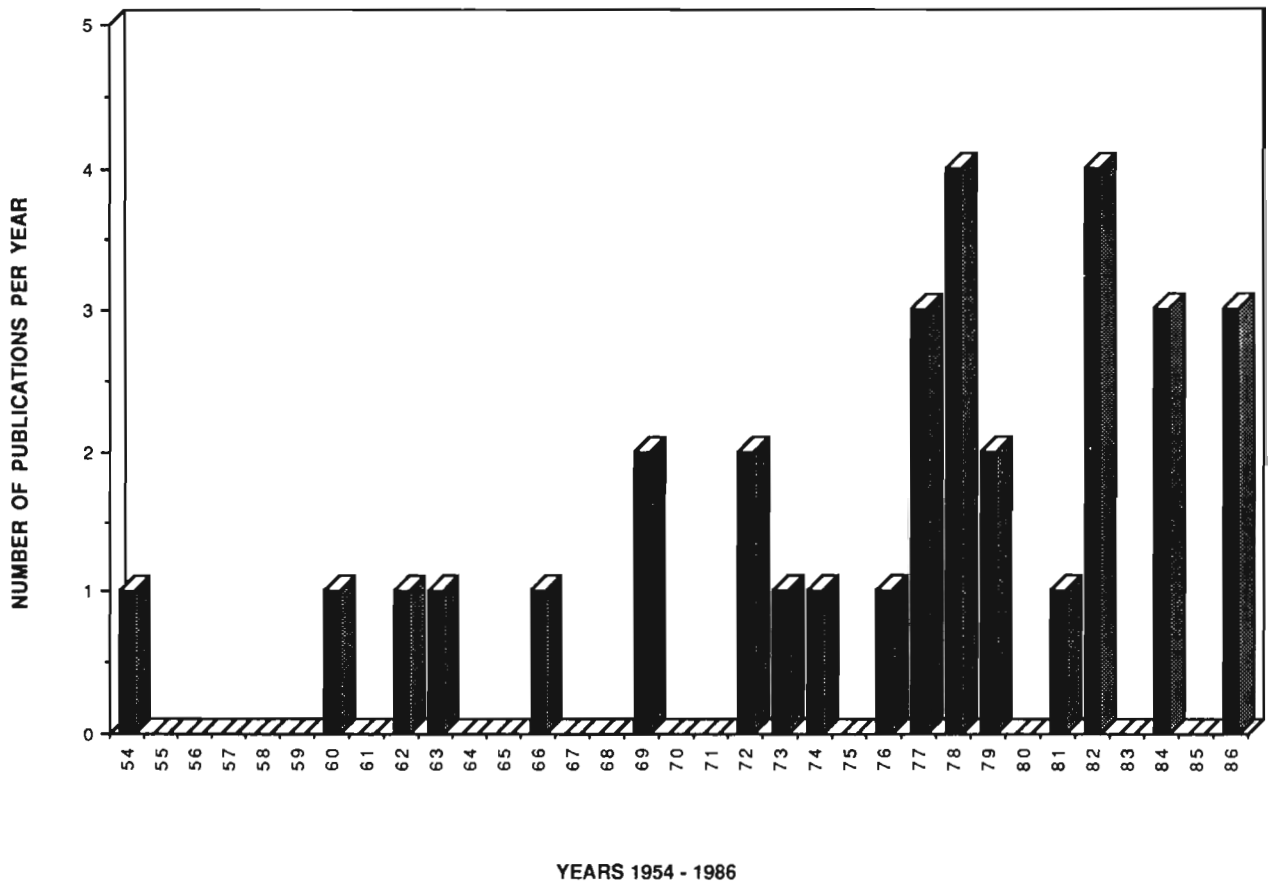


FIGURE 4. Dissertations and theses on the theology of nature (1950 to 1987).

and reached another high point in the mid-1980's.

The number of dissertations and theses related to the theology of nature (Figure 4) is low but increasing. Considering the number of seminaries and universities offering degrees in theology, it appears that the theology of nature is not a popular topic.

Although there has been much written on the theology of nature, the subject still remains ill defined. No synthesis has yet occurred and few contributors are aware of the voluminous literature waiting to be tapped. As Santmire pointed out:

There is, as yet, no comprehensive review of the contemporary discussion of the theology of nature, which emerged in many countries in the late 1960's and which now includes more than twenty-five book-length studies and hundreds of articles. This is symptomatic of the discussion itself, which has generally been fragmented and occasional. Books continue to appear which betray no awareness that an international discussion of the theology of nature has been underway for twenty years. (Santmire, 1985, p. 222)

Susan Bratton of the University of Georgia told the

Christian College Coalition Conference on "Biology in the Christian College Classroom" in Spokane, Washington in June 1987 that "it is time to stop apologizing for our behavior and to get on with the task of being stewards." For this to occur, it is essential that a synthesis take place in the theological understanding of the position of nature and humanity's relationship to it.

The two papers by J.W. Klotz (1971, 1984), published in the *Creation Research Society Quarterly*, were important exceptions to the general lack of publications coming from the "young-earth" press which has focused most of its attention on the time and method of creation. R.E. Timm also recognized this when he stated that young-earth creationists "miss the theological messages of these rich Biblical creation materials" (Timm, 1986, p. 103). Cal DeWitt of Au Sable Institute makes the same point when he likens the Creation to a beautiful painting. While a group of art critics who are standing near the painting argue about details of the artist's technique in painting the masterpiece, people in another group are busy cutting the priceless work of art

into strips, removing the paint, and selling the cloth for toilet paper. Klotz stated that "the consistent creationist is an environmentalist because he recognizes God as his Creator and the Creator of everything. He realizes, too, that he is but a steward with stewardship responsibilities. . . . The creationist seeks to preserve the good world over which God has made him steward" (Klotz, 1984, p. 8).

One of the most significant recent works is *God in Creation: A New Theology of Creation and the Spirit of God* by Jürgen Moltmann (1985). Moltmann has emphasized God's immanence in Creation (the indwelling/sustaining Spirit) in contrast to His transcendent nature (God the Father). This cosmic indwelling of creation by the Creator forces a radical reinterpretation of man's "freedom" to exploit what previously had been seen as raw material to satisfy his wants.

### The Future

Yes, we are moving ahead, but as Pogo has said, "I have met the enemy and he is us." Piecemeal problem solving is not the answer. The world is in need of a sustainable environmental ethic, and the Lord has placed the responsibility for its establishment in the hands of His Church. As the Church incorporates the care of Creation into its theological framework, critters become creatures, environment becomes Creation, and the "natural laws" of science are recognized as the invisible presence of the Spirit sustaining His Creation (Psalm 104:29-30).

The recent controversies raised by Constance Cumbey (1983) and David Hunt (1983) continues to be a concern. The New Age movement is a real threat to the Church and must be addressed. But Cumbey is incorrect to suggest that the Lord is not interested in His Creation and has not placed us in a position of authority for its care. The Creation belongs to the Lord, but its redemption rests in the hands of the Christian. Loren Wilkinson, who was on the receiving end of Cumbey and Hunt's accusations, provides an excellent review of the situation in *Tending the Garden* (Wilkinson, 1987).

A related concern to many in the Church who are working toward the healing of Creation is a branch of "New Age" referred to as "Creation Spirituality." With its strong emphasis on a nurturing, loving care of Creation, Creation Spirituality continues to be quite attractive to quasi-religious individuals, including some Christians who are not well grounded in Scripture. Although heavy in biblical emphasis, much of its teaching draws on extrabiblical material, ranging from pantheism to evolutionary development of "man" and

dreams of utopian societies where "man" finally becomes "Man."

Lynn White's assertion that the solution for our ecologic crisis cannot come from science and technology but must emerge from a religious swell of the people is most significant. Both the New Age in general and Creation Spirituality in particular are becoming a force in today's world, with environmental care a central theme of their theologies. Although the Church is beginning to awaken to its role of earthkeeping, it has produced few recognized leaders in the environmental field. Most see the Church as a latecomer that is still struggling to climb aboard the environmental wagon when, in reality, it should be the driver.

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# Zygon

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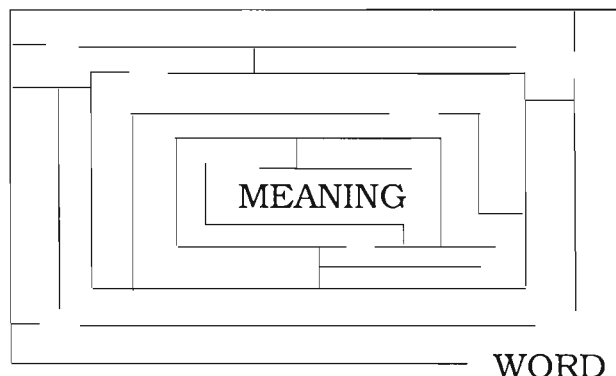
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## Penetrating the Word Maze



*Taking a look at words we often use—and misuse. Please let us know whether these attempts at clarification are helpful to you.*

*Today's words are: "life/death."*

**The Dictionary definitions:** *life*: "the quality that distinguishes a vital and functional being from a dead body;" *death*: "a permanent cessation of all vital functions: the end of life." [Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Springfield, MA (1987)].

\* \* \* \* \*

Sometimes the most profound concepts get squeezed into words that serve perfectly well in ordinary conversation, but then fail miserably when carried over into more technical discussions. Consider the pair "life/death." These two terms appear to be simply the opposite of one another: life is the absence of death, and death is the absence of life.

But what *is* each of these? Something we have or something we are? A possession that belongs to us, or a state of being that characterizes us? Is there only one kind of life? Is it appropriate to ask when life begins and when life ends? Does death begin when life ends? Are these instantaneous or gradual changes?

If we reflect on the way that these words are used, we find that "life" is commonly spoken of as "something that we have." This ordinary usage is certainly augmented for the Christian by the common usage in the Bible of "spiritual life" as something given to us through faith in Christ. As long as these expressions are used to convey existential relationships, few if any problems arise, but if we insist upon using them technically, then all kinds of problems arise.

First of all, we need to recognize that there are several different kinds of life, when used in this popular way, as well

as several different kinds of death. There is biological life (Bible: *body*), human life (a *body* with biological properties associated with *Homo sapiens*), personal life (Bible: *soul*) and spiritual life (Bible: *spirit*) as well as biological death, human death, personal death, and spiritual death.

Biological life characterizes all living creatures, human life describes living human beings, personal life describes the characteristics of human life when the individual is capable of exhibiting the properties attributed to selfhood, and spiritual life describes the characteristics of human, personal life when considered in terms of transcendence and its relationship with God. We will deal at more length with the "body/soul/spirit" and the "human/personal" distinctions in subsequent Word Mazes. For the present it is sufficient to note that "life" and "death" can be used to describe the state of a creature unambiguously only if suitable modifying terms are included.

Secondly, we should take note of the fact that in a technical sense there are no such entities as "life" or "death." We can understand this by asking, "What must be added to a non-living body to make it into a living body?" In keeping with the popular use of the word, the addition of "life" to a non-living body would be necessary to make it a living body. But if we understand this to mean that "life" is some kind of entity, then we are making a serious mistake. For there is no entity that must be added *from outside* to make a non-living body into a living body; what is necessary is that the individual biological organs be present and able to function, and that their proper functioning (blood circulation, lungs

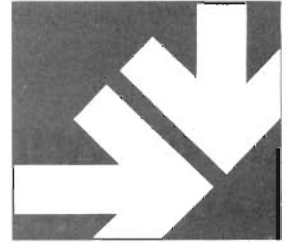
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This column is regular feature of *Perspectives on Science and Christian Faith*, and is written by Richard H. Bube, Professor of Materials Science and Electrical Engineering at Stanford University, Stanford, California.

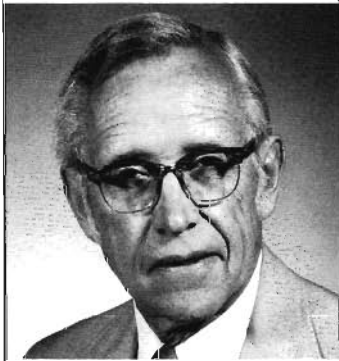


# SEARCH

## Scientists Who Serve God



### HE TRACKS INHERITED DISEASES



V. Elving Anderson (the V. is for Victor) was born in 1921 in Stromsburg, Nebraska. Sixty years later, at its annual Swedish festival, his hometown honored him for his achievements. Anderson is a “genetic detective” who tracks down clues to mental retardation and epilepsy. Part of his job in the Department of Genetics and Cell Biology at the University of Minnesota is to counsel couples worried about passing on defective genes to their children.

Helping to prepare bodies for burial in his father’s small-town funeral parlor probably sparked Anderson’s interest in human biology. As a boy, though, he wasn’t at all sure what direction his life would take. He had many interests.

#### A Different Kind of Mission

In an evangelistic service young Elving gave his heart to Christ and asked God for guidance. His family were Swedish Baptists of the Baptist General Conference, so at eighteen he went off to that denomination’s college in St. Paul, Minnesota. After receiving an A.A. degree at Bethel, which was then only a two-year college, he entered Bethel Seminary to prepare to become a missionary.

As a college sophomore, Elving had been appointed to assist in Bethel’s zoology course. In seminary he continued that teaching, which became a major interest. He also developed a new interest, a home economics student named Carol, whom he married in 1946. He left seminary after two years to take up a scientific career. Yet his early commitment to Christ, plus his seminary studies, have given him a lifelong interest in relating science and Christian faith, both in theory and in practice.

#### Toward a Research Career

After completing his B.A. at the U. of Minnesota, Anderson again taught at Bethel while he went on for an M.S. It kept him busy, but he “learned a lot of biology from teaching it.” His genetic research at Minnesota on human predisposition to breast cancer earned him a Ph.D. in zoology. As Bethel grew into a four-year college, Dr. Anderson chaired its Dept. of Biology, became acting dean and later dean of students. In 1960 he left to take part in a large-scale Perinatal Research Study at the National Institutes of Health, investigating the inheritance of disease in over 50,000 pregnancies.

When Elving and Carol returned from Washington, D.C., to St. Paul, he became a full-time faculty member at the U. of Minnesota, associated with what was then the Dight Institute for Human Genetics. When the professor under whom he had received his Ph.D. retired as head of the Institute, Anderson became its acting director. He continues at the renamed Dight Laboratories and as a professor at the university.

Looking back at his experience of studying and teaching at a Christian liberal arts college, Professor Anderson says, “I can see how God was leading me step by step into human genetics research.” In the clinical terminology that finds its way into his everyday speech, he speaks of the “gradual onset” of his research career the way he might refer to one of the diseases he is tracking. Being a scientist seemed to come so naturally to him, it was almost as though he had inherited a capacity for it.

Heredity affects us all. And because some people inherit life-threatening diseases, Elving Anderson “keeps on tracking.”

# GOOD GENES AND BAD GENES

## "THE DIGHT"

The Dight Institute, established at the U. of Minnesota in 1941, was one of the first centers for human genetics in the U.S. (the other was at the U. of Michigan). Initial funding came from a bequest from Dr. Charles F. Dight, a Minneapolis physician, alderman, and activist for social causes.

Dr. Sheldon C. Reed (Elving Anderson's "chief" at Minnesota) first directed "the Dight." Reed coined the phrase *genetic counseling* and wrote one of the first books on that new area of human service. Such counseling provides information to individuals and families to help them make reproductive plans. Anderson sees it as "descriptive" (explaining as quantitatively as possible the probability of passing on defective genes) rather than "prescriptive" (advising clients about whether or not they should take that risk).

Genetic research at Minnesota is carried out in several university departments, but research at the Dight has focused on genetic factors in such problems as mental retardation, psychotic disorders, and epilepsy. Today a genetic counselor generally has more to go on than a family history of such problems. Chromosomal or biochemical tests may provide additional information for clients who come to the clinic for counseling.

Indeed, as "molecular genetics" has developed, emphasis at the Dight has shifted somewhat. Some years ago its name was changed to the Dight Laboratories, but counseling continues to be one of its functions.

When Elving Anderson entered the field of human genetics nearly four decades ago, there was a sense of fatalism. If some physical or mental problem were genetic, what could be done about it? Today, he says, with all the talk of "genetic engineering," there is fear that we might be able to do *too much*.

It's true that the scientific picture keeps changing. Our new understanding of the chemistry of the genetic material (DNA) has begun to affect human studies. The first scientists to go into human genetics were trained by working on fruit flies or mice. Now the field includes studies on human populations, families, chromosomes, and even human DNA itself. A multibillion-dollar long-term project to "map the human genome" is underway.

## Putting a Gene in its Place

In a sense, Professor Anderson has been sketching in a small area of that huge map. His work on mental retardation and psychotic disorders turned his attention to behavioral genetics. Seeing that the brain would become an important research frontier, he helped form the Behavior Genetics Association. Since about 1975 he has been studying the role of genetics and environment in recurrent seizures (commonly known as epilepsies). It soon became clear that genetic factors are more important in some kinds of epilepsy than in others. Almost 2 percent of the general population have some form of epilepsy by age 40.

With the help of several physicians and a research lab in Salt Lake City, Anderson studied a rare type of very early seizure, called benign familial neonatal convulsions (BFNC). The frequent convulsions begin in babies only three days old and end spontaneously by three to six months. They can cause great concern to parents and even to family physicians who may not know about the natural course of the inherited condition. Only about 10 percent of BFNC patients have seizures later in life.

Recently, Anderson and his colleagues pinned the gene responsible for the condition down to a particular region on chromosome 20 (humans have 23 numbered chromosome pairs). This successful example of gene mapping, though not yet at the level of the actual DNA structure, is a first step in finding out what the mutant gene does to cause the convulsions. The same group is now trying to map other, less benign, epileptic disorders.

## Tracking a Mean Gene Through a Family

Part of Anderson's contribution is to study all the members of an affected family he can find to determine precisely how a mutant gene has been passed from one generation to another, and what other genetic traits have consistently accompanied it.

Soon, Anderson predicts, we can expect to learn much more about how certain genes guide brain development. Then we should be able to diagnose many behavioral and psychiatric problems more accurately and treat them more adequately—and perhaps more humanely.

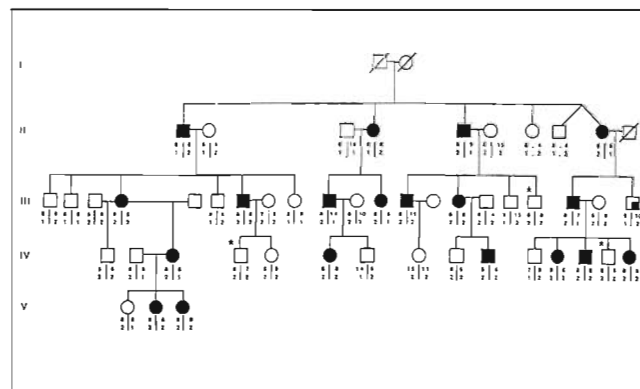


Figure 1:

"Pedigree" of a 5-generation family through which the BFNC gene has been tracked. Dark circles (females) and squares (males) represent individuals who had BFNC symptoms. Arabic numerals designate genetic markers used to locate the BFNC gene. Asterisks designate 3 family members who had the gene but for some reason did not have seizures.

Today a lot of people worry about genetic research and especially about genetic manipulation. When Elving Anderson entered human genetic research there were few ethical or theological implications, but now there are many.

As a Christian, Anderson sees two kinds of problems: (a) In the excitement of new discoveries, some people may get carried away by the promise of research and disregard personal and social concerns. (b) In response, others may be tempted to reject the entire line of work, not making the careful distinctions that seem reasonable and necessary.

### Potentials, Problems, and Priorities

In a 1987 *Eternity* article, Anderson pointed to potentials for genetic manipulation beyond simply a better understanding of how genes work: improved diagnosis of inherited diseases (such as Huntington's chorea); inexpensive production of precious natural compounds (like human insulin); improved treatment of some illnesses (perhaps by "gene therapy"); and creation of useful new species (such as disease-resistant crops requiring no pesticides).

Major problems to be faced include guaranteeing the safety of engineered organisms; preventing unrealistic expectations (of having only perfect babies, for example); deciding between the public good and private gain (as in questions about patenting new species); avoiding both secrecy and over-regulation in research; and preserving a Christian view of what it means to be human.

He set two priorities for ethical decision-making: environmental release of genetically altered organisms and human gene therapy. That was back in 1987. Since then, several experimental organisms containing recombinant-DNA have been deliberately released. In May 1989, physicians at the National Institutes of Health infused a terminal cancer patient with some of the patient's own white blood cells containing a foreign gene. It was not quite gene *therapy*, but it was a step in that direction. Actually it was a tracking effort, hoping to use the inserted gene to mark the lymphocytes acting against the melanoma cells.

### Biblical Guidance for Genetic Experimentation?

Although genes and DNA were unknown to the biblical writers, God's "creation mandate" to Adam and Eve included a basis for science (studying, naming, classifying) and technology (subduing). Genesis makes it clear that such efforts are to be carried out in a spirit of stewardship, of being accountable to the Creator.

Elving Anderson concludes that we should use the new powers given to us by the science of human genetics, without misusing them. We should be realistic about new technologies, expecting them neither to solve all human problems nor to cause inevitable disaster. And we should always remember that God is the ultimate source of all knowledge and power.

Beyond resisting such "technological temptations," though, we must also *show love* by using our scientific knowledge to do good whenever we can. We must *maintain hope*, not in an autonomous science or technology but in Christ's conquest over all that is deadly, including our modern pretensions. We must *exercise faith* as science takes us into unexplored territory.

"Like Abram, who left Ur not knowing where he was to go," says Anderson, "we also face the unknown, but we can go on with confidence, trusting in God."

## MADE IN GOD'S IMAGE

### PLAYING GOD?

"Playing God" is a phrase Elving Anderson doesn't like. When applied to genetic research, it is often misleading, he says. In a paper for a 1988 conference on The Health Sciences and the *Imago Dei* (Image of God), he wrote about the prospects of using genetic knowledge not just to cure disease but to produce better individuals:

"But are we playing God when we attempt to improve persons beyond any given norm? It is the Promethean myth, not the Bible, which describes a god who jealously guards the secrets of the universe from human discovery. The actions we fear are not to be described as playing God, but as mis-playing humans. A more reasonable approach is to insist that all of our endeavors be carried out in the spirit of being answerable to God. The Creator bestows the power of creation (in an analogical sense) on humans, to be used morally."

"All of this," he continued, "must be tempered with the humility that there are limits to the changes genetics can bring. The experience of conversion can produce profound changes in behavior without altering the genes. We cannot bring about the fruits of the Spirit or treat sinfulness by genetic engineering, for humanity is not fully defined or described in terms of DNA. An individual with an excellent genetic endowment would still be subject to arrogant pride and irresponsible behavior toward God and others."



## PUTTING SCIENCE AND FAITH TOGETHER

Elving Anderson makes a good role model for other Christians seeking to integrate faith and work. Many Christians in science have come in close contact with him through the American Scientific Affiliation (ASA). Elving is a past president and has spoken at many ASA meetings and special conferences.

### Finding Ways to Serve

Committed to serving God through his profession, Elving has been described as “gentle but decisive.” His character and personal warmth “demonstrate who is Lord in his life.” That was as true of his 1981 presidency of Sigma Xi, the scientific research society of America, as of his two terms on the board of Bethel College and Seminary. In Sigma Xi he encouraged scientists concerned about the impact of science on society and the need to improve public understanding of science to venture beyond their own narrow disciplines. Anderson feels privileged to serve on the board of the Institute for Advanced Christian Studies (IFACS). He enjoys the stimulus and fellowship of participation in a number of professional organizations, but is particularly in harmony with the goals of IFACS. It seeks to support research and publication in areas strategic both for a particular scholarly discipline and for the Christian faith.

### Working as Part of a Team

“I don’t work effectively by myself,” he acknowledges. “Most of my research has been collaborative, cutting across the usual boundaries between scientific disciplines.” Some problems have to be tackled by a team, of course, but to Anderson, it’s also more fun to work that way. He thinks that Christians who work together at pursuing an understanding of God’s created universe do a better job of it—and can enjoy knowing the Creator and each other in the process.

Elving and Carol Anderson have always thought of themselves as a team, both in raising their four children and in their Christian witness. Once the children were grown, Carol was able to accompany Elving on more of his professional travels. After over forty years together, they’re very good companions.



Elving Anderson believes that Christians are called to “team up” with Jesus Christ, in scientific work as in any other calling. Jesus offers guidance and assurance in thinking through the daily decisions each of us must make. And Jesus is a mighty good companion to have along the way.

Share each other’s troubles and problems, and so obey our Lord’s command. If we think we’re too important to stoop to this, we’re fooling ourselves; we don’t amount to much. Let all of us be sure that we’re doing our very best, for then we’ll have the personal satisfaction of work well done, and won’t need to compare ourselves with someone else. All of us must bear some faults and burdens of our own. For none of us is perfect!

*Galatians 6:2–5*  
TLB (paraphrased)

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breathing, etc.) be initiated.

If "life" and "death" were entities, then the following sentences should make sense:

"When a living creature dies, life is taken away."  
 "When a living creature dies, death is added."  
 "When a non-living creature becomes alive, death is taken away."

So we are led to the conclusion that a subtle transformation of "life" and "death" from nouns to the corresponding adjectives "alive" and "dead" is what is needed to enable us to use these terms in a meaningful way in technical discourse. It is not that "she has life," but that "she is alive." Being alive is a property of her whole self. It is not that "he has death," but that "he is dead." Being dead is a property of his whole self.

This shift from noun to adjective, while correcting one potential source of error, does not do away with the need for the adjectives for "living" and "dead" to be appropriately modified. Thus, it is necessary to distinguish between the different meanings of being "biologically alive," "personally alive," and "spiritually alive," just as between being "biologically dead," "personally dead," and "spiritually dead."

It is also necessary to notice the relationship between these terms. If we limit ourselves to our existence in this world, it is not possible to be personally alive without being biologically alive, and it is not possible to be spiritually alive without being personally alive. It is not possible to be biologically dead without being personally dead, but it is possible to be personally dead without being biologically dead. Unfortunately, the expression "spiritually dead" breaks this symmetry, for it is used to imply that a living person is out of proper relationship with God; thus to be "spiritually dead" in this life, it is necessary to be both "biologically alive" and "personally alive."

Thirdly, we need to recognize that "being alive" and "being dead" describe different states depending on which modifier is used with them, and that each involves a process and not just an event in time. Consider as an example the

situation of the results of conception brought about by a man and a woman. The fertilized ovum is "biologically alive," and it is also an example of "biological human life." Even the sperm and the ovum were alive before conception, and they were both human sperm and ovum. The newly fertilized ovum, however, is neither "personally alive" (i.e., manifesting the properties of selfhood) nor "spiritually alive" (i.e., manifesting the right personal relationship with God).

In the normal progress of time, the unborn that is biologically and humanly alive from conception begins to show the characteristics of being "personally alive" as the consequences of being biologically alive develop so as to be able to give rise to these characteristics. It is not until several weeks after birth that the neocortex begins to function and full claim for being "personally alive" can be sustained. It is not until several years after birth that the young child can be considered to have become responsible for his or her choices and to have entered into being "spiritually alive" when those choices are centered in Christ.

The reverse process occurs at the end of life: being "personally dead" frequently precedes being "biologically dead." The loss of the capability of experiencing selfhood usually occurs with the permanent end of brain functioning, whereas being "biologically dead" may occur at some later time when the final set of biological functions (e.g., growth of finger nails and hair) ceases.

In summary, "being alive" and "being dead" are characteristics of a whole creature and must be carefully modified to take into account that both are processes extended over time. Additional aspects of this discussion will be continued in the next Word Maze.

*Is this description lively enough for you, or do you find its semantic distinctions deadly?*

**Richard H. Bube**

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*The earth is our Lord's and all that therein is:  
 the compass of the world, and they that dwell therein.*

Psalms 24:1

**BIOLOGY THROUGH THE EYES OF FAITH** by Richard T. Wright. (Volume II in "Through the Eyes of Faith" series, cosponsored by the Christian College Coalition.) New York: Harper and Row, 1989. 298 pages, index. Paperback; \$9.95.

The living world has a remarkable capacity to amaze and delight us, often taking us by surprise when it does. Once our attention is caught—whether from firsthand experience or in a biology course—we find that biology deals with many value-laden issues that profoundly affect human life. (p. 13)

For Christians, the Bible provides a world view that serves as a guide to all of life—if it is consistently followed. This text will explore biological science from the perspective of a biblical world view, and examine other world view beliefs that clearly influence the development and interpretation of scientific knowledge. (p. 14)

These two statements taken from the Summary of Chapter One in *Biology Through the Eyes of Faith* clearly define the reasons for and the goals of this book. When we consider that Professor Wright is writing for the beginning biology student we recognize that he has entered on a challenging venture. When we remember the multiplicity of "simple" answers to problems of origins, ethics, and environment that are given to us by Christians and nonchristians, by scientists and nonscientists, the aim of this book raises the hope for an honest and profitable appraisal of modern biology from a Christian perspective. As I went from chapter to chapter of this book I became increasingly impressed with the thoughtful handling of these "value-laden issues," issues that have perplexed and challenged me both as a Christian and as a biologist for nearly fifty years. I was not disappointed in my hope that this was a significant book. The author is well qualified to discuss these issues as he has been a professor of biology in an evangelical college and an active research investigator as an ecologist for many years. Furthermore, he has had the advice of other biologists from the Christian College Coalition so that this book is not merely the personal views of one individual. It is a carefully thought-out and well-organized treatise on a most important subject for all Christians who want to honestly think through the issues of biology and Christian faith.

#### **Four Revolutions**

Wright considers the issues presented by biology within the framework of what he calls "revolutions." *The Darwinian revolution* centers around the problems of origins and, from the perspective of twentieth-century Christians, is largely concerned with questions about the past. *The biomedical revolution* results from advances in our biological knowledge and its technological applications. This revolution centers largely around ethical dilemmas, because these advances have tremendous potential for good and for evil. Similarly, in *the genetic revolution*, spectacular advances in our understanding of hereditary mechanisms allow us not only the positive, exciting prospect of being able to remedy hereditary diseases but also the awesome potential to manip-

## **Biology THROUGH THE EYES OF FAITH**



### **Richard T. Wright**

ulate the genetic future of the human race. These two revolutions are powerfully affecting us now with a host of difficult and controversial decisions in life and death issues. Finally, Wright discusses *the environmental revolution*, a crisis brought on by pollution, overpopulation, and diminishing resources. This revolution has been developing for some time, but biologists, who study the complex relationships of living things to each other and to their environment, fear that this problem has the potential for threatening the survival of many forms of life, including the human race.

To me, as a Christian biologist, these revolutions have been a challenge for many years in the form of what I have come to think of as the "three Es": 1) *Evolution*, the problem of understanding the past; 2) *Ethics*, the problems (biomedical and genetic) of handling the present; and 3) *Environment*, the problems of recognizing and accepting our responsibilities as stewards today so that there will be a decent tomorrow for our children and our grandchildren.

#### **Laying the Foundation**

Since *Biology Through the Eyes of Faith* is aimed primarily at the beginning student in a college biology course, the key "revolutions" are not immediately discussed nor are they presented with neat, oversimplified answers. Rather, there is a careful groundwork laid in the opening six chapters. This introduction presents in a clear and stimulating manner the basic principles and vocabulary that is



essential for understanding the issues. Instead of the all too common either/or, them/us approach, Wright describes the various perspectives of theologians and scientists and their sometimes intricate interrelationships.

In Chapter One, "Biology and World Views," Wright describes the origin of his own interest in biology, mostly through his childhood awareness of birds. (For this reviewer it was snakes and butterflies.) Then he gives a broad overview of biology as the science of life, life that includes human beings, plants and animals, and their impact on one another. He goes on to emphasize, with illustrations, the impact of human "world view" on our attitudes toward the world around us. Here he uses as his major example the cultural conflict in colonial New England between the Native Americans (hunter/gatherers) and the European settlers (property rights and "natural resources"). From a detailed analysis of this episode he derives three lessons: "1) Natural ecosystems are capable of supporting human life on a sustainable basis, but will do so only if ecological realities are recognized and respected. 2) Economic and political power determine the fate of much of the natural environment, especially when the elements of the natural landscape are defined in economic terms. 3) Misuse of land and resources can result in permanent changes." He concludes the chapter with a discussion of the importance of "world views" and the need for Christians to develop a world view consistent with Christian faith. The emphasis here is on our *theistic* perspective in contrast to the *naturalistic* perspective so commonly assumed in biology texts, other writings and television nature programs.

The commentators for these television wildlife documentaries, as well as the meteorologists on local weather reports, frequently refer to the directive activities or to the awesome powers of Nature or Mother Nature. When faced with the unexplainable phenomena of the world around us this seems to be as far as our society will go in the direction of recognizing "God the Father, maker of heaven and earth." Consideration of the relationship of God to His world is largely described in a mystical, pantheistic perspective. To many this may seem less bothersome than a blatant atheistic naturalism, but it is still a far cry from the God of the Bible. Indeed, the Bible, from Genesis to Revelation, is more critical of the pantheistic/polytheistic tendencies of sinful human beings than the atheism that characterizes a small minority of twentieth-century intellectuals.

Therefore, it is helpful that in Chapter Two, "God and His World," Wright defines the biblical perspectives on God and Nature. God is the Creator; God is the Governor. "Nature" and "natural laws," awe-inspiring though they may be, are only the handiwork of Almighty God. As Creator, the God of the Bible uses His Word to demonstrate His power, and His Wisdom to demonstrate His planning. Whether we understand it or not, God calls His Creation "good." Therefore, all nature, including human beings, are to praise Him. Humans as creatures made in His image are to know Him and to serve Him, but we are also to know His Creation, not only for our use but as a reflection of the power and the glory of the Creator.

In Chapter Three, "The Scientific Enterprise," Wright begins with a description of one of his own research projects and illustrates how most scientists get involved in research in a manner quite different from the usual textbook analysis of the "scientific method." No matter how "scientific" a project appears to be there are "shaping principles," "extra-scientific values and assumptions, background beliefs, and commitments that strongly influence both data-gathering and theory-forming" (p. 48). Wright then gives an excellent summary of two world views, held by both scientists and nonscientists in the world today: *naive positivism* (the view usually attributed to scientists by Christians in their attempts to defend their faith) and *New Age subjectivism* (the view that is increasingly prominent in science today from astronomy to zoology). After describing, within the realm of biology, both the expectations of science and its limitations, Wright emphasizes the appropriateness for Christians to study science.

Chapter Four, "Relating Science and Christianity," could be one of the more difficult sections of this book for its primary audience, the student in an introductory biology course. However, like the entire book, this chapter is well written with an honest approach to the relationship of world views and the science/Christianity encounter. Wright describes the development of the shaping principle (paradigm) of *natural theology* in the seventeenth to nineteenth centuries. Here the emphasis was on describing the handiwork of the Creator but, unfortunately, the basic assumption was on a static Nature, a world that remained just as it was when God first made it. Such a natural theology became vulnerable when the natural world was shown increasingly to be in a more or less constant state of change. Rational mechanism replaced God and theology became increasingly deistic. Hence, the stage was set for evolution by natural selection (Darwinism) to replace, in the minds of many people, the presumed static creation of the book of Genesis.

Chapter Five, "Perspectives on Genesis One," gives a good overview of the various approaches to Genesis by committed evangelical Christians. In the analysis of interpretations he lists four *major* interpretations: Reconstruction (or Gap) Theory, Day-Age Theory (Progressive Creationism), Literalist Theory (Recent Creationism/Flood Geology), and Framework (Historical/Cultural) Theory. He further describes four "models for relating Scripture and science": Concordism, Substitutionism, Compartmentalism, and Complementarism. Such a broad evaluation is of the utmost importance when discussing problems of origins with fellow Christians who are not scientists and with fellow scientists who are not Christians. The tendency has been for both groups (and others) to oversimplify and distort it into an either/or choice between an atheistic, materialistic evolution or a recent creationism. This reviewer is particularly sensitive to this problem because of the faddist nature of biblical interpretation as well as scientific theory. When I was in high school and college in the 1930s the prevailing, and often the "only," true interpretation was the Reconstruction Theory as postulated in the Scofield Reference Bible. Recent creationism and especially flood geology was a "disproven," "heretical" view mainly held by Seventh Day Adventists. Such a

“one and only one” approach to controversial matters is arrogantly unchristian and places serious stumbling blocks in the way of people coming to faith in Jesus Christ. Wright, along with Hummel, Blocher, Hyers, Wilcox, and others—even if we do not agree with all of their interpretations—gives an honest summary of Christian options for “approaching the world from the combined perspective of science and Christian faith” (p. 92). I heartily agree with Wright that such a perspective, and the necessary wrestling with the problems, is still a great privilege; it is also a great responsibility that we do nothing that will disgrace our fellow Christians or put to shame those who may be seeking our Lord (Psalm 69:6).

### *The Problems of Origins*

Having laid a solid foundation with his discussion of the basic principles and issues in the relationships of science and Christianity, Wright starts his discussion of specific issues with Chapter Six, “The Origin of Life”; Chapter Seven, “The Darwinian Revolution”; and Chapter Eight, “Where Are You, Adam?” He closes this section with an introduction to our God-given assignment as “Stewards of Creation” (Chapter Nine), a subject to which he returns in greater detail in the concluding chapters of the book.

The origin of life is often argued on an either/or, all or nothing battlefield of spontaneous origin by atheistic, random, biochemical evolution OR an instantaneous, supernatural creation by God. Wright correctly objects to this oversimplification on the basis of: 1) “it implies that God would only be involved if life originated by supernatural or miraculous means” (p. 95), and 2) such a choice is inappropriate in “that the evidence for the spontaneous origin of life is remarkably sketchy.” After giving a careful description of “biochemical evolution” and a careful analysis of the theory’s major problems, he emphasizes both the tentativeness and the possibilities of origin of life hypotheses by stating: “There is no evidence suggesting that this scenario is correct; it happens to be the most reasonable based on what we know about current living organisms and the very limited fossil record of early life” (pp. 102–103).

One of the concepts that has gained popularity among some Christians in recent years is the distinction between “operation science” and “origin science.” Operation science applies to repeated, current phenomena that can be tested by experimentation; origin science deals with unique, non-recurring events and, hence, is not subject to laboratory analysis, confirmation, or falsifiability. Wright correctly emphasizes that an “observational-comparative method” is heavily, and necessarily, used in geology, meteorology, astronomy, and biology. Furthermore, this method does generate plausible explanations. Nevertheless, when it comes to origins, the experimental limitations and the enormous time gap do “place low reliability on attempts at reconstructing the spontaneous origin of life.” Wright concludes this chapter with a well-worded quote from biologist David Wilcox: “Anyone who is a fully biblical theist must consider ordinary processes controlled by natural law to be as completely and deliberately wonderful acts of God as any miracle, equally contingent upon his free and unhindered will” (p.

110). As a Christian and a biologist whose teaching and research centered on amoebae and worms (parasites at that!), I am convinced that even these humble and often despised creatures, along with sparrows and lilies, are magnificent, beautiful handiworks of the Creator and Sustainer of the universe.

Chapter Seven, “The Darwinian Revolution,” and Chapter Eight, “Where Are You, Adam?,” will probably be among the more controversial chapters in this book. In these chapters Wright discusses the theory of evolution in general and the origin of the human race. He briefly and clearly discusses the five components of evolution as outlined by Ernst Mayr: 1) evolution as a reality, 2) evolution by common descent, 3) evolution as a gradual process, 4) natural selection, and 5) the origin of species. Because such a theory has been considered by both its supporters and its opponents as replacing the Creator-God with an autonomous nature controlled by chance, evolution has been a heated subject of debate over the last century. To Christian biologists this debate—and its often accompanying nasty and emotional arguments—has been frustrating, especially when many of our fellow Christians (sometimes “scientists” because they are engineers, physicists, or chemists) display such an appalling lack of understanding of biology. Frequently, they condemn “evolution” even though they unwittingly accept many of its major features, but they refuse to use the emotion-laden word “evolution.” They fail to differentiate what is obvious to every biologist (e.g., living organisms are constantly changing in response to genetic and environmental processes) from the speculations (both of a scientific and a philosophical nature) common to any theory as it is modified in time or by unjustified enthusiasm.

At the same time, the Christian biologist is all too frequently looked on with suspicion if he or she refers to Creation or to God. Wright handles this dilemma with an admirable combination of scientific accuracy, intellectual honesty, and Christian love as he critiques the tendency of “evolution” to degenerate from biological theory to speculative philosophical commitment. Likewise “creation” can be distorted and oversimplified by insistence on a magician-type God who has to prove His power by doing everything in seven 24-hour days.

There are then two major goals of the Christian biologist in this area: 1) to emphasize that biological evolution at any level does not justify “evolutionism” and the substitution of “natural” for “supernatural,” and 2) that creation means “God did it” even though we might quibble about how He did it. The best we can come up with are various theories, but such theory formulation should be part of the fun and excitement of our God-given stewardship of His Creation and never a test of our Christian orthodoxy.

When he considers human origins, Wright outlines the latest thinking of paleo-anthropologists, but he emphasizes the tenuous nature of the evidence. As a Christian biologist I have followed, somewhat peripherally, the ever-changing “solutions” and “answers” to this question. I am not going to get overly concerned with attempts to fit “the latest discovery” into various biblical interpretations. As I have emphasized in my teaching, speaking, and writing in recent years, I

have seen many "facts" of today become the "discarded hypotheses" of tomorrow. On the other hand, while I am willing to accept the possibility of human physical origins through descent from lower animals, that acceptance is very tentative and not something I'm going to consider a threat to my confidence in God, His word, and His works. Like Wright, I would emphasize to both "creationist" and "evolutionist" that "the evidence is not good enough to make a clear choice" of the several views. Meanwhile, I approach the "evidence" of the palaeontologist and the "interpretations" of Scripture with both puzzlement and interest but with continued confidence in the God of Creation. This book will help biology students think clearly about these issues and be aware that evangelical scholars support several options in their attempts to be true to both science and Scripture.

In Chapter Nine, "Stewards of Creation," Wright introduces the subject of human stewardship of God's creation. This is a subject to which he returns in Chapter Twelve, but which he introduces here in the light of God's directives to Adam and Eve in Genesis One and Two. He points out the problems that have developed in human stewardship as the result of sin. Although these problems are often alleged to be the result of Judeo-Christian attitudes towards nature, they are more accurately associated with materialism and secularism. Christians, however, are not without blame, as we often take selfish and materialistic attitudes and actions toward the world around us as we think only in terms of "natural resources." All too often God's creation is "good" not in the sense of a work in which the Creator demonstrates His power and glory, but only in the sense of how we can use it for me and mine.

After emphasizing that such human greed, pride, carelessness and ignorance are at the heart of the problem, Wright urges Christians to assume their dominion responsibilities as God's image-bearers and as creatures who are to serve creation—"to both work and take care of the Garden." Wright's subsequent development of this theme of stewardship is an excellent summary of how and why we are to serve God's creation. He concludes the chapter with a challenging discussion of the need for Christians not only to work together with each other but also the need to work on these problems with nonchristians. In the light of God's use of pagans to do His will, a principle that Wright calls the "Cyrus principle" in reference to that Persian ruler of Old Testament times, we are to join with nonchristians whenever they are working for the benefit of the world around us. This is a principle we as evangelicals frequently use when we are concerned about good government, morals, or ethics. Even though it brings us into close contact with people and ideas with which we are uncomfortable we need to become involved. While this has its dangers, we are more in tune with the biblical commands for witness than when we sit back and see the world getting worse and worse while we piously preach about the rapture or the second coming.

### *The Biomedical and Genetic Revolutions*

In Chapter Ten, "The Biomedical Revolution," Wright discusses the second of the four revolutions referred to earlier in this review. Having taught courses in parasitology and

infectious disease for many years I have been repeatedly impressed with the naiveté of the citizens of developed, Western nations. Not only is there lack of awareness of the plight of the hundreds of millions of people in the Third World today, but there is no comprehension that many of us alive today were born and even brought up before the days of antibiotics. At the beginning of this century, at the time of my parents' youth, the leading cause of death in the U.S. was tuberculosis. In the 1920s measles, diphtheria, and whooping cough were still major causes of child mortality, whereas today it is the rare parent who loses a child to infectious disease in the Western world. Disease control, along with the advances in nutrition, has worked health miracles of which previous generations could only dream. But these same miracles, undeniable advances and benefits, have also brought problems. The drastic reduction in infant and child mortality has been a major factor in the "population explosion." The sophisticated medical technologies that save the lives of the young and prolong the lives of the elderly are often prohibitively expensive and, therefore, society has, so far, been unable to work out the ethical problems of who should get what and when, as well as who should pay for it.

Wright gives us a carefully outlined summary of some of the problems created by the successes of biomedical research. He gives a brief, but clear, summary of the basic components of ethical systems and how these involve respect for persons, beneficence, and justice. He then discusses the complicated issues—issues often grossly oversimplified—of genetic screening, artificial insemination, *in vitro* fertilization, and abortion. He both begins and ends this chapter with an emphasis on "the ethical dilemma of science." He clearly describes the need for Christians to recognize the benefits of biomedical technology as well as the possible misuse of these benefits. Furthermore, he emphasizes that there is a need for ethical and moral principles that will bring these benefits to those who need them most, and not just to those who can pay for them.

The Biomedical Revolution, with many of its advances, is presently with us and will continue to challenge us, but there is one phase of that revolution that is just beginning. Because of the awesome possibilities of the advances in our knowledge of hereditary mechanisms, Wright considers these advances to constitute a separate third revolution. In Chapter Eleven, "The Genetic Revolution," he discusses the ethical implications of recent developments in molecular biology, the deciphering of the structure of the DNA molecule and the genetic code, and what it might be possible to do in the near future. We can now manipulate the hereditary mechanism to "cure" certain hereditary diseases. Such uses can, with reasonable certainty, be considered as ethical and offer new means for the expression of Christian compassion. However, plans are under way to develop these technologies to apply to the germ-line and make changes in the heredity of future, yet unborn, generations. Such potentialities certainly have social and ethical implications that remind us of (and could even surpass) the problems of the "eugenics movement" of the early years of this century. Wright clearly presents the challenge of all this to Christians when he notes, "We are not only reading God's commands, however, but we are also undertaking to revise them for our own purposes. . . . Is this legitimate? The answer depends on the use to which this

knowledge is put, for it can produce both good and evil. It is a great stewardship challenge to guard the integrity of the creation and yet use this technology for accomplishing good ends" (p. 220). This is certainly an area in which Christian biology students need to do some serious thinking, and this book will challenge them to do just that.

### ***Environmental Deterioration***

In Chapter Twelve, "The Environmental Revolution," Wright discusses the fourth of the biological upheavals that involve issues and attitudes related to Christian faith. This revolution is just getting started, but it threatens the future of life on earth. These environmental problems require a renewed commitment to Christian stewardship of the earth and the millions of kinds of living organisms that were created by our God and declared by Him to be "good."

Wright starts his discussion of the subject by a comparison of two futuristic scenarios: the utopian predictions of the "Cornucopians" and the gloom and doom predictions of the "Jeremiads." The Cornucopians are usually economists, businessmen, and politicians—and, I might add, some engineers, technologists, and physical scientists. The Jeremiads are usually biologists and demographers. When we consider the ignorance of biology—especially the science of ecology—among so many economists, businessmen, and politicians this division is not surprising. When we consider that Wright is an ecologist it is not surprising that he lines up with the Jeremiads. As a fellow biologist, who like Wright has been overwhelmed for years by the deterioration of our global environment and who has experienced local examples of this along the New England coast, I must agree that this is the most significant and challenging threat to human survival. As I read the cornucopian fantasies of Herman Kahn, the Christian reconstructionists, and others with little understanding of the living world and the very real threats to it, I fear that perhaps God will let this continue as the ultimate judgment on our man-centered arrogance.

As a Christian I am concerned about the total disregard for the obligations for stewardship on the part of so many of my fellow Christians. It is not surprising that nonchristian materialists should be so self-centered, but that people who claim to honor God as Creator should think only of how they can use His creation for material gain seems contrary to the teaching of Scripture. Therefore, I consider Wright's chapter on the environmental revolution, his emphasis on pollution, population (and related hunger and poverty), resource (especially food) depletion, and the concomitant biological extinction of species, to be another in a series of writings by responsible Christians that call us back to stewardship.

But all is not lost; the battle can be won if people will admit the obvious and will make adjustments in lifestyles that can alleviate the problems. Wright emphasizes, as the competent ecologist that he is, how people—especially Christians—can deal with these threats to our survival. By extensive quotes from the 1984 publication of the World Resources Institute, *The Global Possible: Resources, Development and the New Century*, Wright indicates many of the measures which can be taken to lessen the impact of these threats to our future.

Christian students, while being introduced to biology, need to be reminded that stewardship, not exploitation, is the biblical norm.

In the concluding Chapter Thirteen, "When Earth and Heaven are One," Wright concerns himself with what Christians should be doing. Returning to his earlier theme of world views he reminds us that naturalism, materialism, secularism, and evolutionism "have become the dominant components of the modern worldview." This world view, with which all too many (all?) of us Christians have become tainted, is not serving us well. As Wright reminds us we need to be emphasizing a Kingdom theology of which "shalom"—harmony and wholeness—is a major theme. The world is corrupt because of sin, many crises are heading toward catastrophe, but as Christians we are called on to proclaim the good news of salvation, to reform culture, and to redeem creation. How it must grieve our Lord when we restrict, not only ourselves, but His church to one aspect of this calling to the neglect of the others. With many references to the prophets and to the words of Jesus and Paul, along with quotes from Wolterstorff and Wolters, Wright challenges us to consider our biological understanding through the eyes of Christian faith. We need to be concerned, not only with the salvation of individual souls but with justice and righteousness in human society (Ezekiel 16:49,50) and we need to have compassionate and zealous concern for what God has made and sustained and delegated to us for responsible stewardship. Use? "Yes," but abuse and exploit? "No!!"

Wright concludes this chapter and the text of the book with the following advice regarding "Reforming Biology":

Finally, what of the task of reforming biology? This is a responsibility facing those of us who are Christian biologists. We must seek the deepest possible understanding and penetration into the accumulated knowledge and procedures of the life sciences. As we do this, we must avoid quick and easy judgment. This knowledge is largely correct; what has been learned is primarily the result of honest and painstaking scholarship on the part of thousands of people whose basic goal has been to discover the truth. We should affirm this work, recognizing that it has uncovered God's creational activity. We should not be so naive, however, that we do not expect to see the evidence of human sinfulness reflected in the knowledge and practice of our science. Reforming biology, then means that we should look for this evidence as we read the works that seek to interpret the life sciences, for here is where world views are especially significant.

In particular, our reforming task will be tested as we examine those issues that have most strongly influenced human affairs—the four revolutions I have presented in this text. The Darwinian revolution continues to generate great tensions because of its pronouncements on origins. The biomedical revolution challenges Christian ethics by its direct effects on our reproduction, our health and length of life. The genetic revolution promises to unravel the very instructions that describe living organisms, and challenges us to respond to the potential for changing those instructions. And the environmental revolution calls on us to help shape the future, to be involved in the Kingdom of God as a place on earth where justice and peace reign.

It is our privilege as biologists to study God's creation. Because we understand it in greater depth than others, we are

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also more responsible for its use and its integrity. Because we worship the One who created life, we are able to take the works of our mind and our hands and offer them to him as suitable objects for his Lordship. And because we can see God's wisdom and beauty in living things, we can join them in bringing him the glory and praise that he deserves: "Let everything that has breath praise the Lord" (Psalm 150:6). (pp. 266, 267)

### Conclusions

Each of the chapters in this book is well-organized and includes documentation, a reasonable number of quotations and footnotes, and a helpful bibliography to key works by biologists, theologians and others who are authorities in the problems of origins, ethics, or environment. These references not only give scholarly support for the author's statements but provide the interested reader with possible additional reading. There is also a thorough index at the end of the book.

I can't praise this work enough for its scholarly insights, for its fairness to conflicting views, and for its faithful

application of the Christian qualities of honesty, gentleness, and compassion; qualities that are so sadly lacking in some of the other writings on these important issues. This book is a landmark in the correlation of the several complex issues presented by the science of biology and the biblical basis of Christian faith. It is a "must" for Christians with either a professional or general interest in biology. It would be helpful to those who evaluate science/Bible issues but who often are uninformed about basic biology. Above all, *Biology Through the Eyes of Faith* would make an excellent supplementary text for Biology classes in Christian colleges. It would also be useful to Christian students and campus workers on secular campuses where these issues are so often discussed with an antichristian bias. Last, but not least, it would be a valuable addition to church libraries and to personal libraries. In short, this is a book that no Christian who has any interest in the problems of biology and faith can afford to be without.

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*At the still point of the turning world. Neither flesh nor fleshless;  
Neither from nor towards; at the still point, there the dance is,  
But neither arrest nor movement. And do not call it fixity,  
Where past and future are gathered. Neither movement from nor towards,  
Neither ascent nor decline. Except for the point, the still point,  
There would be no dance, and there is only the dance.*

T.S. Eliot, *Burnt Norton*.

## Origins and Destiny—Reviews and Responses

ORIGINS AND DESTINY by Robert Gange. Waco, TX: Word Books, 1986. 193 pages, index. Hardcover; \$12.95.

### A Review by Clarence Menninga

While this book is “creationist” in many respects, Gange’s concerns are not about age or geological history. Gange’s view of the universe as “13 billion years old” and man “existing as man for 40 thousands years or so” would be unacceptable to young-Earth creationists.

The early chapters deal mostly with new perspectives of the world and its history derived from astrophysics and quantum mechanics. The next chapters present examples of design and complexity in living organisms, and Gange argues that such complexity implies an Intelligence-Designer. The last chapters deal with man’s uniqueness relative to other animals, and with man as morally responsible, made in God’s image.

Gange argues for a Designer-Creator on the basis of design in the universe. I think Gange is correct in his judgment that the universe was designed by an intelligent Designer-Creator, but I was already a believer in the Creator God of the Bible. A few nonchristian scientists have suggested that some Intelligence fine-tuned the universe, but such an inference hardly brings us to the personal God of Christianity. This new “Natural Theology” from astrophysics is not likely to serve us any better than the defunct Natural Theology which was popular in the 19th century.

Gange handles the Second Law of Thermodynamics with the same careless misunderstanding that is too common in other creationist literature. Gange says that the Second Law tells us that “on the average” the entropy of a system increases as physical processes occur in that system. In fact, the Second Law is not about what happens “on the average.” The Second Law tells us that *for an isolated (or closed) system*, the entropy of the system increases as *spontaneous* processes occur in that system. The conditionals *closed system* and *spontaneous* place much tighter restrictions on applications on the Second Law than “on the average” indicates.

The Second Law applies to all systems, whether closed or open; closed systems may be considered by themselves, but consideration of the surroundings must be included when

dealing with open systems. The entropy of a *local, open system and its surroundings* increases when spontaneous processes occur in that system. However, entropy may *decrease* in the local system itself. For example, the rusting of iron is obviously a spontaneous process. The chemical process “iron + oxygen → ferric oxide” results in a *decrease* in the entropy of the iron-oxygen system while the entropy of the surroundings increases, so the net entropy of the universe increases. Note that this spontaneous process produces a decrease in the entropy of the local system *without contradicting the Second Law*.

In the concept which Gange calls the New Generalized Second Law of Thermodynamics, he makes the doubtful claim that “uncertainty in information” is equivalent to “entropy” in the classical Second Law. For further discussion on the non-equivalence of entropy and “uncertainty in information,” see “Entropy and Information” by Jeffrey S. Wicken, *Philosophy of Science*, 54 (1987) pp. 176–193. Even if we grant that “uncertainty in information” is equivalent to entropy in the classical sense, Gange is mistaken in claiming that spontaneous processes may result in a decrease in the entropy of local systems. If evolutionary development of living organisms occurred on Earth, it occurred in local, open systems where decreases in entropy (or “uncertainty in information”) can occur without contradicting the Second Law.

Gange does draw one correct conclusion from the Second Law of Thermodynamics; i.e., that the universe did have a beginning.

Gange makes three all-too-common errors in claiming that it is “statistically impossible” (p. 72) for life to arise from non-living entities by spontaneous chemical reactions. First, he mistakenly equates small probability with impossibility; actually, if some event has probability greater than exactly zero, that event is possible. Second, he mistakenly assumes that an event with small probability will take a long time to

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A longer version of this review was published in the *Christian Scholar’s Review* XVIII:3, pp. 306–310. Reprinted by permission of CSR.



occur; actually, if the probability is greater than exactly zero, it might occur on the first chance trial. Third, he mistakenly assumes equal probability of all possible arrangements of the components of a chemical system; every chemist knows that to be a false premise. As Christians, we affirm that God brought life into existence, but we dare not instruct God how to do that.

In discussing the history of man, Gange tries the usual anti-evolutionist stunt of discrediting paleoanthropologists by reminding us of the Piltdown hoax and the "Nebraska man" error. Pray tell, how was the Piltdown hoax found out, and who exposed it? The credibility of paleoanthropology is actually increased by having access to techniques which can discover hoaxes and errors, and by having exercised the integrity to expose those hoaxes and errors.

Gange suggests that the information content of man's DNA far exceeds that of any other creature, making man unique in the capacity to receive, supply, and transmit information through time. This capacity for communication, Gange says, allows man to have fellowship with the Word who created the universe, and allows the Creator to hold man morally responsible from generation to generation. According to Gange, evil is a physical phenomenon which was introduced into the world by a perverse intelligence. Phenomena which I think of as natural processes under God's direction, such as earthquakes, volcanic eruptions, and tornadoes are characterized by Gange as "the residue of Satan's misuse of free will" (p. 153). Gange suggests that Adam's disobedience altered "the informational specifications of his DNA" (p. 149). Thus, in a very physical way, we are all sinners because "all people were procreated from genetically defective organic machines" (p. 150). I think that Gange's suggestions about man's spiritual being and his sin are much too physical to be theologically meaningful. Being made in God's image makes us qualitatively different from other creatures, rather than merely providing greater information content in our DNA. If faulty DNA is the root of man's problem with sin, how can the death of Jesus provide salvation? Should we not rather seek a solution to our problem by way of genetic engineering with recombinant DNA?

This book is an earnest attempt to apply recent scientific concepts to understanding man and history from Christian perspective. In several respects, however, the book is flawed to such an extent that it is likely to be misleading and confusing, rather than helping the reader to clearer thinking about such serious matters.

## CLARENCE MENNINGA

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## Dr. Gange's Reply to Clarence Menninga

Ordinarily, publications are reviewed through a peer process that includes recognized authorities who are expert in the subject matter under evaluation. Yet Clarence Menninga, a professor of geology at Calvin College, appears to have circumvented the process. After appointing himself to review the book *Origins and Destiny*, he wrote to me saying: "I have written for the journal of the American Scientific Affiliation, *Perspectives on Science and Christian Faith*. . . I also plan to send copies of the review . . . to the members of the Calvin College Board of Trustees, . . . [and] to submit the review for possible publication in *Christian Scholars' Review*." My inquiry, however, shows that neither the trustees nor the journals requested his review of the book.

*Origins and Destiny* deals with highly specialized disciplines that include cosmology, thermophysics, and information theory. These fields of study are not part of geology. They are also far removed from Menninga's background and experience. Why, then, does a geology professor want to invest time publishing comments on subject matter in which he has no expert knowledge? The answer, it seems, is that "Menninga's friendly rival of twenty years" thought so highly of the book that he distributed *Origins and Destiny* to the faculty and Trustees of Calvin College as a means of defending longstanding disagreements between the two. Menninga responded by: (i) badly misquoting the book's content; (ii) alleging errors in the book that do not exist; (iii) addressing concepts that lie well beyond his knowledge; and (iv) being personally involved in a way unfit for objective assessment.

*Origins and Destiny* is, to my knowledge, the only book of its kind ever published to have bridged both the Christian and secular worlds. It is endorsed by the presidents of two major seminaries, and by a nobel laureate and past colleague of Albert Einstein who, to my knowledge, is *not* a Christian. Menninga's allusion to the book as "other creationist literature" is, therefore, absurdly inept. Indeed, his remarks are not a "review," but a bombast. He chides me for misstatements that don't exist (e.g., all chemical arrangements have equal probability) and for ignoring truths that the book accents (e.g., entropy can decrease locally). On the first point, page 74 reads: "When scientists calculate probabilities . . . a variety of factors must be considered, including . . . residue probability . . . codon degeneracy . . . homologous protein lineage . . . [and] synonymous amino acid residues." Current references are then provided from the scientific literature to support the probability numbers used. On the second point, Menninga alleges my ignorance of local entropy reduction (information increase) in local systems, repeating the bromidic theme that evolutionary development can occur in an open system. But is he unaware that the book summarizes this well-worn scenario in a simple illustration (p. 44) with the earth and sun as the closed and open systems? And is he oblivious to the quantification of information in biological structures that I cite (pp. 99-100) to discredit the very scenario that he alleges I ignore?

Ironically, Menninga evokes an example (iron oxidation) actually discussed in the book (pp. 52-54), and where the following quote appears with emphasis: ". . . when the total

package is considered, *more things must end up mixed* [entropy increase] *than unmixed* [entropy decrease].” Indeed, page 54 reads: “We can produce information . . . but only at the expense of information that exists elsewhere.” Appendix 2 also contains several examples of local entropy decrease where it is observed that: “The notion of identifying a *decrease* of entropy with ‘information’ is hardly obvious and so *unintuitive* that even those who have spent a lifetime on the subject receive it with reluctance and resistance.” Current references are then provided.

Menninga writes: “this book is ‘creationist’ in many respects . . .” yet I am neither a creationist (young earth patron) nor an evolutionist (mother nature devotee). Instead, I am a realist. Indeed, page 49 states: “while in principle biological evolution is *not* forbidden, this [New Generalized Second] law does impose severe constraints on how natural structures can change.” Despite this, Menninga lumps me with “other antievolutionists,” and puts words into my mouth that I do not say (e.g., spontaneous evolutionary development is “impossible”). He also charges me with pulling “the usual anti-evolutionist stunt of attempting to discredit paleoanthropologists.” This is as untruthful as it is demeaning. One page of the entire book (p. 117) cites paleoanthropological hoaxes. Seven modern sources document and I quote: “the very real tendency of workers in this area to claim knowledge beyond what the fossils actually warrant.”

Is Menninga unaware that anthropologists disregarded reports of the Piltdown fraud as early as 1916?<sup>1</sup> And does he not know that for the next forty years literally hundreds of thousands paid homage to the hoax at the British Museum of Natural History? Menninga asks: “Pray tell, how was the Piltdown hoax found out?” The answer is a fluorine test in 1953. And, but for that test the deception might still be with us today. When the ruse was uncovered, le Gros Clark of the British Museum remarked: “. . . so obvious did they [file marks on the teeth] seem it may well be asked, How was it they escaped notice before?”<sup>2</sup> The answer is that forty years of preconceived ideas outweighed the “techniques” referred to by Menninga.

Menninga’s other remarks are likewise poor. He misunderstands “statistical impossibility” to be “physical impossibility”; he misapprehends “communication” to be “language”;<sup>3</sup> he seems ignorant of the constraints that limit first trial outcomes;<sup>4</sup> he misconstrues: “Man’s flesh is an ally and vehicle of sin” (p. 149) to mean “evil is a physical phenomenon”; he infers “natural theology” unintended by non-Christian scientists and then faults it for not delivering a personal God; he miscomprehends altered DNA to be a sufficient condition for sin; and he pontificates “we dare not instruct God,” implying that *Origins and Destiny* actually contains such foolish nonsense.

At times I get the feeling that Menninga skimmed a different book. His kindergarten cliché regarding the second law and closed systems is a case in point. Page 53 is but one of an entire chapter on entropy; it reads: “These considerations apply to the *entire* system, and, when applied to the *closed* system. . . .” In fact, Appendix 3 gives a detailed discussion of generalized entropy, concluding with: “These last two

relations constitute the New Generalized Second Law of Thermodynamics for *closed* systems.”

Menninga’s confused rhetoric notwithstanding, there are abundant errors throughout his bravado that underscore thermodynamic obsolescence too rash to ignore. Central among these is his complaint of my use of the term: “on average” in describing the New Generalized Second Law. Menninga wrongly believes that the Second Law is *not* about what happens “on the average.” This conceptual error was accepted fifty years ago because at that time thermodynamics comprised experimental laws. However today they are deducible from the laws of mechanics. These laws show that the traditional “second law of thermodynamics” *has nothing to do with dynamics*. Instead, it is a law of *statics* and constitutes the zeroth law of modern thermophysics.<sup>5</sup> The New Generalized Second Law of Thermodynamics (NGSL) is the first law of thermophysics. Unlike the older law, the NGSL is not constrained to thermodynamic variables, but instead is valid for *any* observable and in nonequilibrium situations; i.e., it applies at *each instant of time*.<sup>6</sup>

Pioneering experts in thermophysics include Jaynes (Brandeis lecturer),<sup>7</sup> Mori (Japan),<sup>8</sup> Scalapine (Stanford University),<sup>9</sup> Zubarev (Soviet Union),<sup>10</sup> and Schwegler (Germany).<sup>11</sup> Baldwin Robertson has also contributed to significant works on the topic,<sup>12</sup> as well as Levine and Tribus, who edited a definitive work.<sup>13</sup> Wolfgang Yourgrau and Alwyn Merwe (University of Denver), and Gough Raw (St. Louis University) wrote an excellent primer outlining the deficiencies of the standard thermodynamic ideas.<sup>14</sup> Another excellent treatise dealing with related matters is Robertson’s “Application Of Maximum Entropy To Nonequilibrium Statistical Mechanics.”<sup>15</sup> However, despite much excellent recent work in generalized thermodynamics, Arthur Hobson’s “Statistical Mechanics” still remains one of the clearest renderings.<sup>16</sup> In discussing the second law, Hobson writes:

Both the ordinary second law and the generalized second are *statistical* laws; that is, they refer only to the *predicted or expected* values of the observables and not necessarily the experimentally measured data. The ordinary second law is a relation between the initial thermodynamic data and the *expected* asymptotic values of the thermodynamic observables. . . . Similarly, the generalized second law refers only to the expected values.

Whereas Menninga believes that: “the Second Law is not about what happens ‘on the average,’” in fact, it is a law that *only* speaks to expectations values.<sup>17</sup> Entropy is a *statistical* concept, and a property of the probability distribution of which it is a function. Indeed, each probability distribution has an entropy.<sup>18</sup>

Entropy was once thought to be an additive *equilibrium* function of state that *never* decreased in a thermally isolated system. The Clausius statement of the traditional second law implied that heat *cannot* flow spontaneously from a colder to a hotter body. But of course we know today that the process is *not* mechanically impossible.<sup>19</sup> Instead, for large systems the *chance* of our ever seeing a measurable heat flow from colder to hotter, even when the temperature difference is small, is so minute that we may, as a practical matter, ignore it. But the

word "chance" emphasizes the *statistical* character of modern thermophysics. Indeed, entropy is *not* a function of what the system is actually doing, but a function of *how much we know* of what the system is doing. Furthermore, by taking a very large number of measurements, it would be possible to *decrease the total entropy of a closed system*.<sup>20</sup> In the case of a gas this involves measuring the positions and velocities of vast numbers of colliding molecules. These collisions give the system access to numerous "microstates," each subject to thermal fluctuations. Since the measured value of an observable depends on the microstate of the system, it too is subject to thermal fluctuations. A definite thermodynamic state *means* that the probabilities of the various microstates are known with sufficient accuracy to make good predictions of the observables *when they are averaged over their fluctuations*.<sup>21</sup> If averages are not taken, the observables have no definite values and the state is indeterminate. Nonequilibrium entropy also fluctuates and, as Hobson notes: "needn't be a monotonically increasing function of time."<sup>6</sup> However, its average value rises because disorder "is highly likely" as time passes.

## NOTES

- <sup>1</sup>Lyne, C. *Proc. Roy. Soc. Med.* (1916) 9:33.
- <sup>2</sup>Millar, H. *The Piltdown Men* (St. Albans, U.K.: Paladin, 1974), p. 204.
- <sup>3</sup>Practically all members of the animal kingdom are genetically preprogrammed to communicate (pp. 125-132), but only humans possess language capability; i.e., the "word" (pp. 137-145).
- <sup>4</sup>See *Statistical Interference*, pp. 50-51 (also pp. 85-87).
- <sup>5</sup>Yourgrau, W. et. al. *Treatise on Irreversible Statistical Thermophysics* (New York: Dover Publications, 1982), pp. 1-54.
- <sup>6</sup>Hobson, A. *Concepts In Statistical Mechanics* (New York: Gordon & Breach, 1971), pp. 140-143.
- <sup>7</sup>Jaynes, E. *Statistical Physics*, 1962 Brandeis Lectures, Ford K. (ed.), (New York: W. Benjamin, 1962); *Am. Jour. Phys.* (1965) 33:391.
- <sup>8</sup>Mori, H. *Jour. Phys. Soc. Japan* (1956) 1:1029.
- <sup>9</sup>Zubarev, D. *Doklady* (1962) 6:776.
- <sup>10</sup>Scalapine, D. *Irreversible Statistical Mechanics and the Principle of Maximum Entropy*, Ph.D. Dissertation, Stanford Univ., 1961.
- <sup>11</sup>Schwegler, Z. *Naturforsch* (1965) 20a:1543.
- <sup>12</sup>Robertson, B. *Phys. Rev.* (1966) 144:151; (1967) 160:175.
- <sup>13</sup>Levine, R. and Tribus, M. (ed.), *The Maximum Entropy Formalism* (Cambridge, MA: MIT Press, 1981).
- <sup>14</sup>Yourgrau, E. et. al. *op. cit.*
- <sup>15</sup>Levine, R. and Tribus, M. *op. cit.*, pp.289-320.
- <sup>16</sup>Hobson, A. *op. cit.*, pp.131-155.
- <sup>17</sup>If a quantum operator does not commute with the Hamiltonian, the parameter involved may assume one of several values when measured with the system in a given energy state. However, the statistical distribution of these values can be calculated. The average value of the distribution is called the expectation value.
- <sup>18</sup>Shanon, C. *The Mathematical Theory of Communication* (Urbana, IL: Univ. of Illinois Press, 1948); Khinchin, A. *Mathematical Foundations of Information Theory* (New York: Dover, 1957).
- <sup>19</sup>J. *Am. J. Phys.* (1957), 25(510).
- <sup>20</sup>Waldram, J. *The Theory of Thermodynamics* (1985), p. 307.
- <sup>21</sup>Fluctuations in space or in phase space not only arise from collisions, but from dissociation in chemical reactions, decay in radioactive isotopes, and even in diffusion processes. The latter is commonly viewed as deterministic, but is actually the average of a random process. Moreover these considerations apply to equilibrium, stationary states, and time-dependent situations, both in linear and nonlinear systems. A good discussion occurs in: van Kampen, N. "Fluctuations in Continuous Systems," *AIP Conf. Proc. No. 27*, edited by R. Piccirelli (New York: Am. Inst. Phys., 1976).

## ROBERT GANGE

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## *A Review of Origins and Destiny (submitted by Robert Gange at the request of ASA book review editor, Richard Ruble).*

If the formation of proteins in aqueous solution is thermodynamically nonspontaneous, how can natural processes initiate life? Just when the unbounded ingenuity of purely materialistic philosophers seems to have provided semi-satisfactory answers to questions like this, along comes a book which adds several new dimensions to the problem of origins. The author, a research physicist and in particular an information theorist, poses some penetrating questions based on recent findings in science: In view of the generalized Second Law of thermodynamics, how can the informational complexity of even the simplest life form arise? How can so many optimized structures in the biosphere be accounted for? Given the interaction of wave functions and observers, how does a handful of inanimate earth eventually make a conscious decision to grab a handful of itself from the moon?

The book attacks these problems in detail and from many interesting angles and concludes that scenarios dealing with life's origins must include more than a series of senseless molecular accidents. Nor is a surfeit of time the answer. Time, the treacherous ally of materialism, can only act as an inexorable eroder or archenemy of information. Can any purely molecular scenario compete with the thesis that intelligence is required to beget intelligence? If so, would not such a scenario be historical dogma rather than science? Materialists who wish to refute the claims of this book please step forward! But please, no innuendos about creationists. Specific and logical arguments are requested.

The simplicity of exposition tends to hide the fact that the author has produced a unique sourcebook which will be of value to any interested person, regardless of world view. The book concludes with eleven pages of annotated appendices and fifteen pages of chapter notes with references to many research journals such as *Physical Review*, *Nature* and *The Journal of Theoretical Biology*. More than one hundred advanced science monographs are cited. Rather than being primarily an attack on the many vulnerabilities of atheistic, stochastic mechanisms, this is a science book which is refreshingly positive in the support of its own views.

The book contains some unusual features: a novel essay on cosmological origins; readable discussions of information and quantum theories which should be of value to both laymen and scientists; a profusion of epistemological morsels and brain-teasing puzzles; and a surprising view of the vast chasm between man and ape that is downplayed so fiercely by some anthropologists. Perhaps most importantly, the book clearly indicts preconceived world views as obstacles to true scientific inquiry. It strikes this reviewer that perhaps it is time to consider intelligent creation and the loss of information in progeny in evolutionary research proposals. Perhaps there is also a warning here for biotechnologists who deal so light-heartedly with a cellular complexity that they cannot fully comprehend.

The last chapter turns to the biblical stories of Supreme Intelligence and man as a moral creature with the power of

choice. As J.R.R. Tolkien has written: "There is no tale ever told that men would rather find was true, and none which so many skeptical men have accepted as true on its own merits." The author is apparently one of these skeptical men, but one who is trying very hard to make the choice easier for others. The plain message is that if we find our miracles only in mindless atoms and reject creation by intelligence, we "do so for reasons of philosophy and not science." We are free to "slide into a mudhole from which we did not come" or we can lay claim to a glorious destiny.

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### *A Chemist Reviews Origins and Destiny*

*This review, by ASA member Jack Haas, dates to the book's pre-publication proofs in 1986. At the time, JASA did not print the following due to the negative review of the book. We publish it here now as, perhaps, another view in this small controversy.*

Engineer Gange seeks to counter a materialistic world view of the origin of the cosmos, lower life and man with a biblical perspective buttressed by the evidence of modern science. The early chapters argue that the universe has a beginning. Here the existence of background microwave radiation, the discovery of hydrogen and deuterium in outer space at concentrations markedly different from our solar system and the new Generalized Second Law of Thermodynamics are seen as supporting an origin in time as opposed to "steady state" or "oscillating" models. The author joins this conclusion with the First Law of Thermodynamics (which he sees as teaching "that a NATURAL process cannot bring into existence something out of nothing") to argue the notion that the natural world came from an UNNATURAL process. Finally, the "New Inflationary Theory" suggests that the universe came into existence "ex nihilo"—an idea found in Scripture.

Chapter five provides ten concepts (time, pleasure and pain, individuality, life, consciousness, etc.) which cannot be explained in mechanistic terms. Later chapters argue for an "intended" over an "accidental" arrangement of nature—

design toward a useful end. The Second Law of Thermodynamics speaks to the necessary loss of information with the passage of time. Since natural processes produce patterns with only modest amounts of information compared to that found in the cell it is impossible for the cell to develop from natural causes. The suitability of the earth for life, the harmony and coherence of nature, information theory, and the lack of natural machinery to systematically increase the complexity of biological structures with the passage of time argue for a "creator god"—to be identified as the God of Scripture. For author Gange:

The very young believe in the Easter Bunny, Santa Claus and the Tooth Fairy. But what are we who are not so young to believe? The materialistic myths of a prior century? Or the modern indications that an Intelligence has made itself known? (p. 101)

Gange fleshes out his arguments with an eclectic range of scientific illustrations which effectively speak to the diversity and complexity of nature. The closing chapters draw the reader to the biblical perspective of man as made in the image of God and present the themes of creation, the Fall and the redemption in Christ.

The author has brought together many of the serious problems that confront the case for a non-supernatural perspective on life. Whether he has fairly presented the arguments of the other side or allowed any room for new information to appear in the course of time is another matter. I feel that it is inappropriate to argue for the existence of God on the basis of scientific models whose lifetime may be short. Nature surely bears witness to the Creator. However, the models by which man explains nature seem more inclined to expose man's limitations than God's attributes.

Unfortunately, *Origins and Destiny* is seriously flawed by its grammar and syntax. The wordiness, overrepetition of ideas, redundant use of questions, lack of continuity, swings in style from comic strip folk talk to sublime metaphor, etc., will soon lose the reader from exhaustion, confusion, or frustration. A tighter editorial hand should have been exercised.

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## Book Reviews

**BIBLICAL CREATION AND THE THEORY OF EVOLUTION** by Douglas Spanner. Exeter, U.K.: Paternoster Press, 1987. 191 pages, indices. Paperback; £6.95.

Douglas Spanner writes from his experience in both science and theology. After holding a Chair of Plant Biophysics in the University of London, he has become a minister in the Church of England.

The author clearly states his purpose at the outset: to commend the biblical doctrine of God the Creator. Though scholarly, the book is non-technical. While well-documented with footnotes and appendices, its readable style is designed for anyone who desires to study the issues. Nevertheless, the author has two groups specifically in mind: scientists and clergy. The former concentrate so much on questions of *mechanism* that their focus on *meaning* is blurred. In addition, most scientists today, like other educated people, misunderstand what the Bible teaches about creation. On the other hand, many clergy suffer from a crisis of both identity and belief, their confidence in the authority of the Bible significantly undermined by a misunderstanding of science and evolution.

At the outset Spanner takes issue with the belief that a successful naturalistic explanation of origins necessarily excludes their God-giveness. The biblical writers consistently portray God working in and through the regular forces of nature and human actions in history. The door is firmly closed and locked on the popular god-of-the-gaps.

The first nine chapters take the reader to the Scriptures. After a chapter on God and the Bible, the author presents an approach to Genesis, the meaning of "creation" in the Bible, and its use in Genesis. This section concludes with a consideration of the Garden of Eden, the temptation and Fall, and the relationship of Adam to mankind.

The next three chapters launch into the scientific arena, dealing with contingency, necessity, the anthropic principle, chance and the origin of life, and Darwinism today. The final two chapters take stock of the issues that have been considered and propose a model to help us think correctly about creation. The book concludes with about 30 pages devoted to 13 brief appendices. They deal with such subjects as the creation days, providence, the meaning of death, the flood, the problem of evil, and chance.

The author's style is generally clear in its logical presentation of the facts and conclusions. Passages in the first section are well documented with Scripture references; they are not easy to *read* but rather afford biblical material to be *studied*. Spanner provides an unusual feature to help the reader: a brief preview at the beginning of each chapter sketches the questions to be discussed and summarizes the major conclusions. Each chapter also ends with a somewhat longer summary.

The book has several important features. The introduction sets the stage for considering the purposes and limitations of the biblical and scientific views of nature. The chapter on the meaning of "creation" in the Bible is especially good in its affirmation of God's continuing activity in "sustaining all things by his powerful word" (Hebrews 1:3).

Spanner's study of the biblical words for creation leads to the conclusion that the Bible does not unequivocally teach "special creation" in the sense that "God *separately* and *individually* created many kinds of plants and animals on the appropriate 'day'" (p. 43). For example, God's creation of "every living creature" involved what we call natural reproduction. The author shows that the phrase "after its kind" can also mean "of every kind." He also points out that the "'chance' element in evolutionary theory presents no insuperable obstacle to biblical doctrine," a fact recognized in the past by conservative theologians such as B.B. Warfield and James Orr.

Spanner also concludes that the primal creation, even though it was pronounced "very good," was not idyllic paradise. Humanity was given the task of "subduing it and bringing it to harmony." His treatment of chance and the origin of life, and the status of Darwinism today are stimulating. The author holds that the story of Eden is to be understood historically and not as a "myth." It is "interpreted history," and takes us behind the scenes into the spiritual realm.

A basic weakness of Spanner's interpretation is his failure to state clearly at the outset that the Bible contains *many* different kinds of literary genres. He asks the question, for example, "What is *its* genre, literary and theological?"—as if the entire Bible had only one. In fact, the Scriptures have prose and poetry, historical narrative, parable, vision and dreams, psalm and proverb, apocalyptic, etc. Each genre has

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its own principles of interpretation whether the literature is sacred or secular.

Although the author holds that Adam and Eve are to be understood historically, and not as a myth, his contrast of myth and revelation is inaccurate. He fails to realize that the revelation comes in a variety of literary forms, as already stated. Myth as a literary form is foreign to the Bible, as Spanner shows, but he comes down on the right side with the wrong reason.

Another weakness is the author's statement that "the Bible does not state in unequivocal terms that Adam and Eve were the physical ancestors of all present day members of the human race" (p. 76). While the Genesis passage may not be "unequivocal," Spanner's exegesis of the classic Romans 5:14-21 passage contrasting the first and second Adam (Christ) is unconvincing (p. 80). Paul's cogent reasoning can hardly be dismissed in one page.

Spanner's exposition of Genesis would have been greatly strengthened by a preliminary analysis of its literary genre. It is evident that the biblical author is reporting past events which actually occurred. The form of the narrative is a framework with two sets of three days. The interpretation of Genesis 1 hardly requires a "sophisticated" approach as Spanner indicates. When we leave behind the complicated baggage of scientific questions regarding mechanism and chronology, letting the author frame the questions and give his own answers, the interpretation is not all that difficult. The narrative gives a concise account of the Creator and his creation, ruling out false philosophies, religions, and superstitions which have held whole continents captive for centuries.

*Reviewed by Charles E. Hummel, InterVarsity Christian Fellowship, Faculty Specialist, Grafton, MA 01179.*

**EVOLUTION AND FAITH** by J.D. Thomas (ed.). Abilene, TX: Abilene Christian University Press, 1988. 232 pages, index. Paperback.

The stated purpose of this book is to "help lift the veil of ignorance about evolution and Biblical creation." It is edited by Emeritus Professor of Bible, J.D. Thomas, of Abilene Christian University, and is written by Thomas and eight other faculty at ACU, plus an alumnus and a special author for an appendix.

The book opens with an introduction by Thomas, follows with a treatment of philosophy by Prof. of History, Arlie J. Hoover, and then has two main sections on science with seven chapters, and the Bible with three chapters. Thomas writes a summary for each section and concludes with an overview, "The Present Picture."

The book does make some excellent points. I.A. Fair, Prof. of Bible at ACU, argues that biblical exegesis should not be done out of a scientific concern for presuppositions, and that the interpretation of Genesis must be based on its own

particular context and purpose: "to direct interpretation up a side street choosing scientific consensus is to detour interpretation into a dead end" (pp. 151, 157). But later, A.R. Lightfoot tells us, "The Genesis account of creation, therefore, should be read for what it purports to be: a straightforward, sober statement of what actually happened" (p. 177).

Particularly helpful and careful chapters are written by James R. Nichols, Prof. of Biology, Michael E. Sadler, Prof. of Physics, and Joe T. Ator, an alumnus of ACU now on the staff at Aerospace.

The book as a whole, however, is frequently enigmatic and lacking in consistency. Sometimes even the same author appears to contradict himself. On page 5 Thomas tells us that "this controversy about evolution is really one about whether God exists or not. It is a controversy about whether God or 'chance' is responsible for the universe." But on page 198, this same author says:

he [the Christian] should realize that his faith is not dependent upon how old the universe is, or how old the earth is. The fact of creation is absolute and clear. How it was all accomplished is not an issue for Christian faith. The Bible is not a scientific textbook and one can have a valid faith in God as the Creator without ever having to consider all these other matters.

The book tends to oscillate back and forth between these extremes.

There is no problem with accepting an age of several billion years for the earth, and Thomas refers to the Expanding Universe as "a demonstrable scientific fact," but there can be no question that evolution must be rejected. Individual Christians can decide for themselves whether or not to believe in a universal flood, since either choice is only a faith choice (no mention is made at any place of Davis Young's book on the Flood). A recent date for the origin of mankind is, however, a must. The authors carve out a unique position for themselves by rejecting organic evolution, theistic evolution, progressive creation, concordism, anti-scientism, fideism, the "gap" theory, the "day-age" theory, and "creation science." No mention is made of the growing biochemical evidence for evolution.

In addition, the book unfortunately abounds in fallacious presuppositions. Thomas makes the statement that "the great danger to all this discussion is that people form decisions and make conclusions without knowing what the facts really are. Ignorance of these details is found among the intelligentsia as well as those less well educated," and then follows this statement *immediately* with, "A major assumption of those who accept macro-evolution is the philosophy of Naturalism" (p. 193).

It is this uncritically accepted foundation of faulty presuppositions that shatters the book's impact. In reading through the book I counted over twenty such statements. They assert, for example, that faith alone without facts is involved in the creation/evolution debate; that God should be admitted as a scientific theory; that macro-evolution is necessarily naturalistic, non-theistic, materialistic, mechanistic, and deterministic; that spontaneous generation was "adopted in order to deny a need for a Creator God and to justify a totally



naturalistic, basic worldview" (p. 124); that advocates of macro-evolution "are left to mere 'chance' interactions of matter as influenced by the laws of nature," with the implication that the organization of the universe "just happened" without meaning or purpose (p. 127); that the basic theory of organic evolution is in direct conflict with Genesis and biblical creation, "since . . . it denies the existence and the necessity of a divine being" (p. 141); that "theistic evolutionists believe that God was responsible for the initial creation of matter, but that he then permitted the matter to evolve through the normal evolutionary process" (p. 142); that theistic evolution "is the effort on the part of some people of faith to compromise with atheistic evolution" (p. 186); and that if atheistic evolution has not been proved, then "there is no reason to question fiat creation in the first place" (p. 187). All of these are summed up in one final quote:

The entire question concerning the theory of evolution is really a battle of ultimates—one of God versus chance-process in nature. It is a battle of purpose and meaning to human existence against the idea that the world and life are meaningless. (p. 197)

As long as this perspective dominates the discussion, any authentic discussion of the relationship between evolution and faith is rendered impossible.

*Reviewed by Richard H. Bube, Professor of Materials Science and Electrical Engineering, Stanford University, Stanford, CA 94305.*

**CREATION'S TINY MYSTERY (2nd edition)** by Robert V. Gentry. Knoxville, TN: Earth Science Associates, 1988. 348 pages. Paperback; \$11.95.

Robert V. Gentry dates his creationist beliefs to the year 1959. In that year, he converted to Seventh Day Adventism, he became convinced of the necessity for a literal interpretation of Genesis, he resigned what must have been a well-paid position in the defence industry, and he began a lifelong quest for scientific evidence of recent, six-day creation. *Creation's Tiny Mystery* is Gentry's personal chronicle of that pursuit. In it, he argues that some of earth's oldest rocks contain evidence of having been formed instantaneously.

Gentry became interested in pleochroic halos in 1962 while doing doctoral work at Georgia Institute of Technology. (He later withdrew from the Ph.D. program because the department chairman refused to approve halos as his thesis topic.) Gentry then set up a laboratory at home and continued his research independently, supported by a part-time teaching job and by private donors. In 1966 he joined the faculty of Columbia Union College, which is sponsored by his denomination. Three years later, finding that he needed more sophisticated equipment than is found at an undergraduate institution, Gentry went to Oak Ridge National Laboratories as a visiting scientist and remained there until 1982.

Pleochroic halos have been known to mineralogists since the late 1800's. Thin, translucent slices of certain minerals

(such as mica), examined under a microscope, can be seen to contain tiny grains of included materials that are surrounded by concentric colored rings, like archery targets. Halo formation was first attributed to radioactive decay in 1907, by John Joly. Alpha particles, emitted by unstable isotopes in the inclusion, penetrate several microns through the surrounding mineral before coming to a halt. Since an alpha particle's likelihood of interacting with matter increases as its velocity decreases, it decelerates most rapidly as it nears the end of its trajectory, and it deposits most of its energy near the end of its path, producing a discoloration there.

Because the penetration range is related to the alpha decay energy, it is often possible to correlate halos with specific radioisotopes. For example, 238-U nuclei undergo eight alpha decays (and six beta decays) before ultimately becoming stable 206-Pb nuclei. In a well-developed 238-U halo (photomicrographs of which are reproduced in this book), one can distinguish six concentric rings that can be attributed to 214-Po (7.69 MeV), 218-Po (6.00 MeV), 222-Rn (5.49 MeV), 210-Po (5.30 MeV), 226-Ra, 234-U, and 230-Th (4.78, 4.77, and 4.68 MeV, respectively), and 238-U (4.19 MeV), thus accounting for all the alpha emitters in the 238-U decay series.

Gentry has discovered several types of unusual radiohalos in biotite and other minerals. One type of halo contains three rings attributed to 218-Po, 214-Po and 210-Po; another type contains only 214-Po and 210-Po rings; the third type contains only the 210-Po ring. None of these halos contain rings that correspond to decay energies of 4.78 MeV or less. Apparently, then, the polonium in these inclusions was not formed *in situ* as a daughter isotope from the decay of 238-U. Gentry concludes that polonium itself must have been present when the rocks originally crystallized.

Polonium halos pose a mineralogical dilemma. Conventional geological wisdom holds that a large formation of granite must have required hundreds of thousands of years to solidify from the molten state. But the halflives of 218-Po, 214-Po and 210-Po are only three minutes, 164 microseconds, and 138 days, respectively. If magmatic cooling required eons, then any polonium that might have been present in the magma could not possibly have survived long enough to become an inclusion in igneous rock, and thus no polonium halos ought to have been formed. Since polonium halos *do* exist, Gentry concludes that the currently accepted geological time scale must be erroneous; the halos, he claims, prove that Precambrian granites must have been created instantaneously.

When Gentry's work came to the attention of the state's attorneys in the case of McLean vs. Arkansas State Board of Education, he was invited to testify at Little Rock in December 1981. One of the pivotal arguments in the trial involved the falsifiability of science. According to the plaintiffs, "creation science" is not really science, because its theories are not falsifiable. As a witness, Gentry attempted to convince the court that his evidence for creation was indeed falsifiable. He issued a challenge in the courtroom (which he later repeated at a 1982 AAAS symposium and at a 1986 conference at Duquesne University): if anyone synthesizes a hand-sized

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piece of granite that contains a single 218-Po halo, Gentry will concede his theory has been falsified. (To date he has received no responses.) Evolutionists promptly dismissed the challenge as meaningless and criticized the proposed experiment as impractical; in fact, the adverse commentary of a prosecution witness prompted the title for this book. G. Brent Dalrymple called polonium halos "a tiny mystery" that would someday be solved.

Gentry's story is replete with personal anecdotes that seem to portray a pattern of anti-creationist prejudice. The reader can scarcely avoid getting the impression that "Gentry must be right, or the devil wouldn't oppose him so." Undoubtedly he has been mistreated on occasions. I was dismayed by the treatment given him by news media in Little Rock, and by the heckling that he has had to endure at recent public appearances. But it is hard to prove that similar prejudice motivated the rejection of his Ph.D. thesis topic, the nonfunding of his grant proposals, the refusal by journals to publish his responses to critics, or the termination of his tenure at Oak Ridge National Laboratories. Moreover, even though these experiences evoke my sympathy, the alleged discrimination does not strengthen Gentry's scientific argument in any way.

*Creation's Tiny Mystery* is intelligible to scientist and nonscientist alike. The first four chapters summarize Gentry's data in a way that can be comprehended by the layman. Trained scientists will appreciate the extensive appendices that include full-color reproductions of sixty radiohalo photomicrographs, and reprints of ten of Gentry's papers. These materials could (and should) be used in undergraduate courses on earth science or mineralogy.

Every ASA member ought to become familiar with Robert Gentry's work. I am impressed by his academic credentials (a master's degree and two years of doctoral study in physics), by his long tenure at a major national laboratory (during which his work was supported by federal grants for at least eight years), and by his publication record in mainstream, peer-reviewed journals. Gentry has a scientific credibility that is too often lacking among adherents of the creationist movement. His painstaking work and his intellectual honesty have earned him respect even from agnostics (one of whom wrote an enthusiastic foreword to this volume.)

Radiohalos are a fascinating natural phenomenon, and Gentry is probably the world's foremost authority on the subject. There are several alternative explanations for polonium halos; Gentry has offered rebuttals to some, but not to all. If his own interpretation of them is the correct one, then polonium halos could represent (in Gentry's words), "the Rock of Gibraltar that stands against the tide of evolution." Certainly anyone who is interested in the origins question should read this book with an open mind.

*Reviewed by Joseph H. Lechner, Professor Chemistry, Mount Vernon Nazarene College, Mount Vernon, OH 43050.*

**THE LIFE ERA, COSMIC SELECTION AND CONSCIOUS EVOLUTION** by Eric Chaisson. New York: The Atlantic Monthly Press, 1987. 260 pages. Hardcover; \$19.95.

Also the author of *Cosmic Dawn*, Chaisson is research physicist at MIT's Lincoln Laboratory and teaches astrophysics at Harvard and Wellesley colleges. Significant ideas are cleverly illustrated, frequently by full-page drawings by Lola Judith Chaisson.

As an introduction Chaisson writes, "if Darwinism created a veritable revolution in understanding by helping free us from the anthropomorphic belief that humans basically differ from other life forms on our planet, then cosmic evolution is destined to extend that intellectual revolution by in turn releasing us from regarding matter on Earth and in our bodies any differently from that in stars and galaxies beyond."

The Universe began with an explosion of something hot and dense, "what that 'something' was we cannot currently say with much certainty. . . . But spontaneous creation makes no sense scientifically, nor is there a shred of evidence to support it." So the author records what scientists believe has occurred over billions of years. He admits that "not even simple cells have yet been made under test-tube conditions," but molecules synthesized in the lab are evidence that every living thing dates back to a single ancestor billions of years ago.

You will admire Chaisson's chapter on the History of Change. He believes " . . . The greatest challenge to traditionally static Judeo-Christian worldview . . . was the publication of one of the most brilliant scientific works of all time, *On the Origin of Species*."

The chapter on Physics of Change elaborates the fundamental laws of thermodynamics as the guide to the changes among all things in the universe. The two preeminent changes are emergence of matter and intelligent life. The implications for the Life Era are that "continued growth via cosmic evolution asserts the need for a global, even cosmic set of ethics if technologically advanced beings are to enter the life era." Fundamentalists should not gain legislative footholds and "a literal discussion of the Bible in science classrooms is a serious mistake. It's even dangerous, for we would soon witness a technological retrenchment of America in the community of nations." Chaisson states that he has endeavored to remain squarely within the confines of accepted natural science and "as an agnostic, though, I find that Bergson disappoints me by asserting, like Teilhard, that the evolutionary process is necessarily guided by divine purpose."

The ethics controlling a Life Era has four types: a civilization controlling the resources of planet earth, the manipulation of one's parent star system, exploiting the energy and material stores of an entire galaxy, and a civilization permitting "intelligence to effectively divorce itself from matter, dominating it at will." "Human actions during the next few decades to a century will largely determine if our species is to have a future." So, "we must now begin playing an *active* role in the process of evolution." We must arrest population growth and diminish the threat of nuclear holocaust. This is

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accomplished by education. Museums must begin to teach, and there must be the adoption of a planet-wide society, rejecting authoritarianism, communism, totalitarianism but a "unitarianism as an ethical synthesis between the two leading politico-economic systems of our planet." The Olympic movement is praised along with UNESCO and the World Health Organization. According to Chaisson, knowledge and compassion are the twin guides to the future.

The appendix is a mathematical guide to the three eras of cosmic evolution (for those readers familiar with the calculus). Because the author has not used footnotes, he concludes with a representative bibliography for further reading. Occasionally, Chaisson writes, "I used to tell my students . . ."—after you read this scholarly treatise, what will you tell your students?

*Reviewed by Russell Mixer, Professor Emeritus of Zoology, Wheaton College, Wheaton, IL 60187.*

**BEGINNINGS: The Story of Origins—of Mankind, the Earth, the Universe** by Isaac Asimov. New York: Walker and Co., 1987. 271 pages, introduction and index. Hardcover; \$19.95.

In *Beginnings*, the most prolific of today's popularizers of science conducts a tour backwards through time. Starting with the relatively recent past ("When did human flight begin?", p.1), Asimov presents the evolutionary understanding of the human race, life, our planet, and the cosmos. Most of the book is devoted to descriptions of the various stages of biological evolution on earth. Thus, it is useful primarily as a painless survey of evolutionary theory and the evidence supporting it for laypeople.

Asimov writes in the comfortable and interesting style which made him a best-selling science fiction writer. Perhaps the only complaint here is that his commitment to inclusive language (p.36) is not put into practice consistently.

In some ways the title *Beginnings* suggests more precision than is possible with such a subject. Precisely one of the difficulties in supporting evolutionary theory is that of finding remains of the "firsts" of major biological groups, a difficulty which may be inherent in the evolutionary process (cf., Teilhard's principle of "the suppression of peduncles"). What Asimov is really doing is sketching the relationships between major biological groups and their relative temporal ordering. He recognizes the "fuzzy" character of evolutionary beginnings but could have given this more emphasis. Uncertainties are especially great when we consider the origin of life itself and the question of the beginning of the entire universe. There is a great deal that we don't know scientifically about origins and evolution, and no useful purpose is served by implying that "only the details are missing." (It is equally unhelpful to use our lack of knowledge as an argument for divine activity, of course!)

### Books Received and Available for Review

(Please contact the book review editor if you would like to review one of these books.)

- J. Barrow, *The World Within the World*, Oxford
- L. Countryman, *Dirt, Greed and Sex: Sexual Ethics in the New Testament and Their Implications for Today*, Fortress Press
- M. Gazzaniga, *Mind Matters: How Mind and Brain Interact to Create Our Conscious Lives*, Houghton Mifflin
- T. Goldstein, *Dawn of Modern Science*, Houghton Mifflin
- J. Halteman, *Market Capitalism and Christianity*, Baker
- J. Hanigan, *Homosexuality: The Test Case for Christian Sexual Ethics*, Paulist
- W. Hamilton, *The Evolution of Sex*, Harper and Row
- A. Jiggins, *Human Future? Living as Christians in a High-Tech World*, Scripture Union
- G. May, *Addiction and Grace*, Harper and Row
- T. Molnar, *Twain Powers: Politics and the Sacred*, Eerdmans
- M. Moynihan (ed.), *Letters: C.S. Lewis and Don Giovanni Calabria*, Servant
- C. Rendekop and U. Bender, *Who Am I? What Am I? Searching for Meaning In Your Work*, Zondervan
- M. Spiegel, *The Dreaded Comparison: Human and Animal Slavery*, New Society
- L. White, *Merchants of Death: The American Tobacco Industry*, Morrow

A mere recital of billions of years of "firsts" would become tedious. Asimov avoids tedium, and holds the reader's interest, by including brief accounts of how discoveries were made and of the scientists who made them. Thus, the book provides a sketch of the history of the relevant parts of science as well as of life and the world.

The question of how this picture of the past may or may not fit in with religious beliefs will be important for many readers, and especially for readers of this journal. For Asimov, religious explanations are only of historic interest, and all supernatural explanations of origins are to be rejected. From the Christian standpoint, one can regard the book as an illustration of how thoroughly science can understand the creation "though God were not given."

Asimov does a good, though ungente, job of demonstrating the impossibility of a literal use of Ussher's chronology, though he probably overestimates the number of people who take that seriously anyway. When it comes to the question of evolution, Asimov, the self-proclaimed rationalist, finds himself in agreement with fundamentalist rationalists in arguing (pp. 42-44) that the Bible and evolution are incompatible. The difference between these rationalists stems from the difference in their presuppositions—Genesis 1-3 as an accurate historical chronicle or the non-existence of phenomena inaccessible to science. But the debate does not have much to say to Christians who recognize that Genesis 1 and a scientist's notebook of observations belong to different literary genres.

There are some inaccuracies in the presentation. For example, there are minor errors in the sketch of the history of modern cosmology in the final chapter. (And while this is not strictly an error, it is interesting to note on p. 267 that Lemaitre is described simply as "a Belgian astronomer," with no mention of the fact that he was a Roman Catholic priest.)

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While these *are* minor, there should be a special attempt to avoid mistakes in a book directed to non-experts, who have little protection against being misled. In some ways, popularizations of science need to be judged more strictly than books written for specialists.

But when all is said and done, Asimov has offered a readable and useful non-technical survey of origins and evolution. It will be helpful for anyone interested in the broad outlines of an evolutionary description of the past. The reader should, of course, be prepared to be critical, and to make his or her own evaluation of the theological significance of the material which Asimov presents.

*Reviewed by George L. Murphy, Pastor, St. Mark Lutheran Church, Tallmadge, OH 44278.*

**THE SCIENTIFIC ATTITUDE** by Frederick Grinnell. Boulder: Westview Press, 1987. 141 pages. Hardcover; \$29.95.

Books about philosophy and sociology of science are often difficult for scientists to read and understand. This is because philosophers and sociologists are observers, but scientists are engaged in the process of discovery. Thus, the author "decided to write a book about science that would introduce important issues in philosophy and sociology of science without getting into the fine details and current controversies of these fields" (p. xiv). Since philosophers' writings seem to be obscure and based on somebody else's experience, biologist Grinnell wants to fill the gap between the theory and practice of science. Grinnell has many eminent predecessors including Hermann Weyl, Henri Poincare, Michael Polanyi, Bertrand Russell, and Claude Bernard. And it seems to be an excellent combination, namely successful scientific activity and deep philosophical insight into science. Can we find the latter in Grinnell's book? Hardly a trace thereof.

The first chapter discusses observation based on well-established concepts of Gestalt psychology. Any observation is based on many assumptions, many of them being of common-sensual provenience. All these assumptions intervene on each and every stage of scientific enterprise, among other things, in experimental design and interpretation (ch. 3). These assumptions range from trivial statements like "students are other persons who can see and think about things the way I do" (p. 19), to ontological statements like "there is a universal order underlying natural events" (p. 43). This observation, however, is not new and the author's lengthy discussion adds nothing to this issue. His discussion of the role of hypotheses in science tritely concludes that they "are not disproved so much as they are replaced by newer ones" (p. 39).

Two chapters on scientific collectives start out with such statements as scientists have to communicate with each other, or to be acceptable new material should be a natural extension of the old (pp. 44-45). Next, there is a long discussion of graduate programs and exams, of lab work, of graduate students, and of Ph.D. theses. The author extensively

describes criteria of accepting research papers and grant proposals.

In the chapter on science and the world, the relationship between science and other aspects of human activity are discussed. Grinnell's book does not add any new element to ongoing discussion in philosophy of science. Focusing on "engagement in science" (p. xvi) amounts to discussing what is already well-known, to repeating trivial truths, to focusing on a commonsense approach to scientific activity. The book can hardly stir any discussion, give any new insight, or open new horizons. The distinction between science and non-science is presented only in form of slogans, and science itself is reduced to the most down-to-earth dimension of looking at things, writing theses, papers, and grants. If the interaction between the world and science is exemplified by the fact that a snowstorm can stop scientists from reaching their laboratories (p. 11), then that can be called anything but revealing.

*Reviewed by Adam Drozdek, Duquesne University, Pittsburgh, PA 15282.*

**SCIENCE & NONSENSE** by John Braddock. Sussex, England: The Book Guild, 1988. 167 pages. Hardcover.

John Braddock, long-time reporter for the B.B.C., sees the modern preoccupation with scientific thinking (material cause and effect) as not only misleading but dangerous. This highly personal book (it has no bibliography or index, and cites only a few poets) is an attempt "to try to reach a more complete and balanced view of the world than the modern narrow obsession with the scientific method permits" (p. 89). The fourteen chapters range from "Science Out of Proportion" and "The Darwinian Dead-End," to "Brains are not the Whole Man."

Braddock criticizes our science-worshipping culture for accepting bad scientific explanations to buttress materialism in place of a metaphysic which he finds much more plausible. The metaphysical (and tedious) nature of the book can be seen in the emphasis given to questions and statements such as:

Just what [do we] human beings think we are doing here on earth? (p. 98) [a question that is stridently repeated at least six times in the book!]

Everything that we do is part of our lives, part of all that we shall ever have and be and as such must be important to us. (p. 140)

The nature of life, as shown by the pattern of things, cries out that the positive is better than the negative, that goodness is better than badness, that strength is better than weakness. (p. 166)

The science that is criticized as nonsense—and usually it is the scientific predilection for seeking explanation in terms of (proximate) cause and effect—lies predominantly in the "human sciences." The critique of the social sciences, and especially social engineering, is often insightful but immersed

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in assertions and caveats about the nature of man and society which tax even the most patient reader.

Braddock describes the "new mode" of cause and effect/scientific/intellectualistic thinking as an over-reaction against the medieval world view. While the latter denied the intellect in order to preserve the realm of the spirit, the former idolizes abstract thought and denies spirit, and much else besides. Moreover, he claims natural selection and Darwinism demand more faith than "straight-forward creation," and then proceeds to offer us his variant of emergent evolution wherein God (or First Cause/Force/Mover) prods his creation at various points to new "themes." Natural cause and effect can then be seen in the development of these themes, but the origin of these themes requires God's direct intervention. Braddock dutifully considers the central problem of "prodded" evolution: if God is required for the "big" nudges, why not for "small" nudges or even to continuously "nudge" creation? He admits, and I concur, that his answer is "unsatisfactory"; only propose nudges where there is either a lack of good scientific explanation or where your metaphysics requires such a nudge. And Braddock's concept of a material world made by an immaterial force requires many such nudges—for matter itself, for life, for self-conscious man.

Note that Braddock's rejection of materialism and Darwinism do not stem from any prior commitment to traditional Christianity or a literal hermeneutic. The Christian *religion* conveniently embodies many of Braddock's ideas and is not "undermined" by his theses, but the Christian *church* fares less well since it uses "mumbo-jumbo" to support untenable positions (p. 127). Braddock ridicules traditional doctrines such as the Second Coming, the Fall, Original Sin, and Redemption to offer us his own truncated Christianity—an intervening Creator who has wisely made "man in his own image" in order to participate in creation more elegantly through man's decision-making apparatus.

The book is a highly personal essay taking us into the world view of one John Braddock. The book is not well-argued, presumably since he intends to be "uncontroversial" (p. 94). Unfortunately, his path of following the "highest common factor of agreement" makes the bulk of the book quite uninteresting, and yet the sweeping indictments of "science" and "materialism" make the book also quite objectionable. Give me a stimulating E.O. Wilson anyday. The high level of assertion purported to be the most reasonable view on the matter frustrates the careful reader's efforts to understand or appreciate Braddock's theses, many of which cover interesting ground in a most tiresome manner. Critics of Darwinism, materialism, scientism, and social engineering will find the book congenial to their viewpoint, but the insightful comments are surrounded by meandering and often trite aphorisms.

*Reviewed by Marvin Kuehn, Science Teacher, Hamilton, ONT, Canada L8S 1M9.*

**THE DREAMS OF REASON: The Computer and the Rise of the Sciences of Complexity** by Heinz R. Pagels. New York: Simon & Schuster, 1988. 352 pages, index, bibliography. Hardcover; \$18.95.

Heinz Pagels is Executive Director of the New York Academy of Sciences and also an Adjunct Professor at the Rockefeller University. He is the author of two previous popular works about science, *The Cosmic Code: Quantum Physics as the Language of Nature* and *Perfect Symmetry: The Search for the Beginning of Time*. The present work is a popular introduction to the study of complex systems. Such systems include the economy, the brain, large molecules, the weather, and animal behavior. Only with the help of the computer can the human mind hope to understand systems as complex as these. Pagels sees the advent of the computer, like the telescope and the microscope in times past, as a tool whose development opens up new scientific vistas.

This book's Part I is entitled "The Sciences of Complexity" and contains useful chapters about complex systems, about the nonlinear equations that are required to describe much of the interesting physical world around us, about which physical systems can be simulated on a computer, and about the current neural network approach to work in artificial intelligence. Along the way are introductory discussions of such topics as strange attractors, chaos, and parallel computing.

These are very informative and clearly written chapters but they constitute only about 115 pages of the book. The bulk of the book is found in Part II, "Philosophy and Antiphilosophy," which is not even hinted at in the title of the book. However, a number of philosophical issues related to science are succinctly introduced and competently discussed. These include the nature of material reality, the problem of cognition, the mind-body problem, the nature of scientific discovery, and the character of mathematics. The chapter on mathematics, for example, manages to cover everything from logical necessity to the various views of the nature of mathematics, while presenting its history and contemporary situation. In the process it gives brief but lucid accounts of the solution to the four-color-map problem, Cantor's diagonal proof, and Gödel's incompleteness theorem. I am, however, a little puzzled by his discussion of scientific method because he says most of the philosophical literature on it is "entirely worthless" (p. 243). This, he explains, is because it is often written by philosophers "who have never done scientific research themselves" and are unfamiliar with "inquiry as scientists are actually carrying it out" (p. 243). But the notion that one must have done something in order to study it is ludicrous, and the notion that one must be familiar with what one studies is too obvious to mention. Pagels says that in rough outline, the hypothetical-deductive system is the correct analysis of method. He criticizes the inductive view, but of course it was advocated by Isaac Newton as well as Francis Bacon and John Stuart Mill. And Pagels admits that the hypothetical-deductive system "was given its strongest formulation by the philosopher Karl Popper" (p. 250). Furthermore, an account of this method appears, for example, in almost every elementary logic book published in the last quarter-century, and usually the account there is more sophisticated than Pagels', since he incorrectly implies that

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while confirmations of hypotheses can only be probabilistic, disconfirmations can be absolute.

Of particular interest to members of the ASA might be the numerous references throughout the book to God or "the Demiurge." I am, however, unable to quite make out his position. Let me share some relevant quotations from a couple of pages to show the problem. "I'm not sure if looking for an alien intelligence in outer space is the only place to look. I think that there is One here already" (p. 155). Pagels then asks us to imagine a creator of the universe, even though most scientists "intellectually reject this belief as hopelessly inadequate and without evidence. And so it seems to be. . . . But we will entertain the notion of the Demiurge for the sake of our argument" (p. 155). He then suggests that just as archaeological ruins can be viewed as a message from those who created the past civilization, the universe can be seen as a communication between the Demiurge who made it and us. And "no human mind could have arranged for any message so flawlessly coherent, so strangely imaginative, and sometimes downright bizarre" (p. 156). Yet Pagels concludes:

Whether God is the message, wrote the message, or whether it wrote itself is unimportant in our lives. We can safely drop the traditional idea of a Demiurge, for there is no scientific evidence for a Creator of the natural world, no evidence for a will or purpose in nature that goes beyond the known laws of nature. (p. 157)

The notion of god reappears quite regularly throughout the book in interesting but in no less puzzling ways.

Even as a popular work, my criticism of this book is that it tries to be too popular. The book begins with an introductory memoir about Pagels' carefree student days in California that has no discernable bearing on the content of the book and which will be boring to all except connoisseurs of *People* magazine. Furthermore, although the book does have a bibliography, it has no footnotes or citations. I found myself constantly wanting to know what book or journal was being quoted and finding no listing in the bibliography. Even fairly extensive (18–20 line) quotations will often have no corresponding listing in the bibliography.

*Reviewed by Glenn C. Joy, Professor of Philosophy, Southwest Texas State University, San Marcos, TX 78666.*

**MEDICAL ETHICS, HUMAN CHOICES: A Christian Perspective** by John Rogers (ed.). Scottdale, PA: Herald Press, 1988. 159 pages. Paperback; \$9.95.

Medical ethics, once the domain of medical professionals and philosophers, has been forced into the lives of everyday persons by the rapid advances of biomedical sciences. In response to the need for information for the general public, the Mennonite Mutual Aid brought together a number of physicians, health care professionals, and laymen to discuss these complex issues. This book is one result of these meetings.

The major portion of the book is made up of thirteen chapters on various topics related to biomedical advances. Some of these include chapters titled: "In the Image of God," "Death and Dying: Prevailing Medical Perspectives," "Prolonging Life, Prolonging Death," "Procreation: Extraordinary Means," "Organ Transplants," "Genetic Engineering," and others.

Each chapter was written by a different person. The authors represent a broad range of specialties such as physicians, theologians, psychologists, nursing faculty, and others involved in some form of health care.

The book was designed to serve as a discussion guide for church groups. At the end of each chapter several questions are provided to stimulate further study and discussion. There is also a brief chapter with suggestions on how to use the book in a group study.

The scientific and medical information in the book is up-to-date and accurate. The book was not, however, written in a technical manner. The medical terminology was kept to a minimum, and the book can be read with little or no formal knowledge of biomedical sciences.

The book is interesting and thought provoking. The authors encourage the reader to begin to think about and make decisions about various "ethical dilemmas." As the authors point out, it is much better to have thought through these issues before one is confronted with a difficult decision regarding a parent, spouse, or child.

The theological views of the authors are conservative. There is an obvious respect for the Bible and its place in the lives of Christians. Although written by members of the Mennonite Church, this book would be suitable for use by other religious groups as well.

There is no index or glossary of terms in the book. There is a select bibliography of nearly 50 sources for further study.

The book is concise, readable, and informative. It was not written for the specialist in this area. Rather, it was written to provide a starting point for consideration and discussion of these issues. For this purpose it is quite appropriate, and I would recommend it highly.

*Reviewed by Philip Eichman, Muncie, IN 47304.*

**PRESERVING LIFE: Public Policy and the Life Not Worth Living** by Richard Sherlock. Chicago, IL: Loyola University Press, 1987. 346 pages, index. Hardcover; \$15.95.

This book has a single purpose: to argue that considerations of whether or not a human life is worth living should play no role in public policy designed to deal with several critical medical issues in medical ethics. This contention is argued in dozens of different contexts and in response to the cited arguments of many other concerned ethicists.

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The basis for the arguments is not a religious one. In fact, Christian concerns or insights receive virtually no attention in the book. The author repeats often that a liberal democratic society is based on the principle of the equal worth of every human being, and that any departure from this principle therefore denies the very basis of the society in which we live.

Richard Sherlock is currently Associate Professor in the Department of Languages and Philosophy at Utah State University. Previously he held positions at Harvard Medical School, Harvard College, Harvard Divinity School, Northeastern University, the University of Tennessee, Christian Brothers College in Memphis, Fordham University, the Clinical Research Institute of Montreal, and McGill University.

It is important to remember that the concern here is with *public policy*, and not with particular moral or religious convictions and positions. As the author himself states,

This book examines the most pressing questions of biomedical ethics and public policy. I will, of course, examine the teaching of moralists and physicians who want to provide a morally correct resolution of these issues of life and death. . . . But my aims are somewhat different. This examination will proceed in light of principles and convictions that underpin our life together in community, that define the essence of our polity, and that establish the limits of acceptable public practices. (p. 12)

Slightly more than the first quarter of the book is devoted primarily to discussing Political Regimes and Public Policies (chap. 1), and Liberal Polities (chap. 2). Then, four major chapters on infanticide, euthanasia, suicide, and abortion follow. The book concludes with a consideration of general issues linking policy to practice.

The author is always erudite, frequently exhaustive and exhausting in the details of his arguments, and often dogmatic in his conclusions. In many places he appeals to a kind of community "intuition" to justify his conclusions. For the development of public or medical policy he rejects any distinction between "human being" and "person." Instead, he argues that "to be a bearer of a right to life, I only need be in possession of that great good, that is, I only need be alive" (p. 145).

In the case of not maintaining the life of severely handicapped infants, for example, he rejects "the case made by those who wish to hedge our historic commitment to these infants, to tie it to some supposed qualities that the infant has or does not have" (p. 116). He counters the argument that the "best interest for the infant can be explicated in terms of pain and suffering," by a fairly abstract argument on the intrinsic differences between "pain" and "suffering."

This book does not escape difficulties often found in treatments of this type. Considerations of permission to end or not continue to maintain life in certain critical cases are usually treated as if they expressed only the conviction that the life involved was no longer "worth living," or that it had lost its value, rather than taking account of the positive claims on human action of genuine compassion and concern for those involved.

A realistic account is also frequently not taken of the very difficult problems introduced into our lives now and in the future by our increasing ability to maintain some form of biological human life almost without limit of time, but with heavy burdens, some perhaps incapable of being borne at all, in terms of expense and sacrifice of others. We do not like to think of decisions on ending human life depending on financial considerations, but we may ultimately have no choice. Christian ethicists in particular should be aware of and be willing to include such considerations.

Those seriously concerned about thinking through the issues treated in this book and many others would do well to come to grips with the arguments provided by the author. Whether they are the final arguments, or whether they need critical revision and extension, is a question that the reader will have to decide.

*Reviewed by Richard H. Bube, Professor of Materials Science and Electrical Engineering, Stanford University, Stanford, CA 94305.*

**IN PITY AND IN ANGER: A Study of the Use of Animals in Science** by John Vyvyan. Marblehead, MA: Micah Publications, 1988. 178 pages, index. Paperback; \$9.95.

This book was originally published in 1969. This subsidized re-publication includes an introduction by Tom Regan and a new forward by Roberta Kalechofsky. The subtitle is somewhat misleading since "A Study of the Use of Animals in Science" suggests a breadth that the book does not possess. The book is largely biographical, and a more appropriate subtitle might have been "The Contributions of Frances Power Cobbe and Anna Kingsford to the 19th-century Antivivisection Movement." It is basically a historical account of the emergence of the antivivisection movement in Europe between 1860 and 1880, and focuses in particular on the contribution of two individuals: Frances Cobbe and Anna Kingsford. About 75% of the book is devoted to biographical sketches of these two influential women.

The author's perspective is clear from the first line of Chapter 1 which reads, "This is not a dispassionate book. It is written in pity and in anger. I am not ashamed of these emotions: on the contrary, they have arisen out of the facts that I should be ashamed to chronicle without emotion" (p. 19). Vyvyan has adopted the position that all animal experimentation is morally wrong and attempts to justify his case by a critique of 19th-century practices. A number of the practices which he criticizes would be illegal in most jurisdictions today; e.g., surgery on dogs without anesthesia. Even such a practice, however, must be seen in the context of its time, since anesthesia during surgery on humans was just coming into widespread use in the period under consideration.

The chief strength of the book is the provision of some background to the emergence of the antivivisection movement of the 19th century. In particular, it recounts the early



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divisions within the antivivisection movement over whether the political activity of the movement should be directed towards immediate abolition or towards gradual restriction of animal use. Vyvyan clearly prefers the latter alternative, since although his long-term goal is total abolition, he recognizes that getting there in one step is simply not a politically realistic goal.

The chief weakness of the book is that while it accurately chronicles some of the abuses of animals which were unfortunately characteristic of the 19th century, it does attempt to create an emotional reaction against 20th-century science based on a critique of abuses of the 19th century. The author's position is that all animal use should be abolished, and hence he attempts to develop revulsion against all use of animals for food or research by recounting some of the more flagrant abuses of the 19th century.

Vyvyan does not give a very satisfying explanation as to why the antivivisection movement became so fragmented so early in its history. He attributes it largely to preferences for different strategies by different individuals or groups. What antivivisectionists share in common is a revulsion against animal suffering, a feeling shared by many who do not share their goal of eliminating all animal use by humans. However, in this reviewer's opinion, there was, and still is, no shared philosophy or ideology as to why animals should not be used by humans for food or research. Hence, it is not surprising that the movement is characterized by divisions and fragmentation. A common passion is not enough to build a unified political movement. Antivivisectionists lack agreement on methods and even goals, because they lack a shared philosophy of the nature of animals and the nature of man. Since there is no agreement on the reasons why animal use by humans should be abolished or restricted, it is difficult to reach an agreement on methods and goals.

This book is likely to be of interest to those interested in the history of the antivivisection movement, but its relevance to the current animal welfare debate is questionable.

*Reviewed by Steven R. Scadding, Department of Zoology, University of Guelph, Guelph, Ontario, Canada, N1G 2W1.*

**PSYCHOLOGY (2nd edition)** by David G. Myers. New York: Worth Publishers, 1989. 623 pages, glossary, references, indices. Hardcover; \$36.95.

David Myers, a Fellow in the American Scientific Affiliation, is a prolific and successful writer. His writings have been widely published in both the secular and Christian press. His association with Hope College as a psychology professor, his authorship of two successful textbooks in psychology, and his speeches given at seminars and workshops reflect his contributions to the field of psychology. With Malcolm Jeeves he authored *Psychology Through the Eyes of Faith*, the first in a series of books sponsored by the Christian College Coalition to implement integration of faith and psychology.

*Psychology*, now in its second edition, is a very polished product. It competes for its spot in the arena of introductory psychology textbooks where there are over 100 other books to choose from. It is as compelling and professional as any of them. It has a stunning layout, eye-catching visuals, and a format intended to assist readers in understanding the complexities of psychology.

Available with *Psychology* are supplements including paper and computerized study guides, instructor's resource manual, test banks, and interactive graphic simulations. This complete package provides the beginning psychology teacher with almost everything needed to prepare a stimulating and educational experience for the student.

Although the book is not overtly Christian, it does have many references to religion as well as an occasional biblical quote. While Myers is its sole author, he was aided by 150 consultants over the six years the book was in revision. The result is an up-to-date book which would be a good choice for use in a first course in psychology or for use by a neophyte who wonders what contemporary psychology is all about.

*Reviewed by Richard Ruble, John Brown University, Siloam Springs, AR 72761.*

**PSYCHOTHERAPY IN A RELIGIOUS FRAMEWORK: Spirituality in the Emotional Healing Process** by L. Rebecca Propst. New York: Human Sciences Press, 1988. 203 pages, index. Hardcover; \$29.95.

Propst, of the Graduate School of Professional Studies at Lewis and Clarke College, builds on her recent papers examining the junction of psychology and religious faith in clinical practice. She also employs anecdotal information from her practice of psychotherapy.

The approach of the book is unusual. Instead of proposing means of integrating psychology and theology at an abstract level, Propst dives into the application of psychological and theological principles to the concrete circumstances of emotional pain in religious individuals. She emphasizes specific problems and individual cases as she builds the argument that faith, particularly Christian faith, is an integral component in the psychological healing process. In so doing, she avoids the temptation to simply add religious jargon to the psychological treatment, instead making the faith issues and principles part of a unified scheme to overcome suffering.

The obverse temptation, commonly seen in books by Christians on the subject of emotional distress, is to subvert clinical psychology to a simple, "faith alone" formula. Propst successfully overcomes that temptation as well, offering treatment suggestions which are based on sound psychological research and appropriately limited to pertinent diagnostic categories. She integrates with integrity.

After a brief introduction which outlines the goals of the book (to provide "self-growth" help for Christian lay people,

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and to provide a step-by-step counselling guidebook for pastors, counsellors, and psychotherapists), Propst presents her Christian perspective on emotional suffering and a brief history of the relationships between psychology and Christian faith.

Chapter 3, on the healing partnership, is the high point of the book. Here Propst draws heavily on the ideas of Karl Barth and Juliana of Norwich to describe the ideal situation for emotional healing: a human relationship. The ideal relationship for therapy—and this need not be professional therapy in every case—is one in which the person in need feels safety: safety for self-examination and self-revelation, with the concomitant risks and explicit desire for acceptance. It is a mutual relationship (Buber's "I-Thou"), with the therapist modeling vulnerability and genuine, but non-intrusive, sharing. Here, too, Propst effectively draws material from the perfect humanity of Jesus as she forges a model for the helping relationship.

The rest of the book presents material from cognitive psychotherapy in conjunction with the problems and diagnostic syndromes for which it is ideally suited. Most of that information is readily available in standard texts and review articles, but Propst adds the dimension of faith. Cognitive psychotherapy, which admits that what a person thinks may indeed influence her emotions and even her behavior, is ideally suited to Propst's form of integration. Propst's contribution in these chapters is her demonstration that religious thoughts, thoughts of faith, play a real and significant role in emotional healing. Instead of dismissing religious thought and imagery as indicative of a deranged mind, as many psychologists have been accused of doing, Propst uses them to heal and build the whole person, both spiritually and psychologically. This idea is valuable, and connects the current work to that of Paul Tournier.

Propst offers a balanced discussion of anger and assertion in a separate chapter, presenting some of her work with women in the Church. She also suggests, in simplified form, ways to use cognitive therapy to enhance life skills such as relaxation, goal-setting, and communication.

The main value of the book, then, is its connection of an uncommon model of integration with the practice of cognitive psychotherapy. That contribution is marred somewhat by a tedious writing style, uneven editing, and occasional over-simplification. For example, the statement "... depression results when the individual has learned to perceive himself as helpless in the face of his environment" (p. 100) needs updating in the light of more recent research. The level is best suited to the upper undergraduate or introductory graduate course, where it may be a serviceable ancillary text. Its unusual approach to integration justifies its use by Christian psychologists and counsellors, but its utility to lay people is limited to those who are well-read in psychology or theology.

*Reviewed by Paul Young, Associate Professor of Psychology, Houghton College, Houghton, NY 14744.*

**COUNSELING FOR PROBLEMS OF SELF-CONTROL** by Richard P. Walters. Waco, TX: Word Books, 1987. 214 pages. Hardcover.

Volume 11 in the series *Resources for Christian Counseling*, this book deals with such diverse problems as explosive temper, compulsive spending, and impure thoughts. Gary Collins, series editor, says that the purpose of these volumes is to "provide books that are clearly written, practical, up-to-date overviews of the issues faced by contemporary Christian counselors" (p. 8).

Walters, minister of counseling of the First Presbyterian Church in Boulder, Colorado, has written a book which admirably fulfills the purpose of the series. It grew out of his counseling in a church context and reflects his Christian commitment. It deals with contemporary problems in a practical way. It is clearly written, with good illustrative case studies, adequate theoretical explanation, and seven appendices on how to cope with anger, bad habits, unwanted thoughts, and temptations of various kinds.

Walters is eclectic in his counseling style. He believes in being directive in the early stages of the counseling process, especially if there is a crisis situation, or if someone is in danger. He advocates a more non-directive approach while getting to know the counselee and the counselee's problems. However, he believes a directive manner is often needed to precipitate and facilitate change in the later stages of counseling.

One of the practical tools Walters uses, and presents to the reader, is the IDEAS diagram. The name of the diagram is based on an acronym for Intellect, Decision, Emotion, Action, and Situation. He organizes a verbatim account of the counseling conversation under the five headings of the acronym. He points out to the counselee that these five areas are not equally under the counselee's control. Then, he encourages the counselee to accept responsibility for those areas which can be controlled, while recognizing that others might need to be accepted or tolerated. He then teaches the clients to develop their own diagrams of other situations in order to plan appropriate reactions. Once the client has understood the dynamics of the situation, it is still necessary to resolve root problems, by discovering unmet needs and determining ways to meet them adequately.

Walter's book is useful in treating specific problems, as well as in getting to and working on root problems. It will be helpful to those involved in general counseling, as well as in the problems of self-control with which it specifically deals. It can also be used in teaching situations, since it is well organized and written in non-technical language. Many counselors will ask clients to read it in order to understand better their own counseling process.

*Reviewed by Joseph M. Martin, Professor of Missions, Edward Lane Bible Institute, Patrocinio, MG, Brazil.*

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**THE DIVORCE DECISION** by Gary Richmond. Waco, TX: Word Books, 1988. 184 pages, appendix. Paperback; \$8.95.

This book effectively accomplishes its stated purpose: to make the reader aware of the consequences of divorce on children, finances, emotions, relationships, and the future. Its readable style and numerous examples help the reader who may be contemplating or pursuing a divorce to face the issues.

Richmond draws from his experience as a pastor to single parents for three years; the pain and hurt he viewed with this group led him to write. Although divorce is not ruled out as a viable solution to troubled marriages, Richmond reasons that working hard at an unhappy marriage may be much less painful and may produce more desirable results than a divorce would.

The effects on various aspects of life are dealt with by citing examples and then drawing conclusions. Richmond illustrates how friends are likely to choose sides, children lose the emotional support they need from parents, and loneliness characterizes lives. Examples show the risk involved when placing a person's family and finances in the hands of lawyers and judges who may or may not properly prepare for a divorce case. A sample lawyer's bill serves as a reference for the huge expense that can be incurred in divorce proceedings.

Richmond explains that divorce rarely rids a person from a relationship with a former mate, especially if children are involved. Custody and visitation rights force making arrangements with the other parent. And even after remarriage, similarities between an "ex" and a new mate can cause overreaction and added tension in the new relationship.

Although Richmond acknowledges that divorce is permissible by God in certain circumstances, he cautions that the choice must be made with care. He says, "God has a low view of aloneness, a high view of marriage, and He hates divorce." A full chapter is devoted to this topic.

Hope for and steps to reconciliation are offered in the concluding sections of the book. Appendix A contains a reprint by Charles Swindoll called "Attitudes." Help in choosing a counselor is offered in Appendix B with a reprint of an article by Kelsey Menehan from *Today's Christian Woman*.

This book gives pointed, practical, and understanding counsel on the issues surrounding divorce. For those considering divorce, Richmond forces a realization of the consequences and cost of the life-changing decision. Those who are ministering to people facing the difficult choices of a divorce will benefit from this book as well.

*Reviewed by Joan Aycock, Editorial Coordinator, Outreach Publications, Siloam Springs, AR 72761.*

**FRAGMENTED GODS: The Poverty and Potential of Religion in Canada** by Reginald W. Bibby. Toronto, Ont., Canada: Irwin Publishing, 1987. 319 pages, index. Paperback; \$12.95 (Can.).

University of Lethbridge sociologist Reginald Bibby, who also studied theology at a Baptist college, compiled this comprehensive study of religion in Canada from three major surveys. He also checked census statistics, attended many meetings of different religious groups, and referred to a wide range of literature. Abundant statistics do not dry his style, but they do tend to mask profound statements and make the coverage appear less substantial. His address at a diocesan study (December 2, 1988) helped to correct this reviewer's first impressions and increased his understanding.

Canadian attendance at religious services dropped from a 1945 average of 66% of the population to less than 30% today. The decline is paralleled in other Western democracies and occurred in most religious traditions. Persistent rumors developed, unsupported by evidence, of people turning to other faiths, televised services, or outright disbelief. In fact, an inactive majority remains affiliated with the same religions followed more actively by previous generations. Only 4% of Canadians watch religious television programs. Most viewers are elderly, and 80% also attend services.

New religious movements recruited far fewer members than implied by sensationalist reports. According to the Bibby and Brinkerhoff "Circulation of Saints" survey, burgeoning evangelical churches in Calgary gained 1.9 outsiders per year; the rest of the increase came from similarly conservative Protestant congregations, migration from rural areas, and births. People claiming no religious affiliation constituted 11% of the population in 1971, but only 7% in 1986; many returned to their parents' religion.

Half the population, dominated by the majority in Quebec, is Roman Catholic. Another 40% affiliates with Protestant Christian denominations. Roman Catholic attendance declined later than the rest but reached similar proportions. Mixed response to Vatican II reforms may have hastened the drop, and transfer of responsibility for Quebec education from Church to government may have been a factor. Bibby suggests a common cause of reduced attendance—highly selective consumer attitudes, reflecting society's increased options along with trends to specialization. In effect, he says, we have fragmented the gods, by compartmentalization. This analogy, the source of the book's title, while sounding ominous or tragic, may be encouraging to biblical religions because what can be fragmented is distinct from the essential basis of our faith. Cultural values are closely linked to religious expression, but pluralism in society often makes religion appear marginal. The "fragmented gods" of changing cultural values could be idols, deserving their fate.

Pluralism is highly respected, moderating ethnic and religious exchanges, tempering zeal. New Right campaigns attract little support, in contrast to their recent American surge. Our humanist minority is thus less driven to confrontationist reactions, according to one member's discussion with the reviewer. Affiliations are so consistent, even within the

inactive portion, that "a tighter religious market" prevails.

Rites of passage ("hatch, match, and dispatch," in Bishop Reed's words) attract the inactive majority back to their traditions. Although commitments have diversified, complete apostasy is rare. As Archbishop Lewis Garnsworthy remarked, "It's not that they're leaving; it's just that they're not coming!" Bibby expects the trends to continue, because young people are even more selective than their older relatives. However, young adults who deny religious affiliations are likely to reaffirm some degree of commitment within a few years.

Biblical knowledge may be lamentably scarce in Canada. Its scarcity is equally evident in American surveys, despite the much higher percentage of people declaring conversion experiences and conservative Christian affiliation.

Ultimate questions still concern the inactive as well as active members, reflecting a great potential for spiritual renewal. The author urges the biblical religions to integrate their vision of ministry, connecting concerns for God and neighbors, together with self-affirmation. Evangelism must be paired with caring. He suggests that a "sermons from science" exhibit at Montreal's Expo '67 was more effective than the subtler approach applied by dominant denominations (this reviewer wonders whether science was really presented, rather than pseudoscience). Marketing techniques, however, are not the whole answer. Some evangelicals asked Bibby how to reach outsiders; he replied, only half-jesting, that statistics showed that "the best way is to befriend or marry them."

His analysis and synthesis provide a timely reminder of the prophetic message, besides the sociological significance. The book is especially relevant to Canadians seeking understanding of religious trends, but comparisons with patterns in allied nations will widen the book's application.

*Reviewed by John R. Armstrong, Honorary Assistant in Deacon's Orders, St. Philip the Evangelist Anglican Church, 631-49th Avenue, S.W., Calgary, Alberta, Canada T2S 1G6.*

**ONE FAITH, MANY CULTURES: Inculturation, Indigenization and Contextualization** by Ruy O. Costa (ed.). Maryknoll, NY: Orbis Books, 1988. 162 pages. Paperback; \$10.95.

*One Faith, Many Cultures* is volume 2 in an annual series from the Boston Theological Institute. This Institute is a consortium of nine schools in the Boston area with diverse perspectives on issues discussed. The papers presented in 1986 are published in this book.

As may be expected in such a volume, some chapters are more profound than others. The papers were presented in two days' time, so they do not address each other directly. They are units which stand alone, though they are related to the same general topic. Inculturation, indigenization and context-

tualization are treated as distinct concepts, with contextualization as the broadest term, which includes political and economic realities. Some of the lecturers would like to broaden it even more, to include a dialogical relationship with the Gospel, so that the context receives the influence of the Gospel while also leaving its imprint on the Gospel. Others insist that the Bible is to impact society, to be understood from within that cultural setting, but believe the Gospel is not to be changed by that process.

The major divisions of the book deal with a presentation of general issues, a historical section which highlights Roberto de Nobili and Bartolome de las Casas, an examination of two christological approaches, treatments of contextualization in the Third World and in the United States and, finally, "a prophetic reconception of God for our time."

The most controversial papers deal with christology. One advocates a sharp distinction between the Jesus of history and the Christ of faith, in order to reduce Jesus' claims to uniqueness. The purpose of this is to remove barriers to dialogue with followers of other faiths. The other christological study is from a feminist point of view. It stresses Jesus' warmth and friendship, while rejecting his atoning death and his all-sufficiency in salvation as offensive to women who want to participate in their own salvation.

The study of de Nobili and de las Casas, the analysis of Base Ecclesial Communities and a case study of a hispanic church in the United States emerge as the high points in this collection of papers. They make the book worthwhile, and the other chapters raise some provocative questions.

*Reviewed by Joseph M. Martin, Missionary in Residence, Belhaven College, Jackson, MS 39202.*

**KINGDOMS IN CONFLICT** by Charles Colson with Ellen San tilli Vaughan. Grand Rapids: A Judith Markham Book, a copublication of William Morrow/Zondervan, 1987. 399 pages. Hardcover; \$15.95.

Charles Colson is well qualified to write a book about what he considers the inevitable conflict between the kingdoms of politics and religion. He was at the heart of the Nixon administration and has had ongoing contact with political leaders in various countries throughout the world. He has been a Christian leader in the United States, with ministries in other countries, for over a decade. He also did extensive reading and research in preparing the manuscript.

Colson contends that when political leaders use their power for religious ends, they usurp God's role. The Kingdom of God is established by God's power, not by human effort. In a frightening prologue, he describes an imaginary event in 1998, in which the president of the United States avoids political action because of his position on biblical prophecies about the Middle East. It is all too believable.

The roles of government and church are interrelated but distinct. Government's role is to maintain a just order for all citizens and to punish those who practice injustice. The church's role is to preach the Gospel and to hold government accountable in its role. In order for the church to fulfill the latter role with integrity, it must avoid commitments and ties with any partisan political system.

This resume of the book's major thesis sounds dry and simplistic. The book is neither. There are case studies from Germany, the Philippines, Nicaragua, Northern Ireland, and other countries which flesh out the issues. These accounts give remarkable depth and warmth to the book. They also demonstrate the power of the Gospel in changing human lives, and in reconciling people who adopt divergent political positions.

Colson's view of human sinfulness leads him to distrust the state and the institutional church as solutions to the world's problems. Both have valid roles but need to be kept accountable, because power tends to corrupt. He mentions the family as another force for good in society. But his main hope is in what he calls, quoting Jacques Ellul, the "little platoons." These are individuals, families, or small groups who respond to human need or to situations of injustice, and who act in ways which bring lasting change. His documentation of these "little platoons" is inspiring and encouraging. It suggests ways to respond to similar situations in other settings.

For those seeking insight into the relationship between politics and faith, this book offers challenging thoughts well expressed. For those seeking devotional reading, there are accounts of conversions, reconciliations, and acts of faith. For those desiring personal insights into historical situations, Colson offers gripping details.

*Kingdoms in Conflict* sensitizes readers to important issues, suggests concrete ways to respond to political and social problems, and presents interesting and edifying case studies. There is something here for everyone.

*Reviewed by Joseph M. Martin, Professor of Missions, Edward Lane Bible Institute, Patrocinio, MG, Brazil.*

## **A FIGHTING CHANCE: The Moral Use of Nuclear Weapons** by Joseph P. Martino. San Francisco, CA: Ignatius Press, 1988. 283 pages. Paperback.

Joseph Martino is a Senior Research Scientist at the University of Dayton Research Institute. Previously he served in the U.S. Air Force for 22 years, retiring as a Colonel. His career has involved weapons development and systems analysis. He is a fellow of the Institute of Electrical and Electronics Engineers.

Joseph Martino has plunged into an arena that is fraught with technical and moral difficulties, and he has made some headway. Those who believe that preparation to fight a nuclear war increases the likelihood that such an event will occur will not be happy with Martino's thesis. He confronts

the issue directly, starting from the question: What if deterrence fails? Martino criticizes the U.S. Catholic bishops' pastoral letter for failing to answer that question. He believes that deterrence eventually will fail, and under present posture that failure must be catastrophic. The associated problem is that our present plan requires an *immoral response* in the form of massive retaliation amounting to "vengeance from the grave." Included as pieces in this immoral posture are silo-based missiles, anti-ABM and civil defense initiatives, and nuclear arms control treaties, because they all reinforce the present MAD approach to nuclear deterrence. MAD makes disarmament appear better than deterrence, he says; arms control favors a closed society and thereby increases the risk of war.

Martino proposes that the U.S. restructure its nuclear posture from retaliation to *nuclear warfighting*. He believes that warfighting capability not only would be moral under *jus in bello* grounds, but also would provide improved deterrence because the enemy would be more inclined to believe that we would use our nuclear forces. The proposed capability would consist of "small yield" nuclear devices—perhaps as small as a few kilotons—of high accuracy; a doctrine and technology of command-and-control; defensive posture (SDI, ABM, and Civil Defenses); targetting selected in response and in proportion to the aggression; and population centers to be avoided as much as possible. Using these means, the U.S. can conduct a just nuclear war, and moreover in so doing teach morality to the aggressor.

The author also provides a defense of the justice of the Western cause. He believes that the U.S. and the U.S.S.R. are not moral equals; the U.S. position is worth defending under *jus ex bello* because the U.S. is *comparatively* more moral. The U.S.S.R. is expansionist and oppressive, whereas a democracy cannot be so by definition; the very term means government by consent of the governed. In his view Christianity does not require pacifism; passive resistance works only in a democratic society; defense of (Western) values is of equal importance to preventing the slaughter of innocents; killing in defense of victims of injustice is Christian; and nuclear resistance will produce fewer deaths than surrender to Communism.

It is axiomatic to Martino's thesis that nuclear war could remain limited in scope. The concept of limited nuclear war fought with small yield weapons is not new. Henry Kissinger urged the U.S. to develop this capability in his 1957 book, *Nuclear Weapons and Foreign Policy*. Martino argues that on this basis the U.S. nuclear posture could meet the criteria of *discrimination*, *proportionality*, and *legitimate authority*. However, distinction between strategic and tactical response is not made clear. Present NATO "flexible response" posture calling for graduated escalation from conventional to nuclear weapons presumably would be acceptable to Mr. Martino if small weapons and improved command and control were included. In strategic terms, limited nuclear options has been understood by strategists not in terms of warfighting, limited or otherwise, but as a component of deterrence that corresponds to an ability to respond in measure to provocation at any level.

It is difficult to perceive of a nuclear war being fought for

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weeks or months while allowing for the rational dialogue that the author posits. It is equally difficult to believe that a defensive posture would be recognized as such by the Soviets, or that the U.S. could teach them morality by our conduct of war. Certainly the Soviets are not convinced that our SDI system is entirely defensive as we claim. Our European allies are likely to be troubled by the concept of limited nuclear war because they perceive that such a war is likely to be fought on their soil.

This reviewer would like to see more comparison between the morality/deterrent capability of Martino's nuclear war-fighting scenario and other national security concepts besides MAD; e.g., defensive defense, competitive strategies, balance of power, arms control, and nuclear disarmament. The cost of such a revised force structure must be considered as well; it is likely to be orders of magnitude greater than the cost of our present nuclear forces. How we are to posture our defenses during the transition from today's nuclear deterrent to the proposed structure is equally problematic.

There are a few technical problems, such as the author's claim that nuclear winter has been disproved, that mobile missiles can escape a nuclear exchange but SSBN's cannot, that x-rays from a space burst cannot injure anyone on earth, and that all on earth can become more affluent simultaneously. This latter point is disputed on the bases of energy and environmental constraints, which are rather peripheral to the topic of this review.

Mr. Martino presents a carefully reasoned analysis of the present nuclear dilemma and offers a well thought-out alternative. Some of the arguments seem fanciful to this reviewer, yet the work is so carefully researched and well organized that reading it quickly evolved into a short study. It provided a framework for better searching the bases of my own understanding of the nuclear arms race and the moral issues involved. Whether one is involved with nuclear weapons or is just seeking to become more informed, this book offers strong food for thought. Regardless of one's position on "nuclear morality" it offers a clearly articulated argument for morality of a nuclear force properly configured.

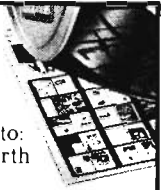
*Reviewed by Jack Swearingen, a nuclear weapons designer who is on loan to the Department of Defense as a Scientific Advisor in Arms Control Verification OUSD(A)/SAC&C Rm 3D1028, The Pentagon, Washington, D.C. 20230.*

**COMPUTERS IN BATTLE: Will They Work?** by David Bellin and Gary Chapman (eds.). New York: Harcourt Brace Jovanovich, 1987. 362 pages, index, references. Hardcover; \$14.95.

And the voice of Ronald Reagan was heard from on high: "I call upon the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete."

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Who could resist the Great Communicator's 1983 offer to scientists to turn in their black hats for white ones and ensure world peace at the same time? But war and defense is a tough topic, especially for Christians, especially for scientists who are Christians, and especially now that the Strategic Defense Initiative (SDI) has been proposed, is being worked on, and will cost a bundle.

The basic message of this collection of eleven essays is that the original vision of SDI is a pipe dream. Most of the authors are computer professionals, and include among others Alan Borning, Jonathan Jacky, Severo Ornstein, and David Parnas. Many of the authors also are involved with Computer Professionals for Social Responsibility and all are skeptical of the hopes and claims for SDI. Some of the articles are: "A History of Computers and Weapons Systems" by Paul N. Edwards, "Computers and the Strategic Defense Initiative" by Eric Roberts and Steve Berlin, "Artificial Intelligence as Military Technology" by Tom Athanasiou, "Role of Military Funding in Academic Computer Science" by Clark Thomborson, and "Computers and War: Philosophical Reflections on Ends and Means" by the philosopher John Ladd.

In the past, ballistic missile defense plans, from Eisenhower's Project Defender to Johnson's Sentinel project to Nixon's Safeguard system, have been abandoned because of cost and ineffectiveness. So history is on the side of the SDI critics. More specifically, the short reaction times required to intercept missiles in the boost phase seems to preclude having humans meaningfully "in the loop." This makes the question of computer reliability critical. There are a number of separable areas to consider: hardware reliability, software design, software implementation, and system testing. It is ludicrous to think that if we can achieve 95% reliability, we can knock down 95% of incoming missiles. It would be much like saying that if the airplane we are boarding is 95% reliable, we will get 95% of the way home. We may not get anywhere or we may all die.

There are well-known examples of small errors and oversights causing large problems. The Mariner space probe was lost because a period in the software code should have been a comma. Computer programs interpreting radar signals have confused both the rising moon and a flock of geese with missile attacks. And an attack-simulation tape accidentally left where it should not have been was confused with a real attack. These past errors illustrate different types of possible future mistakes.

Estimates for the amount of software programming required for SDI range from 10 to 100 million lines of code. It is an axiom of programming that it is impossible to eliminate all bugs in even moderately large programs, so even the

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proponents of SDI acknowledge that perfection is not possible. Additional problems such as the fact that systems for battle can only adequately be tested in actual battle, that the USSR would be trying to disable or counter anything the United States does, and that SDI will not even attempt to deal with submarine-launched, bomber or cruise missiles, should cause everyone to at least examine the proposed program very closely. This debate may be especially important in light of budget deficits, the funds for defense vs. butter issues, John Tower as Secretary of Defense, the military-industrial complex, and the new military-education complex.

You may want to supplement this work with pro-SDI and other material. The list of addresses at the end of the book provides addresses for everything from the Computer Professionals for Social Responsibility (CPSR) to the Defense Advanced Research Projects Agency (DARPA). CPSR's view is that the issues are too important not to be publicly debated, and they maintain that "the fundamental issues involved are not so complex as to be beyond the grasp of the lay person." With that I certainly agree.

*Reviewed by Glenn C. Joy, Professor of Philosophy, Southwest Texas State University, San Marcos, TX 78666.*

**CIVILIZATION IN CRISIS: A Christian Response to Homosexuality, Feminism, Euthanasia, and Abortion** by Richard A. Fowler and H. Wayne House. Grand Rapids: Baker Book House, 1988. 209 pages. Paperback.

This book is divided into four parts under the headings: "Feminism," "Abortion and Euthanasia," "Homosexuality," and "A Christian Response." In each of these sections, the authors attempt to provide what is described in the preface as "wise and timely advice for those who are seeking Christian answers to these problems."

The authors did a good job of summarizing the conservative Christian viewpoint for each of these areas. They have gone to the Scriptures and provided a reasoned exegesis of various passages. Numerous secular writings were also cited.

The authors are to be commended for their desire to help those seeking assistance in these areas. These are certainly serious threats to the Christian community today. Unfortunately, this book does not provide any new insights into these problems. Each section is a basic summary of what has been said many times before, but no new ideas or information were added by the authors.

The book also suffers from other weaknesses. First, there does not seem to be any central theme or unifying principle in the book. Each section seems isolated from the others, and the entire book is fragmented and disjointed.

Second, there are some weak sections dealing with counseling individuals with problems. Again, information of this sort is much needed today. However, the examples in the book are very superficial and really not very helpful.

Third, the book does not provide any real or concrete solutions to these problem areas. This seems to have been the intent of the authors, but they were unable to accomplish the task.

Some parts of the book, such as the section on homosexuality, were well written and contain some useful information. However, the book as a whole is somewhat disappointing, and readers may want to go elsewhere for information on these areas.

*Reviewed by Phillip Eichman, Muncie, IN 47304.*

**BIBLICAL ARCHAEOLOGY** by Henry O. Thompson. New York: Paragon House, 1987. 467 pages, index. Paperback; \$14.95.

Archaeology in lands important to the Judeo-Christian heritage is a multifaceted enterprise. It spans a broad expanse from scientific methods, tools, and scholarship to illumination of ancient cultures to religion itself. Biblical archaeology therefore resonates on several levels with ASA readership who as scientists own special respect for scholarship and the scientific method, and who as Christians approach the endeavor for enlightenment and enfleshment of historical aspects of the faith.

Thompson has extensive experience in biblical archaeology. He received his Ph.D. in Archaeology and Old Testament from Drew University and has served for several years as Director of the American Center for Oriental Research. He has experience in field archaeology, having directed a number of excavations in biblical lands.

*Biblical Archaeology* is written in the style of Thompson's other books, *Mekal: the God of Beth-Shan* and *Archaeology and Archaeologists*. The book is quite readable, and reflects a quiet light-heartedness. Extensive research is evident in the detailed and in some cases overwhelming data presented. This is particularly apparent in the sections treating the history of organized archaeological pursuits in biblical lands since the 1660 founding of the Royal Society of London, which alone accounts for over 100 pages of text! Thompson is sensitive to the varied religious backgrounds of his readers, particularly in those areas where archaeological finds might be interpreted to conflict with the biblical record (e.g., Jericho's innocency during the period of the Conquest).

There are six main sections in the text: basic questions concerning the archaeological enterprise (Chapter 1), a history of archaeology as it relates to biblical lands (Chapters 2 to 4), recent advances in archaeological methods and tools (Chapters 5 and 6), aspects of daily life in biblical times as evidenced by pottery, clothing, technology, etc. (Chapters 7 and 8), a correlation of archaeological finds to the biblical record (Chapters 9 to 12), and a probing of the relationship of archaeology to religion (Chapter 13 to 15). The book has over 200 illustrations; a helpful glossary and adequate index assist in the book's use as a reference. Extensive notes at the end of



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each chapter provide a valuable resource for the reader interested in more information or primary sources.

The strength of *Biblical Archaeology* lies in Thompson's communication of the "big picture" of archaeology. In addition to traditional results of archaeological investigations, he describes the problems of where to dig and how to dig, who has dug and thereby contributed to the field, as well as the tools available to archaeology. The last item exemplifies Thompson's detailed style of writing; it includes a description of magnetometers, gradiometers, resistivity surveying, sub-soil radar, seismic recording, photoarchaeology, underwater archaeology, stereophotography, dating methods, microscopy, and spectography.

Throughout the book Thompson addresses issues not uncommon to ASA readers: the tension between (archaeology) science and religion, their respective claims, and how one might be responsible to both. This is one unique aspect of the work, compared to earlier books such as Albright, Wright, Kenyon, and Cornfeld. Another unique feature is reporting of ongoing field work in the last ten years, including excavations at Lachish, Jerash, Gezer, Ugarit, and Masada.

The main disappointment of *Biblical Archaeology* was in some sense an opposing perspective of its strength: the surprising brevity of the description of the finds in biblical lands, their historical significance, and impact on the biblical record. This comprises six chapters, less than 50 percent of the book. This observation is exacerbated by the discovery that less than six pages of text is devoted to the post Herodian (i.e., New Testament) period. One might, by analogy, consider this akin to a telephone book, the first half of which provides interesting information on the history of the phone company, its employees' contributions, how service personnel install phones, and from which all the S to Z listings have been eliminated. Still, the book could be bought for these six chapters and the rest used for reference material.

A second weakness of the text is presentation of unnecessary tangential information presumably for the sake of completeness. Examples are a history of museums, 18 pages devoted to aerial and underwater photographic methods, and even use of bulldozers as an archaeological tool!

Overall, I found *Biblical Archaeology* to be an interesting disappointment, interesting in style and presentation of topics relating to archaeology, a disappointment from the perspective of treatment and analysis of ancient artifacts from biblical lands.

*Reviewed by David L. Bourell, Associate Professor of Mechanical Engineering and Materials Science and Engineering, The University of Texas at Austin, Austin, TX 78712.*

**THE DARK ABYSS OF TIME** by Paolo Rossi. Chicago: University of Chicago Press, 1986. 388 pages. Paperback; \$14.95.

Vico is one of the most prominent figures in Italian history of philosophy. He was not very well known in his own times, but after his death his works, especially *The New Science*, gained more and more popularity and became a firm part of the European philosophical tradition. His works have been analyzed from different perspectives, but such an analysis should also include a discussion of traditions that influenced Vico or traditions he attacked. But, as Rossi points out, many Vico scholars never show more than a slight familiarity with Vico's interlocutors of the 17th century. "Precisely because of their relation to Vico, they ought to be taken up again and studied anew" (p. x.). Rossi wants to fill a gap with this book. Although his goal is quite modest, the book is impressive and worth studying not only by Vico scholars. In fact, the book goes well beyond the original framework and turns out to be a well-documented and lucidly presented panorama of the 17th- and early 18th-century discussions on the history of earth and man.

The book has three parts, each discussing a different aspect of history. Part one presents approaches to the history of earth, or 17th-century geology. Part two introduces the reader to discussions on history of man, and the last part shows different theories on the origin of language and writing. In this respect Rossi's book is a treatise on history of science, or rather on three of its branches: geology, history proper, and linguistics. But the histories of these three disciplines are not analyzed in a vacuum; in Rossi's book they are presented in connection with a broader picture of the history of ideas, and as a consequence we can see a tight connection between the three. Thus, the same authors were frequently interested in the history of the earth and in the history of language (cf., pp. 199-200, 267). The central point in all these discussions was the Bible: how to relate current discoveries in science to the Bible and what should take precedence in the face of conflict. It is interesting to see what answers to these questions have been given and what arguments have been used. Some discussions sound very contemporary and can be found in many of today's books. I shall mention only three examples.

First, compare "the works of [Nicholas A.] Boulanger in which he attempts to make a connection between the natural mutations of the earth and the myths, customs, and fables of the ancients" (p. 102) and the works of Immanuel Velikovsky. Second example: "divine truth, in [Athanasius] Kircher's thought, finds its highest and most complete manifestation in Christianity, but it is immanent in all religions and all philosophies, and it was first revealed to men within the ancient wisdom of the Egyptians" (p. 123). Very similar rationale can be found in confirming the biblical account of the Flood by myths from different parts of the world, or in tracing biblical truths in the Chinese alphabet (C.H. Kong and Ethel R. Nelson). Lastly, the discussion about the age of the earth: can it be expressed in terms of thousands of years, or millions of years? This problem was by far the most frequently debated in the 17th century. The century itself can be seen as the period of "discovery of time" (p. 36), the

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century "introducing time" into the concept of nature (p. 109), since many attempts had been made to justify the view of the millions-years-old earth.

The adherents of a very old earth succeeded in the sense that this view is now widely accepted and taught in almost all schools. But supporters of a young earth view do not give up using arguments that cannot be easily refuted. They have many eminent predecessors, and the views of some of them, first and foremost Vico's, are thoroughly presented by Rossi. Rossi goes very deeply into history of science of the early modern era. He presents views of well-known scholars, and of those whose names have sunk into oblivion and are not remembered today. We also read about obscure activities of some known figures like Leibniz's research in geology, Newton's in theology, or Spinoza's analyses concerning language.

*The Dark Abyss of Time* is truly a magnificent book. The reader might not agree with all of Rossi's opinions and evaluations, but the broad and erudite picture he gives of the 17th and beginning of the 18th centuries by far supersedes all possible flaws.

*Reviewed by Adam Drozdek, Duquesne University, Pittsburgh, PA 15282.*

**THE JUST DEMANDS OF THE POOR: Essays in Socio-Theology** by Marie Augusta Neal, SND. New York: Paulist Press, 1987. 142 pages. Paperback; \$8.95.

Sister Marie Augusta Neal has written a tract to popularize Liberation Theology; i.e., to promote a world socialistic system under moral pressure drawn from Christianity.

Professor Neal teaches sociology at Emmanuel College in Boston. Her work is of interest to readers of this journal especially because of its attempt to approach the issue of poverty from the perspective of both the Bible (Church) and sociology. Her views may be summarized in the following assertions.

(1) There is a free-market (capitalist) economy in the world that has made some very wealthy, some moderately wealthy and some poor or very poor. She judges this to be immoral. (2) This capitalist economy is the *cause* of these people being poor. (3) The poor have a *right* to the wealth generated by the system and possessed by others. (4) The poor generally *don't know* they have this right, hence they must be taught ("conscientized") to claim this right; i.e., impose their "just demands." (5) These just demands can only be met by transforming the entire world economy to a socialistic base. (6) Christians in places of power and wealth must therefore be taught to *relinquish* these so that socialism can be instituted in response to the "just demands of the poor." Moral, biblical, or Church *pressure* must be placed on the wealthy and powerful

to effect this. By "relinquishment," Neal does not mean the micro-economic level of individual charity, but rather the macro-economic level of allowing socialism to replace the free-market economy.

Some of the difficulties with her presentation of this thesis are as follows.

(1) Methodically, she leaves crucial terminology such as "right" and "justice" vague and undefined. Her central thesis is not exposed to balanced criticism. She does not expose the strengths and weaknesses of either socialism or free market capitalism. Hence, she fails to show that socialism is the best way to help the poor and that a free-market economy is not.

(2) As a sociologist she routinely pontificates: churches exist to fulfill a role assigned by the sociologist; i.e., to reinforce commitment and provide an environment for social change. Likewise, people are to stop preferring their own families to strangers, as this is an impediment to establishing socialism.

(3) In political philosophy she assumes, with Weber, that the "right to use power is given by those over whom or with whom it is exercised"; in other words, the consent of the governed. But this theory is neither historical nor logical.

(4) Theologically, following the party line of Liberation Theology, theology is to be created by reflection on human experience (praxis) rather than revelation from above. Theology should be "concerned less for who God is than for where God is found" (i.e., among the poor—p. 95, cf. p. 108). The Gospel is no longer the forgiveness of sins and eternal life based on Christ's work on the cross, but a social gospel of the redistribution of wealth. The good news to be announced to the poor is "that they need be poor no longer" (p. 65).

(5) Economically, she opposes the ideology of economic growth through developmentalism: the outside help to poorer countries to help them build an infra-structure (p. 61). This would preserve the existing economic order she wants replaced. But non-economic, family, and spiritual factors affect growth, too. These factors, subsumable under the "politics of envy" hold whole regions back from participation in the progress other countries have made in the past 300 years under a free market economy.

Professor Neal's work is a study in the rhetoric of the Liberation Theology movement. It is intended to enlist American Christians (Catholics) in the movement for world socialism. Unfortunately, it provides no balanced treatment of the issues involved in sociology, economics, or theology.

*Reviewed by Gilbert Brewster Weaver, John Brown University, Siloam Springs, AR 72761.*

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**JACK: C.S. Lewis and His Times** by George Sayer. San Francisco: Harper & Row, 1988. 278 pages, index. Hardcover; \$19.95.

**THE C.S. LEWIS HOAX** by Kathryn Lindskoog. Portland, OR: Multnomah Press, 1988. 175 pages, index. Hardcover; \$11.95.

**C.S. LEWIS AND THE TRUTH OF MYTH** by Mark Edwards Freshwater. Lanham, MD: University Press of America, 1988. 145 pages, index. Paperback; \$13.95.

Three new books have been published recently which will be added to the already large collection of works concerned with C.S. Lewis. Readers of Lewis' writings form a diverse group. I first became interested in C.S. Lewis, for example, through his works on Christian apologetics. Others are more interested in his literary works, while many are drawn to Lewis through his children's stories.

Just as Lewis' readers come from different backgrounds, so do the three authors of the books being reviewed. Further, the three books are quite different in terms of subject matter, style of writing, and intended audience.

George Sayer, author of *Jack: C.S. Lewis and His Times*, was a student of Lewis' at Oxford University in the 1930s, and later became a close friend, associate, and colleague of both C.S. Lewis and his brother Warren. Sayer has written a scholarly biography of the man known to so many through his writings. The book is thoroughly documented, primarily from personal letters, diaries, and other writings of C.S. Lewis, his brother, and others closely associated with them. Sayer also draws from a personal association with these two brothers spanning many years.

Although the book is scholarly and contains extensive quoted material, it is still quite enjoyable to read. The author has been able to blend together quotes from various sources with his own personal commentary to produce a readable and interesting biography. *Jack* has a very complete index and also a lengthy, annotated bibliography of not only the works of Lewis, but also secondary sources as well.

The book is divided into chapters roughly representing various periods in Lewis' life. The author has been very frank and personal in relating the life of Lewis. I must admit that as a reader, I was at first a bit uncomfortable with Sayer's frankness, especially with Lewis' personal problems, struggles, and disappointments. However, after finishing the book I can now say that my respect and admiration for C.S. Lewis has grown.

I believe that this book will in time become one of the important reference works on the life of C.S. Lewis. Anyone desiring to know more about his man's life will want to read Sayer's book.

Kathryn Lindskoog has spent more than 30 years studying C.S. Lewis and his writings. She is the author of several books, including two others on C.S. Lewis. She began her study of Lewis' writing as an undergraduate student, and was able to

meet him during a summer study in England. Lindskoog also corresponded with Lewis before his death regarding her writing projects.

The "hoax" in *The C.S. Lewis Hoax* is not C.S. Lewis the man or his writings, but is rather the "marketing" of Lewis by the representatives of his estate. In the book, Lindskoog makes a number of accusations aimed primarily at Walter Hooper (representative of the Lewis Estate and editor of numerous reprintings, revisions, and later collections of Lewis' writings). She claims, for example, that Hooper (and others associated with him) have: (1) Used the popularity of Lewis' writings for their own benefit; (2) Made statements regarding his (i.e., Hooper's) relationship with Lewis that cannot be substantiated; (3) Promoted claims regarding events related to Lewis and his brother, Warren, which cannot be substantiated (e.g., the "bonfire"); (4) Removed without permission, and later published personal materials of Warren Lewis; (5) Knowingly published items attributed to Lewis which he did not actually write (having perhaps done the writing themselves); (6) Forging personal letters which appear to have been written by Lewis.

These accusations have all been documented by Lindskoog and raise some serious questions which must be answered. Joe R. Christopher, author and authority on Lewis, stated in the foreword to the book: "If even half of the argued conjectures in it [the book] are correct—and I suspect that more than half of them are—there will have to be major revisions in the background of our understanding of Lewis. The major works, which came out in Lewis's lifetime, are not affected; but both the minor works afterwards and their critical presentation will have to be reconsidered."

As Christopher stated, the original works of Lewis, and Lewis himself, are not in question. Rather it is the editing and later publication of his works to which Lindskoog has drawn attention. It will remain for Hooper (and his associates) and C.S. Lewis scholars to sort out this seeming dilemma. For others, Lindskoog has written an interesting investigative account of what she sees as an actual "hoax."

An interesting sidelight in this book is a letter written by ASA member Walter Hearn to Lindskoog regarding some apparently spurious scientific information. The full text of the letter and biographical information on Hearn are given in a footnote.

Personally, I am not qualified to evaluate the claims of this book. I would encourage others more knowledgeable than myself to read the book and weigh the evidence.

The third book to be reviewed is *C.S. Lewis and the Truth of Myth* by Mark Edwards Freshwater. The author received a Ph.D. in Humanities from Florida State University and teaches in a college in Alabama. The style and format of this book would suggest that it was originally a doctoral dissertation. It has a scholarly style, and extensive footnotes and bibliography typical of a thesis or dissertation. Although it is slightly less readable than the other two books, it is nonetheless interesting and informative reading.

Freshwater has written a good summary of Lewis' conversion to Christianity and how this is reflected in his various writings. He first briefly outlines Lewis' life, literary works, and his conversion. The author then discusses various topics such as Lewis' views on the divinity of Jesus, the Kingdom of God, miracles, the historical validity of the Gospels, the relationship with Aslan and Christ, and others.

This book would be very useful to anyone wanting to know

more about how Lewis' views on Christianity were reflected in his writings. The extensive footnotes could enable the reader to go to the original works themselves. Although there have been other books written on this general topic, this one is up-to-date, and should become a useful reference tool in the future.

*Reviewed by Phillip Eichman, Muncie, IN 47304.*

## Letters

### Crises of Conscience

On receiving the latest issue of *Perspectives* I read the article "Crises of Conscience for Christians in Science" by Dr. Bube with mounting dismay. My memory went back to the early months of 1945 when I was a 21-year-old combat engineer platoon leader in Germany, fighting Hitler and the Nazis. I believed that I was a Christian, and I believed in what my country was doing in fighting that war. A few months later I saw the Dachau concentration camp shortly after it was liberated. The memory still haunts me, and until I read Bube's article I had never thought that we had sinned in fighting those who had done such awful things and would be doing them still if we had not won that war.

But if I understand Bube correctly, we should have overcome the Nazis "only through self-giving and active love." "Christians are forbidden to . . . fight (in physical violence) for the cause of Christ. . . ."

My feeling that we had served our Saviour nobly and, God knows, sacrificially in putting an end to the horrors of Nazism is not Christian realism, Bube says, but only "religious pragmatism," a view "held by religious people who may indeed have made a commitment of one type or another to Jesus Christ, people who regard themselves and who are regarded as Christians" but "which effectively denies any real significance for the teaching and life of Christ in many of the situations of life." Bube's characterization conveys a vivid sense of scorn for such benighted people.

So the cold, the hunger, the fear, the loneliness and separation from our families, the wounds, the blood, the deaths of my friends and five years out of my life were wasted entirely; Our Lord didn't want them—He was willing to let the holocaust go on until the Bubes of this world overcame the Nazis with love!

I don't believe it. I don't think Bube believes it. When Jesus was asked to give the greatest commandment, He quoted Deuteronomy's exhortation to love God with all your heart and soul and might, but He added "and with all your mind." Christians are called to think, not just to pursue the kind of intellectuals' Biblical literalism that Bube's article exemplifies.

And when I read in my paper that the new Soviet openness has revealed yet a third mass grave with the remains of some 300,000 of

Stalin's victims out of the twenty million total, I thank my God for those young men, many of them Christian, who forged the weapons that prevented the spread of that devilry over much of the rest of the world. We couldn't save everybody—I still have to fight tears every time I think of what happened in Cambodia—but we did our best, and I expect to face my God not too many years from now with no apologies. If that's "religious pragmatism," so be it. Let those who stand on the sidelines in the battle against evil have their "crisis of conscience;" mine is clear.

James B. Patrick  
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Staunton, VA 24401

### Oops! Book Review Correction

For a number of years, about two decades ago, I worked closely with Raymond Seeger in the American Association for the Advancement of Science Section L (History and Philosophy of Science) and also on the Sigma Xi national lecture series. Only since then did I discover that he is a regular contributor to the *ASA Journal*, and also that he is a brother of the folk singer Pete Seeger. It is a great joy to realize that he is still active in retirement, as witnessed both by his note on Francis Bacon in the June, 1989 issue and his review of my *Scientific American Reader*.

Nevertheless, I must protest a factual error in the review. Ray Seeger states that one would like to know if the photos, the synoptic sentences under each title, and the biographical paragraphs are due to me, but "unfortunately, no check can be made with the original articles because specific references are not given." Actually, the date and month of each article is printed directly under each author's name, so it is easy to check the issues of *Scientific American* and to discover that the photos and synoptic sentences are original whereas the authors' biographies were updated.

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