JOURNAL OF THE
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Evangelical Perspectives on Science and the Christian Faith

In this issue . . .

Deduction vs. Induction

The Rediscovery of Genetics

Christic Origination of Science

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

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EDITORIAL

Putting Things in Perspective

As evangelical Christians we in ASA believe that "the Holy Scriptures are the inspired Word of God, the only unerring guide of faith and conduct." Therefore, we find it disturbing when we encounter serious disagreements among ourselves over "what the Bible says" about such subjects as evolution/creation, war/peace, the role of women, church/state relations, and other controversial issues. We all tend to protect our own traditions and interpretations as the only right answers. Worse yet, we question the orthodoxy and/or the Christian commitment of those with other views. In this issue of the *Journal,* Richard Bube discusses the role of deductive and inductive hermeneutics as an important facet of these differences. Using examples from yesterday and today, Professor Bube examines how an overuse of either of these methods explains the differences and keeps us apart from each other and from the truth. We need to avoid the perils of the "proof-texting" extremes of deduction and the vague, experiential excesses of induction.

Any discussion of evolution must take into account the scope and limits of hereditary variation. All too often authors of biology texts lead us to believe that genetics has provided crystal clear signals in this area. John Lothers gives us some insights into the tensions that occurred in the early years of this century between the newly rediscovered principles of genetics and Darwinian natural selection. Since biologists are still discussing the relative importance of heredity, environment, and natural selection, it is useful to be reminded of the diverse reactions to these concepts in the past. Here is another area where Christians and non-Christians, biologists and non-biologists, need to remind themselves, with the required humility, of the limitations of human knowledge, even in the late twentieth century.

Many people assume that science and religion, especially Christianity, always have been and still are adversaries. However, a careful study of the history of science demonstrates that modern science developed only within a Christian framework and that a major part of that framework has been the recognition of the

orderly processes of creation and providence. Enrico Cantore carries this phenomenon back still further to Jesus Christ Himself: "the followers of Christ could not help feeling stimulated by him wholly to involve themselves with nature as not just a gift but also a task from God demanding the engagement of their entire personality." Professor Cantore gives us a good reminder that science developed uniquely from a Christian base that includes not only the teachings of the church about Christ, but the very nature and teaching of Christ Himself.

The Communications section of this issue includes two complementary perspectives on the "Canopy Theory" and more of Raymond Seeger's continuing series on the religious inclinations of great scientists.

As this issue goes to press we are beginning to receive manuscripts of papers presented at the Oxford University meeting with our friends of the Research Scientists Christian Fellowship. During 1986 we hope to bring you a number of the significant and stimulating papers that were presented at this landmark international meeting of Christians concerned with relating their science to their Christian faith.

WLB

"Reckless words pierce like a sword,
but the tongue of the wise brings healing."

Proverbs 12:18

Deduction *vs.* Induction: Understanding Differences Between Biblical Christians

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Why is it that different groups of Christians, each committed to faithful biblical exegesis, so often disagree? Is this caused by an "anything can be argued from the Bible" situation in fact? When many of the peripheral reasons for these differences have been understood and put aside—such reasons as historical, political, economic and ethnic—a prominent reason remains. It is the thesis of this paper that differences between equally committed and equally biblically knowledgeable Christians arise from the choice of a hermeneutical perspective: whether that of deduction of biblical truth from specific passages, or induction of biblical truth from the Bible and experience as a whole. Once one of these two perspectives has been chosen to the practical exclusion of the other, the conclusions of exegesis are inevitable and completely predictable. Examples are given from the areas of biblical inerrancy, creation and evolution, slavery, and the role of women. Only a position in which both deductive and inductive hermeneutics are integrated is adequate for reliable biblical understanding.

Introduction

One of the doctrines of the Christian faith is that Christians are led into a knowledge of truth by the guidance of the Holy Spirit as they study and apply the revelation of the Bible. Differences between conservative Christians who take the Bible as normative and more liberal Christians who regard the Bible as an inspiring historical record only are understandable because of the fundamental difference in attitude toward the Bible. But the cause of differences between two groups of conservative and evangelical Christians, both openly dedicated to sound biblical exegesis and acceptance of the Bible as the Word of God, is more difficult to understand. Such differences are commonly an embarrassment to evangelism and apologetics for they appear to undermine the fundamental evangelical faith in the final authority and sufficiency of Scripture as a guide to faith and life. They appear to lend support to the common complaint that the Bible is such a complex book that it is possible to derive any doctrine one wants from it, and that therefore in the final analysis biblical doctrines are really subjective rather than the objective revelation of God.

There are, of course, a variety of reasons why even evangelical Christians committed to sound biblical interpretation often disagree. The interpreters are after all human and are subject to the common failings of human nature. They are not only fallible, sinful creatures, but they are also participants in an historical situation, a specific culture, an ethnic heritage, a political and economic milieu, that shapes their understanding of Scripture almost without their recognition of that fact. There is another reason for such disagreement between biblically committed Christians, however, and it is so prevalent and so forceful in its effect, that it is the one that we discuss in this paper. It is the *a priori* choice of one of two hermeneutical perspectives to the exclusion of the other: a deductive perspective as contrasted with an inductive perspective. The conservative Christian traditionalist leans heavily on the deductive perspective and this choice already shapes the conclusions to be reached even before examination of the Bible begins. Another valid approach exists, however, that of an inductive interpretation; in the hands of evangelical, biblically committed Christians, it also leads to a particular conclusion frequently different from that traditionally derived by deduction.

We illustrate the practical consequences of these choices of hermeneutical perspective by considering the specific topics of biblical inerrancy, creation versus evolution, slavery, and the role of women. We argue that only an integration of deductive and inductive approaches is adequate to obtain an authentic understanding of the biblical revelation.

Deduction *versus* Induction

The deductive approach to understanding starts with the acceptance of a basic principle and then seeks to deduce by logical analysis what the consequences of that principle are in other aspects of life. If a is always twice b, and if in a particular case we know that b is three times c, then we may deduce that a is six times c. We started from the general principle relating a and b which is always true, and then in a specific case we applied the laws of logic to deduce the implications of the general principle in the specific case.

The inductive approach looks at a variety of specific evidences and attempts to draw from those evidences the general principle. We might, for example, consider the following sets of data relating a and b to c:

a	c	b	c
6	1	3	1
12	2	6	2
18	3	9	3

From the regular pattern of these observances, we might inductively conclude that because of the relationship that both a and b have to c, it appears that a is always twice b.

Such an example, of course, is the simplest of all possible cases. When we step outside of the area of elementary mathematics into principles and conclusions that are far more complex and intrinsically ambiguous, the stages of analysis are less well defined.

It is admittedly simplistic, but nevertheless perhaps useful, to realize that the development of modern science from pre-Galilean science was in large measure a shift from the deductive approach to what should be called an inductive/deductive approach. Aristotelian science functioned largely in the deductive mode. Because rest was the natural state of a body (general principle) one could deduce that a moving body would eventually come to rest. Because a circle was a perfect geometrical shape (general principle) one could deduce that the shape of planetary orbits is circular. One major change introduced by Galileo and others was to shift from attempting to deduce truth about the universe from general philosophical principles to identifying truth by the more inductive process of the accumulation of data and observation. Instead of asserting that

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we know what the universe must be like *a priori* on the basis of general philosophical (or theological) principles, the modern scientist attempts to identify the properties of the universe by exploring the universe itself, by building up a supply of observations and data that lead to the formulation of an apparently valid general principle. Then the integration of induction and deduction manifests itself, because this "general principle," formulated from the combination of inductive data and human creativity, is then tested experimentally to see whether its predictions will continue to conform to tests of the real world in other situations beyond those used to establish it inductively in the first place. Established and accepted principles, originally developed by a largely inductive process, thus become the basis for deductive applications to probe still further.

Examples of both of these approaches can also be seen in Christian apologetics concerning the divine inspiration of the Bible. For example, if we start from the general principle that we can reliably understand the Bible concerning what it teaches, we deduce from passages in the Bible that speak of its being divinely inspired the *prima facie* evidence for biblical inspiration. If, on the other hand, we start from the effect of the Bible on people's lives, on its beauty and lofty expression of language, on its amazing consistency between diverse authors and times, and on its unique role in the history of much of the human race, we induce from these data that the Bible is a divinely inspired book that can be trusted in what it teaches.

Difficulties arise when we desire to go further and decide what it is that inspiration ensures and what is not essential to the consequences of inspiration. Then it is necessary to decide whether the specific Bible passages that teach about inspiration are sufficiently clear, specific, detailed, complete and relevant so that we can deduce from them the full consequences of inspiration, or whether we must look at the actual substance, pattern, model, and example of biblical authors themselves to enable us to decide what inspiration means. Are the *teachings* clear and evident, such that the proper course is the deductive one of interpreting all biblical *phenomena* in terms of the teachings, or is a sure insight into the meaning of the *teachings* to be gained only by an evaluation of the *phenomena* in an inductive approach?

In view of the historical background and developments of recent centuries, it is not surprising that Christian scientists today generally regard a purely deductive approach as inadequate in both science and biblical interpretation. This is one reason that evangelical Christian scientists today frequently find themselves in disagreement with the conservative Christian traditionalist who frequently operates in the same mode as did Aristotelian science. By considering four well known and typical examples, we hope to demonstrate the inadequacy of adopting either a deductive or an inductive approach exclusively, and the importance of allowing insights from both approaches to be assimilated and integrated.

Each of the four following illustrations of the critical nature of a deductive versus inductive approach has been treated at great length in many places previously. Here we do not try to present exhaustive cases, but simply to point out the way in which the choice of deduction or induction dominates the process of biblical exegesis.

Biblical Inerrancy

The issue of biblical inerrancy deals with the relevancy, the reliability and the truthfulness of Scripture.[1-6] Deduction starts with a handful of passages that appear to teach directly about the nature of Scripture and deduces from these passages the answer to all questions in this area and the context in which all other biblical and non-biblical evidence must be evaluated. Induction recognizes the existence of these teaching passages but in order to understand their full extent and domain insists that it is necessary to look at the phenomena of Scripture themselves so that the teaching passages may be rightly understood. Deduction subjects the interpretation of the significance of all other phenomena, whether biblical or extra-biblical, to the supposedly clear understanding of those specific texts that deal with the inspiration and character of Scripture. Induction subjects the understanding of these specific texts to an appreciation of the actual phenomena of Scripture with which it is assumed that they must be consistent. Deduction regards phenomena of Scripture that do not appear to agree with the understanding of the teaching of specific texts as *problems*; induction regards understandings of specific texts that are inconsistent with the phenomena of Scripture as *eisegesis* rather than exegesis.

In view of the historical background and developments of recent centuries, it is not surprising that Christian scientists today generally regard a purely deductive approach as inadequate in both science and biblical interpretation.

The question of the nature of the biblical revelation itself is a classical example of this methodological dichotomy between deduction and induction. Advocates of a deductive approach center on such passages as II Timothy 3:16 and II Peter 1:16–21. The deductive argument is straightforward. Considering II Timothy 3:16, for example,

(a) The Scriptures teach that Scripture is God-breathed.

(b) Since God is omniscient, omnipotent and all-truthful, it follows that Scripture itself must partake of these same qualities.

Often in our own scientific age, these arguments are then extended as follows:

(c) A standard of truthfulness is scientific accuracy.

(d) Scripture must therefore be scientifically accurate in whatever it proclaims.

The advocates of deduction therefore assume that they *know* the full and complete implication of these and other specific texts dealing with the character of Scripture.

Advocates of induction follow a somewhat different approach. Not being sure of all that is included in the "inspiration of Scripture," they argue that the way to find out is to look at the phenomena of Scripture themselves. They call attention to other biblical teaching on the *purpose* of revelation[7] and suggest that the effects of inspiration should be consistent with the purposes for which the revelation was given and probably not with others. They recognize the obvious fact that every word in the Bible does not express in itself a basic truth of God,[8] and they trace the progressive revelation concerning the identity and coming of the Messiah[9] as an example of the mode of revelation. They note that the demand for total scientific accuracy would force an interpreter to believe that the Bible was not factually accurate,[10] and that a number of well known examples exist of apparent discrepancies.[11] They observe that the New Testament use of Old Testament "prophecy" is not always obvious from the Old Testament text itself,[12] that the use of numbers in the Bible has a clearly symbolic aspect as well as a literal aspect,[13] and that demand for historical accuracy between differing accounts of the same events would again force an interpreter to conclude that the Bible is lacking.[14]

Simple deduction leads to the conclusion that the Bible is a perfect, totally accurate, scientifically exact text and that simple explanations for all of the above "problems" are in principle possible without violation of this conclusion. Simple induction leads to the conclusion that the Bible is shot through with variations and cultural influences that prevent it from being considered the inspired Word of God. It is only by combining deduction with induction that we can arrive at the biblically faithful witness to its own character. Then inputs from induction keep us from reading *our* concepts of logic and scientific accuracy into the biblical revelation, and inputs from deduction keep us from failing to see the divine Word of God presented to us in a way that faithfully preserves and communicates God's purposes in Jesus Christ.

Creation and Evolution

A bibliography on the subject of creation and evolution would run to hundreds, if not thousands of volumes.[2,3,15–18] Students of the debate agree more and more unanimously that the issue is decided by presuppositions and not by factual evidence. There is a strong ingredient of deduction versus induction present in these presuppositions.

Advocates of a deductive approach argue that the opening chapters of Genesis provide us with a clear, scientifically accurate account of the events involved in the origin of the universe, the earth, living creatures, and human beings. The only mechanism active in all of these origins is the *fiat* act of God, forever impossible to describe in terms of scientifically understandable process, and active in history for all of these origins for not more than about 10,000 years. Those making these deductions assume that they know the full implications, purpose, and context of the Genesis text, and to them it is clear that this text provides the same kind of news as that given by a newspaper reporter observing the events, and the same kind of information as would be given by a scientific attempt to describe these events.

Inductionists, who also revere the Bible as the revelation of God, are not convinced that the Genesis text can be given this simple interpretation if one is to be faithful to all of the revelation that God has given to us,[19,20] and even if one is concerned to be faithful only to the biblical record itself.[17] They reject the thesis that the creation versus evolution debate is a critical frontier in the defense of the faith. It is not a conflict between the Bible and science, for the true set in which the conflict must express itself, if there is one, is between theology (a human interpretation of the Bible) and science (a human interpretation of the natural world). It is not a conflict between Supernaturalism and Naturalism because God's action in nature must not of necessity have only a supernatural description. It is not a conflict between Design and Chance because this confuses scientific "chance" with philosophical "meaninglessness" and fails to see that "chance" can be the method of design. Finally it is not a conflict between atheism and theism because a theist can readily accept evolution as a working hypothesis for our description of God's activity in history.

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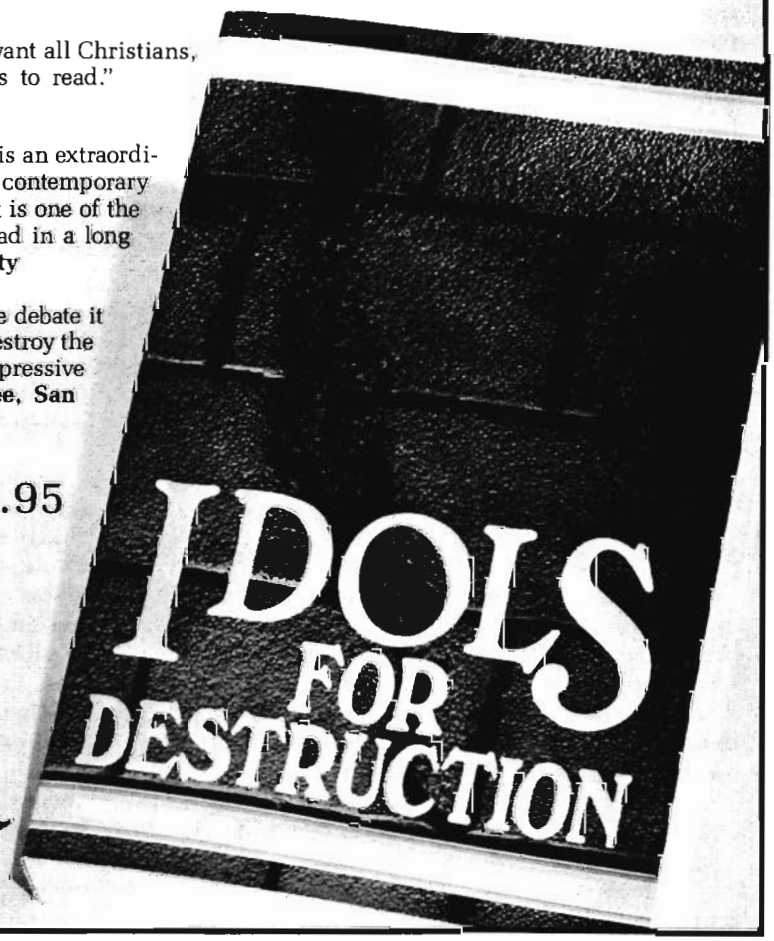

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The creation versus evolution debate, on the other hand, can be seen indeed as an example of the conflict between deduction and induction, since deductionists claim that the Bible alone can be the source of all knowledge in this area. It is a conflict between human interpretation of God's Word and God's Work, by those who would discount the latter in arriving at the former.

Inductionists separate the profound biblical doctrines based on Creation from the possible mechanisms by which creation was expressed. They note the symbolical elements in the Genesis text associated with events on different days being apparently not chronological but polemical, with references to a tree of life and a tree of the knowledge of good and evil, as well as to a speaking serpent and to the use of the number "seven." They recognize the basic biblical teaching that sets forth God as our Creator and Redeemer.[21] They strive to appreciate the practical purposes behind the existence of the two creation accounts in Genesis 1 and 2. And they are forced to take seriously all of the extra-biblical data and evidence concerning the age and natural history of the earth, which they regard as God's revelation through the things He has made.

Simple deduction leads to the conclusion that Genesis gives us a complete and scientifically relevant description of the mechanisms for various origins, and that all internal or external evidence to the contrary must be dismissed as mistaken and fallacious. Simple induction leads us to believe that the universe and the human beings in it came into being by a long series of meaningless events over a long period of time, and that we have no long-time purpose, meaning or relevance. Once again, it is only by combining deduction with induction that we can understand the truth of God's creative activity and its significance for our lives, while at the same time retaining an openness and integrity in matters suitable for scientific investigation. It is by combining deduction and induction that we know that as Christians we must always say, "Yes," to Creation quite independently of the validity of evolution, while we can suggest also a tentative "Yes" to evolution and an openness to future developments.

Slavery

Christians today may find it hard to realize that little more than a hundred years ago in the United States the biblical teaching on slavery was a critical issue for Christians. Today one would have to search far and wide to find a single Christian willing to make a public defense of slavery on the basis of the Bible. What is the cause of this rapid change in attitude?

The biblical treatment of slavery has similarities to its treatment of the two illustrations we have just considered, but there are also significant and marked differences. In the case of biblical inerrancy and of creation versus evolution, an argument could be advanced that deduction focussed on a few specific texts and that induction focussed on many general phenomena within and outside Scripture. Slavery does not follow this pattern exactly. Here one can argue that a major portion of the direct, and particularly the indirect, teaching of Scripture *assumes* slavery as a vital and continuing institution. It is only in a few general and "visionary" passages that explicit expression is given to what Christians have now come to see as a fundamental expression of Christian living and concerns, one that is at serious odds with the institution of slavery. Yet it is these few prophetically interpreted passages examined inductively, supported by the unspoken but always present perspective of Scripture, that Christians today would champion without reservation in spite of the much larger collection of passages that form the basis for deductive interpretation with respect to slavery.

Throughout the entire Bible the institution of slavery is accepted as self-evident, and major models of Christian living are based on it by the biblical authors. In particular the Bible teaches that the slave/master relationship is a type of the Christian/God relationship—in much the same way that the husband/wife relationship is presented as a type of the Christ/Church relationship. One can construct an excellent case that to reject the institution of slavery is to reject a basic biblical model. And yet the Bible reaches beyond the years of culture and commonly accepted usage and may be seen as *beginning* to point to something else: an inevitable consequence of the continuing witness of the Holy Spirit to His people.

From the time of Noah in Genesis 9:25–27, slavery is described in the Bible. This particular passage was used very recently to defend the slavery of black people in the United States. All together there are about one hundred references to slaves in the Old Testament.

By their remarks, the authors of several New Testament books make it clear that they view their relationship to God as that of slave to Master: they were slaves of sin; they were bought by the precious blood of Christ; now they are slaves of God.[22] Jesus used the institution of slavery as the background for many of His teachings,[23] and Paul followed His example.[24] In I Peter 2:16, Peter expressly exhorts Christians to live as slaves of God. In a key teaching on the Incarnation in Philippians 2:7, Paul speaks of Jesus taking the form of a slave. In at least three places Paul teaches explicitly about the roles of slaves, exhorting submission of slave to master.[25]

To cite particular biblical passages that point the way to the present attitude toward slavery is not an easy task. Perhaps three New Testament passages might be cited in this connection. In both I Corinthians 7:20–22 and Galatians 3:28 Paul affirms that in Christ the relationship of slave to free person is done away as a statement of human reality. He clearly does not teach that slavery should be abolished, but he does emphasize that in Christ the slave is free and the free person is a slave of God, so that all intrinsic distinctions related to the social status of each is irrelevant in Christ. And in the tantalizing passage of Philemon 16, Paul seems to be urging Philemon to give expression to the unity between his slave Onesimus and himself by accepting him as an equal brother. But certainly these few passages cannot be treated as a deductive basis for a Christian stand against slavery. Rather it is the overwhelming inductive evidence from the total biblical teaching on the value of the human being, every human being, made in the image of God that has led to the end of slavery. It is in a Christian context the outworking of the basic unity of all believers in Jesus Christ that in the course of time has led to the abolition of slavery and to the present unthinkability of any Christian's "owning" another person made in the image of God and part of the body of Christ.

Any simple deductive approach to the subject of slavery must lead to the conclusion that slavery is a divinely approved institution that models many basic human/God relationships. Although the Bible does not explicitly teach that slavery is approved by God, its total use of slavery as a viable and illustrative institution can lead deductively to few other conclusions than that slavery is acceptable for the child of God, both as slave and as master. It is only when one builds on the total "analogy of Scripture" with historical guidance from the Holy Spirit (which includes all those political, economic and social factors that led to the abolition of slavery), that one is enabled to inductively respond to the few prophetic passages that speak of a reality that transcends contemporary social practice and culture.

Women's Roles

When we come to the question of women's roles, particularly those involving the allowable roles for women in the offices of the church and the roles suitable for women in society, we come to a topic that combines all of the features of the previous three questions together with a dynamic social movement. Here there are key passages that can be interpreted deductively to set the boundaries of women's activities, as in the case of biblical inerrancy and creation *versus* evolution. Here there is the assumption of a cultural and social practice in the biblical teaching with use of these practices as illustrations and examples, as in the case of slavery. Here there is finally an underlying biblical perspective that comes to light in a few prophetic and "visionary" passages, as in the case of slavery. The interaction of deductive and inductive approaches is perhaps more complex than in any of the other three examples we have considered.[26–38]

It is by combining deduction and induction that we know that as Christians we must always say, "Yes," to Creation quite independently of the validity of evolution, while we can suggest also a tentative "Yes" to evolution and an openness to future developments.

If we turn to the actual descriptions and activities of women in the Bible, we see first that in the Old Testament by law women had a limited position that often bordered on their being treated only as possessions.[39] Only men bore the sign of the covenant; only men could divorce their spouses; only men could refuse a leviratic marriage; only a man could make an unbreakable vow. In the tenth commandment wives are linked with house and household slaves or servants. The biological functioning of women was associated with ceremonial uncleanness, and sexual access to women captives in war was considered a right (although it is certain that Jesus dealt with this issue differently according to Matthew 5:28). Clearly the revelation of the Old Testament comes to us out of the context of a patriarchal society, just as the treatment of slavery comes to us out of the context of a slave-owning society. The question is whether this patriarchal character is normative or incidental. A deductive approach inevitably favors the former. An inductive approach can be used to support this conclusion, as for example when the above Old Testament illustrations are considered normative, but an inductive approach also provides considerable evidence for a different approach to the question.

The deductive approach claims some nine New Testament passages from the practical teaching of Paul as the foundation for the development of biblical propositions about women's roles.[40] It can even claim that Paul himself provides the model for the deductive approach in I Timothy 2:12–14:

(a) Adam was formed first, then Eve.

(b) Adam was not deceived, but Eve was deceived.

(c) Therefore women who carry on the line of Eve are allowed neither to have authority over men nor to teach men, but are to remain silent and submissive.

A similar example is provided by I Corinthians 11:8,9. In keeping with a deductive approach, it is emphasized that if we wish to know what the Bible teaches about women's roles, we must look primarily at those passages that teach on this subject. When this is done, it is claimed that the passages in I Corinthians and I Timothy clearly forbid the ordination of women. Women are expressly forbidden to hold any teaching/ruling office in the church, for timeless reasons grounded in creation, the Fall, and God's purpose for men and women. Similarly Ephesians 5:22–33 is seen to be the foundation for a deductive conclusion emphasizing an authority hierarchy in the family.

Clearly the revelation of the Old Testament comes to us out of the context of a patriarchal society, just as the treatment of slavery comes to us out of the context of a slave-owning society. The question is whether this patriarchal character is normative or incidental.

The position developed by deduction can be summarized as follows. The woman is subject to the man because the man, as created first, is directly in the image and glory of God, whereas the woman, created after the man and for him, is the glory of the man. Because of her lesser endowment (presumably) she was deceived by the Tempter whereas the man was not. Therefore she should never aspire to teach the man, but always learn from him in subjection and quiet humility. This means that the woman is subordinate to the man in the family and in the church. This does not imply that the woman is inferior to the man, but that in following this subordination she fulfills the order of creation as intended by God. The woman is complementary in leadership, but subordinate in government.

An inductive argument can also be offered in support of this position, although it is definitely secondary to the deductive argument. The whole biblical record, it is argued, testifies that the male predominates in Scripture: Old Testament patriarchal society, Jesus Himself, the twelve disciples, the office holders in the early church. In keeping with this inductive evidence, the symbolism of God's relationship to His people requires a male office holder in the church and a male authority in the home. The male/female hierarchy is only one step in the whole "chain of authority" that extends from God to men to women to children.

Inductionists ask the fundamental question: Are the practical teachings of Paul sufficiently understood in terms of their local context that they can be unquestionably advanced as the normative guidelines for all times? Is the patriarchal pattern of the Bible intended to be normative, or is it a cultural framework from which the Holy Spirit may bring something more complete as in the case of our understanding of slavery?

In order to answer these questions, inductionists look at the actual roles described for women in the New Testament. Here there is a great wealth of material not usually considered by deductionists, some of it admittedly difficult to evaluate.[41] An examination of the Gospels, the Acts and the Epistles shows that women played a consistent and prominent role in the life of the early church from its very beginning. Sometimes it is not easy to identify the exact nature of this role, since offices and roles were not clearly defined. It may also be noted that Jesus broke traditions concerning women in several instances in order to more clearly define the intent rather than the practice of the Old Testament law. He revealed His most profound mission to the outcast Samaritan woman at the well, whom His disciples would not even have spoken to. He did not sanction the killing of the woman taken in adultery. He welcomed Mary into the most intimate relationship and chided Martha for not understanding this. He moved to oppose frivolous divorce practices that threatened women's welfare. He accepted the attentions and love of the woman who was a former prostitute. He taught several times using parables or expressions in which men and women were parallel actors, and even used women in parables to represent God. He taught that in the resurrection any distinctions that might presently exist in the marriage relationship would be done away with since marriage itself would be done away with.

Furthermore inductionists note that it was to a woman that Jesus taught most clearly about the resurrection. It was to a woman that Jesus first appeared after His own resurrection. It was a woman who was the first convert in Macedonia. It was a woman, who, with her husband, taught Apollos a more complete basis for his preaching. It was a woman to whom Paul sends his first greetings at the end of the letter to the Romans, a closing that indicates, by the way, that at least one-third of "the leaders" in the church at Rome were women.

In dealing with the Genesis record, inductionists note that Genesis 1:26,27 recounts how God made man, male and female, in His image; man and woman consitute a fellowship of equals as in the Trinity. In Genesis 1:28 they are given joint responsibilities. The subordination of woman to man comes only after the Fall, as one of the "curses." But in Christ there is a new creation, superseding the Fall as described in Galatians 3:28. Through faith, by grace, the equality of male and female in human relationships is restored (Note I Corinthians 11:11,12.). Maleness and femaleness are complementary aspects of the image of God. In Christ women, like men, are called to responsibly exercise all of the gifts of the Holy Spirit in mutual submission, one to another in the church and in the family. The whole recorded history of women in the Gospels, Acts and the Epistles suggests that in actual fact men and women were treated equally with the same opportunities to use their spiritual gifts. No roles are forbidden to the woman *a priori*, but she is free to respond to the gifting of God in whatever way these gifts may lead. Furthermore she is responsible to exercise these gifts to the fullest for the glory of God and the witness to Christ. Inductionists draw a common theme from the New Testament record: under Christ, every person, male and female, should have the opportunity to develop and use whatever gifts the Holy Spirit has given.

Inductionists note the close parallel between Christians' response to slavery and their response to the role of women. Passages that call for the submission of women to men parallel passages that call for the submission of slaves to masters. What has happened in the case of slave/master is seen as a type of what is happening in the case of female/male. Their combination in Galatians 3:28, together with the Greek/Jew relationship is seen as the most significant insight the New Testament provides. It is evident that Paul fully realized the meaning of the Greek/Jew situation (Galatians 2:11–14), although its outworking caused much concern in the early church. In relation to slavery or to women's submission inductionists see Paul as still at the stage of his times in terms of everyday practical advice designed to avert criticism and persecution of Christians. But what he taught by inspiration leads inevitably in God's providence beyond that situation to the full realization that all men and women are made in God's image, that in Christ all men and women are called to be mutually submissive and mutually supportive in the exercise of their gifts, and that there cannot be an ordained and inflexible hierarchy into which all men and women must fit.

Summary

We have examined four quite different areas of interpretation concerning which conservative evangelical Christians have in recent years been in wide disagreement. This disagreement can be traced in large measure to the choice of an approach to biblical exegesis, whether one of a deductive or an inductive nature. Once strong commitment has been made to one or the other of these two types of approach, a wide divergence in conclusions and commitment is inevitable. Authentic understanding of the biblical message can be obtained only from a combination of deductive and inductive insights.

Traditional conservative Christianity has often been based heavily on a deductive approach to Scripture. In this sense such Christianity has followed the pattern of science before Galileo and Newton. It has emphasized specific passages in the Bible, assumed to give a clear and easily understood teaching on the matter; all other descriptions and events, whether biblical or extra-biblical, must then be interpreted to fit the deductions made from the selected passages.

Recognizing the essential role of induction in the development of modern science, Christian scientists in particular are sensitive to the need for an inductive component to the approach to biblical interpretation. While recognizing the value of the specific selected passages of the deductionists, inductionists seek to fit these passages into the total context of descriptions and events with which they deal in order that the overall meaning of the selected passages may be understood in a totally biblical context.

These differences come to light in the examples we have considered. Is the meaning of the biblical interpretation to be gained by the passages that teach on biblical inspiration and "inerrancy" regardless of the kind of book the Bible actually is—or is the meaning and scope of the teaching passages on inspiration enlightened by seeing what kind of book the Bible actually is? Or again, is the question of the role of women in the church settled by the passages that directly teach on women's roles in specific New Testament churches—or is this teaching understood only when we take a close look at the total experience of women in the New Testament?

A simple deductive approach leads inevitably to the conclusion that the Bible is a supernaturally perfect book that conveys correct answers to all questions regardless of whether these questions are relevant to the purpose of the biblical revelation or not; that the universe came into being some 10,000 years or less ago, and that all the answers suitable for a scientific description of origins are contained in the Genesis record; that slavery is a God-approved institution mirroring for our edification great truths of the Christian faith; and that women are ordained by God's will to be hierarchically subject to men in church and family.

Christians who see the necessity for induction as well as deduction regard these conclusions as inadequate and as failing to convey the true nature of the biblical revelation. They see instead that the Bible is a divinely inspired book designed to convey God's revelation according to His purpose, but one that will lead to confusion and apparent error if answers are demanded to questions inconsistent with that purpose; that demanding a choice between creation and evolution is an inappropriate procedure, since all Christians must believe in God as Creator and Redeemer of His people, and may or may not believe in the mechanisms of evolution according to their current understanding of scientific insight; that slavery is an institution rooted in the fallenness of human nature that has existed for many years, and, like other existing social structures, can be used to illustrate divine truths, but is contrary in its essence to the biblical doctrines of both creation and redemption; and that women's subjection to men also has its root in the fallenness of human nature but by the grace of God can and must be overcome in and through Jesus Christ.

The choice of a deductive versus an inductive approach (or better yet an integrated inductive/deductive approach) occurs at such a primary stage of biblical interpretation that it is almost reduced to an elementary faith choice. No inductionist can convince a deductionist that his/her way is faulty by direct argument, any more than a deductionist can accomplish the same ends with an inductionist. Nothing less than a change of paradigm is required; nothing less than a kind of "conversion experience" is adequate. And in such cases there is not much one can do except witness, love, and wait for the Holy Spirit.

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Impact of the Rediscovery of Genetics on the Concept of Variation in Darwinian Theory

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Development of an evolutionary paradigm was delayed for several decades after publication of Darwin's The Origin of Species. *One of the causes for the delay was the rediscovery of genetics with a consequent awareness that there were limitations on variation. The rediscovery led to conflicts which further delayed development of a consensus. Conflicts between the concept of discontinuous variation of the geneticists and the concepts of continuous variation and natural selection of the paleontologists, biometricians and other evolutionary biologists developed and remained unresolved into the 1920's and 1930's. Organisms were not as plastic as had been thought in Darwin's time. It is suggested that lack of knowledge of genetics, when evolutionary theory was being developed, might have contributed to its acceptance and affected its formulation.*

"It could be argued that nothing approaching a 'Darwinian paradigm' became established until the 1930's, and even that paradigm was Darwinian only in a very loose sense."[1] This article will examine some of the causes of the long delay in development of a consensus on evolution particularly emphasizing the impact of the rediscovery of Mendelian genetics which showed that there were limits on capacity for variation. What effect did the rediscovery of laws of heredity and limits on variation have on a concept of evolution which was vague about limits (which actually included no limits) on variability? Charles Darwin expressed his view on potential for variation as follows:

> What is the limit to the possible amount of variation of any part or quality, and, consequently is there any limit to what selection can effect? These questions can not be positively answered, but it is certain that we ought to be cautious in answering them by a negative.[2]

> The fluctuating and, as far as we can judge, never ending variability of our domesticated productions, the plasticity of almost their whole organization, is one of the most important lessons which we learn from the numerous details given in the earlier chapters of this work.[3]

Darwin's hypothesis of heredity, the hypothesis of pangenesis,[4] was consistent with the idea that change in heredity could be induced by the environment thus making heredity rather plastic.

An erroneous understanding of heredity was not limited to Darwin. No other prominent 19th century scientist other than Mendel understood it either. Carl von Naegeli and Kerner von Marilaun

> . . . were far too busy studying highly variable genera which showed promise of evolving in front of their eyes to stop and examine the laws of inheritance. . . . The neglect was thus in part a result of assuming that the study of constant forms will not lead to the source of variation, and in part [due] to the simple fact that the cytologists had yet to discover the material basis for Mendelism and for a concept of heredity far more non-variable than any Darwinian was prepared to accept.[5]

For a further discussion of why Mendelism was not understood prior to 1900 see Jenkins.[6] The most obvious gap in the theory of evolution was the almost complete ignorance of the laws of inheritance.[7] Some general biology texts and lectures fail to communicate the

problems for evolution that followed rediscovery of genetics in 1900, and merely say that genetics supported the evolutionary view. (Knowledge of genetics did, of course, help with the problem of swamping of variations by the much more numerous individuals not showing the variation, but this is the only effect of genetics that is normally mentioned.) This article is intended to provide a balance on this issue.

Even before rediscovery of genetics a number of problems had developed in evolutionary theory. Some of these will be examined to provide a context for the conflicts which were to follow.

Problems That Had Developed in Evolutionary Theory by 1900 Prior to Rediscovery of Genetics

Problem of Swamping Effects

Abnormal variations ("sports") were said to be swamped by breeding of the individuals possessing them with the much larger number of individuals having unchanged characteristics.[8] In response it was suggested that there might be simultaneous mutation in the same direction so both individuals involved in a mating might have new characteristics. This suggests either a Lamarckian response to the environment or an internal orthogenetic drive (evolution in a certain direction).[9] In either case fluctuating, fortuitous individual variation would have to be abandoned and with it much of the importance of natural selection.[10]

Neo-Lamarkism began in the United States in the 1860's. Two such Lamarkian views were those of 1) Cope, who thought characteristics were acquired by movement of parts,[11] and of 2) Hyatt, who believed that characters belonging to adults become embryonic in the next higher species.[12] Cope thought that characteristics of the vertebrate skeleton were acquired through motion or use by gradual accretions of modifications. Darwin had himself prepared the way for a Lamarkian position. He held the environment responsible for change in domestic productions through its effect on the reproductive organs and spoke of use and disuse.[13,14] As pointed out previously, Darwin's hypothesis of pangenesis was consistent with a Lamarkian interpretation. Darwin's reaction to the problem of swamping effects included "his increasing attribution of variation to such Lamarkian factors as the direct action of environmental conditions and the inherited effects of habit use and disuse."[15] An example of orthogenesis as expressed by Nageli was that "life, once formed from lifeless matter, contained an urge driving towards even higher forms . . . towards perfection.[16]

The mutation theory of Hugo de Vries was also a way of solving the difficulty of swamping.[17] If the mutant form was infertile with the parent type it could not be swamped through back crossing.

Disenchantment with the Speculation of Morphological Darwinians

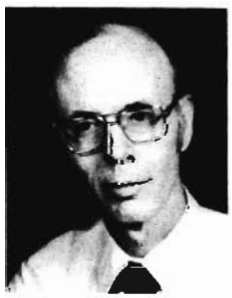
Some biologists including William Bateson didn't like the speculation that was evident in the thinking of the Darwinians. Bateson said "'If,' say we with much circumlocution,'the course of nature followed the lines we have suggested, then, in short, it did.' That is the sum of our argument."[18] According to Raymond Pearl,

> In the minds of an astonishingly large number of people . . . it is precisely the same thing to show that something logically must be so as it is to show that it is so . . . . As everyone knows, this attitude led practically to the intellectual bankruptcy of the whole evolution theory in the late nineties . . . .[19]

Polarization into Opposing Viewpoints by the Turn of the Century

Conflict between Discontinuous and Continuous Variation

Darwin and his followers refused to admit the possibility of evolution of species by abrupt changes. Wallace and other followers insisted upon the exclusive efficiency of selection exercised upon small individual



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fluctuations. The establishment of the mutation theory (evolution by jumps) presumably would be fatal to Darwinism.[20] Darwin's bias against evolution by jumps was caused by the fact that the majority of its supporters were thinking in terms of mutations large enough to produce the discontinuities between species, therefore denying the role of selection in accumulating the many intermediate steps.[21] William Bateson had said in 1894 that the discontinuity of species results from the discontinuity of variation.[22] In 1909 he said that evolution by accumulation of small changes is shown to be false by the study of genetics.[23] Paleontologist Henry Fairfield Osborne argued, however, that most of the cases of discontinuity in mammals cited by Bateson were teratological and had no direct significance in evolution.[24] To naturalists, paleontologists, and many others it seemed impossible that the large mutations of the geneticists could give rise, under the action of selection, to changes of the type they could observe in evolving faunas and floras. Many geneticists regarded the means by which evolution is brought about as again an entirely open question.[25]

Conflict between Discontinuous Variation and Natural Selection

This was closely related to the conflict between discontinuous and continuous variation since natural selection was thought to act on continuous variation but was thought to be unnecessary with discontinuous variation. Natural selection had been used to excess even in Darwin's time, some people having said it induces variability.[26] By the end of the 19th century there was a distinct reaction against selection. Some eminent biologists felt that mutation had made natural selection unnecessary. However, between 1910 and 1920 belief in natural selection was revived.[27]

Conflict between Biometricians and Mendelians

"Three separate modes of evolutionary explanation led into the 1920's that were distinct in their approaches: the genetic, the naturalist, and the biometric or statistical."[28] A brief history of the conflict between the biometricians and Mendelians follows. The biometricians, Pearson and Weldon, chose at first to fight Mendelism as a trivial exception to biometrical heredity with which it could not be made to conform.[29] Weldon realized that discontinuity in heredity meant an end to that continuity in variation upon which the biometrical school was founded.[30] So the first step in the Mendelian controversy was provided by Weldon's belittlement of Mendel's work in the first volume of *Biometrica*. Bateson's rejoinder came in the form of a small book in 1902. It was delayed since he first set to work to repeat Mendel's experiments. In addition struggling geneticists at the time had few periodicals available in which to publish their articles.

> To Bateson as to others Darwinism was overplayed and suspect. In contrast Mendel offered an arithmetically simple and biologically successful approach . . . Darwinism, biometry, and continuous variation were out. Mendelism, simple arithmetic and discontinuous variation were in.[31]

Integration of opposing viewpoints could not be expected from Bateson and Pearson. Bateson criticized what he felt was careless experimental technique in Pearson's work. No artificial crosses were undertaken. The flowers were left uncovered, open to the insects which may introduce the pollen of any other flower which they happen to carry.[32] Jennings said that biometricians that devote themselves to careful biological investigation fall away from Pearson.[33]

To naturalists, paleontologists, and many others it seemed impossible that the large mutations of the geneticists could give rise, under the action of selection, to changes of the type they could observe in evolving faunas and floras.

The Pure Line Concept of Johannsen and Its Impact

Johannsen's Results

Johannsen showed that it was not possible to change, through selection within pure lines, the correlation between length and width of the beans that he was studying. Selection of hereditary characteristics could induce some degree of physical alteration but the effect would halt unless there were added mutations. Selection within pure lines produced no new shifts in genotype.[34] According to Peters this was a bombshell to evolutionary thought. It showed that selection could not extend the limits of previously established variability.[35]

Support from Other Scientists

Support came rather soon from other workers using varying experimental material. East, who worked with maize, said that corroborative evidence had been received from so many lines that it could hardly be doubted that the main points of the hypothesis were correct.[36] Jennings showed that selection for size in Paramecium comes to the end of its action.[37]

> A very large share of the apparent progressive action of selection has really consisted in the sorting over of pre-existing types so that it has by no means the theoretical significance that had been given to it.[38]

Pearl selected for fecundity in the fowl, getting high and low lines.[39] This work expanded the evidence for limit on selection to "non-selfed" organisms. Pearl wrote:

> It seems to me that it has never been demonstrated that continued selection can do anything more than (1) isolate pure biotypes from a mixed population which contains individuals of different hereditary constitution in respect to the character or characters considered, [or] (2) bring about and perpetuate . . . certain combinations of hereditary factors which would never (or very rarely) have occurred and would have been lost in the absence of such systematic selection. . . .[40]

Continued selection in pure lines has been wholly negative as reported by various workers for cereals (including wheat and oats), hydra, *Aphis* (an aphid), lentils, peas, soybeans, and lupines.[41]

Critics

Opposition to the pure line theory came particularly from three critics.[42] It came from Pearson and Harris because Johannsen's work shows the "utter untenability of the correlation coefficient as a measure of heredity."[43] The third critic, Castle, said he selected through sixteen generations for size of the hooded pattern in the coat of rats.[44] Variation occurred in the length of the pigmented hood and the width of the back stripe. Castle wrote that

> In this case selection had modified steadily and permanently a character unmistakenly behaving as a simple Mendelian unit.[45]

> The plus and minus series have from time to time been crossed with the same wild race. Each behaves as a simple 3:1 ratio among the grandchildren.[46]

Castle stated further:

> A single variable genetic factor was concerned in the original hooded race, that a changed condition of this same factor was produced in the minus race and another changed condition in the plus race and a third appeared in the mutant race. All are allelomorphs of each other and of the nonhooded or self condition found in wild rats. . .[47]

In an article in *The American Naturalist* in 1917, Hagedoorn and Hagedoorn commented: "It is well known that Dr. Castle counts among the few last geneticists who still believe that the genes themselves are modified by selection."[48]

In 1919 Castle published a correction:

> I thought two years ago that I had evidence that a single gene had changed in the course of a selection experiment . . . . I now find this view rendered untenable by further experiments . . . the supposed changes in a single gene are more probably due to changed residual heredity, which very likely may consist wholly of other 'modifying' genes.[49]

The further experiments he performed were to cross plus and minus hooded races with a third race and recover hooded characters as a recessive in the F_2 generation. The hooded pattern in the two selected races became identical when the modifiers were thus removed.[50] However, Castle still criticized most geneticists for extending the pure line theory to cross-fertilizing forms.[51] Harris, another of the three above-mentioned critics of the pure line theory, referred to it as follows, " . . . the pure line theory . . . the rank vines which have grown from the nineteen bean seeds which Johannsen planted in 1901."[52] Two arguments he used against pure line theory were (1) characters that are not inherited can't be taken to prove that selection is ineffective (Maybe seed weight isn't inherited.); and (2) improvement for any single character can't be said to be unlimited. Because a wheat plant "can not be made to yield all grain and no stubble, we are told that selection can only isolate already existing types."

Some general biology texts and lectures fail to communicate the problems for evolution that followed rediscovery of genetics in 1900, and merely say that genetics supported the evolutionary view.

Effect of the Ideas of Discontinuous Variation and Pure Lines on the Theory of Evolution

Some biologists expressed reservations about the Darwinian Theory although not about evolution. Conklin said

> . . . the experimental study of genetics has been a little disappointing. We had supposed that organisms would be more tractable, more willing to evolve than we find them. The older view that organisms were plastic and could be molded 'while you wait' now reminds one of the view of certain childless theorists, that children are plastic clay in the hands of parents or teachers; both of these views neglect the fact that the living organism, delicate and responsive beyond compare, is still wonderfully strong, stable and stubborn. So far as the factors of evolution are concerned experimental study has been a weeding out process, and at times it seems that nothing will be left.[53]

In a 1914 address Bateson said

> The outcome (of evolutionary aspects of genetic research) as

> you will have seen is negative . . . destroying much that 'till late passed for gospel . . . We are just about where Boyle was in the seventeenth century. We can dispose of alchemy but we can not make more than a quasi-chemistry. We are awaiting our Priestly and our Mendeleeff.[54]

And in a 1922 address Bateson said that faith had given place to agnosticism. Though our faith in evolution stands unshaken we have no acceptable explanation of the origin of species.[55] Not all scientists took as strong a position as Bateson, but views similar to his were widely held. D. H. Scott, a botanist, said

> In our present total ignorance of . . . the causes of variation . . . we can form no clear idea of material on which selection has had to work and we must let the question rest . . . all is again in the melting pot.[56]

M. Caulbery, an exchange professor at Harvard, said

> The data of Mendelism embarrass us also very considerably. All that it shows us, in fact, is the conservation of existing properties. Many variations which have seemed to be new properties are seemingly traced to previously unobserved combinations of factors already existing.[57]

Many of the modern ideas about sources of variation had been suggested before 1920. In a 1917 article in *The American Naturalist* three kinds of variability were given: (1) modification, the non-inheritable effect of the non-genetic developmental factors, (2) real inheritable variation caused by mutation or loss of genes, (3) real inheritable variation caused by recombination of genes.[58] Modifying genes, which would later be the basis for synthesis and resolution of some of the conflict (particularly that between continuous and discontinuous variation), had been suggested by the 1920's. Castle had mentioned them in a paper cited earlier. T. H. Morgan[59] in the United States and the Chetverikov School in Russia also mentioned them.[60] Modifying genes permitted small genetic changes so that continuous variation (as well as discontinuous) could be explained genetically. However, . . . "in the early 1920's the study of evolution seemed to have reached a blank wall beyond which for the moment advance was impossible."[61]

Thus the magnitude of the problem was such that over twenty years after the rediscovery of genetics the tension remained unresolved. Genetics had not been so clearly and simply a buttress for evolutionary theory as has been suggested in some general biology text books and by some lecturers. An example of a statement found in a general biology book follows:

> The weight of scientific evidence over the past 100 years is strongly supportive of Darwin's basic precepts, and such areas of biological specialization as biogeography, . . . genetics, and molecular biology, have provided especially strong support.[62]

In a 1973 debate on evolution William V. Mayer said "In the meantime [since 1860] . . . the evidence on which the theory of evolution rests has been buttressed by genetics, biochemistry, and whole new scientific fields unknown over a century ago."[63] Over-simplification, however, can lead to erroneous impressions. Theistic scientists need not feel that the evidence compells them to echo such statements.

Implications and Discussion

It would be interesting if we could know what might have happened if genetics had been understood before Darwin's publication. Was the theory of evolution accepted in the 19th century primarily because of convincing scientific evidence or might it have been accepted because of other contributing factors? Perhaps one contributing factor could have been the lack of understanding of heredity when the issue was being discussed.

Some of the other factors, which are outside the scope of this paper and hence only mentioned here, might include

(1) Limitation of explanations to only two: monophyletic macroevolution, and the then prevalent fixity of species concept, with evidence for change being taken as evidence for the former.
(2) Creation alternatives rejected because of a metaphysical commitment. "Once it [our metaphysical position] has been adopted it will shape, rather than be shaped by, our scientific or common-sense observations."[64]
(3) Creation alternatives rejected because anything supernatural is not considered science. Failure to see the difference between operation science (where, according to Thaxton et al., "appeal to God is quite illegitimate since by definition God's supernatural action would be willed at His pleasure and not in a recurring manner"[65]) and origin science, where hypotheses are not testable or falsifiable, has led to "excluding the divine from origin science as well as from operation science."[66] This viewpoint is, no doubt, more fully developed now than it was during the 19th century.

The idea that life arose by chance from energy striking a primordial atmosphere is now being seriously questioned. In *The Mystery of Life's Origin* Thaxton et al. write

> A major conclusion to be drawn from this work is that the undirected flow of energy through a primordial atmosphere and ocean is at present a woefully inadequate explanation for the incredible complexity associated with even simple living systems and is probably wrong.[67]

A theistic position would reject the idea that the

increased complexity accompanying evolutionary change from a primordial chemical atmosphere up to the first cell, and on to all the complex organisms, occurred by chance without divine guidance. Evolution by chance could be compatible with a deistic position but not a theistic one. Perhaps monophyletic macroevolution *per se* may also be questioned. Its acceptance could have been due in part to the sequence of historical events rather than to clear scientific evidence. The formulation of the theory and extent of change postulated would most likely have been affected by an understanding of genetics and limits on variation. The extent and direction of the subsequent refining of the theory could also have been influenced by the strength of the commitment to the theory as originally expressed.

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The Christic Origination of Science

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Historians increasingly agree that Christianity uniquely influenced the rise of science. The present essay investigates the issue of principle lying behind this fact. Assuming that science is a humanistic factor, i.e., one which affects the whole way people conceive and practice human dignity, it seeks to explain why and how science ultimately arose. To this end it first outlines the humanistic presuppositions of science. Then it examines how these presuppositions were developed by Christianity and why they were the results of the activity of Christ himself, thus tracing the origin of science to Christ living and acting in his followers. It closes with a brief message for Christians and scientists.

Introduction: From Fact to Principle

This essay investigates the contributions Christ, living and acting in his disciples, made to the rise of science. *Christic* refers here to Christ while *Christian* refers to his disciples; *Christianity* accordingly designates the totality of Christ's disciples taken as a cultural unit. *Science* means the systematic study of the intrinsic intelligibility of nature or observable reality. *Humanism* means—according to its original and still more common usage—the doctrine of human dignity, open to religion.[1]

This essay starts from two realizations. Contrary to a common prejudice, history has proven the intimate association of science and Christianity, since the former arose only from the latter; this influence, however, has not yet been adequately investigated. In fact, at least ever since Whitehead's seminal remarks, historians have increasingly documented the decisive role of Christians in the rise of science.[2] An outstanding example is Jaki's survey of all the cultures (Chinese, Indian, Graeco-Roman, Arab, etc.) which achieved the technical presuppositions of science such as logical and mathematical sophistication, refined technology, advanced scholarship and the like.[3] Jaki proves that only Christianity generated "live-born science," and this because of the typical Christian dogma of creation. Hence his insistence on "the crucial role played in the origin of science by . . . belief in . . . the creative act of God."[4] This view is becoming consensual. For instance, the Marxist Joseph Needham, an authority on the history of Chinese science and technology, preceded Jaki in stating that China failed to develop science proper because it "lacked the idea of (divine) creation."[5] However, such consensus tends to remain sterile, as can be seen from these two authors. Thus Needham effectively ignores Christianity and traces the origin of science to "the analyzable differences in social and economic pattern between China and Western Europe."[6] Jaki, in turn, is satisfied with such a baffling thesis as "the existence of a single intellectual avenue forming both the road of science and the ways to God."[7]

This essay faces the issue of principle raised by the above disclosure of fact. For the discussion of this issue—as Needham, for instance, points out—is important to avoid the seemingly "inescapable dilemma" of ascribing the origin of science to either "pure chance" or "racialism however disguised." Indeed, "chance" must be rejected because it entails "the bankruptcy of history as a form of enlightenment for the human mind" while "racialism" asserts without proving that "one particular group of peoples . . . possessed some intrinsic superiority to all other groups of people."[8]

This essay will follow a *humanistic-genetic approach.* We shall take for granted that science profoundly affects the way people conceive and practice human dignity.[9] On this basis, we shall investigate the reasons for the fact that science arose solely from Christianity. We shall consider three main questions: (I) How is it possible to understand this fact? (II) What does this fact actually amount to, that is, what did Christianity uniquely do to originate science? Why and how did it do it? (III) What message should we extract from this fact and its explanation?

I. The Humanistic Implausibility of Science

How is it possible to understand the fact that science arose only from Christianity? Undoubtedly, at first blush the question may appear far-fetched, and even more bizarre the tentative answer that science ultimately arose because of the personal activity of Christ. But we should not be confused by this reaction due to two instinctive yet misleading prejudices of contemporary public opinion: one prejudice being that science is a spontaneous or natural cultural phenomenon and the other that science has nothing to do with religion. Indeed, if science were so natural from the cultural point of view, why did it not viably arise until 1600 A.D.? Also, if science had nothing in common with religion, why did it arise only from Christianity? Great scientists of the past and the present tend vigorously to refute these prejudices on the strength of their own creative experience. Thus, for instance, Galileo himself was surprised that science—as embodied in the heliocentric doctrine—could assert itself at all. Against those who "wonder that there are so few followers of [it]," Galileo professed himself "astonished that there have been any up to this day. . . .

> Nor can I ever sufficiently admire the outstanding acumen of those who have taken hold of this opinion and accepted it as true; they have through sheer force of intellect done such violence to their own senses as to prefer what reason told them over that which sensible experience plainly showed them to the contrary.[10]

Einstein, in turn, used to insist on the religious connotation of science. Thus, for instance, he dismissed the psychological explanation that Max Planck's "inexhaustible patience and perseverance" in quantum research was due to "extraordinary will-power and discipline." His own explanation was of a basically religious kind:

> The state of mind which enables a man to do work of this kind is akin to that of the religious worshiper or the lover; the daily effort comes from no deliberate intention or program, but straight from the heart.[11]

Such experience of creative scientists provides the key for understanding why science arose only from Christianity. This key is the *humanistic implausibility of science* which consists in the virtual impossibility for people living in the prescientific age to accept and implement the humanistic presuppositions of science itself, that is, a series of theoretical convictions and ethical motivations without which science cannot exist. We can identify at least four such presuppositions which need to be widely shared by a culture before science can be produced by that culture. The first two are the unwavering persuasions that nature has a transensible structure and that this structure can be penetrated by the human mind; the other two are the unquestioning assurances that the intellectual exploration of such structure is inherently rewarding and obligatory for humans.

The persuasion about the *transensible structure of nature* is the fundamental theoretical conviction. Indeed, people would never do science unless they were certain that the structure of nature that can be observed through the senses is true, but only in a superficial manner, so that it points beyond itself to a more genuine and realistic truth. For science demands that the mind go beyond the sensible appearances of nature. But this step amounts to a wrenching change of attitude for prescientific people as can be seen by the difficulty of accepting the heliocentric system referred to by Galileo. For the acceptance of this system required a seemingly reckless attitude: what seemed to

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be self-evident, i.e., the turning of the sun around the earth, had to be judged misleading; whereas what appeared to be nonsensical, i.e., the turning of the earth around the sun, had to be deemed most reasonable. Hence the first aspect of the humanistic implausibility of science: science could only arise if people were prepared to turn around their instinctive way of considering nature in relation to themselves and their dignity.

The persuasion about the *intrinsic intelligibility of nature* is the complementary theoretical conviction on which science rests. Indeed, people would never do science unless they were certain that the transensible structure of nature can be truly understood by the human mind, that is, known with precision in its countless manifestations and also grasped as a unified whole. For this is clearly what science demands of its practitioners to start to exist. It requires that they aim at *discovery*—i.e., the intellectual detection of some hitherto unknown feature of nature—and that they do so with antecedent trust of being able to succeed in their effort, no matter how remote from ordinary views the feature of nature may be they set out to explore. Hence the second aspect of the humanistic implausibility of science which compounds the first: science could only arise if people not only became certain about the transensible structure of nature but also were ready to assume as unquestionable that such structure was graspable by the human mind.

The assurance about the *inherent rewardingness of the intellectual exploration of nature* is the fundamental ethical motivation of science. Indeed, people would never do science unless they were certain that the efforts required for seeking the understanding of nature were worthwhile in themselves rather than because of some effects they might produce, such as technological applications, public acclaim and so forth. For science, being the quest for discovering the unknown, would never exist were its practitioners to count beforehand on being eventually able to use their discoveries for practical purposes. Actually, a scientific researcher cannot even be sure ahead of time that he will eventually achieve the discovery he set out to attain. Accordingly, science could not start to exist unless those who first engaged in it deemed the intellectual exploration of nature to be the inherent reward of their efforts, and this because such an exploration actualized their human dignity as seekers for truth. Hence the third aspect of the humanistic implausibility of science: science could only arise if people were ready to commit all their resources to the intellectual exploration of the transensible structure of nature as to an enterprise which deserves to be carried out for its own sake, independently of any further advantages that can arise from it.

The assurance about the *inherent obligatoriness of the intellectual exploration of nature* is the other basic ethical motivation of science. Indeed, people would never do science in the more demanding sense of the term—that is, engage themselves in the exploration of hitherto completely unknown areas of nature—unless they were certain that their efforts were not only worthwhile in themselves but also somehow obligatory for them. For the trail-blazing work of science is so daunting that it can hardly be endured by the persons who feel attracted by it unless they are sustained by a sense of *noblesse oblige*. That is to say, they must be convinced that it is their duty, as scientifically gifted individuals, to engage in research and persevere in it, no matter how great the difficulties involved, under penalty of injuring human dignity in themselves and others. Hence the fourth aspect of the humanistic implausibility of science: science could only arise if people were able so comprehensively to overcome their instinctive objections toward the exploration of the transensible structure of nature as to regard this exploration not only as its own reward but also as their inescapable obligation as dignified human beings.

In sum, the origin of science is very surprising because it demanded such a radical change in the way people conceived and practiced their dignity with regard to nature that it could hardly occur without the mediation of some unique humanistic factor; the more so, when one considers that science can viably exist only if its humanistic presuppositions are widely shared. For science is public in principle, affecting as it does the overall way people think and act. Hence it cannot survive, much less thrive, unless the cultural milieu in which it is started by some pioneers is largely prepared to welcome and support it. This being the case, it makes sense to hypothesize the activity of Christ in Christianity as that unique factor which makes it possible to understand why science arose at all.

II. The Humanizing Activity of Christ Toward Science

What did Christianity uniquely do to originate science? Why and how did it do it? In light of the preceding, we shall answer these questions in three successive steps as follows: (A) Christianity developed the humanistic presuppositions of science; it succeeded in doing so because Christ (B) rebuilt the foundations of humanism and (C) educated his followers to the methodological autonomy of science.

The Christian Development of the Humanistic Presuppositions of Science

The unique contribution Christianity made to the origination of science was to develop the humanistic

presuppositions of science itself. Four hints taken from the history of prescientific Christianity suffice to indicate the nature of this contribution: (i) the conviction about both the reality and the transcendence of the cosmos, (ii) the appreciation of material labor as a quasi-liturgical service of God, (iii) the estimation of natural things as God's messengerial gifts to humans and their fraternal companions, and (iv) the conviction of intellectual research as a humanizing obligation toward God.

(i) ***The conviction about both the reality and the transcendence of the cosmos*** is especially evident in medieval art. For this art is characterized by what has been called "the figural interpretation of reality" which presents two simultaneous features. One is the affirmation of the genuine reality of sensible things, "in continual fight against merely spiritualistic and neo-Platonic tendencies;" while the other is the insistence that this reality has a meaning which points beyond itself:

> Earthly life is absolutely real, of the reality in which the Logos has penetrated, but for all its reality it is only . . . a "figure" of what is authentic, future, final and true . . . the earthly event is a prophecy or "figure" of that part of reality immediately and completely divine which will become actualized in the future.[12]

In other words, earthly things are both real and transcendent because they bear the impress of the Son of God who created them and continually supports them. An example of such "imitative medieval art whose immediate purpose was the sensible representation of transcendent contents" is "the idealism and naturalism of Gothic sculpture and painting."[13]

This attitude was something new when compared with non-Christian cultures. For it exhibited "a new ability to give sensible form to things," one in which "sensible experience arose to new life."

> To give to the real event its legendary strength, to insert it with all its spiritual dignity and its miraculous power in the everyday experience: this is the naturalism of the early Middle Ages which culminated in a spirituality which embraced the whole earthly life . . . [14]

Another example of the same new way of considering nature is the symbolism of Dante's *Divine Commedy* which stresses the transcendent aspect of things: "For things are not things merely. Things in the created universe are both things and signs."[15] Yet Dante's symbolism is most realistic, for it pays close attention to the objective concreteness of things:

> The sign which is found in things inheres in them objectively . . . the sign is thought to be in the thing and yielded by the thing. God has put it there. Man does not contribute it out of his own mind and heart. He discovers it.[16]

Hence a first humanistic connection between science and Christianity is clear: the education of the human mind to the perception of a transensible structure of nature, the invitation to discover an objective, if hidden, message of meaning conveyed by the sensible appearances of nature itself.

(ii) ***The appreciation of material labor as a quasi-liturgical service of God*** is embodied in the operative motto of the Benedictine order *Ora et Labora* (Pray and Work). It manifested a new humanistic mentality—and one with important scientific implications—for it proclaimed as never before in the history of humankind the dignifying significance of the human intercourse with nature. Indeed, this mentality assumed that material labor was not meant to remain purely material, since it had to be undertaken and conducted in imitation of and in association with the Son of God who became a laborer for our sakes. Accordingly, Christianity was the first culture which made many of its members esteem the working involvement with nature as genuinely humanizing, thus going beyond the lingering reservations of other religiously advanced cultures, such as the sapiential tradition of the Old Testament (cf., for example, Sirach 38:24–34).

Indeed, people would never do science unless they were certain that the structure of nature that can be observed through the senses is true, but only in a superficial manner, so that it points beyond itself to a more genuine and realistic truth.

With regard to science, this mentality proved important for at least two reasons, one technological and one motivational. The technological reason lies in the fact that, by systematically engaging themselves in material labor, these Christians were able substantially to contribute to the technical presuppositions of science (observation of nature, use of instruments, etc.). Thus the period between 1250 and 1350 has been called "the century of inventions" because in it "foundations had already been laid for the later technological ascendancy of Europe."[17] But the motivation that was fostered by this attitude was even more important for the rise of science. For these Christians were able to develop an involvement with nature which was both practical and intellectual, since educated persons were

numerous among them. As a consequence, they introduced the idea that the intercourse with nature was an inherently rewarding and obligatory occupation, the means to glorify God and serve neighbor, and actually a way to share in the cosmic wisdom of God himself: "There was a sense in which the cathedral builders, like the clock-makers, had a celestial prototype."[18]

For Christianity . . . truly enabled its members to accept as reasonable a transensible structure of nature and its intrinsic intelligibility; likewise it enabled them to regard the exploration of this intelligibility as both inherently rewarding and obligatory.

(iii) ***The estimation of natural things as God's messengerial gifts to humans and their fraternal companions*** found its highest expression in the *Canticle of Brother Sun* by St. Francis of Assisi. Though Francis was himself no intellectual, his poem documents how Christianity humanistically prepared the advent of science because it so movingly embodies the common views of the time about the meaning of nature as the carrier of a transensible intelligibility which both commands and rewards the attention of people.

> In sum, the *Canticle of Brother Sun* is the poetic *credo* of the medieval belief in the beauty, goodness and intelligibility of the created world. It sums up that tradition that can be seen in the hymns, the arts and the poetry of the period.[19]

This poem is particularly impressive because it stresses that absolutely everything that takes place in God's creation—including explicitly suffering and death—makes eminent sense, no matter how displeasing it can be to human sensibility.

Concretely, this poem points to science in two principal ways. One is the evidence it gives of a commonplace—namely, the doctrine of the so-called two books of divine revelation—which was to inspire such scientific pioneers as Kepler, Galileo and the founders of the Royal Society:

> God is revealed to men by means of two books: the Bible and the world of nature. This was axiomatic in the medieval world . . .[20]

The other pointer is the persuasion conveyed by this poem that natural things are preeminently useful to people not as instruments of power but as messengers of meaning: "Things prove useful precisely in so far as they signify God."[21]

(iv) ***The conviction of intellectual research as a humanizing obligation toward God*** was the special legacy of St. Thomas Aquinas, the great synthesizer of the prescientific Christian world view. His inspirational relevance for science is increasingly acknowledged also by secular-minded historians.[22]

Thomas starts from St. John's teaching that, since all things were created by the Logos–Son-of-God, they manifest the light of God (cf. John 1:3–5): "The very actuality of a thing is a certain light of it."[23] Hence he derives two consequences: the greatness of things in the plan of God and the intellectual character of human dignity. Thus he speaks of "the nobility of things" which consists in their "existence."[24] And he perceives the operations of nature as an expression of God: "the very operation of nature is also an operation of the divine power."[25] But he also clarifies that, precisely because things have been created by God, they have been made by him to operate on their own:

> Thus therefore should one understand God's way of operating in (natural) things, that the things themselves have their own operations.[26]

Thomas also derives the intellectual character of human dignity from God's universal illumination of humans (cf. John 1:9): "The light of natural reason . . . is nothing but an inprint of the divine light in us."[27] Accordingly, "the rational creature is worthier than all temporal and bodily creatures;"[28] also, "the human being is above all the mind of the human being."[29]

On the strength of these views, Thomas insists both on the realism of human knowledge and the human duty to pursue knowledge. He insists on the realism of human knowledge, because the mind depends for its illumination on the things that exist outside it: "The object of knowledge is the thing known according to its existence outside the knower."[30] And he insists on the human duty to pursue knowledge, because only thereby can people fulfill the goal God intended to attain by creating the mind and the universe as a whole:

> The goal of the human soul and its ultimate perfection is to go through the entire order of creatures by knowledge and love and so to reach the first principle that is God.[31]

In particular, Thomas champions the study of creatures as beneficial to religion, because "this study leads to admiration of the most high power of God . . . inflames

the souls of humans toward love of the divine goodness."[32] Thus he indignantly rejects the opinion that "it does not matter for the truth of the faith what one feels about creatures, provided one has the right feeling about God." He reasons thus:

> Any error about creatures entails a false opinion about God and leads the minds of people away from God.[33]

As a result, we have a first explanation of principle for the historical fact that science arose only from Christianity. This explanation is that Christianity was the only culture which succeeded in developing the humanistic presuppositions of science. For Christianity, as we have seen, truly enabled its members to accept as reasonable a transensible structure of nature and its intrinsic intelligibility; likewise it enabled them to regard the exploration of this intelligibility as both inherently rewarding and obligatory.

The Christic Rebuilding of Humanistic Foundations

Why did Christianity, alone among other cultures, succeed in developing the humanistic presuppositions of science? The answer is implicit in the foregoing survey. Indeed, Christians were able to achieve the outlined convictions and motivations precisely because they were Christians—that is to say, in so far as they were in vital communion with Christ. Thus the development of the humanistic presuppositions of science and the consequent origin of science itself must somehow ultimately be traced to the activity of Christ himself. But what activity, operating in what manner?

The clue to the detailed answer is offered by a well known anthropological datum: educated persons of all advanced cultures previous to Christianity balked as a rule at considering as objectively dignified and socially acceptable the systematic involvement with nature which is indispensable for scientific research. Impressive examples are the postures adopted by such scientifically gifted individuals as Aristotle and Archimedes. For Aristotle was a great observational biologist—the "father of biology" according to many, and the chief hero of Charles Darwin himself. And yet Aristotle the ethicist has no room in his system of values for the material activity demanded by scientific research, so much so that he expects the sage—i.e., the genuinely dignified person—to dedicate himself solely to contemplation while leaving the involvement with matter to lesser humans such as artisans and slaves. The same dim view of material activity was taken by Archimedes, another great forerunner of modern science—and he was highly praised by Antiquity for that view, as we know from Plutarch:

> Archimedes possessed such a lofty spirit, so profound a soul and such a wealth of scientific theory, that although his inventions had won for him a name and fame for superhuman sagacity, he would not consent to leave behind any treatise on this subject . . . regarding the work of an engineer and every art that ministers to the needs of life as ignoble and vulgar . . .[34]

Clearly, then, non-Christian educated persons tended to be afraid of material nature, regarding it as impure in itself and as a source of degradation for those who dealt with it. But this is the clue for the activity of Christ that led to the development of the humanistic presuppositions of science by his followers. For Christ disclosed that human sin rather than intrinsic impurity lies behind the widespread tendency to fear nature; also, he enabled his followers to reverse their fear of nature and to work with him in fulfilling God's plan about the whole cosmos.

Christ disclosed that human sin rather than intrinsic impurity lies behind the widespread tendency to fear nature. He taught in this vein particularly when exposing the mentality underlying Jewish dietary laws and similar purity rules, saying, "There is nothing outside a person which by going into him can defile him, but the things which come out of a person are what defile him" (Mark 7:15).[35] Christ insists that impurity comes only from the human heart and its sinfulness:

> What comes out of a person is what defiles a person. For from within, out of the heart of the person, come evil thoughts. . . . All these evil things come from within, and they defile a person. (vv. 21–23)

But this Christic teaching obviously applies in general to the relationship of humans to nature and therefore discloses the root of the human tendency to fear nature.

The dynamism connecting human sin to the fear of nature is already evident from the biblical narration of the Fall. Adam and Eve sinned by refusing to acknowledge nature as God's messenger to them and thus they reduced nature itself to the mere instrument of their self-aggrandizement. Having been tempted to "become like God, knowing good and evil," they "saw that the (forbidden) tree was good for food and . . . a delight to the eyes and . . . to be desired to make one wise." (Gen. 3:5–6). The result was a thorough upheaval in the relationship between humans and nature as originally intended by God and one which caused humans to fear nature itself. For nature was now "cursed" by God because of the human sin (cf. vv. 17–19).

Paul, illuminated by Christ, further clarified such dynamism of human sin and fear of nature by outlining in some detail the inwardly personal character of sin, the radical inversion it causes in the relationship of

humans with nature and the dehumanizing consequences this entails. Sin involves nature in the first place because it is an inward refusal by humans to recognize God through nature and thereby acknowledge their dependence on him. Indeed, the sinners

> by their wickedness suppress the truth. For what can be known about God is plain to them . . . clearly perceived in the things that have been made. So they are without excuse; for although they knew God they did not honor him as God or give thanks to him. (Rom. 1:18–21)

Sin involves nature in the second place because, as a consequence, sinners radically invert the God-intended relationship of humans to nature. Nature is no longer for them the means for communion with God but rather the means for the rejection of God:

> They exchanged (literally, *inverted*; Greek, *ellaxan*) the glory of the immortal God for images resembling mortal man or birds or animals or reptiles. (v. 23)

Sin involves nature in the third place because, as a further consequence, sinners become dehumanized, inwardly and outwardly. It does so inwardly, in that they are no longer able properly to judge the significance of things, and yet they claim to be better able than other people to do so. "They became futile in their thinking and their senseless minds (literally, *hearts*) were darkened. Claiming to be wise, they became fools" (vv. 21–22). It does so outwardly, in that God abandoned them to their disgraceful instincts: "Therefore God gave them up in the lusts of their heart to impurity . . . " (v. 24; cf. vv. 26–31).

For Christ disclosed that human sin rather than intrinsic impurity lies behind the widespread tendency to fear nature; also, he enabled his followers to reverse their fear of nature and to work with him in fulfilling God's plan about the whole cosmos.

As a result, it is clear why sin leads people to a fearful attitude toward nature. The reason is ultimately the sinners' awareness that they are at the mercy of the powers of nature instead of being the dominators of nature as they set out to be. Hence, for instance, their bragging with bad conscience about satisfying all their perverse inclinations: "Though they know God's decree that those who do such things deserve to die, they not only do them but approve those who practice them" (v. 32). Hence also their servile cringing before the forces of nature; having become "slaves to the elemental spirits of the universe" (Gal. 4:3; cf. Col. 2:8), they live in a perpetual superstitious anxiety about doing or not doing the proper thing in dealing with nature: "Do not handle! Do not taste! Do not touch!" (Col. 2:20).

Christ enabled his followers to reverse their fear of nature and to work with him in fulfilling God's plan about the whole cosmos. Christ's activity was not only theoretical but also very much practical in helping people overcome the fear of nature instilled in them by sin. Thus through his self-sacrifice of love he overcame the inversion caused by sin in the relationship between humans and the totality of God's creation:

> For in him all the fullness of God was pleased to dwell, and through him to reconcile [literally, "*to undo the inversion*;" Greek, *apokatallaxai*] to himself all things, whether on earth or in heaven, making peace by the blood of his cross. (Col. 1:20)

He also mediated the divine healing of the human heart: "God's love has been poured into our hearts through the Holy Spirit who has been given to us" (Rom. 5:5).

Above all, Christ associated his followers to himself in fulfilling his God-appointed mission with regard to the totality of the cosmos. For God has "a plan for the fullness of time: to unite all things in him [Christ], things in heaven and things on earth" (Eph. 1:10). Hence, in and through Christ, the Christians are entrusted with everything that exists:

> All things are yours, whether . . . the world or life or death or the present or the future, all are yours; and you are Christ's; and Christ is God's. (1 Cor. 3:21–23)

The purpose of this entrustment is that, by actualizing their dignity as children of God, the Christians actively share in Christ's liberation of the cosmos from the influence of sin:

> For the creation waits with eager longing for the revealing of the children of God . . . because the creation itself will be set free from its bondage to decay and obtain the glorious liberty of the children of God. (Rom. 8:19–21)

Consequently, the Christians should not fear the suffering and death entailed by their association with Christ relative to the totality of creation because only through them can they bring forth genuine and lasting life for themselves and for everything else:

> We know that the whole creation has been groaning in travail together until now; and not only the creation, but we ourselves, who have the first fruits of the Spirit, groan inwardly as we wait for adoption as children, the redemption of our bodies. For in this hope we were saved. (vv. 22–24)

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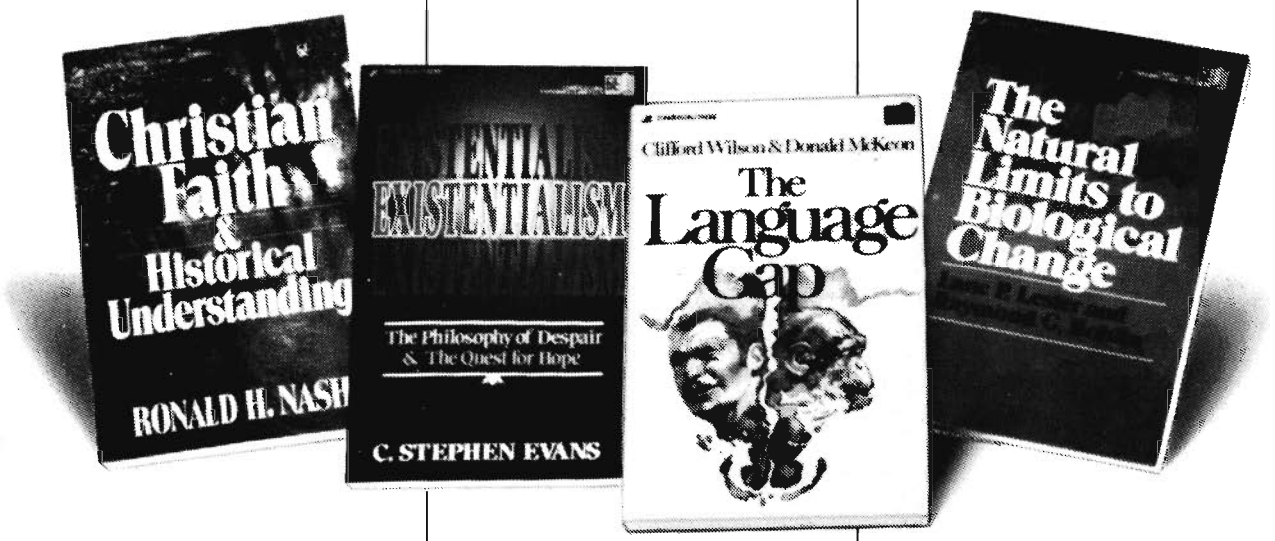

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As a result, it is clear that Christ most profoundly and most powerfully rebuilt the foundations of the relationship between human dignity and nature. By the same token, it is also clear why Christianity was the only culture which succeeded in developing the humanistic presuppositions of science and, as a consequence, the only culture that brought forth live-born science. This therefore is the ultimate explanation of the origin of science—one which excludes both chance and racialism, to refer to Needham's "dilemma"—the activity of Christ himself, operating in and through his followers. In this sense we are justified to speak of the Christic origination of science.

The conclusion reached here, though unusual, is not totally unprecedented. For instance, a similar view can be found in the works of the evangelical theologian Thomas F. Torrance who has reflected much on the influence of Christ on the origin of science:

> Bathed in the Light of God that shines in concentrated form in Jesus Christ, the universe took on a radically different aspect.
>
> The incarnation [of Christ] had the effect of sanctifying the physical universe for God, thus requiring for it a new respect altogether, if only as the medium which God has established for communion between himself and mankind, but also as a creaturely realm of reality endowed with meaning and direction in the creative purposes of God which are yet to be consummated. Thus it was from the sheer goodness and beneficence of God, which overflowed into the world through Jesus Christ and were embodied in his physical existence in our space and time, that Christianity learned to read the authentic nature of empirical reality, no longer as something hostile, malevolent, or alien to the human spirit, but as the very sphere in which God's presence has come to dwell in order to share his own glory with it. The implications of this for a new scientific view of the universe can be seen . . .[36]

The Influence of Christic Education on the Methodological Autonomy of Science

A major objection which surfaces is, if the activity of Christ originated science, how can science itself remain a distinctively human enterprise? For science is truly such—a proof of human creativity, an outstanding glory of the human race.

A concrete answer can be had by considering Galileo, and this for two reasons. The first reason is that Galileo became the scientist par excellence precisely because of the humanistic influence of Christ on the culture from which he issued and in which he thrived. The second reason is that Galileo was able so harmoniously to integrate science with the Christian faith as to discover that the faith fosters the methodological autonomy of science itself.

In the first place, it is clear that Galileo became the scientist par excellence because of the humanistic presuppositions of science which Christ had inprinted in the culture in which Galileo was to operate. Indeed, such attitudes had become so accepted in Galileo's environment that he could appeal to them as self-evident verities when publicly explaining the foundations of scientific research. Thus, for instance, Galileo rejected the still widespread tendency to study nature solely in order to "save the [sensible] appearances," and this he did by assuming as self-evident the existence and intrinsic intelligibility of the transensible structure of nature. Contrasting the mentalities of the "philosophical" astronomers and of the "mathematical" ones, he took for granted that the former,

> going beyond the demand that they somehow save the appearances, seek to investigate the true constitution of the universe—the most important and most admirable problem that there is. For such a constitution exists; it is unique, true, real and could not possibly be otherwise; and the greatness and nobility of this problem entitle it to be placed foremost among all questions capable of theoretical solution.[37]

Likewise Galileo assumed as unquestionable the rewarding character of the intellectual exploration of nature:

> When I consider what marvelous things and how many of them men have understood . . . I recognize and understand only too clearly that the human mind is a work of God's and one of the most excellent.[38]

In the same vein Galileo found it obvious that people should regard the intellectual exploration of nature to be an obligation of their dignity:

> Sarsi says he does not wish to be numbered among those who affront the sages by disbelieving and contradicting them. I say I do not wish to be counted as an ignoramus and an ingrate toward nature and toward God; for if they have given me my senses and my reason, why should I defer such great gifts to the errors of some man?[39]

In the second place, Galileo was so deeply permeated by Christ's humanistic influence as to find in his Christian reading of the Bible the very evidence for the methodological autonomy of science, and this in the light of an unbroken tradition in the Christian Church. For Galileo highly respected the Bible:

> I think in the first place that it is very pious to say and prudent to affirm that the holy Bible can never speak untruth—whenever its true meaning is understood.[40]

But Galileo also knew, with tradition, that God manifests and communicates himself to humans not only through the Bible but also through nature, and this according to the teaching of the Bible itself:

> For the holy Bible and the phenomena of nature proceed alike from the divine Word, the former as the dictate of the Holy Ghost and the latter as the observant executrix of God's commands. . . .[41]

> A hundred passages of holy Scripture . . . teach us that the glory and greatness of Almighty God are marvelously discerned in all his works and divinely read in the open book of heaven.[42]

Thus Galileo found it self-evident that God—being consistent with his own principles and respectful of the dignity of humans he had created with the ability to understand nature on their own—would never demand that humans forgo the use of their faculties in order to learn from the Bible about the structure of nature:

> But I do not feel obliged to believe that the same God who has endowed us with senses, reason and intellect has intended to forgo their use and by some other means to give us knowledge which we can attain by them. He would not require us to deny sense and reason in physical matters which are set before our eyes and minds by direct experience or necessary demonstration.[43]

Consequently Galileo could not doubt that science should be recognized as autonomous relative to the Christian faith and this according to the teaching of the same faith. Even more, Galileo inferred therefrom that the discoveries of science were meant by God to help humans better to understand the very word of God in the Bible where this deals with the structure of nature:

> In questions of nature which are not matters of faith it is first to be considered whether anything is demonstrated beyond doubt or known by sense-experience, or whether such knowledge or proof is possible; if it is, then, being the gift of God, it ought to be applied to find out the true senses of the holy Scripture in those passages which superficially might seem to declare differently.[44]

As a result, the answer to the objection under consideration is clear: the Christic origination of science does not mortify but rather intensifies the humanity of science and its creativity. For Christ does not make scientific research superfluous for his followers demanding of them that they learn from the Bible what they can learn through the use of their faculties. Rather, he educates them creatively to use their faculties with autonomy relative to the Bible, an autonomy which even leads to a better understanding of the Bible itself.

To sum up, we can define more precisely the Christic origination of science as *the humanizing activity of Christ toward science.* For Christ's mission was to enable people to actualize their God-given dignity and not, properly speaking, to make them scientific. However, by carrying out his mission Christ could not avoid making his followers able to produce science on their own. Thus Christ did indeed originate science, but indirectly and mediately, as we have seen. In other words, Christ originated science as a signal, yet only partial or peripheral, result of his overall formative-educational activity relative to humankind.

Indeed, Christ formed the human being anew or recreated him (cf. 2 Cor. 5:17). In particular, Christ gave the human being a new heart and consequently a new mind, like his own: "We have the mind of Christ" (1 Cor. 2:16). Also, Christ associated all human beings to himself in fulfilling God's plan with regard to the totality of his creation. Accordingly, Christ continually educates his followers—through illumination, encouragement, warning and consolation—to cooperate with him in fulfilling the plan of God. But science falls within this divine plan. For God already at the beginning wanted humans to work not only physically but also intellectually as his representatives vis-à-vis the remainder of his creation (cf. Gen. 2:15,19; Gen. 1:26). Christ, then, gave new emphasis to this work when he disclosed that all things originated from him, as the creative Word of the Father, and were intended for him, as the Father-appointed king of the universe. Accordingly, the followers of Christ could not help but feel stimulated by him to wholly involve themselves with nature as not just a gift but also a task from God demanding the engagement of their entire personality. Thus, in the execution of this engagement, they first developed the humanistic presuppositions of science and then originated science itself.

As a result, the answer to the objection under consideration is clear: the Christic origination of science does not mortify but rather intensifies the humanity of science and its creativity.

III. Conclusions and Implications for Christians and Scientists

What message should we, Christians and scientists, extract from the Christic origination of science? Here are a few suggestions.

1. *There is no automatic connection between the discipleship of Christ and science.* Since Christ originated science only indirectly and through the mediation of his followers, it is always possible to be a Christian and not realize the relationship of Christ to science. Thus, for instance, Byzantine Christianity did not give rise to science; also, many Western Christians never cordially welcomed science. On the other hand, since Christ originated science through his human followers, it is always possible for other humans to do science without being themselves disciples of Christ and even without reference to Christ.

2. *Science cannot be truly understood without reference to Christ.* Though science can be practiced without reference to Christ, it is obviously necessary to refer it to Christ in order to grasp its humanistic genuineness. For science ultimately stems from Christ via its humanistic presuppositions inspired and motivated by him.

3. *Science is undermined by the cultural rejection of Christ.* Though science can be practiced without reference to Christ, it needs to remain faithful to its Christ-caused humanistic presuppositions to thrive and even to survive. Hence the cultural rejection of Christ undermines science. Sadly, but predictably, examples multiply in our post-Christian culture to prove that this is indeed the case. For instance, some quantum physicists now spurn the intrinsic intelligibility of nature and take pride in advocating "the chaos behind the law."[45] Other scientists scoff at the inherent 'rewardingness' of the intellectual exploration of nature, as for instance the Nobel Prize winner Steven Weinberg: "The more the universe seems comprehensible, the more it also seems pointless."[46] Still other scientists make science a positive instrument of theoretical dehumanization; e.g., Carl Sagan: "I am a collection of water, calcium and organic molecules called Carl Sagan. . . . Is there nothing here but molecules? Some people find this idea somehow demeaning to human dignity. For myself, I find it elevating. . . ."[47]

4. *Christians have a great responsibility concerning science.* Since Christ originated science through his followers, he obviously expects them to be responsible for the preservation of the genuineness of science, theoretical and practical. Thus Christians should thank God for his gift of science through Christ, and repent of their failings which have scandalized many over the centuries into concluding that Christianity and science are incompatible. Christians should make scientists feel spiritually at home in the Church. Moreover, Christians should appreciate and encourage the efforts of many scientists to be faithful to their calling, especially with regard to the central concerns and aspirations of contemporary humankind, such as the quests for development, peace and education.

5. *Christian scientists have unique leadership tasks.* Though all followers of Christ are responsible for the genuineness of science intended by Christ, it is up to Christian scientists to take the lead in this regard. They should do so inside the Church, inside their professions and inside society at large. Inside the Church, they should help their fellow Christians effectively discharge their great responsibility concerning science. Inside their professions, they should illuminate and encourage their students and colleagues about the humanistic presuppositions of science; in particular, they should prove through their example that scientists can and should actualize their human dignity through their science and not in spite of it. Inside society at large, they should educate the public, especially the young, about what science is meant to be by God in Christ; also, they should strengthen all efforts aimed at making science genuinely beneficial to the needy, for science can do increasingly much to relieve the wants of Christ (cf. Matt. 25:34–40). In short, they should do whatever possible to keep science faithful to its Christic origination as a chief means to glorify God and to humanize people.

6. *The Christic origination of science should move Christians to recognize, respect and cooperate with all cultural traditions, notably Judaism.* For if Christ himself ultimately gave rise to science, he did so by operating not in a cultural vacuum but rather in a cultural plenum. In effect, science only started when the contributions of many non-Christian cultures were available: the arithmetic and geometry of the Indians, Egyptians, Babylonians, Greeks, Arabs, etc.; the technology of the Chinese, Greeks, Romans, etc.; the logic and philosophy of the Greeks, Arabs, Persians, Jews, etc.; the observational patrimony and the scholarly traditions of most nations on earth. Thus the influence of Christ on the origin of science was clearly a spirit of recognition, respect and cooperation vis-à-vis all cultural traditions as valuable, if imperfect, responses to the self-manifestation and communication of God to humans through the intelligibility of the cosmos. As a consequence, since in our time more than ever science develops through the efforts of people of all cultures, it is obviously the duty of Christians to recognize, respect and cooperate with all cultural traditions, thus better to fulfill the plan of God in Christ for humankind as a whole.

Special consideration is due to Judaism for two main reasons. First, ancient Judaism bequeathed to Christianity the conviction which, as history and philosophy disclose, was the indispensable presupposition for the live birth of science—namely, the awareness of the creation of the cosmos by God through his word. For only starting from this conviction could Christians give rise to science, having realized that the word of God was a personal and incarnate one, Jesus Christ the very Son of God, who invited them to see the cosmos as a personal self-manifestation and communication of God to them. Second, modern Judaism excels as no other cultural group in the area of scientific creativity, and this clearly because of its religious tradition of the creation of the cosmos by the divine word.

Accordingly, for the sake of Christ the originator of science, Christians should gladly work with representatives of all cultures to make science one of the main agencies for the fostering of human dignity in our time instead of allowing it to become a major threat to the same.

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[34]Cited from Friedrich Klemm, *A History of Western Technology*, tr. D. W. Singer (Cambridge, MA: M.I.T. Press, 1964), pp. 21–22.

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[36]Thomas F. Torrance, *Divine and Contingent Order* (New York: Oxford University Press, 1981) pp. 65, 67–68.

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[38]*Dialogue* (cf. above, n. 10), p. 104.

[39]*The Assayer* in *Discoveries*, p. 272.

[40]*Letter to the Grand Duchess Christina* in *Discoveries*, 181.

[41]*Ibid.*, p. 182.

[42]*Ibid.*, p. 196.

[43]*Ibid.*, p. 183–84.

[44]*Ibid.*, p. 199.

[45]John A. Wheeler, "On Recognizing 'Law Without Law'" in *American Journal of Physics* 51 (1983), pp. 398–404. See also, along the same subjectivistic lines, the widely acclaimed book by the physicist Heinz R. Pagels, *The Cosmic Code: Quantum Physics as the Language of Nature* (New York: Bantam Books, 1983).

[46]Steven Weinberg, *The First Three Minutes: A Modern View of the Origin of the Universe* (New York: Bantam Books, 1979), p. 144.

[47]In *Time*; Oct. 30, 1980, p. 68.

"... Western technology and science originated as by-products of Western moral virtues, and they could never have come to fruition if these virtues had not begotten them. They are outward visible signs of inward spiritual graces: devotion to truth that is prepared to follow an argument honestly, wherever it may lead; an ideal of integrity in workmanship; and perhaps above all, a feeling of charity for one's momentary opponent."

Arnold Toynbee, "A Turning Point in Man's Destiny" (1954), *The New York Times Magazine*, December 26, 1954.

Communications

DOES THE CANOPY THEORY HOLD WATER?

Informed scientists who are Christians have largely ignored the Canopy Theory, apparently assuming incorrectly that it, like most other naive theories and notions, would soon die out. The Canopy Theory is the belief that there was a vapor covering (or canopy) around Earth's atmosphere between the time of Creation and the Flood. Although the Theory had been conceived earlier, it was popularized among fundamentalists during the first part of this century by such works as *The Coming Kingdom and the Recanopied Earth* by Vernon P. Kellogg. Kellogg and others believed that the Canopy would be replaced at the beginning of the Millennium. Because this Theory, far from dying out, actually appears to be growing in Christian schools and colleges and their curricula as well as in sermons, Sunday School lessons, commentaries, and in much fundamentalist thinking today, the weak foundations of this notion must be publicized.

The Theory purports to account for the longevity of the antediluvians, the supposed fact that no meat was eaten before the Flood, the supposed fact that there was no rain or snow before the Flood, the existence of dinosaurs, the first mention of rainbows (after the Flood), the supposed absence of fermentation before the Flood, and the "waters above the firmament" as the source of rain for forty days and nights at the beginning of the Flood. It is sometimes extended to account for the longevity of people during the Millennium (Isaiah 65:20).

One of the Theory's basic assumptions is that "harmful rays" of the sun were blocked by this water Canopy, and that it was these "harmful rays" that prohibited prehistoric life after the Flood and that today induce or stimulate fermentation, shorten human lifespans to 70 or so years, cause a craving for meat eating, and permit snow and rain.

In evaluating any theory of Biblical interpretation, it is well to remember the principle that "where the Bible is specific, we must be specific, and where the Bible is vague, we must be vague." Thus, the Bible does not mention a Canopy, neither prior to the Flood nor during the Millennium. Neither does it mention that there was no snow or rains and no fermentation before the Flood nor that there would be none during the Millennium. To illustrate the weakness of the argument that, because neither Genesis 1 through 5 nor other Scriptures mention meat-eating, snow, rain, or fermentation, there were none of these things prior to the Flood, we need only point out that neither does the Bible mention hair, lips, eyebrows, volcanoes, lakes, forests, jungles, dishes, flatware, deserts, rocks, comets, sand, waterfalls, prairies, diseases, decay of dead plants and animals, honey, milk, hammers, nails, saws, wind, North and South Poles, Equator, boats, and so on *ad infinitum*.

1. Let's take the argument that because drunkenness is first mentioned after the Flood (Genesis 9:21–24), that there was no fermentation before the Flood. Yeast action in grape juice is not dependent upon the presence of "harmful rays." As any student in an Introductory Microbiology lab soon learns, yeast and certain other microorganisms grow faster in the absence of ultraviolet and certain other rays of the sun. If no fermentation existed prior to the Flood, leaves, dead trees, animal wastes, and dead animals would not have decayed. The Earth would have been inundated with vast amounts of constantly fresh body wastes as well as with unspoiled dead plants and animals.

2. What about the assertion that there was no rain or snow prior to the Flood, and that the only way that plants were watered was by mist (Gen. 2:6) and rivers (Gen. 2:10)? The references in Genesis do not limit the watering of plants only to a single mist or even to a series of mists and by a river or rivers. Genesis 2:10–14 describes four large rivers in existence before the numerous and complex events of the Sixth Day. These huge rivers obviously could not have come from a mere mist that occurred once or even many times. Rivers

come from rains and melted snows. They also come from underground streams. However, underground streams also come from rains and melted snows. The four large rivers in Eden, which went over "The whole land of Ethiopa" (Gen. 2:13) to Assyria (Gen. 2:14) and included the Euphrates (Gen. 2:14) would have required rains, rains, and more rains over an extended period of time. No mere mist will ever do as an adequate explanation for these vast rivers, and certainly not a mere mist that occurred only a few hours or literal days before.

3. Then what shall we say about the changes in lifespans with the Flood? Could the sudden removal of the Canopy due to the forty days and nights of rain account for the differences in lifespans before and after the Flood? No, it could not because if it did affect lifespans, the change would have been immediate. Genesis 5 lists the lifespans of people before the Flood as ranging between 777 years and 969 years. Genesis 11 gives the lifespans of people shortly after the Flood as tapering from 600 or so years down to 200 or so years. Several centuries after the Flood we find that Abraham is very old at 175 years of age (Gen. 25:7–8). Deuteronomy 34:7 tells us that Moses was still physically strong when he died at 120. However, the Psalm of Moses, Psalm 90 (v. 10) indicates that by the time of Moses it had become unusual to reach beyond 70 or 80 years of age. This gradual tapering down of lifespans between the Flood and the time of Moses gives no support for the notion that the sudden removal of a Canopy at the Flood resulted in the shortening of lifespans after the Flood.

Some have suggested that before the Flood the word for "year" probably meant "month." While it is true that this would reduce Methusaleh's 969 year lifespan to almost 81 years, this theory would force us to accept (Gen. 5) that Seth fathered Enos (Enosh) at about age five and one-half, that Enos fathered Cainan (Kenan) at seven and one-half, that Cainan fathered Jared at nearly five and one-half, and that Enoch fathered Methusaleh at nearly five and one-half. Besides, the original Hebrew does not allow the interpretation of years as months. This interpretation, too, is faced with the lack of an explanation for the long transition of lifespans shifting gradually from 900 or so years down to 70 or so years, and of a determination of the point in this gradual transition at which the meaning of the designation for "year" changed from the duration of a month to the duration of a year. While the sudden removal of a Canopy at the Flood would be expected to make a sudden change in life expectancy, the gradual reduction in lifespans is more consistent with the concept that the Creator brought about progressive changes in human genetic makeup over the generations between the Flood and the time of Moses.

4. Is it valid to assert that there was no meat eating prior to the Flood merely because the Bible does not mention this practice until afterwards, and since Genesis 2:9 mentions that certain plants were "good for food," but neglects to mention the same for animals? We have already mentioned a few of many things that did exist before the Flood even though they were not mentioned in Scripture. Meat and fish are never viewed by Scripture as inferior to fruits and vegetables. You will no doubt recall how Abraham in Genesis 18, verses 1, 7 and 8, had a calf prepared for the Lord to eat, how Jesus fed the loaves and fish to the multitudes, and how Jesus baked the fish on the shore for the disciples. Then, of course, we should point out that both fossil and modern animals include meat eaters. The huge sharp teeth of *Tyrannosaurus*, for example, were specifically designed for meat eating. In fact, our own cuspid teeth are specifically designed for meat eating. And, it should be noted that all skeletal remains of humans have these carnivorous teeth regardless of their antiquity.

It has been suggested by some vegetarians that meat eating induces violence against people, and that the peaceful conditions of the Millennium will at least partly be due to the abstinence from meat. Here again is a baseless assumption. Bulls and rhinoceroses are vegetarians, and yet they can be vicious. Dogs and cats thrive on meat, but otherwise can be most gentle. Adolph Hitler was a vegetarian. The Masai of Africa and other heavy meat-eating humans are often calm and gentle. Many of the ancient Cossacks of Russia were historically largely vegetarians, yet they were commonly aggressive. Some Canopy Theorists assert that the "harmful rays" of the sun induce a craving for meat. Yet, vegetarians and near vegetarians are often found in parts of the tropics with much sun while Eskimos and Laplanders are noted for meat and fish eating.

5. There are two major Canopy Theories: The Visible Canopy Theory (e.g., Kellogg et al.) and the Invisible Canopy Theory (e.g. the curricula of Accelerated Christian Education, Bob Jones University, etc.). The Visible Canopy Theory is the older one, and it is the view that the Canopy was a blanket of cloud, thick enough to be the source of the heavy rains for forty days and nights (Gen. 7:12). But, such a thick cloud would block the view of the sun, moon, and stars, and would prohibit their assigned function for "signs, and for seasons, and for days, and for years" (Gen. 1:14). Any such thick cloud cover would render the expression "evening and morning," in Genesis 1, meaningless. All would be dark on Earth. Photosynthesis would never begin, and therefore there would be no plant growth and no oxygen for respiration. Without plant growth there would be no fruits and vegetables for food, no lumber for houses and furniture, no flavorings, few tools, no fuel, and so on. Conditions would resemble those postulated for the "nuclear winter." The temperatures would drop much below those experienced in past centuries following dramatic volcanic eruptions. Thus, instead of life spans being lengthened, all human, plant, and animal life would have been impossible. In short, the Visible Canopy Theory does not "hold water."

Being determined to hang onto the Canopy Theory in order to find a physical rather than a supernatural explanation for the cause of life-span reduction, but realizing some of the above difficulties, some modern proponents have conceived of the Invisible Canopy Theory. This theory seeks to account for "the waters above the firmament" (Gen. 1:7), the great longevity of the antediluvians, the lack of reference to rain and snow before the Flood, the lack of mention of antediluvian fermentation, the lack of reference to eating meat before the Flood, etc., and yet seeks to avoid the serious difficulties of the Visible Canopy Theory.

While in some ways the Invisible Canopy Theory is more clever than the Visible Canopy Theory, yet it also faces

serious flaws. If the Canopy were invisible, why should Genesis 1:7 call attention to the "waters which were above the firmament"? The reference is obviously to something visible, i.e., ordinary clouds. Otherwise, the reference would make no sense to the people reading Genesis. If the Canopy were invisible, it would obviously have too little mass to make it capable of supporting forty days and nights of rains (Gen. 7:12). An Invisible Canopy that was suddenly removed at the Flood could not account for the gradual reduction in lifespans of persons born after the Flood any more effectively than could the Visible Canopy Theory. It certainly offers no explanation for the mechanism for the supposed shift from universal vegetarianism to a diet including meat. It is incapable of explaining the existence of the huge river systems before the Flood as being supplied without snows and rains. It offers no help whatever in trying to account for the imagined fact that there was no fermentation before the Flood. If the Invisible Canopy had any mass whatever, it would interfere with the solar spectrum and could produce a greenhouse effect as well as otherwise reduce photosynthesis.

Indeed, the Earth does have an invisible canopy, a tiny ozone layer that filters out some ultraviolet radiation. If this true canopy were nonexistent or if it were considerably thicker, life on Earth would be impossible. The point here is that even if tiny and invisible, any canopy acts as a filter. It is impossible to conceive of an Invisible Canopy that could be massive enough to be the source of the forty days and nights of rains of the Deluge, that could allow the solar spectrum to penetrate enough to produce photosynthesis, and still not produce a life exterminating greenhouse effect or something resembling a "nuclear winter." Every single transparent substance (whether glass, quartz, water, alcohol, oils, gases, or whatever) blocks out some of the solar spectrum. In fact, our atmosphere is an invisible canopy, and yet it filters out some of the solar spectrum. For example, at sunrise and sunset the light must travel through more atmosphere to reach us, and more of the violet and blue parts of the spectrum are filtered out, giving a reddish hue to the sun and sky. Yet, the atmosphere is much less massive than would be required of the so-called Invisible Canopy of water vapor. In short, the Invisible Canopy Theory, like its older sister theory, does not "hold water" either.

This discussion leaves us with some unanswered questions, such as, if there were no Canopy to supply rain for forty days and nights, then where did that rain come from? One might as well ask "Where did the loaves and fish come from that Jesus used to feed the five thousand?" Or, where did the water come from that came out of the rock in the wilderness? Or, where did the wine come from that Jesus made out of the water? Again, where the Bible is specific, we must be specific, and where the Bible is vague, we must be vague. Frankly, the Bible is not clear about what it means by "windows of heaven" (Gen. 7:11) as the source of the rains. By no stretch of the imagination, however, can "windows of heaven" be made to fit a Canopy, Visible or Invisible. Perhaps it refers to God's great creative resources. The Bible is not clear on this point. And, we must not be guilty of trying to help God out of an imaginary problem.

As scientists we are supposed to be strictly honest with our investigations, data, and conclusions. And as Christians the emphasis on honesty of thought is also vital. Strangely, however, when this author has patiently pointed out these and other difficulties (such as those pertaining to annuli of fossil trees, coral, reptiles, molluscs, etc.) to leaders of Christian schools, writers and directors of science curricula for Christian school use, instructors in Bible colleges, pastors, and students, he has generally gotten such evasive and less than honest reactions as "Maybe God assigned angels to pump water into the Edenic rivers," "The Edenic rivers came from mist and from vast underground caverns," "How do you know that the Creator did not change the laws of nature so that there could be a massive Invisible Canopy that would still allow passage of all of the helpful rays but simultaneously block the harmful rays?—I still do not understand why you say that would be the act of a capricious Creator," "Why do you have a spirit of doubt?", "But in spite of all of these things you say, I have never heard a fundamentalist leader mention them, and I still believe the Canopy Theory because all the great fundamentalist leaders believe it" (this is incorrect, of course), "While the Theory may not be correct as you say, I will still teach it because it has long been taught," etc.

I feel that it is urgent that we as scientifically trained Christians continue to strive for academic excellence while at the same time making real efforts to help our well meaning fellow Christians who are pastors, teachers, writers, students, youth leaders, evangelists, and laymen to be honest, accurate, and effective. We must help them in the very broad areas of Bible-science overlap so that they do not bring the cause of Christ into needless disrepute.

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BOTANICAL AND ECOLOGICAL OBJECTIONS TO A PREFLOOD WATER CANOPY

One of the basic tenets of the young-earth creationists (specified in the Creation Research Society's statement of beliefs) is that the Noachian Deluge was world-wide. Almost all young-earth creationists believe that nearly the entire geological record was produced by this Deluge, Morton[1] being one exception. Scripture makes no mention of God creating water specifically for use in a Flood; either the Biblical account cannot be taken literally or else the young earth creationists are duty-bound to find some reservoir in which forty days and nights of rain water were stored prior to the Flood. In order to explain the forty days and nights of rain, some kind of water canopy seems necessary.

For many years the young earth creationists have made reference to a belief in a preflood water canopy.[2] Some, like Udd,[3] have insisted that only a belief in a liquid canopy constitutes acceptable biblical exegesis; but others have hypothesized canopies of ice crystals[4] or water vapor. The water vapor canopy theory has been the most popular. An elaborate mathematical model of a vapor canopy over the earth has been constructed by J. C. Dillow, published in a series of articles in the *Creation Research Society Quarterly*[5] and in a book, *The Waters Above*.[6]

In this article I wish to explain that while a water canopy over a planet is not a physical impossibility, *our* earth could not possibly have been surrounded by any such canopy. My frequent reference to Dillow's writings is not intended as a specific criticism of him, but of the entire vapor canopy concept. I am a plant ecologist and will focus primarily on evidence of plant adaptations that would have been incompatible with survival on a canopied preflood earth.

The prevailing opinion among young-earth creationists is that the preflood earth was uniformly tropical. Some, such as Peterson,[7] insist that Adam's descendants could not have filled the earth, as per divine command, and have remained naked, if there were cold regions. Others appeal to a tropical earth as the explanation of how all the plants that ended up in the coal deposits could have been growing on the earth at a single point in time.[8] At least two young earth creationists, Morton[9] and Ferguson,[10] have objected to this belief but have not come up with an alternative source of forty days and nights of rain. Young-earth creationists sometimes claim that a universally tropical preflood earth is evidenced by the fact that the frozen mammoths had "tropical plants" in their stomachs. Dillow[11] lists the plants found in the stomach of the Beresovka mammoth. They are *not* tropical plants nor does Dillow claim them to be so. All the plant taxa can be found in Siberia today, and show only that the climate in northern Siberia was slightly warmer at the time the mammoth was buried than it is now. Nevertheless Dillow[12] assumes that the earth was universally tropical. One problem the young-earth creationists have not dealt with is that many fossil trees (antediluvian trees, according to their model) have tree rings,[13] which indicate seasonality, either of hot and cold or of wet and dry.

A Dark Earth

Most young-earth creationists have also assumed that Genesis 2:5 makes reference to the entire preflood earth, thus that there was no rain and thus no cloud formation prior to the Flood. However, a relatively small 4000 square mile tropical forest can transpire into the air about 100 billion gallons of water in one year.[14] If for 2000 years the earth was filled with tropical forests, where did the billions and billions of gallons of transpired water go? In addition, water would have evaporated from the ground and from oceans. In the absence of major weather fronts, as Dillow[15] claimed was the case, thick cloud layers would have accumulated and the earth's surface would have been dimly lit.

Some species of plants can survive under dim light conditions, but there are many species of plants that require high light and could not have survived on a poorly lit, howbeit warm, earth. This fact was twice brought to the attention of the readers of the *Creation Research Society Quarterly* by Manners,[16] but the only response to him has been Westberg's[17] erroneous statement that heat can substitute for light as an energy source for plants. Furthermore, while it is true that in most species of plants the individual leaves can reach their maximum photosynthetic rate at only a fraction of full sunlight intensity, the total mass of leaves of an individual or a group often does not reach its highest photosynthesis rate until almost full sunlight intensity is reached.[18] A plant can die even if its uppermost leaves are operating at full capacity, because the majority of its leaves are shaded and causing a net loss to the plant.[19] How could most plant species have survived 2000 years of dark cloudiness prior to the Flood?

Plant Adaptations

On today's earth, plants are adapted to an incredible variety of extremely harsh conditions. Desert cacti and shrubs tolerate hot dry conditions by combinations of characteristics such as the following: small leaves or none, deep or widespread roots, thick waxy coverings, dry season leaf deciduousness, accumulation of solutes, and nocturnal carbon dioxide uptake.[20] Some, like *Tidestromia oblongifolia*, cannot grow unless subjected to very hot dry conditions.[21] Arctic tundra plants are adapted to grow in the poor, thin soil overlying the permafrost layer, and can tolerate frosts, partly because they retain old leaves as nutrient reserves and partly because they grow prostrate, protected by the layer of still air near the warm ground.[22]

However, even the climatic regions which we do not usually consider harsh, such as the seasonal north temperate regions, pose some survival challenges for plants. For instance, in many species, if seeds germinated as soon as they were ripe in the autumn, they would die in the winter. This does not occur, because the ripe seeds in autumn have high concentrations of the hormone abscisic acid, which can only be broken down by winter conditions, a process known as stratification.[23] Also, if perennial plants bloomed in late autumn they might fail to set seed because of the absence of pollinators or because of over-winter death of the developing fruits. This does not happen because they also have high levels of abscisic acid, and therefore do not bloom until they have experienced winter, a process known as vernalization.[24] If all broad-leaved trees kept their leaves all winter, the leaves of many of these trees would be damaged by wind, snow, ice, and cold temperatures. This does not happen because the leaves contain the pigment phytochrome, with which the trees are able to measure the daylength. When the days begin getting shorter in early autumn, an orderly and careful process of leaf senescence begins in which macromolecules are broken down and removed from the leaf and stored in the stems, after which the leaf is dropped, a protective layer of tissue already having sealed the wound.[25]

Plants have to pay a price for having such adaptations, however. Even if given plenty of water, desert bushes will still use their food reserves to put down deep roots, and desert cacti will still use their food reserves to make thick leafless stems. Tundra plants grow relatively slowly even if provided

with plenty of nutrients and warmth, not having the biochemical and structural ability to take advantage of resource abundance.[26] Seeds that normally require stratification will not grow, and perennials that normally require vernalization will not reproduce, and deciduous trees will still drop their leaves in response to daylength, if kept under uniform mild conditions. The price they pay for survival during winter is the inability to grow should winter fail to come. Plants of the moist tropical rain forests, in which rain comes nearly every day, do not have these desert, tundra, or temperate adaptations, and are noted for their rapid growth. If desert, tundra, and temperate plants were mixed in with these moist tropical plants on a uniformly warm earth, the latter would very soon overtop and shade out the former. If, as the young earth creationists claim, the earth was warm and mild for 2000 years and suitable for the growth of tropical forest, where did the antediluvian desert, tundra, and temperate plants live? There are tens of thousands of such species.

Christian bioloigsts are continually awed at the ability of plants to survive under such various adverse and challenging conditions, and see in such intricate adaptations the handiwork of God. Special creationists should be inclined to cite these complex adaptations as too intricate and perfect for evolution to have produced. Instead, the young earth creationists strive to convince us that the earth as it was originally created and for 2000 years was devoid of all of these interesting habitats and therefore of the plant adaptations that can persist only in such habitats.

Three Attempts to Address These Difficulties

Most young earth creationists have not been totally oblivious to these problems. Howe[27] claims that many modern desert species grew in desert areas before the Flood. He claims that a moist tropical earth under the canopy would not necessarily have to be *completely* devoid of desert areas. These desert areas would have to be very small, however, or else one of the young-earth creationists' purposes would be defeated. As we have seen they wish to explain how all the coal deposits were formed from plants that were in existence the day Noah entered the Ark, and they rely on the productivity of tropical forests to account for the necessary biomass. The alternative to having preflood homes for all of today's desert plants is to have them come into existence after the Flood. In this view, a thorough remaking of the earth's plant life, whether by natural processes or by miracle, would have been necessary.

Some young-earth creationists, such as Marsh,[28] believe that variation "within kinds" is possible, and that the Genesis "kinds" (*min*) may actually correspond to what modern taxonomists regard as the genus or family level. Jones[29] considers animal *min* to correspond most closely, though not point by point, with taxonomic genera, and Howe[30] considers plant "kinds" to be for the most part plant families. Thus, a single wide-ranging interbreeding kind, as originally created, can divide into smaller populations and diversify into different species as natural selection and drift (random factors) cause a *subset* of the original big population's genes to be retained, and others lost, in each of the smaller populations. This, they are quick to point out, is speciation but not evolution, since no new genes originate. Howe uses this concept to imply that the genes for desert survival may have been present in the preflood populations of plants, even though these genes were not expressed very extensively. After the Flood, these genes were expressed as natural selection brought about adaptation to the new harsh conditions.

Could today's desert flora have existed in the proposed (and necessarily small) preflood desert areas? Or could they have originated from tropical ancestors since the Flood? If today's desert flora consisted of only a small number of species, genera, or families, and if all deserts were more or less alike in species makeup, these explanations might be believable. But desert diversity is truly amazing. First, there are many different kinds of deserts. The lower elevations of Death Valley have almost nothing except *Tidestromia oblongifolia*, and the Mojave Desert is dominated by two species of bushes, *Larrea tridentata* and *Ambrosia dumosa*. In contrast, the Sonoran Desert has a wonderfully diverse flora, with many genera and families represented, and consisting of bushes, succulents, and tiny short-lived desert annuals.[31] South American deserts have yet other species, and Old World deserts have an almost entirely different flora. Australian deserts have yet a different set of species, with a striking representation of the family Myrtaceae. Many deserts have leafless spiny succulents, the "cactus" of the layman, but in the Americas they are all in the family Cactaceae, a family almost totally confined to the New World, while in South Africa they are members of the genus *Euphorbia*, and in Madagascar they are members of the family Didiereaceae, found only on that island.[32] This amazing diversity could not have fit into just a few forgotten corners of the antediluvian earth. Furthermore, the species of each of the distinct arid regions has its own set of ecological interactions. Arizona, South African, and Australian organisms could not get along if mixed up willy-nilly. Thus the preflood deserts would probably have been a major climatic region, just as they are today, and there would have been preflood analogs of separate Sonoran, South American, South African, and Australian deserts.

But in addition to the existence of many kinds of deserts and a great diversity of species, the *taxonomic pattern* of this diversity cannot be explained by postflood speciation. The young-earth creationists who espouse this possibility do not realize the magnitude of the biological transformation they are invoking. In this approach the young earth creationists are appealing to the same processes that evolutionists appeal to, except mutation. And yet, astoundingly, they suggest that these processes could have operated within just 4000 years to produce the awesome variety of desert plants. We can see how unsatisfactory this explanation is even if we, for simplicity, confine our discussion to succulents.

Succulents have a large number of complex adaptations to desert conditions, not the least of which is a whole biochemical pathway for taking up carbon dioxide at night, and sealing themselves up during the hot daytime, in contrast to most plants, which take up carbon dioxide in the daytime.[33] Succulence is found in a wide variety of plant families (twenty-one, according to Lamb and Lamb[34]). Some of these

families are mostly succulent desert plants, but others consist primarily of temperate, moist-area plants: the milkweed family Asclepiadaceae whose genus *Stapelia* looks very cactus-like; the Euphorbiaceae in which some species of *Euphorbia* are cactus-like while other genera inhabit moist regions, such as the rain forest rubber tree *Hevea*; the genus *Senecio*, in the daisy family Asteraceae, which contains temperate weeds but also cactus-like species; and the Vitaceae, the grape family, consisting mostly of vines, but which contains some species of *Cissus* which are cactus-like succulents with nocturnal carbon uptake.[35] If desert survival genes were floating around in the milkweed, euphorbia, daisy, and grape families before the Flood, we would expect to see some such genes today in the populations of the moist-area species of these families, and we would expect these families to have been more successful at invading deserts than they have been.

It is even more difficult for the young earth creationists to explain the origin of the cactus family by postflood speciation. Most of its 2000 species, which come in an enormous variety of sizes and shapes, are desert dwellers. Could these thousands of species all have arisen from tropical forest ancestors? Botanists think so—the small subfamily Pereskioideae, considered primitive because it has leaves, which the vast majority of cacti do not, is found in relatively moist areas. Some cacti live in trees of tropical forest, rooted in relatively dry tree bark. The unreasonable part of the young-earth creationist scenario is that they want to fit the whole process into 4000 years or less! How could *Carnegiea* (giant saguaro) genes have been hiding for 2000 years in rain forest cactus populations, then, in what would be an instant (for gene frequency changes in populations of long-lived cacti), separate out to form a desert species?

Finally, the young earth creationists do not explain where the plants that require *cold* seasons lived on the preflood earth, the very seasonality that the canopy is purported to have made into uniformity. On the one hand the young earth creationists want to prove that the preflood earth was very, very different from today's world, universally mild and tropical, yet on the other they want to show that it wasn't very different after all, and had deserts big enough to accomodate today's desert diversity. They can't have it both ways!

The remaining option for the young earth creationists is direct intervention by God. Armstrong[36] appealed to divine intervention for the origin of the desert kangaroo rat. Lammerts[37] published such a statement also, with reference to plants. This contradicts the usual young-earth creationist insistence on creation being *completed* in one week.[38] Morris, Director of the Institute for Creation Research, considered a belief in postflood creation to be a willful ignoring of the Genesis record, which makes no mention of such creations, and that the Bible judges those who believe in it as being led astray by their own lusts.[39] Lammerts[40] defended himself by saying that Psalm 104:30 described postflood creation. This is an obscure reference at best. The young-earth creationists who espouse this opinion want us all to accept literal Biblical accounts of the Flood, yet on the other hand have to invent a major portion of their theory from extra-biblical imagination. Just like the others, they can't have it both ways!

Conclusion

The young earth creationists need the canopy to explain the origin of Flood waters and need a tropical earth to explain the coal deposits. Some of them have invented elaborate mathematical models of such a canopy, but have had to resort to grasping at straws to explain how today's diversity of plant life could be descended from the flora of a uniformly tropical earth. With this vital leg found to be broken, how can the body of young earth creationism or Flood geology stand?

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FOUR C'S FOR THE CHRISTIAN: CHRIST, CHURCH, COUNTRY AND CORPORATION

Christian men and women with a fundamental commitment to Jesus Christ find their everyday loyalties sought by three principal "bodies." Each body has its own legitimate area of claim, and each body can overstep the bounds of its legitimate area to make the living of a responsible Christian life difficult. When any of these three bodies seeks to replace the Lordship of Jesus Christ in the life of a Christian, it plays the role of anti-Christ: a force that is in antithetical conflict with the claims of Christ. Interactions with church and state have taken place for many years and are fairly well recognized and appreciated. The growing role of the modern corporation in shaping the lives of Christians is perhaps not so well realized. It is the purpose of this communication to heighten our awareness of the potential role of the modern corporation, and to suggest guidelines both for Christians in charge of corporations and Christians working for corporations to prevent the modern corporation from playing the role of the anti-Christ in our lives.

The Body of Christ

What has often been called the "invisible church," the fellowship of all true believers in Jesus Christ constitutes the *Corpus Christi,* the Body of Christ. Each Christian man and woman is incorporated into this living Body of Christ as a vital cell or organ in a physical body. When we in faith accept the grace of God offered in Jesus Christ as Lord and Savior, we become baptized into His Body. After that our allegiance to brothers and sisters in the Body is at least as compelling as any other allegiances we may have, even those involving natural brothers and sisters. The Body of Christ lives under the Headship of Christ Himself, and is motivated by the love of God and our neighbor; it expresses its highest goal in the effort to live out a model life on earth of what it means to be a citizen of heaven, as part of the total effort of making disciples for Christ.

The Church Organization

It is, of course, not possible to identify the *Corpus Christi* uniquely with particular Christian churches or ecclesiastical organizations (the "visible church" or *Corpus ecclesiae*). The *Corpus ecclesiae* has for its charter the carrying out of the work of *Corpus Christi* in the world, but consisting of human organizations as it does, it often falls short of that commission. Hence sources of conflict may indeed arise between the *Corpus Christi,* the authentic Body of Christ in its mystic unity, and the *Corpus ecclesiae,* the earthly structures in which the *Corpus Christi* is temporarily housed. It is sad but true that there are times when a Christian must choose between the claims of *Corpus Christi* and the counter-claims of *Corpus ecclesiae,* which invokes the name and Lordship of Christ to enforce its own authority. In particularly sad and tragic times the *Corpus ecclesiae* may so deny by its confession and/or its life the very heart of its relationship to Jesus Christ Himself, that it can become anti-Christ. Even in less dramatic situations, the demands of the ecclesiastical organizations for the support and maintenance of their own earthly existence can hinder or make more difficult genuine devotion and service in the cause of *Corpus Christi.*

The Secular State

By the fact of their existence in the world as citizens of secular states, Christians also participate in a *Corpus populi,* one of many "Bodies" of the people. The particular *Corpus populi* to which a Christian is related by citizenship or residency has authentic claims upon the Christian such as fulfilling the responsibilities of good citizenship and recognizing the role that legitimate state functions can play in God's plan for human life in a sinful world. At least in an ideal construction, each *Corpus populi* should be motivated by a desire to preserve order and a love of justice, and expresses its goal in the effort to secure and defend social justice within itself and the rest of the world after the pattern set down by Christ Himself. But the claim of a State may greatly surpass this legitimate area, become the absolute claim of a totalitarian State, and express the role of anti-Christ.

It is not surprising that the history of nations records a continuing conflict between the *Corpus ecclesiae* and the *Corpus populi.* In times of proper functioning, the church organizations strive to protect and uphold the Christian under the pressure of non-Christian demands from the State. Perhaps there are also occasions when the State exercises its appropriate powers to protect and uphold the Christian against the pressure of non-Christian demands from church organizations. When the *Corpus populi* and the *Corpus ecclesiae* are seen as the framework within which to live out a subset of one's responsibilities as a member of *Corpus Christi,* then all is well. But when either seeks the ultimate allegiance of the Christian, not recognizing the ultimate sovereignty of Christ, totalitarian persecution and repression of *Corpus Christi* results.

Making a Living and the Modern Corporation

There has always been an additional force competing for

people's allegiance: the force associated with the necessity for them to make a living. Perhaps we simply forget how difficult it has been for many people for many centuries, when a six or seven day work week dominated their lives and left little time for anything else. And perhaps we forget the more recent developments in which the industrial revolution uprooted people and made their search for support a dominant factor in their lives, if not the dominant factor. One of the reasons that we forget these things is that we like to believe that we have moved on to more enlightened days, to situations in which it is possible for men and women to work 40-hour weeks in dignity, with time to spare for other activities and commitments to *Corpus Christi, Corpus ecclesiae,* and *Corpus populi,* not to mention family and friends. We like to believe that, at least in the Western world and certainly in the United States, positions of responsibility and challenge are available to any with the abilities to handle them, and that these positions need not lay total claim to their lives to the exclusion of all other commitments. Surely in considerable measure we seek to believe in an illusion, however, and we close our eyes to the terrible toll in broken families and divorce, for example, that participation in such positions regularly extracts. A societal structure based so strongly on competition drains its participants of their lives and strength, and then casts them away for fresher material.

A particular manifestation of this situation in the modern world is the existence of the industrial corporation—particularly the large corporation, but not necessarily excluding the small corporations. This industrial corporation (note that the word is derived from *corporare,* to make into a body) can appropriately be labeled *Corpus Mammonae,* the Body of Material Wealth. It is motivated by the love of power and of money, and its goal is the increase of profit. Unlike the *Corpus ecclesiae* or the *Corpus populi,* which pose no necessary or inevitable dilemma for the Christian as long as they express themselves in terms of the ideals that they themselves publicly espouse, the *Corpus Mammonae* is a constant threat to the Christian, particularly when it is most faithful to its own ideals. Although certainly corporations, as well as any other domain of life, *can* be brought under the Lordship of Christ by committed Christians involved in the corporations, it is a continuing challenge for Christians involved in corporation activity to resist falling under the spell and domination of *Corpus Mammonae* ("No one can serve God and Mammon;" "It will be hard for a rich man to enter the Kingdom of Heaven."). Certainly it is one of the most difficult and crucial undertakings that a Christian can make.

Some modern Corporations often seek to become all things to their workers: father, confessor, commitment guide, home, family—yes, even State and Church. Multinational corporations vary in size and power, but some challenge the power of any single State at least as effectively as do the church organizations. And, although the Corporation will condescendingly agree to observe the forms of religion, it will not tolerate any claims of the *Corpus Christi* that might lead to a restriction on profits. Allegiance to the Corporation must often take first place in all time commitments—over allegiance to church, family, or other social activities. The man or woman who is unwilling to sacrifice time with family or church fellowship in order to put in the 60 to 70 hours a week needed to allow the *Corpus Mammonae* to forge ahead to more products and bigger profits, is treated with the contempt "they deserve,"—certainly no less contempt than is showered on Christians in totalitarian nations when their *Corpus Christi* commitments begin to threaten their *Corpus populi* commitments.

Perhaps Christians are not really aware of the full dimension of the threat imposed by the *Corpus Mammonae* and for the necessity to develop, work out, and put into practice Christian alternatives. Because of the natural tendency to compartmentalize our lives into religious and non-religious segments, it is extremely easy to get caught up in the *Corpus Mammonae* syndrome without fully realizing it until some crucial crisis point is reached when the nature of the incompatibility suddenly becomes apparent. The consequences for the sensitive Christian, who is aware of the extent of the conflict involved, may well become catastrophic. Just as in some totalitarian nations, where Christians are usually squeezed into a tiny and politically ineffective minority, denied access to higher education and socially prestigious jobs, driven to seek careers and lifestyles on the borders of the society in which they live, so also under the growing impact of the unlimited *Corpus Mammonae,* Christians may again well be forced to "drop out" of the main streams of social activity—not because "dropping out" symbolizes their lack of desire to be involved in society (as characterized by the Flower Children of the 1960s), but because *Corpus Mammonae* will not allow them to "hang in" without exacting too high a price in violation of personal values associated with commitment to *Corpus Christi.*

Guidelines for Christians

If it is agreed that the above discussion outlines the potential dangers, suggesting guidelines for Christians is neither particularly profound nor easy. A Christian in charge of a corporation, or about to set up or become involved in a corporation under his/her control, needs to weigh the costs both to him/herself and to those who will be employed. Short periods of intense effort, when other activities are temporarily suspended, in order to achieve a goal is both understandable and even commendable; but a lifestyle of intense effort in which all other values and activities are excluded is not. If, as the manager of a corporation, a Christian demands of others that they devote their lives entirely to the corporation, he/she has already violated a fundamental recognition of what being truly human in Christ means. If there is no easy way to operate a corporation in our competitive society except in this way, a Christian should consider seriously whether or not this is an acceptable life's calling.

For those who are about to choose a life's work in a Christian framework, great care and sensitivity are required. If a particular corporation environment seems almost certain to threaten other human relationships and the fundamental lifestyle of care for others that should characterize the Christian life, it may well be that such an environment must be rejected even if it offers high promise of material wealth, power and influence. Any career pursuit followed for its own ends that is destructive of family and Christian fellowship

relationships falls outside the permissible area for a Christian.

Finally, it should not be overlooked that indeed some Christians may be called to establish and work within corporations as the tangible expression of their commitment to Christ, their desire to order structures in a Christ-pleasing way, and their commitment to help others by providing opportunities for employment and sharing. Such Christians need to be upheld in prayer for their path is a long and treacherous one, and they would do well to be aware of the dangers and to count the costs regularly.

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HEISENBERG, THOUGHTFUL CHRISTIAN

Throughout his life Werner Heisenberg (1901–1976), whose uncertainty principle (1927) of quantum mechanics inaugurated the "golden age" (five years) of atomic physics, basked in the Greek philosophy of his classical education. (His father was Professor of Greek at the University of Munich.) In his last two years at Maximilian Gymnasium, puzzled by a hook-and-eye atomic model in the physics textbook, he found greater satisfaction in Plato's explanation of the perfect solids in terms of simple triangles—a unifying principle behind the universal mutability. His resolve to study mathematics was rebuffed by the disinterest of the mathematics professor in contrast with his warm reception by the theoretical physicist Arnold Sommerfeld (1868–1961), who became his mentor for the doctorate.

At twenty-one he spent some time at the University of Göttingen, where he became an assistant to Max Born (1882–1970). Three years later he was a Rockefeller scholar at the Neils Bohr (1885–1962) Institute for Theoretical Physics in Copenhagen. At twenty-five he was made Professor of Theoretical Physics at the University of Leipzig, where he started his own institute four years later. In 1933 he received the 1932 Nobel Prize in Physics for his Uncertainty Principle (1927).

Despite his personal dissatisfaction with Naziism, he decided to remain in Germany. In 1939 he was called up by Army Ordnance to work on atomic energy; he recognized the potentiality of an atomic bomb, but overestimated the technical efforts requisite. In 1941 he became Director of the Kaiser Wilhelm Institute for Physics at Dahlem. In May 1945 the British took him captive to Godmanchester, where he was released eight months later. He became Director of the Kaiser Wilhelm Institute of Physics in Göttingen: renamed the Max Planck Institute in 1947 and transferred to Munich in 1958. Heisenberg died at seventy-five; he had made numerous lecture tours in the U.S.

Heisenberg admitted in his early acquaintance with Wolfgang Pauli (1900–1958), "I did not know what was meant by understanding in Physics." His friend replied, "Understanding nature surely means taking a close look at its connections, being certain of its inner workings." He believed "our scientific work in physics consists in asking questions about nature in the language we possess and trying to get an answer from experiments by the means that are at our disposal." Although his quantum mechanics was initially positivistically oriented (a reliance upon observed frequencies and intensities), he himself was not favorable to positivism inasmuch as it does not encourage any theory in its early stages of conception, (e.g., quantum theory). He began his "Physics and Beyond" (1971) with the statement, "Science is made by man." He was attracted by the simplicity and beauty of the mathematics of idealized nature. (In the Physics Auditorium at the University of Göttingen is the motto: "*Simplex sigillum veri*" [the simple is the seal of the true].) A scientific theory has to be true not only to observations, but also to the idea of truth and beauty. "The beauty of nature is reflected in the beauty of science." For him, "In the beginning was symmetry." Hence he was quite pleased with the new physics in which the conservation of matter is lacking and in which there is a limit to the divisibility of the same thirty elementary particles—all being of the same "substance," say, energy, and transformable into one another with similar properties. He looked upon elementary particles as Aristotle's "potential," different kinds being associated with particular fields of force.

He felt that science in the past had often been overly optimistic—probably because it had been over-simplified. Nowadays science limits its understanding more modestly within the framework of experience. Quantum theory, indeed, which has revolutionized all physics, was not initially concerned with a central part of physics.

Heisenberg thought continually about the philosophical implications of science. "It is in quantum theory," he claimed, "that the most fundamental changes with respect to the concept of reality have taken place, and in quantum theory in its final form the new ideas of atomic physics are concentrated and crystallized." "Atomic science has turned science away from the materialistic trend it had during the nineteenth century." He was quite in agreement with the abandonment of the causality principle in order to relate the solution of Schrödinger's equation to observations. He emphasized the idea of "closed" systems, (definitions, axioms, mathematics), e.g., Newtonian mechanics, heat including statistical mechanics, electrodynamics including restricted relativity, and quantum theory—thus not attempting a single, comprehensive system.

When he was fifty-five, Heisenberg gave the Gifford lectures at St. Andrews on "Physics and Philosophy." He himself was religious, a member of the Evangelische Kirche (Lutheran and Calvinistic mixture), which his family had traditionally attended. As he once wrote me, he obviously did not subscribe to all the tenets of his grandparents. Nevertheless, he and his wife educated their children "definitely along the lines of the Christian religion." He was once asked by Pauli if he believed in a personal God. This was his reply:

"Can you, or anyone else, reach the central order of things, or events, whose existence seems beyond doubt, as directly as you can reach the soul of another human being? I am using the term 'soul' quite deliberately so as not to be misunderstood. If you would put the question like that, the answer is yes."

For him "the spiritual pattern of the community [connection between good, beautiful, and true] we call the religion of the community"—it includes culture with or without a god. Religion, he believed, is the foundation of ethics, ethics the prescription of life; it concerns ideals, not norms. It is also the foundation of trust. Faith requires trust; we must believe *in*—not just *about*. "If I have found faith, it means I have decided to do something and am willing to stake my life on it." Heisenberg believed one cannot live by distinguishing sharply between knowledge and faith, i.e., science and religion; he felt that modern physics has thrown fresh light on basic ethical and political problems. "Human, philosophical, or political problems will crop up time and again and the author [Heisenberg] hopes to show that science is quite inseparable from these more general questions." He admitted you cannot be a good politican and a good scientist at the same time. He noted with regret Descartes' emphasis upon mind and matter in a world somewhat isolated from God, who became thus more transcendental and less immanent.

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This is the fifteenth in a series on scientists and their religion.

PLANCK, PHYSICIST

Max K. E. L. Planck (1858–1947), a conservative, never planned a scientific revolution; he never sought a new general philosophy of physics; he merely tried to solve a particular problem.

Born in northern Kiel, he graduated at seventeen with a classical background from the Maximilian Gymnasium in southern Munich, where his family had moved. Later he expressed his indebtedness to his high school teacher of mathematics, Hermann Müller, who had "the art of making his pupils visualize and understand the laws of physics. My mind absorbed avidly, like a revelation, the first law I knew to possess absolute, universal validity, independently of all human agency—the principle of the conservation of energy."

At the University of Munich he studied mathematics and experimental physics (there was no professor of theoretical physics), primarily with Philipp von Jolly (1809–1884), who bemoaned the apparent completion of physics as a discipline—except for more accurate measurements. For one year he attended the University of Berlin, where he attended the poor lectures of the versatile Hermann L. F. von Helmholtz (1821–1894) and the too polished lectures of the admirable Gustav Kirchhoff (1824–1887). His thesis resulted from his reading the stimulating Rudolf J.E. Clausius (1822–1888), whose entropy function (1865) he used to clarify the statement of the second law of thermodynamics—much to the displeasure of Kirchhoff, who never accepted the idea that the entropy increase of an irreversible process can be measured by that of a reversible one. Undoubtedly Planck had this in mind when he wrote, years later in his *Scientific Autobiography* (1948), "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die and a new generation grows up that is familiar with it." After serving as an instructor at the University of Munich, at twenty-seven he was appointed Associate Professor of Theoretical Physics at the University of Kiel (probably through his father's contacts). Four years later he received the same title at the University of Berlin, where he replaced Kirchhoff; he was made professor in four years. At forty-two, at a meeting of the Berlin Physical Society, he announced (1900) his law for the spectral distribution from a "black body"—the birth of the Quantum Theory. He received the 1918 Physics Nobel Prize for this achievement.

At seventy-two Planck became President of the Kaiser Wilhelm Institute Society. In 1945, at the age of eighty-seven, an American car brought him from his estate on the Elbe to Göttingen, where I met him that fall. He died two years later; a eulogy was given at the St. Albani Church by Max von Laue (1879–1960), a former student. His life was marred by personal tragedy: his eldest son had been killed at Verdun in WWI and his second in WWII; his house had been set afire by a bomb; he himself had been buried for several hours in an air raid shelter in Kossel. Yet he had served his country in peace; he had been President of the Academy of Berlin (a member for more than fifty years) and Rector of the University of Berlin (a teacher there for more than forty years).

In science, his proposal of a quantum of action h was epoch making. It was based upon a simple equation $S = k \ln W$, where S is entropy, W is thermodynamic probability, and k is a constant (ironically later named after Ludwig Boltzmann (1844–1906), whose probability interpretation of the second law of thermodynamics had been initially opposed by Planck). His conservatism, however, compelled him to seek unsuccessfully for years an adjustment of his new quantum theory to classical physics. In 1906 he made a significant contribution to Walther H. Nernsts's (1864–1941) heat theorem, the so-called third law of thermodynamics; he established the positive, absolute value for the arbitrary, additive constant for entropy.

Planck was interested in general principles and the unity of physical theory. "I had always regarded the search for the absolute as the loftiest goal of all scientific activity." He was particularly pleased that the quantum of action retained its significance in relativity because of the relativistic invariance of the Principle of Least Action. He was concerned about the very meaning and limits of "exact science." Physical science, he was certain, indicates the existence of a real world—but

he felt it is a "real marvel that we encounter natural laws at all which are the same for men of all races and nations." At the same time, science itself reveals a rational world order; the universe seems to have a universal plan. Planck saw the scientist as a man with imagination and faith, i.e., a working hypothesis. For example, the causality principle in science is neither true nor false, but rather a heuristic act of faith on the part of the scientist.

He gradually crystallized his own attitudes to general questions such as the relation of science to religion and the connection between causality and free will. Planck believed in a supernatural being, omnipotent, omniscient, and benevolent. "Religion is the link that binds man to God"—resulting from "the respectful humility before a supernatural power, to which all human life is subject and which controls our weal and woe." Questions of ethics are outside the realm of natural science. He believed in the absolute values of ethics, e.g., "truthfulness [except for conventional, social morality] is the noblest of all human virtues."

The existence of God is solely and exclusively a matter of faith—a religious faith. He was favorable to all religions, but he himself chose Christianity. He did, however, regret the Church's demands for unquestioning belief, which served to repel questioners. For example, he believed "the faith in miracles must yield, step by step, before the steady and firm advance of the facts of science, and its total defeat is undoubtedly a matter of time."

Planck regarded the unity and order of religion as similar to that of science. Hence he regarded these as compatible inasmuch as they are logically separated; they both have the same goal, i.e., "recognition of an omnipotent intellect ruling the universe." They agree that there is a rational world independent of man, and that the character of this world can not be known directly, but only indirectly recognized or suspected. On the other hand, they do differ; in the case of religion one deals with a personal God, given directly and immediately, whereas in the case of science one has only sense impressions. Thus science enables man to learn; religion requires him to act. Science operates primarily with the intellect, religion with sentiment. Science is objective in that it is concerned with truth or falsity in the material world; religion is subjective in so far as it deals with values, i.e., what ought or ought not to be—good or evil, noble or base. Yet they both oppose scepticism and dogmatism. In their common, overlapping area, however, they do move toward the same objective—like parallel lines toward the point at infinity. "No matter where and how far we look, nowhere do we find contradiction between religion and science"—there is "complete concordance."

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This is the sixteenth in a series on religious scientists.

MENDEL, MONK

Gregor Johann Mendel (1822–1884) was born of German peasant stock in Heinzendorf, Silesia. His teacher in the village school recognized his exceptional talent and recommended a higher school at Leipnik, thirteen miles away. At twelve he entered the High School at Troppau, twenty miles distant, where the headmaster was an Augustinian from the monastery in Altbrünn (Brünn was the capital of Moravia). Owing to the poverty of his family, he faced financial problems resulting in illness, but did manage to complete the six-year course. He then attended the Philosophical Institute affiliated with Olmütz University, where he did some private tutoring. His weakest subject was philosophy; he did not take history or natural science. His physics teacher, however, recommended this poor, Catholic youth to the Altbrünn monastery, where he became a novice at twenty-one. The following year he began a four-year course at the Brünn Theological College. Through his diligence, within a month a year later, he was made subdeacon, deacon, and finally priest. At twenty-six he received a certificate for the completion of his theological training.

The year following he was given an additional duty (twenty hours per week) as Deputy High School teacher at Znaim, but was later released from parish responsibilities owing to illness. Although he failed to pass the state qualifying examination for teacher, at twenty-nine he was made a supply teacher in the Brünn Technical High School. The next year he entered the University of Vienna as an extraordinary student (here he had Christian J. Doppler [1803–1853] for physics); he became a life-long member of the Zoological and Botanical Society of Vienna. At thirty-one he returned to be a supply teacher for physics and natural history at the Brünn Modern School. Three years later he again attempted the qualifying examination—he never passed it.

His elementary school teacher had encouraged the farm boys with information about fruit growing and bee keeping. Mendel liked to grow flowers and became interested in horticulture. (Later he had a fuchsia emblem on his abbot's arms.) An amateur, he taught himself botany while he was a novice. From 1856 to 1876 he investigated the cross-fertilization of edible peas.

At forty-six, however, he was unexpectedly elected prelate, a mitred abbot, by his fellow monks. The management of the wealthy estate, which was a center for the spiritual and intellectual life of the community, left little time for the leisure or repose indispensable for a life of research. He supported music in Brünn (he himself was not musical); he initiated a Fire Brigade in Heinzendorf. He had to travel much. In 1870 he was Vice-Chairman of the Brünn Society for the Study of Natural Science, which he had helped to found eight years earlier. At forty-eight he was elected to the National Committee of Agriculture. Unfortunately, in 1874 he became concerned about a national tax being imposed on all monastic property for support of religious (Catholic) activities; he believed it was unconstitutional. For ten years he waged a wearisome and futile fight—won by the state after his death at sixty-one. He was laid to rest in the monastery burial ground.

Mendel was certainly not a recluse, religious or scientific. He was apparently an exceptionally good teacher, a friend rather than a master. He had keen interest in his work, tenacity and great patience. Modest and reserved, he had a tranquil demeanor and a noble spirit; he was considerate and kind. He was fond of animals and birds. Good-natured, he had a sense of humor. Not sentimental or romantic, he had a practical mind; he was shrewd but just. On occasions he gave private lessons free. Upon being made abbot he distributed his last month's teaching salary among the three poorest boys in his class. He helped defray the medical schooling of his two nephews.

He was basically a naturalist; he had his own microscope and telescope (he observed and recorded sun-spots regularly). He noted weather phenomena daily over a period of time; i.e., pressure, temperature including maximum and minimum, humidity, and precipitation. He watched a tornado carefully. At thirty-four he began his study of hybrid peas in the monastery garden. He spent two years reducing thirty-four different kinds to twenty-two pure strains; e.g., white, violet; tall, dwarf (1/5). What made his work so productive was the simplicity of his approach: he restricted his investigations to one or a few peas with strongly contrasting characters, e.g., round and yellow versus wrinkled and green; in the case of each successive generation he observed the total number; he followed each individual separately. Thus he was able to formulate his so-called laws: the first with respect to the dissociation of characters (dominant and recessive), the second with regard to the possibility of all combinations of any assortment of characters. After eight years of precise and neutral observations Mendel reported his findings in 1865 to the local Society for the Study of Natural Science, which published them in its Proceedings the following year. It was probably little appreciated by the audience and certainly not at all understood by the scientific world, which learned of it only through the 120 journal exchanges of the Society. In view of the excitement over Darwin's variability of species, little attention was paid to the complementary aspect, *viz.*, the constancy of characters and of hereditary factors involved in such changes. Mendel tried other plants, particularly hieracuim, his favorite—unsuccessful because of its abnormal reproduction. His last experiments were done in 1876.

It was not until 1900 that several scientists realized the significance of his work; notably, the Frenchman Hugo de Vries (1845–1933), the German Carl Corens (1864–1933), and the Austrian Erich von Tschermak (1871–1962). The spreading of Mendelism was the result of the British William Bateson (1861–1926), who was largely responsible for the 1910 erection of the Charlemont statue in the Brünn Klosterplatz by "the friends of science" to the "Investigator P. Gregor Mendel."

There was little odor of sanctity in the scientific writings or personal letters of Mendel. He kept his faith and his science separate in watertight compartments—probably owing to his own lack of philosophical interest *per se*.

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This is the seventeenth in a series on religious scientists.

"It must be obvious to the attentive student of the Imprecatory Psalms that their effect is to restrain us from sin, to make us love and value justice, to lead us to commit vengeance into the hand of the Lord, thus strongly deterring us from private and personal revenge, and to show us that God is to be praised for His justice as well as His mercy. History itself teaches us that civilization progresses most rapidly when justice and mercy go hand in hand in the conduct of affairs, as they do in the Scriptures of God."

J. H. Webster, "The Imprecatory Psalms" (1907), in *The Psalms in Worship* (John McNaugher, ed.).

Book Reviews

INTIMATIONS OF REALITY: Critical Realism in Science and Religion by Arthur Peacocke. Notre Dame Press, Notre Dame, IN (1984). 94 pages. Paperback, $4.95; cloth, $10.95.

This little book contains the text of the 1983 Mendenhall Lectures at DePauw University, delivered by Arthur R. Peacocke, Dean of Clare College, Cambridge University, and well known biochemist and author on topics relating science and religion. As indicated by the sub-title, it develops the concept of "critical realism" as an appropriate perspective for the Christian scientist to hold in both the scientific and theological areas. There are two principal lectures: "Ways to the Real World," and "God's Action in the Real World."

Addressing himself to the fundamental question of whether science and/or religion tell us about a world that is real to us, Peacocke first surveys the various perspectives that have developed in the scientific field: naive realism, logical positivism (which the author calls the "received view" or "standard account"); a socially contextualized view of scientific theories (a paradigmatic view); and finally the sociology of scientific knowledge. Finding all of these lacking, he then introduces the concept of "critical realism" as one based on the idea "that the long term success of a scientific theory gives reason to believe that something like the entities and structure postulated in the theory actually exist." Theories and models are regarded as "candidates for reality." This leads him to a discussion of the meaning and use of models and metaphors in science; the use of complementary models reminds us that we do not have a literal description of reality.

Next Peacocke turns to the theological endeavor and shows how models and metaphors are also the form of expression in this area, indicating that a critical realism is appropriate for both areas. He concludes his first lecture by restating the observation that there is a hierarchy of order in the natural world, and that we may see "the scientific and theological enterprises as interacting and mutually illuminating approaches to reality."

In his second lecture, Peacocke explores the relevance of our scientific understanding of the world to the account we give of God's relation to the world, arguing that any theological description of God's relationship to the world cannot be given in an intellectual vacuum, but must take account of the best that we understand from scientific investigations. The most outstanding inputs to theology from science are seen to be the following: (1) many different sciences indicate that the world is in the process of evolution, "a seamless . . . web which has been spun on the loom of time," which makes extremely unwise any attempt to base theology on a god-of-the-gaps; (2) our awareness of our ignorance engenders in us a "sense of mystery at the quality of the known and the quantity of the unknown;" (3) our awareness of our dependence on and involvement in the whole cosmic process is heightened, "indicative of a far greater degree of man's total involvement with the universe" than ever imagined; we recognize that the cosmic order is "a necessary prerequisite of conscious personal existence."

These scientific developments have certain additional implications for theology: (1) a reinforcement of the sense of God's transcendence; (2) time itself as part of the created order, joining with matter-energy-space-time to form the character of this order; (3) the sense of God's immanence in his creative activity in the natural order, a continuing process from beginning to end, bringing forth new emergent forms of matter; (4) questioning of the concept of God as the deterministic Law-Giver determining *all* in advance in view of the constant appearance of change, development and emergence.

Whether the metaphor of "panentheism" proposed by Peacocke is an adequate one for the biblical revelation of God is a question to which considerable thought may well be given. Peacock argues that

> we could say that the world is *in God*, there is nothing in the world not in God. This understanding of God's relation to the world is sometimes called "panentheism," which has been

> defined as the belief that the Being of God includes and penetrates the whole universe, so that every part of it exists in him, but that his Being is more than, and is not exhausted by, the universe. . . . God creates a world that is, in principle and in origin, other than "himself" but creates it, the world, within "herself."

It is conceivable that this model might be used to describe the creative and sustaining activities of God, but it is not clear whether it is at all adequate for a description of the domain of personal interactions between God and man: sin, salvation, *et cetera.*

Peacocke adds additional insights from the world of biology, which he believes are significant for the development of an informed theological position: (1) the continuity of the biological processes of evolution; (2) the open-ended character of biological evolution in which chance and law combine to produce new forms of matter; (3) the recognition of the principle that new life occurs only through the death of the old, suggesting perhaps that God is involved in whatever suffering is necessary (creative suffering) for the fulfillment of his creation; (4) the interpretation of "chance" as "creative agent."

Peacocke searches for new metaphors more adequate to describe the perspectives given to us by science that deal with the relationship between God and the world. He suggests that we might view the Creator as composer, or that we might view the relationship between God and the world as analogous to the relationship between the human mind and body. In all of these Peacocke recognizes that the transcendence of God is of a higher order than any human agency/action transcendence can convey.

In giving human beings the freedom to act independently of the intentions of their Creator, God incurs a cost to himself, the cost of love. Peacocke draws the parallel with human experience: "risking love on behalf of another who remains free always entails suffering in the human experience of love."

This little book is packed with stimulating thoughts and ideas of immense importance to those who believe that it is a worthwhile project to seek for models of God that are consistent with the totality of his revelation, in Word and Work. No models are bound to be completely adequate, else they would describe all the aspects of reality, a goal beyond achievement. Peacocke struggles with the inputs from science and seeks to understand how these inputs can be expressed in the framework of biblical theology. In his recent publications (*Creation and the World of Science* and this book) Peacocke has limited himself to an exploration of God as Creator; the reader cannot help but hope for a more complete exploration in which we may see God as Creator *and* Redeemer.

Reviewed by Richard H. Bube, Department of Materials Science and Engineering, Stanford University, Stanford, California 94305.

Books Received and Available for Review

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

Aeschliman, M. D., *The Restitution of Man* (C. S. Lewis and the Case against Scientism), Eerdman's

Alcorn, R. C., *Christians in the Wake of the Sexual Revolution*, Multnomah

Baker, D., *Acceptance: Loosing the Web of Personal Insecurity*, Multnomah

Baker, D., *Beyond Rejection: The Church, Homosexuality and Hope*, Multnomah

Banks, R., *The Tyranny of Time*, IVP

Barker, S.; Johnson, J.; Malone, R.; Nicholas, R.; and Whalton, D., *Good Things Come in Small Groups*, IVP

Barrett, E. C. and Fisher, D., *Scientists Who Believe*, Moody

Blamires H., *Words Made Flesh* (God Speaks to Us in the Ordinary Things of Life), Servant

Carey, G., *A Tale of Two Churches* (Can Protestants and Catholics Get Together?), IVP

Clark, G. H., *Logic*, Trinity

Clements, C., *Witness to War*, Bantam

Coleman, R. E., *The New Covenant* (A Devotional Study of the Blood of Christ), Nav-Press

Colquhoun, F., *Four Portraits of Jesus* (Christ in the Gospels), IVP

DeSanto, C. P., and Poloma, M., eds., *Social problems: Christian Perspectives*, Hunter

Frair, W. and Davis, P., *A Case for Creation*, 3rd ed., Moody

Frydenger, A. and Frydenger, T., *The Blended Family*, Zondervan

Gehring, W. R., *Rx for Addiction*, Zondervan

Gresk, G. E., *Come Holy Spirit I Need Thee*, Vantage

Gunton, C., *Enlightenment and Alienation* (An Essay Towards a Trinitarian Theology), Eerdman's

Henry, C. F. H., *The Christian Mindset in a Secular Society* (Promoting Evangelical Renewal and National Righteousness), Multnomah

Hincklay, J., Hincklay, J. A. and Sherill, E., *Breaking Points*, Zondervan

Holmes, M., *Who Am I God?*, Bantam

Kaufman, G. D., *Theology for a Nuclear Age*, Westminster

Kirk, A., *The Good News of the Kingdom Coming* (The Marriage of Evangelism and Social Responsibility), IVP

McLeish, J., ed., *Faithful Witness: Urbana '84*, IVP

Mills, W. E., *Glossolalia: A Bibliography*, Mellen

Pannenberg, W., *Anthropology in Theological Perspective*, Westminster

Peace, R., *Small Group Evangelism*, IVP

Peterson, E. H., *Earth and Altar: The Community of Prayer in a Self-Bound Society*, IVP

Russell, L. M., ed., *Feminist Interpretation of the Bible*, Westminster

Ryken, L., *Windows to the World: Literature in Christian Perspective*, Zondervan

Sanders, R. K., and Malony, H. N., *Speak Up! And Christian Assertiveness*, Westminster

Smith, J. M., ed., *Women, Faith and Economic Justice*, Westminster

Strashelm, L. L. and Bence, E., *Something Beautiful*, Zondervan

Taylor, R., *Single and Whole*, IVP

Trobisch, I., *Learning to Walk Alone* (Personal Reflections in a Time of Grief), Servant

Wan Den Aardweg, G., *Homosexuality and Hope* (A Psychologist Talks About Treatment and Change), Servant

Webster, J. C. B. and Webster, E. L., eds., *The Church and Women in the Third World*, Westminster

THE WAY THE WORLD IS: THE CHRISTIAN PERSPECTIVE OF A SCIENTIST by John Polkinghorne. Eerdmans, Grand Rapids, MI (1983). 140 pages. $4.95.

I first met Polkinghorne in the pages of his *The Particle Play*. That book, well reviewed in the secular press, is an exposition of modern nuclear physics. I was amazed to read, in the final pages, after plowing through a discourse on quarks, color, etc., the following:

> Mathematics, which essentially is the abstract free creation of the human mind, repeatedly provides the indispensable clue to the understanding of the physical world. This happening is so common a process that most of the time we take it for granted. . . . It seems to me a remarkable fact. . . . Israel developed the idea of the Word of God who was his agent in the creation of the world. The Prologue to St. John's gospel not only makes the astonishing identification of that Word with Jesus of Nazareth but also says that the Word is the true light that lightens every man. The use of mathematics to comprehend the universe shows a relation between the workings of our minds and the structure of the world. I believe that this is one aspect of what the writer of the Fourth Gospel is telling us. (J. C. Polkinghorne, *The Particle Play*, Freeman, Oxford, England, 1979, pp. 125–126)

Upon reading that, I was not surprised to find that Polkinghorne was not only a trained physicist, but was studying theology. This book, although not perfect, is a worthy attempt to put the author's two backgrounds together. The book was written, says its author, not only in an attempt to explain to his physicist colleagues why he chose to leave their profession and become a minister, but why he is a Christian at all. It would make an excellent gift for bright students, a nice text for a minicourse on physics and philosophy, and belongs in every library having an interest in integrating Christian faith with learning. Polkinghorne writes well, but concisely, like a scientist, not with the redundancy that might have been found in an equally excellent book by a philosopher or a theologian. The content, in fact, is dense enough that I shall have difficulty in giving a synopsis of the book, but feel that an attempt is worth the effort.

The first chapter, "Apologia," contains part of Polkinghorne's justification for writing. He wants to emphasize that the scientific point of view has perhaps been oversubscribed to, and is not the only valid one.

> It is natural to feel at times a temptation to agnosticism, to say, "Let us hold to the certainties of scientific knowledge, and for the rest, let us recognize that it is mere opinion." . . . Yet it seems to me that to succumb to it would be gravely diminishing, for it would mean the dissolution of all that makes us truly personal. . . . In actual fact none of us lives his life in that way. Nevertheless I believe that in this area lies the nub of what is felt in our age to be the science-religion question. At heart it is not a logical or a philosophical problem, but a psychological one. It is not what scientists say, but the way that they say it; their bright certainties put other sorts of thought into the shade. (p. 4)

The author also states his considerable reluctance to write about theology, because of his recent beginning at study in this area.

The second chapter, "The Scientific View of the World," is an attempt to distill what science has learned into a few aspects, these being

1. The universe is intelligible.
2. Both chance and necessity are basic to explaining how things are.
3. Slight changes in the way things are would make life impossible.
4. The universe is vast almost beyond any hope of comprehension.
5. The world, as we know it, does not seem to need God or man.

The third chapter, "The Personal View of the World," shows clearly that Polkinghorne is aware that science isn't everything. He begins with this statement:

> Beauty slips through the scientist's net. You could take a performance of Bach's *Mass in B Minor* and Fourier-analyze the pattern of sound . . . but by those means you would never come to appreciate what it is all about. An exhaustive chemical analysis of the pigments of a Rembrandt self-portrait would miss the point of the picture . . . It seems to me that the recognition and experience of beauty is as real and primary an experience as any we encounter. (p. 17)

A second phenomenon which demonstrates that science cannot tell us all that there is to know about the world is our sense of moral obligation. Without expanding this chapter into a three hundred page philosophical tome, Polkinghorne nonetheless disposes, or shows that it is possible to dispose, of some frequent arguments against this sense of moral obligation being real. He gets to the heart of the weaknesses of sociobiology, for instance, in a paragraph. Thirdly, he brings up the possibility of the subjective nature of the world as shown to us by quantum physics.

Having shown that there is serious reason to believe that the world can, yea must, be perceived by more than the tools of objective science, Polkinghorne goes on to note in chapter four, "The Religious View of the World," some of the reasons for believing that there is really a supernatural God. First, he notes that hope is apparently an innate human characteristic, even when there doesn't seem to be a reason for hope. Secondly, he notes that people really have religious experiences. Although these are difficult, if not impossible, to quantify, this does not mean that they aren't real.

At the beginning of chapter five, "The New Testament Evidence," Polkinghorne summarizes his first four chapters as follows:

> The kinds of consideration outlined in the preceding chapters would, I think, incline me to take a theistic view of the world. By themselves that is about as far as they would get me. The reason why I take my stand within the Christian community lies in certain events which took place in Palestine nearly two thousand years ago. . . . The experience of science should make one open to the unexpected, aware that apparently slight circumstances may be frought with large significance. The odd behaviour of a culture near an open window leads to the discovery of penicillin; a tiny separation of two spectral lines in hydrogen . . . is the trigger to the unravelling of quantum electrodynamics . . . The claim that in Jesus and the events

> associated with him, the nature of God and the destiny of man are revealed is a strange one, but it is not to be set aside without careful inquiry. (p. 33)

He then applies "careful inquiry" to the question of the divinity of Jesus in this chapter and the following ones, "Jesus," "The Death of Jesus," "The Resurrection," and "The Sequel," which is about the church. Polkinghorne appears to use the attitude of dispassionate inquiry which scientists are supposed to have and he demonstrates the sort of knowledge one would expect a graduate of a first-class seminary to have. As I do not have such knowledge, I am not the best evaluator of what Polkinghorne is doing here, but it largely rings true. To summarize what is already highly condensed matter, he finds that there is strong evidence for the divinity of Jesus. His conclusions are all the more striking because the man is obviously no doctrinaire inerrantist. For example, on p. 41, he suggests that Matthew 18:15–18 is "extremely unlikely" to have been spoken by Jesus, a statement which certainly gave me pause. There is, however, solid scriptural insight here, as when Polkinghorne notes that Jesus *began* his sayings with "amen" forty-nine times in Matthew, Mark, and Luke (often disguised in translation as "verily" or "truly."

> We are familiar with "amen" at the end of a prayer as a mark of concurrence with what has been said. This usage would also have been natural for the people of Jesus' day. . . . Jesus, however, employs the word completely differently, for he puts it at the beginning. This way of using amen is idiosyncratic to Jesus; no one else is ever represented as using it. Thus there can be no doubt that in it we hear his original voice. Its force is considerable, for it is an unequivocal assertion that what follows in Jesus' pronouncement is certainly the case. Here is no rabbi engaged in the characteristic Jewish pleasure of argumentative discussion. He is the one who knows. We are not surprised that people "were astonished at his teaching for he taught as one who had authority and not as the scribes . . . " (pp. 60–61)

There are two additional chapters, "Other Views of the World," and "The Christian View of the World," and a brief summary statement. The book is rounded off by a glossary and an adequate index. An unusual device was the asterisk system used throughout the book to refer to the glossary. Although this system has some advantages over looking in a glossary to find even if there is an entry, and doesn't clutter up pages like footnotes, it wasn't used perfectly. Some of the glossary entries were no more enlightening than the sentences which referred to them.

Polkinghorne s writing reminds me of what the writing of C. S. Lewis might have been, had Lewis been a scientist. Lewis never wrote that "Christology has not yet found its Dirac." But, Lewis, like Polkinghorne, wrote an appealing type of apologetics, one which examined the evidence without some of the built-in prejudices found in me and many of the other readers of this *Journal*. The effect is to impress one with the reality of the historic doctrines of the Christian faith, which Polkinghorne believes are true, not just because he has been taught that they are, but because they make sense. It is not possible for me to know whether or not Polkinghorne's writing will convince unbelievers, as Lewis's occasionally did, but it has certainly strengthened my own faith.

Reviewed by Martin LaBar, Central Wesleyan College, Central, SC 29630.

THE BIBLICAL DOCTRINE OF MAN by Gordon H. Clark. The Trinity Foundation, P.O. Box 169, Jefferson, Maryland 21755 (1984). 101 pages. Paperback $5.95.

The Biblical Doctrine of Man is the seventh book of a series published by Trinity Foundation, an organization established for the purpose of counteracting "the irrationalism of the age" and exposing "the errors of the teachers of the church." Trinity Foundation endeavors to carry out these aims by publishing books which stress "the Bible as the sole source of truth" and the "supreme importance of correct doctrine." Accordingly, this particular volume by Gordon Clark presents a doctrinal study of man. The topics dealt with in this volume are generally familiar—for example, the image of God, the soul and its origin, the fall, and man's depravity.

Clark's interpretations of Scriptures are conservative and generally straightforward. He makes frequent comparisons with other theological traditions and, on a whole, does a competent job of exegesis. There are a few surprises, especially when discussion turns to Adam before the fall. Clark argues that Adam was "altogether righteous" and presumably had been given the Ten Commandments. In addition, although Adam may have reasoned relatively little before the fall, his logic was without fallacies. One cannot help but wonder, if these statements were correct, why did Adam fall? How could he have thought incorrectly about the temptation presented him by Eve?

Although *The Biblical Doctrine of Man* can be considered reasonably successful in summarizing many Christian doctrines regarding man, it fails on three counts as a work of Christian apologetics. First, it fails to effectively counter the growing Humanist consensus with cogent argumentation. For example, Clark champions the view that man was created as a full-grown adult, Adam, but makes little attempt to show why this particular view is the correct or best understanding of man's origins. It seems inconsistent, therefore, that he should state that evolutionary scenarios suffer from an "intellectual weakness" (which he never explains) and as a result must rely upon "legal force to ban the view they dislike" (also never adequately developed). What little refutation of science the author presents simply relies upon misrepresentation and false arguments, including a rehash of the old Piltdown case.

The Biblical Doctrine's second fault rests with its failure to define and organize. For example, the chapter entitled "Apriorism" attempts to deal with the question of epistemology; after three pages of rambling and name dropping the reader still has no clear grasp of Clark's theme. Is the author arguing for how we know God exists? Or is he discoursing on the condition of the mind at birth? Or is the discussion one regarding Adam's mental state before the fall? Maybe it's all three simultaneously. For good measure, the author decides not to lead us out of confusion but to finish the chapter by introducing still another element, namely, "universal propositions." But where do they come from? How do we know they exist? What are they? No answers here."

Weak arguments and poor organization would have been sufficient crimes; but the reader is treated to one more. The book plainly has an unattractive, preachy voice. "No reader

above the third grade," "bless their little gizzards" (in reference to animals), "as any partly educated Christian realizes," and "uninstructed American pagan" are a few of the book's obvious maledictions. In the end, who is Clark's audience? He seems to offend most everyone and helps only those who don't need help.

Theology should be for everyone, the interpretations plain and capable of universal understanding. This seems to be the purpose of *The Biblical Doctrine of Man*. Clark and the Trinity Foundation have an admirable purpose, but one which, regretfully, they have not managed to achieve.

Reviewed by Paul E. Rothrock, Biology Department, Taylor University, Upland, Indiana 46989.

IN THE BEGINNING by Henri Blocher, tr. David G. Preston. Inter-Varsity Press, Downers Grove, IL (1984). 240 pages.

Henri Blocher, professor of systematic theology at the Faculté Libre de Theologie Evangelique, Vaux-sur-Seine, France, has written a comprehensive analysis of the opening chapters of Genesis, stating the varied views held by scholars, giving two sizes of print, the smaller distinguishing more specialized material, and stating his preference for certain explanations. Detailed references are listed.

"Especially when one prepares to read Genesis, one point of philology must be underlined, the importance of *figurative language*, or tropes in the broad sense." "Everyone will agree that the biblical writers liked figures of speech, metaphors, symbols, transpositions more than the unpoetic West." He distinguishes "three principal ways of picturing the relationship of the Bible and science . . . *concordism*, antis*cientism*, and *fideism*" and recognizes two tablets, two quite distinct groupings: 1:1–2:3(4) and 2:4–4:24 which complete each other. Any decisions "concerning the first three chapters of the Bible can be taken only in the light of the rest of God's revealed Word" which the author does with frequent references and careful analysis.

In deciding between the reconstruction theory (the gap between 1:1 and 1:3), the concordist interpretation (the days were ages), the literal interpretation, and the literary interpretation, he chooses the latter (Day 1 corresponds to Day 4, Day 2 to Day 5, Day 3 to Day 6). "The author's intention is not to supply us with a chronology of origins." "Our Lord Himself did not see the seventh day of Genesis as a literal day."

"God alone gives form and gives being, owing nothing to anything." He created living creatures according to their kind (not to be interpreted as species) and man as "the one for whom the whole world has been made," but "Mankind's being an image stresses the radical nature of his dependence." The image refers to our spirituality, or our dominion, our original righteousness or our sexuality. "The addition 'male and female he created them' should above all assure us that our sexuality is the work of God and that it is not incompatible with the privilege of the image of God." Man is the head of the woman but that involves no inferiority. This relationship is similar to 'the head of Christ is God,' and "It is in the light of this model that we can best understand the horror of adultery, the tragedy of divorce and the bitterness of polygamy, for Christ remains eternally faithful to his one Church, for which first of all he gave up everything."

The author suspends judgment after considering the suggestions on the location of Eden and the nature of the trees and goes on to study the breaking of the covenant which was "Revolt against the Lord," independence from the Sovereign Father. The temptation had no sexual connotation. The tempter is called the snake who is the devil and the account is not a myth but a historical event and "for a historical sin there is a historical redemption."

May I repeat that the author gives a wealth of material collected from many authors—I can merely hint at his broad outline. You will enjoy reading his detailed analyses.

The effect of the original sin is that "the beauty and harmony of existence is shattered, and in their place come shame, fear and pathetic excuses." But in Genesis 3 "we see the first glimmer of dawn" in that God makes garments. "God brings to fulfilment in the garments of salvation depicted in the beginning by those of Genesis the paradoxical, revelatory function of clothing. Clothed in the grace of God, the children of God are freer and more open to the eye of God and man than were Adam and Eve."

Blocher continues with the aftermath and the promise, considering the meaning of the chapters through chapter 11. He suggests that "the flood marks the end of God's patience and that it is a cleaning operation on the world, a kind of 'de-creation.'"

We science folks are particularly interested in the Appendix; scientific hypotheses and the beginning of Genesis. This rapid survey is selective. "Amongst the areas of friction we shall choose questions that relate firstly to the measurement of time, secondly to the origin of living species and finally to the origin and antiquity of mankind, that is to say mankind in the strictly biblical sense." The author is well aware of the attitudes of the Creation Research Society and even refers to the A.S.A. book, *Evolution and Christian Thought Today*. After reviewing differing beliefs the author settles his approval on radioactive dating methods, and at least a moderate amount of transformation of species as indicated by the fossil record. Regarding man, although the actual amount of scientific information available here is relatively small, he sees a remarkable development in mankind about 10,000 B.C., although he allows that creatures that were physically similar and had some evidence of a religious culture go back much further. His final conclusion is "it seems best simply to say that we do not know enough to draw very significant conclusions."

I am sure you can appreciate how masterful this book is when the above paragraph is my summary of 19 pages of small print of very thorough and fair analysis of many

scholars' opinions. Do get this book if you wish to be well educated in Genesis.

Reviewed by Russell Mixter, Professor Emeritus, Department of Biology, Wheaton College, Wheaton, IL.

THE GENE BUSINESS: WHO SHOULD CONTROL BIOTECHNOLOGY? by Edward Yoxen. Harper & Row, New York (1984). 230 pages. $15.95.

We are living in an age of great bioethical dilemmas. Mechanical organs have been successfully engineered. Animal organs have been transplanted into man. Frozen, drowned, dead individuals have been brought back to life. Test tube embryos and drug-induced multiple births are almost commonplace. What will we have next—synthetic mother's milk? The author says that is not too far around the corner.

Yoxen, a professor at the University of Manchester, covers the history of biochemical research in an overview fashion from the "first bowl of yoghurt" to recombinant DNA and the ethical concerns that have been raised since the 1970's. He says that much of the competition and potential danger involved in present research has economic roots—"the sudden appearance of large amounts of money has increased the temptation to grab others' ideas" (p. 53), and that for most, pecuniary motivations have overridden scholarly concerns.

The question is who *decides* what is proper or improper when it comes to research and development in the field of biotechnology? Was the U.S. Supreme Court justified in 1980 by deciding that patents could be obtained on microorganisms? Yoxen feels that "purely commercial research will drive out the less immediately applicable, academically more promising work and that conceptual development in biology will slow down" (p. 78).

He examines the social and political ramifications of the various biochemical machinations stirring the medical/drug industries, agriculture, and the chemical industry. Hormone use in animals affects humans, and hormone use among humans is increasing. Artificial blood and new vaccines could have enormous impacts. Mechanically harvestable fruit and vegetable strains put farm workers out of work or keep them employed at lower wages while producing crops of inferior quality. Seed supplies, likewise, are put in a precarious position since many crops are controlled almost exclusively by large conglomerates. Many drug companies spend more time trying to sell new drugs or equipment to doctors and hospitals rather than trying to eliminate disease and prevent sickness in the first place. In the same way, chemical plants look for biotechnological avenues for marketing more chemicals.

There are many questions and many problems. Yoxen has trouble, as would anyone, in arriving at equitable answers and solutions. First, he says, we must strive for excellence and decide "who sets the standards?" But who *will* decide? He suggests participatory allocation of research funds and cooperative research aimed at the common good. He also calls for the raising of public awareness, which may be the more readily accomplished means.

He clearly feels that we are living in a unique age, as evidenced by the following:

> We are living in the early phases of a major industrial transformation, a revolution perhaps. I think that our attitude to and interaction with nature are being recast, and I do think that the energy that is behind this process is awesome. The problem is that the phenomenon under analysis is exceedingly complex. It is also emergent and fluid, its nature and direction are not yet fully manifest.
>
> At one level I find this process of industrial restructuring and the signs that something new is appearing endlessly fascinating. It is a regrouping of forces that doesn't happen that often. We have a rare historical opportunity to watch it all in motion, to see the technical skills of gene-splicing being used to unlock another cycle of industrial change. It is obvious that . . . the technical advances are here to stay and that they will continue to alter decisively our notions of what is possible scientifically and industrially. (p. 174)

This is a discussion of profound importance. Time alone will tell what comes from the Pandora's box of biotechnology.

Reviewed by Luren E. Dickinson, Assistant Librarian, Ambassador College.

THE GRAVEDIGGER FILE by Os Guinness. Inter-Varsity Press (1983). 245 pages. $6.95.

A defector changes sides and brings with him the details of a plot to undermine the western church. "The deep bell of the University Church was tolling over the almost deserted square as he loomed out of the misty November night under the winter flowering cherry tree. Under his arm was a white bag with the familiar *Blackwell's* trademark. He thrust it into my hands and, seizing my arm, piloted me brusquely across the square and on toward Broad Street."

So begins *The Gravedigger File,* one of the more imaginative and intriguing books to cross my desk in many years. It is the contents of this white paper bag which the book reports, unedited; a series of memoranda on the overthrow of western Christendom.

At the heart of this plot is the strategy of *secularization*, the process through which, starting from the center and moving outward, successive sectors of society and culture have been freed from the influence of religious ideas and institutions, making the former less meaningful and the latter more marginal. Like a spiritual *Megatrends*, the memoranda detail the major thrusts of the secularist's strategy: the increase of pluralization in order to multiply faiths and ideologies to the point that no one makes any commitments at all; confusion about the true nature and aims of secularization; the multiplication of counterfeit religions; the increasing restriction of religion to the private sphere in order to make it seem less *plausible* (less *seeming* to be true) if not less credible; the damage to Christian ideas through loss of certainty and comprehensiveness; and, finally, the damage to Christian

involvement through increasing polarization between liberals and conservatives. Yet the story ends with the biter bit, as a top enemy operative is ultimately converted by a prominent Christian, disparagingly referred to by the enemy as "the old fool."

Os Guinness has produced a compelling work. Despite the fact that some sections read more like a doctoral dissertation than an inter-department memo (which is what they are alleged to be), the book is almost impossible to put down. Guinness masters both wit and clarity with stiletto-like precision, penetrating mind and heart in a single stroke.

There is a temptation to parallel the book with C. S. Lewis's *The Screwtape Letters*, but that is both unjust and unwise. The operatives in *Gravedigger* are human, not demonic. Guinness lacks some of Lewis's literary skills, but none of his intellect and insight. *The Gravedigger File* will sometimes shock and offend, and occasionally (deliberately, I think) overstate enemy successes, but it is not a book to be ignored. I plan to read it again . . . and again.

Reviewed by Fred Van Dyke, Assistant Professor of Science, Fort Wayne Bible College, 1025 West Rudisill Blvd., Fort Wayne, IN 46807.

MAKING CHRISTIAN SENSE by Paul L. Holmer, in the general series edited by Richard H. Bell on Spirituality and the Christian Life. The Westminster Press, Philadelphia, PA (1984). 118 pages. Paper $7.95. ISBN 0-664-24614-1

This book had a greater impact on my life and was more helpful to me personally than any book, apart from the Bible, which I have read in years. I strongly recommend it.

Paul L. Holmer is Noah Porter Professor of Philosophical Theology at Yale Divinity School. He addresses the problem of life losing its meaning. He speaks to this problem in a way that is both distinctively Christian and psychologically sound. He identifies conditions which cause many to view life as meaningless and empty. Then he describes how to make sense of life in a Christian way by fashioning distinctive Christian emotions, by developing new virtues, by finding new power and shape for the will, and by viewing the world with the new mind available to us in Jesus Christ.

The book is written with simple eloquence. It does not review the opinions of scholars nor encumber itself with references and citations. Its argument will stand upon its coherence and the reader's personal validation of its assumptions from his own experiences and observations of his fellow men.

The book is not for the faint-hearted nor for those interested in easy platitudes. Holmer manages to provide a balanced emphasis upon the responsibility and capability of the individual and his dependence upon God's grace. He does this in a way that avoids religious jargon and should be understandable by readers with little or no Christian background, but without becoming trite for the one who has been a serious Christian for a long time. His handling of despair, both as part of the problem addressed and in his suggestions for overcoming it, is superb.

Holmer's diagnosis of the problem of making sense of life is better than his approaches to solving this problem; yet the solutions that he presents are very perceptive. Application of the insights in this brief book will help one apply what Holmer calls the "grammar of life" so that life will indeed make sense. And by so doing, the Christian can progress toward the goal of freeing himself from the control of circumstances which hinder love and service for God.

Reviewed by D. K. Pace, The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland.

THE PRACTICAL CHRISTIANITY OF MALCOLM MUGGERIDGE by David Porter. IVP (1983). 124 pages. $4.95.

"I certainly find the dogmas of . . . the Christian religion . . . completely incredible. I can't possibly and could never believe in them," said the journalist Malcolm Muggeridge on the BBC in 1964. Four years later this author wrote, "All I have cared about is the living presence of Christ." How is one to understand these apparently irreconcilable remarks of a candid journalist? Do they represent a change in attitude?

David Porter, a free-lance writer in England, sought the solution to this puzzle by having a series of conversations with Muggeridge on practical pertinent questions. This book is an attempt to re-view their informal discussions. An evangelical Christian himself, Mr. Porter sought answers to specific questions addressed to this recent Roman Catholic convert, who had been brought up in an atheistic family and had become a nominal Anglican. Unfortunately his method of presentation lacks coherence and unity.

To be sure, anyone interested in Muggeridge as a person will find his views stimulating, particularly those summarized in the so-called "Postscript." The author is convinced that Muggeridge is a genuine Christian, but has only a minimal interest in theology *per se*, although he himself felt instructed in the limitations of religious language, in the meaning of holiness and of Christian mysticism. He learned that worship should belong to the very mystery of life, not associated merely with the extension of everyday life. On the other hand, the fellowship of the gospel should be the fellowship of ordinary human beings.

Muggeridge believes that the incarnation—with its associated resurrection—is "the central meaning of history." We reach ultimate reality—insofar as at all possible—through the imagination, which must be utilized in approaching the Bible (A.V. preferable). He has read the N.T. through a number of times; he is fond also of the *Book of Common Prayer* and Bunyan's *Pilgrim's Progress*. One of Muggeridge's more

startling comments was his conjecture that "there are probably many more Christians in the U.S.S.R. than in America now."

The author differs with Muggeridge in believing that everyone has a definite time when he is "born again;" he could not pinpoint it in the case of Muggeridge.

Reviewed by Raymond J. Seeger, Bethesda, MD.

E. F. SCHUMACHER: HIS LIFE AND THOUGHT

by Barbara Wood. Harper & Row. 394 pages. $19.50.

Few books have dropped into the marketplace of ideas with the freshness and vigor of "Fritz" Schumacher's *Small Is Beautiful: Economics As If People Mattered.* First appearing in 1973 it has now sold over a million copies and continues to serve as a guide and resource to those disaffected with the dehumanizing tendencies of modern culture.

E. F. Schumacher: His Life and Thought is an engaging and competently written biography by his daughter. It tells us much of what we would want to know about this remarkable man.

Schumacher, the son of a German economics professor, studied as a Rhodes scholar at Oxford (which he disliked) and at Columbia University (which he enjoyed). As the tides of Naziism swept Germany, he decided to make England his home and there distinguished himself as a brilliant economist and independent thinker.

After the war he worked as economic advisor to the British Control Commission in Germany and then as advisor to the National Coal Board in England. Later he pioneered the concept of 'intermediate technology,' which sought to upgrade productivity in developing countries while safeguarding the dignity of individuals and the traditional values of a culture.

An atheist until the age of forty, Schumacher thereafter came to see spiritual reality as fundamental to human existence and sought to rethink economic and other human activity in that light. Originally influenced by Gurdjieff and Buddhism, he came in time to find his spiritual home in the Roman Catholic church. Judging from his *Guide for the Perplexed,* a book published at the time of his death (1977), his Christian faith was of an unusually eclectic sort.

Barbara Wood is to be thanked for producing this satisfying biography. By weaving into her tale his domestic life (his first wife died of cancer) as well as his intellectual development, she has given us a human account as well as an intellectual odyssey of one of the more creative individuals of this century.

Reviewed by Martin Johnson, Asheville, NC.

SCIENCE AND RELIGION IN THE THOUGHT OF NICHOLAS MALEBRANCHE

by Michael E. Hobart. University of North Carolina Press, Chapel Hill (1982). 195 pages with bibliography and index. $19.95.

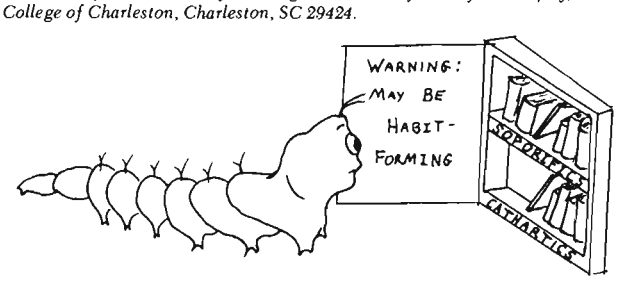
Among the early followers of Descartes, Nicolas Malebranche (1638–1715) must be judged preeminent. His written work, however, lacked the clarity and brevity of his mentor's, and very little of it has subsequently found favor with translators. Hobart's book, then, is a foray into difficult yet important regions of intellectual history, and his success is both gratifying and promising.

Malebranche "explicitly desired to consummate 'modern' Cartesian science—just as he believed Thomas Aquinas had perfected the science of Aristotle and antiquity—by integrating it thoroughly into a religious view of the world consistent with Catholicism" (p. 4). But if Malebranche's aims were clear, his results were not, and Hobart has resorted to a strategy of seeking out the "deep structures" in his discourse relying on a theory of models developed by Max Black. The resulting analysis in terms of conflicting metaphysics of 'number' and 'substance' is illuminating, but takes rather long to set up.

The actual text of this book runs shy of 150 pages and can be divided fairly neatly into thirds. The first two chapters are a review of the history of the concepts of number and substance, and a discussion of their relation in the work of Descartes. The second third examines in great detail the role of 'number' as a "submerged model" in the philosophy of Malebranche. It is only in the final third, the last two and one half chapters, that the book directly bears on the theme of its title and relates all of these ideas to natural theology, occasionalism, and the role of God in Malebranche's metaphysics. Hobart's concluding insights are a worthwhile reward to the reader who has persevered this far even without an interest in the specialized early material.

The book is beautifully produced by the University of North Carolina Press and generally very well written, if occasionally uneven. Hobart's reliance on the popular writings of Lovejoy, Randall, Collingwood, and Whitehead when placing his own detailed studies of the primary sources into a broader context results in no notable errors, but seems a bit odd in view of the wealth of material published in the forty to fifty years since these books first appeared. But all in all, this is an excellent study of an important, if often neglected episode in the attempts to synthesize the scientific concept of 'number' with the theological features of 'substance' in a world view dominated by the unity of God.

Reviewed by Charles D. Kay, Visiting Assistant Professor of Philosophy, The College of Charleston, Charleston, SC 29424.



ARCHAEOLOGY: THE RABBIS AND EARLY CHRISTIANITY by Eric M. Meyers and James F. Strange. Abingdon Press, Nashville (1981). 207 pages. Paper $7.95.

This book is an impressive historical archaeological study of rabbinic Judaism and Christian origins in Roman Palestine. The authors are both field archaeologists, one Jewish and one Christian. This is a text for the nonspecialist, yet there is plenty of depth to it. Anyone interested in the relationship of Christianity and rabbinic Judaism during the time of early Christianity will find it of interest.

According to the authors, their purpose is not exhaustive or definitive. They "have striven to suggest the rich dialogical relation between texts and monuments that exists in Greco-Roman Palestine." They offer "an introduction to a set of themes that [they] believe are crucial for a reliable and faithful understanding of the period." As a professional archaeologist with field work in historical archaeology, I believe that they have accomplished their task. I suspect (hope) that this will only be the first of such studies using this methodology. Other regions of the world have received this treatment and I hope it becomes the norm in Biblical archaeological studies. The more eclectic and holistic we can be in methodology and sources, the less reductionistic our conclusions will be. I have long been disturbed by the narrowness of some of the studies done in Biblical Studies and the lack of cross-fertilization among disciplines.

The book begins with a useful chronology. The chapter headings are "Introduction: The Relevance of Nonliterary Sources," "The Cultural Setting of Galilee: the Case of Regionalism and Early Palestinian Judaism," "The Context of Early Christianity and Palestinian Judaism," "The Languages of Roman Palestine," "Jewish Burial Practices and Views of Afterlife, and Early Christian Evidence," "Evidences of Early Christianity: Churches in the Holy Land," "Synagogues, Art, and the World of the Sages," "Jewish and Christian Attachment to Palestine," and "Conclusions." The text also has thirteen maps and drawings that are precise and clear. The chapter headings indicate the wide range of this book. This book both pleads for and is a model of a broadening of scholarly interest rather than a retreat into an ever-increasing narrowness of interest. In a way, it reminds us of the generalist. This problem of narrowness is not confined to any one discipline, but is an endemic problem in most of them as well as in our larger society.

I highly recommend this book as a book to read for personal growth or as a text (secondary) in a variety of courses and levels.

Reviewed by Charles O. Ellenbaum, Professor of Anthropology and Religious Studies, College of DuPage, Glen Ellyn, IL 60137.

PROPHECY IN EARLY CHRISTIANITY AND THE ANCIENT MEDITERRANEAN WORLD by David E. Aune. Eerdmans (1983). 522 pages. Hard cover $29.95.

It is not likely that Aune's *magnum opus* on prophecy will top conventional lists of best sellers in today's Christian reader's market where so many publications on prophecy are piously marketable and mediocre banalities. This is most unfortunate for this effort needs to be read by every student who is serious about the sociocultural milieu in which inspiration and revelation formed the New Testament. As a matter of fact, it did not take this reviewer long to discover that here indeed is a richness of information woven with commendable articulation which provides unifying continuity in the thesis as it captures the reader's attention.

Surely the dedicated scholar who ponders this examination of prophecy will concur with I. Howard Marshall who has written that "Professor Aune has written the most comprehensive and detailed study of early Christian prophecy yet to appear." In addition, one may accept the publisher's suggestion that this book is "comparable in scope to Johannes Lindblom's *Prophecy in Ancient Israel*" in that it "offers the first comprehensive treatment in English of the place of prophecy in the New Testament period."

I was especially appreciative of the wealth of sociocultural information that sets the stage, as it were, for the prophetic expressions in such cases as John the Baptist, the Lord Jesus Christ, the Apostle Paul, and the Apostle John's Apocalypse, to mention some included in the exhaustive compendium. This opus has enabled me to overcome a naive view which I formed when young, from provincial and parochial denominational enculturation; that is, that the inspired New Testament (and Old as well) authors somehow lived and wrote in a sociocultural vacuum. This misconception about inspiration and revelation persists repeatedly in some Christian writers who ought to know better.

As an "evangelical" anthropologist and missiologist, I believe that the book responds to the need of mature college and university youth who have questions about the fanciful mysticism of some authors in their analysis and exegesis of the Bible. While the Bible's universal truths are to be maintained, we must recognize the sociocultural setting through which the prophetic statements were made in order to appreciate the realism of their application then as in our contemporary world, especially for cross-cultural interaction as in evangelical Christian mission.

Aune's "previous surveys of early Christian prophecy" at the beginning of the book appropriately prepares the way for the reader. His critique of several authorities enabled me to recall my own dimmed information about prophecy and served to sharpen my focus as he referred to Guy's *New Testament Prophecy: Its Origin and Significance* (1947); the fascicle of the *Theologisches Worterbuch zum Neuen Testament*, in which Friedrich's discussion of New Testament prophets and prophecy became a standard treatment of the subject; Cothenet's "Prophetisme dans le Nouveau Testament;" more recently Crone's *Early Christian Prophecy: A Study of Its Origin and Function* (1973); and other comparable efforts by experts.

Despite the numerous scholarly contributions he surveys, Aune concludes that there remains much new ground to be

plowed; his book is one wherein he proceeds to do this. As he states in his preface, "This study is written from the perspective that early Christianity must be understood within the setting of the ancient Mediterranean world, without unduly emphasizing the Israelite-Jewish heritage of early Christians nor neglecting the dominant Greco-Roman culture within which both Judaism and early Christianity grew and changed" (page xi).

The author emphasizes that like any first-rate scholar his work is not complete in an absolute sense. He joins all of us in our finite attempts to discover and describe approximations of ultimate reality. Thus one may find himself a bit uneasy when Aune uses "science" in a manner in which it seems that "scholarly" is more appropriate. For example we read, "Surprisingly, the theory of the creative role of Christian prophets in the composition and reformulation of the sayings of Jesus has been widely assumed as a self-evident truth rather than *scientifically* demonstrated" (page 237, emphasis added). While many of us in the so-called "social sciences" may tolerate and even indulge in such usage, our ASA colleagues in the natural sciences may raise eyebrows at such points.

He further uses the term "science" for conclusions that indirectly challenge the biblical statement that "by faith we understand that the universe was formed at God's command, so that what is seen was not made out of what was visible," and "without faith it is impossible to please God, because anyone who comes to him must believe that he exists and that he rewards those who earnestly seek him" (Heb. 11:3,6 NIV). At what point, we must ask, do we Christian scholars cross the fine line in our efforts from research findings to an intrusion into the infinite realm of reality, both present and in the future? Are there models now in use which will allow a sharpening of that fine line of division?

Thus when I read the following statement under the caption "The Non-Pauline Origin of the Oracle": "If we assume the oracular nature of I Thessalonians 4:16–17a, is there any further evidence to suggest that the oracle originated with the prophet other than Paul?" (page 256), I note that Aune employs what is common to many scholars—the use of inferential idioms of science. The formula is well known, by assuming this as part of our theory in our research we may infer or conclude the answer in testing the data. Of course this is quite legitimate and reasonable, but the unsuspecting reader may fail to see that such findings deal with the probable, not with the absolute as may eventuate for some of the uninitiated. Hence, such methods may—not must—tend to challenge biblical authenticity for the reader and defeat or at least frustrate the reader in appreciating the very thing desired by the author; in this case, Aune's luminous treatment of prophecy. I do not have a comprehensive answer for this "weakness," but my caution is that we may find ourselves bordering on slippery ground.

Having voiced my uneasiness in what are obviously insignificant matters to genuine evangelical Christian scholars, I congratulate Professor Aune for an outstanding product. As to the book's print, format, and other mechanical aspects of publishing, we have a book that warrants a permanent slot in our professional libraries. We will find it to be a standard reference on prophecy in early Christianity; its 346 pages of textual analysis, its 98 pages of informative notes, and its bibliography and index will find us turning to it again and again. I commend it for the reading to ASA members and others interested without hesitation.

Reviewed by George J. Jennings, LeMars, Iowa 51031

CHRISTIAN FAITH AND OTHER FAITHS by Stephen Neill. Inter-Varsity Press, Downers Grove, IL (1984). 304 pages. Paper $7.95.

I have yet to read anything from Stephen Neill that wasn't well done. His death is a great loss. In one sense, this book reflects his work in India, his earlier book of the same title, and his work in England since he left India. This is an extensive revision. I had his earlier book and this one is significantly different.

This book should help support mission endeavor both within and without the United States. In country after country, we see Christians being attacked (e.g., Israel, Moslem countries, Communist countries) and mission action being slowed for a variety of reasons. One possible reason might be an inability to articulate our faith and practices in the face of other sincere believers of other religions. We live in a culture that worries more about a person's sincerity than the truthfulness of their position. This book will help you understand your faith and the faiths of others.

The organization of the material is traditional: The Problem Set, The King of the Jews, Islam in Crisis, Renascent Hinduism, The Doctrine of the Lotus, The Primal World, No Faith and Faith Implicit, A Search for Light, and Christendom. Though this keeps the reader from being shown broad themes such as we find in other books (e.g., *Christianity and World Religions*), it is less confusing to the beginning student of Christianity and other faiths. This book will give you much basic information but also much of the debate concerning our response to other faiths. This is not an introductory book to other religions but an introductory book about Christianity and other religions.

I recommend this book highly.

Reviewed by Charles O. Ellenbaum, Professor of Anthropology and Religious Studies, College of DuPage, Glen Ellyn, IL 60137.

ISLAM: A CHRISTIAN PERSPECTIVE by Michael Nazir-Ali. Westminster Press, Philadelphia (1984). 192 pages. Paper $11.95.

This is not a hatchet job on Islam nor is it an introduction to Islam. The author and I both agree that Dr. Rahman's *Islam* is

a masterful introduction. What is it then? "In this work, I have tried to present an appreciation (using the word in the sense of a critical appraisal) of facets of Islam from the standpoint of one who is a Christian with a Muslim background living in a Muslim context" (p. 7). He has done this well. Traditionally the two poles of Christian thought on non-Christian religions have been either a non-critical semi-syncretic acceptance of the religion as having equal validity with Christianity or a non-critical rejection of it as demonic. If we accept that all truth comes from God, how do we handle what seems to be Christian truth in a non-Christian religion? In this book, we do not find an all-embracing answer to the question of "How must a Christian react to Islam." Instead we find one Christian brother's answer to his question of "How do I react to Islam." He says that part of Islamic culture is God-given and good. Other parts come under the judgment of the Gospel and are to be rejected. Some is authentically a genuine consciousness of God while some is a contradiction of that quest for answers. I am living and teaching in the midst of a strong Islamic community that is active in seeking converts in the Chicago area. How I act and respond to their challenge is not an idle question but one I face on an almost daily basis.

The book gives some valuable background on the beginnings of Islam and its development in the chapters entitled "Genesis, Development, and The Growth of a Muslim Culture." The chapters "Modern Revival" and "The Reconstruction of Muslim Thought" give us some much needed background for what is going on today in Islamic cultures. The remaining chapters, "The Return to Fundamentalism," "Gazing into Jamshid's Cup," and "The Christian Presence," are very thought-provoking. To his concluding prayer, following, I can only say, amen.

> Almighty God, our Heavenly Father, who didst put thy Spirit upon our Lord Jesus Christ, that He might bring forth judgment to the Gentiles, and by a voice from heaven didst declare Him to be thy beloved Son: we beseech thee to bring all Muslim peoples into the fellowship of thy Church, that they may worship thee in spirit and truth; through the name of thy Son, Jesus Christ, our Lord. Amen."

Reviewed by Charles O. Ellenbaum, Professor of Anthropology and Religious Studies, College of DuPage, Glen Ellyn, IL 60137

CHRISTIANITY AND WORLD RELIGIONS: The Challenge of Pluralism by Sir Norman Anderson. Inter-Varsity Press, Downers Grove, IL (1984). 216 pages. Paper $6.95.

This book by Anderson is a substantially revised and expanded edition of his *Christianity and Comparative Religion* which is now out of print. It is significantly different and better. If you have his earlier work, don't put off getting this book. He points out that there have been a large number of excellent publications recently dealing with the on-going debate about the world's great religions and their relation to the Christian and to Christianity. We are not discussing a philosophical position but a foundation for or against evangelism. We are dealing not only with people's minds and hearts but also with their souls and eternal destiny. If I believe that all religions are basically valid even though Christianity has "an edge," what will be my response to mission? Mission is both over there (wherever that is) and over here. My mission field is comprised of those I live with and come into contact with—my co-workers, neighbors, and students. These include Moslems, Jews, Hindus, Buddhists, Sikhs, and many others. In my county there is an Islamic Center, a Buddhist Temple, a Hindu Temple, a Zororastrian Temple, and lots of "gurus" of various types. I'm not even talking about the various Christian heresies such as Mormons, Christian Scientists, Jehovah's Witnesses and others. If I believe that those religions may contain some God-given truth but also much that stands condemned by the Gospel, I must be a missionary.

Of course, why should I be different from others who turn down a mission? Should I risk my neck and reputation, in order to witness? Yes. This book will help you be a credible witness in that you will now have greater knowledge about the other religions. Unlike other books of this type, Anderson does not deal with particular religions in his chapters but instead deals with themes. I think that this is a wise choice. The chapters are "Introduction," "A Unique Proclamation," "A Unique Salvation?", "A Unique Disclosure?", "No Other Name?" and "Proclamation, Dialogue, or Both?"

This book is well worth the time and effort it takes to read it.

Reviewed by Charles O. Ellenbaum, Professor of Anthropology and Religious Studies, College of DuPage, Glen Ellyn, IL 60137

LIFE SCIENCE AND RELIGIONS by Kieran Burns. Philosophical Library, New York (1984). 222 pages. $25.00.

The back cover of *Life Science and Religions* assured me that the publisher had published books by, among others, Einstein, Sartre, Schweitzer and John Dewey. In my opinion, this volume does not belong with such company.

Burns, who has done research on stress, in particular stress associated with birth, has taken the examination of the treatment of birth stress by various religions as his theme.

Among the negative criticisms I must make are the following: 1) the taking of its own subject matter too seriously, 2) an uncritical acceptance of various traditions and/or religious sources, apparently on an equal basis, yet, paradoxically, not accepting scripture when it seems to conflict with his own beliefs, 3) making sweeping, general and undocumented statements, 4) being about too many topics, connected only loosely, and 5) taking certain catholic beliefs (especially concerning the divinity of Mary) as if they were the only Christian ones.

In support of some of these criticisms, I offer the following two quotes:

> Life science is an ideal parameter for a central role in evaluation of scripture and for attainment of understanding of cultures, traditions and religions. (p. 2)

> In some scriptures it is clearly stated that God could create a man in a moment of time. There is a clear incompatibility between these scriptures and life science. . . . Scripture is understood in human terms, and written in man's language, which is inadequate in relating to God. The influence of man on the content of scripture is evident from the scientific content. Where there is something incompatible with scientific truth this is of human origin. (pp. 8–9)

Besides being disturbed by the methodology of Burns, I have some other problems. There are several charts interspersed in the chapters examining the major religions. For example, one of these (p. 167) gives a scatter diagram of the amount of ACTH in plasma versus the hours of duration of the first stage of human labor. Apparently Burns did the work himself. There is no documentation, or any indication of methodology, and, most important, so what? So stress, presumably related to the amount of ACTH, increases as the length of labor increases? That's news?

The last chapter is entitled "Life Science and Apparitions." It is not well connected to the rest of the book, and the purport of it is that apparitions (mainly of Mary, Christ's mother) are scientifically supportable. The contents of this chapter are largely quotations from reports of such apparitions. Exactly what the implications of the appearances of Mary have to do with Life Science are not addressed, and the book closes with a three-sentence paragraph about the appearance of Mary at Fatima, rather than any attempt at a summary chapter, paragraph, or even sentence.

I am afraid that I cannot recommend this book to anyone.

Reviewed by Martin LaBar, Central Wesleyan College, Central, SC 29630

ABORTION AND THE CONSCIENCE OF THE NATION by Ronald Reagan. Thomas Nelson, Nashville (1984). 96 pages. $7.95.

The above citation is based on that given in the usual location by the Library of Congress. However, it is apparent that the book is a compilation of three essays published in *The Human Life Review*, of which only the one at the beginning of the book is by Reagan. The others are by C. Everett Koop, presently serving as Surgeon General of the United States, and by Malcolm Muggeridge, British editor, lecturer, critic and broadcaster. All three essays speak out strongly against abortion used as a form of birth control. A central theme, in Reagan's words, is "As a nation, we must choose between the sanctity-of-life ethic and the quality-of-life ethic" (p. 25).

The President wrote the essay from which the book takes its title apparently without its being solicited, on the 10th anniversary of the 1973 U.S. Supreme Court decisions which legalized abortion under most circumstances. Reagan compares the status of slaves before and after the *Dred Scott* Supreme Court decision of 1857, which denied blacks citizenship rights, with that of the unborn today. He urges that the citizenry act to overturn the *Roe* v. *Wade* decision, namely by peaceful political means. He does not expect this struggle to be easy, and notes that Wilberforce exhorted his followers to pray for the overthrow of slavery in Britain for decades before that result was achieved.

Koop's essay "The Slide to Auschwitz," is what one would expect from the title. He reiterates the findings of L. Alexander (*New England Journal of Medicine*, 241:39–47) who claimed that Auschwitz would not have been possible without the citizenry first being propagandized towards acceptance of euthanasia, and without the silence of physicians in the face of this propaganda, and its result. Both of these actions were based partly on Hegel's philosophy of rational utility. (Alexander's historical analysis is apparently correct, based on the lead book review in the Jan. 31, 1985 *Nature*.) Koop's article was first given as an address to pediatricians, and he was asking them to stop what he sees as a similar slide toward mass extermination of infants, and others, unwanted for whatever reason. Koop spent many years as a practicing pediatrician, and he says that "no family has ever come to me and said, 'Why did you work so hard to save the life of my child?' And no grown child has ever come back to ask me why, either" (pp. 43–44). Koop argues strongly that rearing "defective" children is a blessing.

Muggeridge's essay is entitled "The Humane Holocaust." He, like Koop, mentions the holocaust in Nazi Germany, citing the Alexander article and a book, *A Sign for Cain*, by Wertham as evidence that the roots of the holocaust predated Hitler's rise to power, and that, initially, the holocaust was aimed against handicapped Aryan Germans. Then Muggeridge points out that, ironically, in the very countries that defeated Germany in World War II, a holocaust is taking place, with unborn babies as its victims.

Abortion and the Conscience of the Nation makes for interesting reading. The essays are intense and gripping. While not particularly scholarly, nor making any pretence to dispassioned examination of the issues, the stature of its authors means that this small book has value in the continuing debate over abortion.

Reviewed by Martin LaBar, Central Wesleyan College, Central, SC 29630.

JUSTICE FOR THE UNBORN: Why We Have "Legal" Abortion and How We Can Stop It by Randall J. Hekman. Servant Books, Ann Arbor, MI (1984). 183 pages. Paperback.

According to the book, Randall Hekman is the father of eight children, and has been a Probate Judge in Kent County, Michigan, in which Grand Rapids is located, since 1974. In 1983, he achieved some notoriety when the case of a pregnant

13-year-old in foster care, whose biological mother would not grant permission for an abortion, came before him. (Michigan law requires biological parental consent for a foster minor child to have her ears pierced.) He ruled, on the overwhelming weight of the evidence that an abortion would not be in the best interest of the girl, that she could not have one. Some time later, when her foster parents explained the facts of fetal anatomy and behavior, the girl wrote the judge thanking him for his action. The child died as a neonate.

Apparently, the above-cited experience led to the book. The first four chapters tell the story, aided by three documents added as appendices. The first one is Hekman's legal ruling, the second is a newspaper editorial strongly critical of that ruling, and the third is Hekman's reply to the editorial. There are also nine pages of notes at the end of the book, but there is no index. The remaining twelve chapters are arguments against abortion, and the judicial and governmental philosophy that has led to it, and some suggested means of setting things to rights, or at least rights according to Hekman's view. (I am in general sympathy with that view, but the book is not an unbiased treatment of the issues, and there are honest Christians who do not agree with Hekman on all points.)

Having given the essence of the story behind the book in the first paragraph above, I move to Hekman's view of the way things are, and how to change them.

The author seems to have some real insight into the Bible. He uses James 1:27 and Proverbs 31:8–9 as evidence that God is against abortion, for example. Also, says Hekman,

> God's most powerful statement that unborn children are really people is found in the incarnation itself. If God himself can take on the form of a tiny unborn child, that little being must be greater and more important than we can even begin to fathom. (pp. 44–45)

Although I make no claim to be a legal scholar, and hence cannot judge Hekman as one, he certainly exhibits some of the trappings that would be expected of such a scholar. He gives an outline history of how the Supreme Court came to be given power to interpret the constitutionality of federal laws, and how it left "strict constructionism" at about the beginning of this century to, in effect, make law, rather than interpret it; for example by pulling a legal "right to privacy" out of a non-existent legal hat in *Griswold*. The *Roe* and *Doe* abortion cases of 1973 are the strongest examples of such judicial law-making, but they are not by any means the only ones. The *Miranda* case, and associated cases having to do with police behaviors, are also examples where the Court did far more than interpret the law, and actually made rules, according to Hekman. I was a bit surprised that there weren't more references to strictly legal journals in Hekman's documentation of his assertion that the 1973 rulings were not good constitutional interpretation, or law, based, as they were, on a perverse reading of the 14th Amendment to the Constitution. I was even more surprised by the statement that "If you have absorbed even some of this chapter, you know more about the proper method of judicial review than most graduates of law schools" (p. 76).

Hekman seems quite familiar with the arguments for abortion, which he counters in chapter seven, which is mistitled "The Arguments for Abortion." The book simply puts them up, then shoots them down, without trying to support them. This chapter, in addressing the question of aborting defective newborns, states that "As Christians, we know that there are no mistakes with God" (p. 54). True, but that doesn't necessarily mean that God is responsible for everything that happens in this fallen world, does it?

The author has an intriguing solution for what he sees as a symptom of an unchecked judiciary. After considering constitutional amendments, the attrition of the present Supreme Court, and the like, Hekman asks that about 2,000,000 of us go to Washington to exercise a constitutional right, namely to "petition the Government for a redress of grievances" (First Amendment). He wants, in conjunction with that, a debate between some legal scholar and Justice Blackmun (who wrote the majority opinion in *Roe*) or Justice Powell. The latter wrote the majority opinion in *Akron* v. *Akron Center for Reproductive Health*, which specifically reaffirms *Roe* without establishing the constitutional basis for it, but simply by invoking it as a precedent, writes Hekman; and which opinion states that "a State may not adopt one theory of when life begins to justify its regulation of abortions" (quoted on p. 106 of Hekman). I was a bit confused in trying to reconcile this bold plan with a later statement (p. 144) that the author isn't sure of the best strategy for combatting abortion.

Chapter 14 is used in examining the strategy of Samuel Rutherford, in his *Lex Rex* (1643). Rutherford, apparently, had a theory of government which Hekman finds himself comfortable with. That theory is that the governors derive their powers from God, and are answerable to Him, and to the people. I quote the penultimate paragraph of the chapter, which summarizes Hekman's philosophy of government:

> When a leader oversteps the bounds of his delegated authority, when he injures innocent people, when he rewards those who do wrong, he must be restrained and rebuked by the ultimate authorities—the people. A leader has God's blessing only to the extent that he remains a servant of God and His word. As a leader departs from this standard, he . . . may be intimidating. But he is not powerful unless the people swallow the lie.

The book specifically states that our primary vocation is not to fight abortion, but to follow Jesus (p. 140) and closes on a note of optimism. Hekman feels that the days of essentially unlimited abortion are numbered.

Reviewed by Martin LaBar, Central Wesleyan College, Central, SC 29630.

THE REDISCOVERY OF INNER EXPERIENCE by Lucy Bergman, Nelson-Hall (1982). $17.95.

In the past decade, a new fascination has begun in the West with inner experience phenomena, which is rapidly evolving into a serious courtship. Mystical experience, borrowed or adapted from the East, has been at the core of this rediscovered phenomenon. In her book entitled *The Rediscovery of*

Inner Experience, Lucy Bergman attempts to address the distinctives of inner experience and its rediscovery by contemporary psychology. Bergman introduces the reader to psychological literature on six inner experiences: dreams, daydreams, mystical states, madness, orgasm and dying. The rationale behind the above set of experiences is stated by Bergman as "the capacity of each of these experiences to reveal the authentic nature of persons and ultimate reality."

Next, the author examines the beliefs and assumptions behind contemporary, popular literature and attempts to demonstrate how the inner experience literature fits comfortably within the framework of contemporary social conditions. Finally, the author introduces the concept of *psychological religiousness* as it emerges from the writings of inner experience advocates. Bergman then examines the continuity of psychological religiousness with traditional forms of Western religions, and its radical departure from these traditional forms.

Author Bergman describes psychological religiousness as a "modern form of faith, serving as an alternative to traditional concepts of faith and existing within the context of the consumer orientation and the private sphere." Her attention to psychological religiousness is not one of unqualified endorsement, but, rather, includes a serious critique of the beliefs, values and assumptions of inner-experience advocates. For example, unlike the assertion of psychological advocates of inner experience that the rediscovery of inner experiences points to the failure of Western religions to speak to people today, the author believes that inner experience religiousness represents the failure of psychology as a science to answer religious questions.

Throughout the book, the author emphasizes the religious and moral dimensions of inner-experience claims rather than the 'scientific' value of current perspectives. The key to the meaning of *experience* is taken from William James (*The Varieties of Religious Experience*), who contrasts what is socially given and what is authentically the individual's own immediate reality. In defining religion itself, the author recognizes the difficulty in expressing it in traditional terms and therefore chooses Geertz's view of religion (*The Interpretation of Cultures*) as a 'system of symbols' and Luckmann's approach (*The Invisible Religion*) as a 'world view' in order to explain how psychological religion functions. The main thesis of the book is presented in the last chapter, where the author attempts to set the principle theological themes of psychological religiousness and provides a brief critique of its adequacy (or inadequacy) as an alternative to traditional religions for those persons seeking a more 'relevant' religion for modern times.

Although Bergman's conclusion is that psychological religiousness falls short of providing a "fully adequate alternative to traditional religion," her arguments to support her contentions are not as thorough as one would have hoped. In her analysis, Bergman first identifies the salient features of psychological religiousness of inner experience as

(1) its impersonal nature as force, energy or power,

(2) its vagueness,

(3) its anonymity,

(4) its ability to circumvent evil, and

(5) its ineffable nature.

Bergman then correctly points to some of the inadequacies of these characteristics. These include

(1) the well-attested capacity of self-deception inherent in inner experience claims;

(2) the real possibility of extreme selfishness; and

(3) the inability of psychological religiousness to express adequately the great paradoxes of life such as bondage-freedom, defeat-victory, etc.

In her critique, however, Bergman stops short of demonstrating forcefully the crucial weakness of inner experience advocates: the inability of the individual to distinguish between right and wrong, and good and evil, without recourse to objective criteria which would provide grounds for such discernment.

In general, Bergman fails to articulate, or recognize, the uniqueness of the Judeo-Christian tradition which

(1) successfully balances the privacy of inner experience with the universality of the objective world 'out there,'

(2) tempers inward-directed personal ecstasy with outward-directed sacrificial service,

(3) complements 'head' knowledge with 'heart' experience and, finally,

(4) provides an absolute, objective basis for distinguishing good from evil.

Only once (Ch. 9, p. 160) does Bergman come close to recognizing the uniqueness of the Holy Spirit both as a person (traditional Western concept of God) and as a power or force (Eastern or mystical emphasis), thus acknowledging the intrinsic ability of the Judeo-Christian tradition to harmonize the traditional, ritualistic approach (credo) with the inner-experience claims of the ineffable and the nondiscursive (OM).

Overall, however, all those who view the renaissance of the 'inner experience' movement seriously will find Bergman's book to be of special value, because of its scholarly treatment and its original insights into the diverse manifestations of the inner experience phenomena.

Reviewed by K. J. Touryan, Vice President of R & D, Mt. Moriah Trust, Englewood, Colorado.

WHEN YOU'RE FEELING LONELY by Charles Durham. Inter-Varsity Press, IL (1984). 186 pages. Paper $5.95.

This is a very timely book because it addresses a very prevalent problem: loneliness. There are 59 million unmarried adults in the United States, a condition which has great

potential for loneliness. Twenty-five percent of those Americans polled say they have been lonely recently. Women admit to more loneliness than men and among those who have lost a mate in death it is reported to be the most serious of all problems.

Durham defines loneliness as pain caused by some sort of isolation from a person or persons. This isolation can be physical, ideological or emotional. Loneliness is not the same thing as being alone and it is possible to be lonely with other people around. Thus loneliness is possible in a crowd, a family and a marriage.

Can Christians be lonely? Yes, says the author. Loneliness is not sin, nor a condition to be sought. In the words of John Milton, "Loneliness is the first thing which God's eye named not good." Humans need particular kinds of human relationships such as the family, a mate, a few close friends, and a social network. One kind of relationship cannot be substituted for another. God does not intend to take the place of human friends, and close family ties do not fill the need for a social network.

The author has some helpful things to say to those who are lonely because unmarried, and to those who are lonely because married. He speaks knowingly, honestly, candidly and empathetically. To the lonely unmarried, he advises them to realize that value and identity are not the same and that they are valuable in God's sight no matter what their marital state. To the lonely married, he stresses that being responsible is more important than being fulfilled and encourages them to cultivate behaviors which foster marital intimacy rather than calling the marriage off.

Other topics discussed by Durham include community, solitude and reaching out to the lonely. Community, people who live in the same location and have a mutual interest in each other, is a strong hedge in personal growth. When people reach out to others who are lonely they take a big step toward ending their own loneliness. "Though locked in the arctic cold of a winter of loneliness, the chilled heart can know the spring of warm love again . . . the heart of the matter will always remain, 'Find someone to love.'"

The author of this volume, Charles Durham, is pastor of the Prairie View Church of the Brethren located in Friend, Kansas. He delivers easy reading, illuminative stories, penetrating insight, and good advice. This book should be helpful to anyone facing loneliness, and that includes everyone sooner or later. Since young people are often puzzled by intimacy, marriage, friendship and solitude, this book will be especially helpful to them in relating these topics to the problem of loneliness. I enjoyed reading this book, benefited from it and am happy to recommend it.

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

CRISIS & CATHARSIS: The Power of the Apocalypse by Adela Yarbro Collins. The Westminster Press, Philadelphia, PA. 179 pages. Paper $11.95. ISBN 0-664-24521

Professor of New Testament at McCormick Theological Seminary, Adela Yarbro Collins discusses the authorship, date, situation, social themes, and psychological meanings behind the apocalyptic language of the Book of Revelation in the New Testament. He shows familiarity with the findings and issues of contemporary scholarship, but his perspective is primarily that of current liberalism. He uses the historical-critical method to assess biblical texts in "terms of their congruence with critically reconstructed history" instead of the traditional approach that addresses passages of Scripture in accordance with the "rule of faith" (p. 166).

He describes evangelical and fundamentalist approaches to the Book of Revelation as ones which take the text of this portion of Scripture at face value and then dismisses them as "precritical" and "naive." He does not seriously confront or refute such views; he merely dismisses them.

Collins seeks to develop a "critical" reading of the text of Revelation that gets "behind" the text, with the help of history, sociology, anthropology, and especially psychology" (p. 22). The result of this process is seen in the following summary.

> The movement from a precritical to a critical reading of the Apocalypse involves the experience of its vision as a broken myth. The critical reader can no longer simply live and move and have one's being within the "world" of the text. A critical reading also leads to an awareness of how the text is flawed by the darker side of the author's human nature, which we, like all the readers, share. In spite of, and perhaps because of, these insights, we can move to a personal reinvolvement with the text on a new level. A postcritical reading is one in which a partial, imperfect vision can still speak to our broken human condition. (p. 172)

Collins' book contains a number of interesting historical items and some insightful psychological suggestions, but this reviewer feels that it provides little help for the person seeking to know God better through a study of the Book of Revelation. Collins has essentially removed the divine factor from the Apocalypse.

Reviewed by D. K. Pace, The Johns Hopkins University Applied Physics Laboratory, Laurel, MD.

WHOLENESS AND HOLINESS: Readings in the Psychology/Theology of Mental Health edited by H. Newton Malony. Baker Book House (1983). 344 pages. Paper $12.95.

This stimulating and balanced anthology contains many of the seminal writings on religious values and counseling published during the past several decades. The perspectives presented range from the emphatic biblicism of Jay Adams to

the more philosophical orientation of Paul Tillich. Twenty-three articles are grouped under five headings: 1) the human predicament, 2) the experience of living, 3) the meaning of health, 4) the process of healing, and 5) methods of therapy. Contributors include Seward Hiltner, S. Bruce Narramore, William Rogers, and Samuel Southard.

The primary value of this book is its convenience in providing this collection of articles together. The dates of original publication of these articles span almost three decades, from the early 1950's to 1980. Only those with access to a very good library could easily locate all of them apart from this book.

Malony is director of programs in the integration of psychology and theology and professor of psychology at Fuller Theological Seminary. It is clear that he edited this book to provide students, both undergraduate and graduate, with a tool for comparison of the several major points of view on the interrelationship between Christian faith and western psychology. Malony has also provided a useful index of authors, subjects, and scripture references in the book.

Reviewed by D. K. Pace, The Johns Hopkins University Applied Psysics Laboratory, Laurel, Maryland.

THE MAJESTY OF MAN; The Dignity of Being Human by Ronald B. Allen. Multnomah Press, Portland, Oregon 97266 (1984). 221 pages.

In this book, the author, Professor of Old Testament Language and Exegesis at Western Conservative Baptist Seminary in Portland,Oregon, uses the content especially of Psalm 8 to develop the theme of Christian humanism or theistic humanism—"humanism in praise of God." The response to secular humanism is not, he argues, to reject humanism, but to recognize the foundational biblical support for humanism within the context of historical, biblical, Christian faith.

The book is divided into three main sections: "The Mystery of Man," "The Majesty of Man," and "A Mandate for Man." In the first section he touches on some of the characteristics of increasing secularization and warns against improper Christian reactions to these real dangers. Rejecting the premise of secular humanism that man is the measure of all things, Allen upholds the affirmation of biblical humanism "that man has great dignity and supreme importance because of the reality of who God is as Creator, Savior, and Judge, and what he does for his people based on these realities."

In the second section, Allen begins his exposition of Psalm 8 with its assessment of the value of the human being. "Man is the crown of the cosmos, the measure of creation. Man as male and female is God's finest work." He then investigates the revelation of Genesis 1 with its teaching that "Man is God's great wonder-work!" This teaching is certainly not to be limited to the male, but is true also of the female as the male's equal. The Fall does not remove this image of God, which mankind retains even in its fallen state, and it is this retained image of God that demands the treatment of human beings with dignity. It is the incarnation of Christ, the Second Person of the Trinity, in human form that gives the final argument for Christian humanism.

In the final section, Allen considers four main issue-related areas: 1) a balanced perspective of male and female, 2) the significance of wisdom with a brief exposition of Proverbs, 3) living humanly with regard to self, the creation, things, and others and 4) an evaluation of the weaknesses of secular humanism.

The book concludes with an appendix that discusses the meaning of the Hebrew *bara*, in which Allen argues that *bara* in and of itself does not speak of *creatio ex nihilo*, but means "to fashion anew—a divine activity;" a bibliographic guide to further reading; and Scripture and subject indices.

A stylistic weakness of the presentation is the breaking up of the material into very short sections—so short that it is virtually impossible to present a sustained argument. On page 121, for example, there are parts of four separate sections on a single page. Many sections are scarcely a dozen lines long. Occasionally the author adopts a somewhat patronizing attitude, as when he apologizes twice on two consecutive pages for mention of the German word *Heilsgeschichte*.

Perhaps the major reaction to the book however can be cautiously summarized by saying that one receives the impression of an author deeply enveloped in traditional, conservative orthodoxy, reaching out to break free of some of the limitations of that sometimes largely cultural position, but still so enmeshed in such a perspective that even the most modest departures seem like radical and revolutionary pronouncements. Although he speaks out strongly in defense of Christian involvement in the sciences, in another place he implies that perfect health brought about by genetic manipulation would be an evil. Although he argues that the phrase "Scientific creationism" is an oxymoron, he speaks as though he regarded the perspective of "progressive creationism" as a major modern breakthrough. Although he argues strongly for equality between male and female, he argues equally strongly for the leadership of man over woman resulting from his priority in creation and his role in naming the woman. His major departures from a "tight six-day chronology" interpretation of Genesis 1 occur in footnotes in which he indicates that the naming of the animals "may well have stretched over a longer period of time" than the evening of the sixth day, and in which he even mentions the position of R. K. Harrison that Genesis 2:23 might be properly classed as "religious drama." Although he argues that there is still room for "mystery" in theology, he decries "fuzzy thoughts about the inner-workings of the Trinity." Under his exegesis, Genesis 3:16 is transformed from "Your desire will be to your husband, and he will rule over you," to "You will tend to desire to usurp the role I have given to him as the compassionate leader in your home, rejecting his role and belittling his manhood." While arguing that Christians must be involved in care for the environment and ecology, he interjects, "When a group of Christian men go into a primitive wilderness area for a week to hunt with bow and arrow, they are going on a pilgrimage."

There is much that is good and valuable in this book, many emphases that uphold the biblical view of human beings as creatures made in the image of God, with an inherent identity and dignity based on that fact. Often, however, the reader must rescue these precious insights from the anachronistic framework in which the author, in spite of all his radicalness, still places them.

Reviewed by Richard H. Bube, Department of Materials Science and Engineering, Stanford University, Stanford, California 94305.

SUPERIOR BEINGS: IF THEY EXIST HOW WOULD WE KNOW by Steven J. Brams. Springer-Verlag, New York (1983). 202 pages. $21.95.

In the introduction to *Superior Beings* Brams states that his book is "first and foremost a philosophical investigation of characteristics of superior beings and their possible impact on games played with human beings." Indeed, this is an accurate assessment. Brams uses game theory, a system of describing and quantifying interactions between two or more beings, to probe the meaning of superiority and the effects of different superior attributes on the outcome of games. A game is the interactions of the two or more beings according to a defined set of rules. Brams confines most of his analysis to simple two dimensional games between a person (P) and a superior being (SB). In a previous book (*Biblical Games: A Strategic Analysis of Stories in the Old Testament*, MIT Press, Cambridge, MA, 1980) he examined the interactions of the "God of the Hebrew Bible" with various players. *Superior Beings* also draws most of its examples from the Bible.

This book presents a novel approach to some very old theological questions. Another reviewer wrote, "I am surprised that nothing of this kind seems to have been attempted before" (H.N.V. Temperley, *Nature* 308:87, 1984). In addition to its novelty the text is well written. An erudite introduction to game theory is presented that does not require great mathematical prowess. An excellent glossary is also included. This is quite useful for those unfamiliar with game theory.

The main themes are developed in a logical sequence. Later chapters depend on arguments presented in previous ones. References to figures from the earlier chapters are made frequently. This is bothersome as the reader must flip back and forth between the figures and the text, but it is understandable considering publication costs. Another minor problem is the switching of the position of P and SB (on the ordinate and abscissa) of the outcome matrices. These inconsistencies can be confusing unless one pays careful attention to each figure (*e.g.*, Figure 66, p. 147).

Despite its many positive attributes there are two major problems I believe readers will find with this book. The first is that the outcome of most games is based on *a priori* assumptions and operational definitions. Brams is well aware of this and even invites readers to propose their own definitions and derive their own conclusions within the context of game theory. However, conclusions are so closely linked to the presumed objectives of each being and to the ranking of outcomes that unique solutions are unlikely.

One assumption of game theory is that the players act rationally. A rational act is defined by Brams as one that leads to the best possible outcome for a player. Was Jesus's death on the cross a rational act? It would hardly fit Brams's definition. Yet, the entire New Testament could be viewed as the interaction of Jesus (presumably a rational being) with other players in a two-dimensional sense.

With regard to the 'Revelation Game' Brams states (p. 18) that "God has an overriding reason for not revealing Himself directly: it would undermine any true test of a person's faith, which I assume to be belief in God not necessarily corroborated by direct evidence." Again, this assumption of divine objectives conflicts with the Scriptures (*e.g.*, Romans 1:21, Hebrews 1:1). A different interpretation of the revelation game is possible when the outcome matrix is reordered. Such is the case with the search-decision game (p. 34) and indeed for all other games based on scriptural examples.

The second major problem is more fundamental and is not explicitly addressed by Brams. Can the interaction of a superior being and a person, such as that of the infinite biblical God and a finite human being, be accurately characterized by game theory? This problem is in part related to the subjectivity of operational definitions and *a priori* assumptions, but it goes beyond this. Modelling the behavior of an infinite being is impossible except where we have knowledge of such a being's character. As long as that knowledge is incomplete any behavioral model must be speculative at best.

This is evident in Brams's attempt to explain the problem of evil by showing how arbitrary behavior (which appears evil to P) allows SB to achieve his best outcome.

> This may result in wrongful punishment of the righteous and undeserved rewards to the wicked, making SB appear unethical if not despicable. I conclude that though this behavior may be inconsistent with the supposed benevolence and rectitude of God, it is not necessarily irrational or misguided for certain goals one might attribute to a superior being.

Such an argument assumes that the behavior of SB is 1) arbitrary and 2) designed to maximize SB's own benefits. Moreover, if one assumes a sovereign God who acts according to his own will (as do the Scriptures) then the behavior of such a being is beyond the modelling capabilities of game theory, which requires knowledge of the objectives of each player. Brams's thesis is well-written and logically presented; nevertheless, the applicability of his methods to the problems addressed is questionable.

Reviewed by Bradley Bennett, Department of Biology, U. of North Carolina, Chapel Hill, NC

THE SUPREMACY OF JESUS by Stephen Neill. IVP (1984). 174 pages. $5.95.

This book is the third in the "Jesus Library" edited by Michael Green. The author is the late Assistant Bishop in Oxford. He brings a broad scholarship and wide experience (life in India and Kenya, Germany and the U.S.) to the problem of the uniqueness of Jesus among the world's religious leaders; e.g., Gautama, Moses, Muhammad, and Zarathustra. He compares Christ's ethical teachings with those of Aristotle, Confucius, and Plato. In general, he approaches each question historically with candor, grace, and often fresh insight. The author concludes that Jesus is not only unique, but actually supreme!

The Introduction poses "The Central Point of History," *viz.*, "What is your beloved more than another beloved?" (S. of S. 5:9). Nine chapters are devoted to various aspects of this question, each beginning with a definitive concern and ending with a concluding quotation. These are (1) "Human Nature: Reality and Caricature," (2) "Moses and Law: Jesus and Liberation," (3) "Teachers East and West—Guatama, Socrates, Jesus," (4) "A True Prophet: or More Than a Prophet?", (5) "Jesus or Barabbas—Which Is the True Messiah?", (6) "The One Son through Whom All Can Become Sons," (7) "The Friend through Whom Bad Friends Can Become Good Friends," (8) "One for Many—Does It Make Sense?" and (9) "Savior from What? Savior for What?"

Highly recommended!

Reviewed by Raymond J. Seeger, Bethesda, MD

THE GREAT REVERSAL; Ethics and the New Testament by Allen Verhey. Eerdmans (1984). 246 pages. Paper $13.95. ISBN 0-8028-0004-1

I was very disappointed in *The Great Reversal.*

It is an erudite review of contemporary ideas about the nature of the New Testament, its literary forms, and the processes by which ethics develop. Verhey, Associate Professor of Religion at Hope College in Holland, Michigan, is intimately familiar with the literature on this subject and has written a conveniently organized and well indexed book. He argues that "the ethics of the New Testament is diverse and pluralistic" (p. 73) and then describes a variety of concrete situations addressed in various portions of the New Testament. After this, he addresses the methodological considerations in developing ethics.

So, why the disappointment? What's wrong with *The Great Reversal*?

First, I found only husks, no grain. Verhey's "modest proposal" provided "no recipe for making decisions on the basis of Scripture" (p. 196). His ambition was merely to "bridge the gulfs" among some Christian academic disciplines and others in the Church. After 200 pages I was no more equipped to address ethical issues than when I started.

Second, while examining some issues with excruciating philosophical rigor, Verhey cavalierly ignores equally momentous presuppositions in his position. For example, he accepts the contemporary idea that the New Testament is not simply what it claims to be as evidenced in the following

> The Sermon [on the Mount] is Matthew's construction rather than a verbatim record of a lecture by Jesus. (p. 85)
>
> The Pastoral Epistles were probably not written by Paul. (p. 126)
>
> The Bible stakes its case on history, but it is quite unconcerned about minute circumstantial accuracy. (p. 175)

Verhey does not directly address the issue of how documents of such character can be a reliable guide for ethics (or theology).

Finally, a nit pick. Verhey chose to lump Christian thinkers into only three general categories: liberal, neo-orthodox, and fundamentalist. The latter category, containing both evangelicals and fundamentalists, is treated quite superficially and dismissed without the depth of treatment given the other two. I had expected a more balanced treatment. Two writers, Carl Henry and Harold Lindsell, predominantly are used to represent the "fundamentalists" in contrast to dozens cited from the other two groups.

Verhey's intended audience eludes me. The book is far too technical for the lay person or for beginning students of theology and religion. Advanced students should not need the tutorial provided by Verhey's extensive review of the literature. Perhaps he is aiming at the academics on the shores of the gulfs which he hopes to bridge, with a primary intent to establish his credentials as one who knows the field.

Reviewed by D. K. Pace, The Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland.

WALKING IN WISDOM; STUDYING THE PROVERBS OF SOLOMON By William E. Mouser, Jr. Inter-Varsity Press (1983). 169 pages. $4.95.

From childhood I was taught to love the proverbs both for their content and for their form. I wish my father and I had had this book then, and I am thankful it will be available as I try to engender enthusiasm for wisdom in my own children. The author claims that his book "will aid [the reader] in beginning an enjoyable and profitable lifetime study of Proverbs." I agree.

The book comprises thirteen chapters and two appendices. Chapter 1 defines a proverb as a brief, concrete, general truth with diverse applications; it is neither a law nor a promise. Thus, proverbs require study or meditation before they can be understood. Chapter 2 explains the purpose of Solomon's collection, as given in its introductory verses, as moral development (acquiring living skills and moral discipline) and mental development (distinguishing between things, especially right and wrong).

Chapters 3 through 10 deal with various technical devices used in the proverbs, giving a framework for recognizing and understanding them, together with numerous examples. The chapter titles are clever and illuminating. The aspects covered are synonymous and antithetical parallelelism ("But & Both, Either & Or"), asymmetrical antithetical parallelism ("Filling in the Blank"), emblematic parallelism ("Cerebral Cartooning"), synthetic parallelism ("Conundrums and Other Mind Benders"), recognizing figures of speech ("As Plain as the Nose on Your Face"), similes and metaphors ("Your Hair is Like a Flock of Goats"), synecdoches ("All About Parts and Wholes"), and metonymies ("Houses That Talk").

Chapter eleven deals with the practical nature of the proverbs—they must be applied to daily living. Chapter twelve again stresses the theme of meditation, gathering together a set of specific recommendations for studying and applying the proverbs. Finally, chapter thirteen points to other books useful in studying Solomon's sayings.

Most chapters conclude with study questions; answers are provided in an appendix. A second appendix, a delightful thing to find in the last few pages of the book, gives two sample "meditations" in detail.

This book is not a commentary. Mouser recommends Derek Kidner's *The Proverbs* in the Tyndale Old Testament series, and I heartily agree. Mouser does not deal with every verse, while Kidner does, albeit briefly. But Mouser gives a valuable framework that goes beyond what Kidner's necessarily limited introductory material can do. The two taken together make an excellent pair of tools for dealing with the Book of Proverbs.

In short, this book is a treasure. I was delighted to see it and have been recommending it highly since I read it.

Reviewed by David T. Barnard, Director of Computing Services and Associate Professor of Computing and Information Science, Queens University, Kingston, Ontario, Canada.

Letters

Praise and Appraisal

Thank you for giving us the outstanding essay review by Paul Fayter in the latest issue of the *Journal*. It is one of the finest pieces of thoughtful commentary that I have ever read on any subject; certainly I have not seen a more insightful review of the creation/evolution literature. I trust that we will hear from Mr. Fayter again, and I hope that we won't have to wait too long.

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Exception Taken: A Critique of Norman Geisler's Response to Davis Young

Geisler's response to Young (*JASA*, March 1985, pp. 51ff) demonstrates a technique against which informal logic texts warn, that of persuasive definitions. It is, says Fogelin (*Understanding Arguments*, 2nd ed., p. 52), "a particularly subtle form of slanting . . . to gain an argumentative advantage." It involves slipping a question-begging revision into the discussion. Specifically, Geisler redefines 'science' to include reference to supernatural causes and interventions, miracles, singularities, citing "the founders of modern science" in justification. He could have noted that philosophy was once called the queen of the sciences. Or that the seven liberal arts were also called the seven sciences. But this would have exposed the archaic nature of his usage.

The *Oxford English Dictionary* noted, some sixty years ago, that 'science' was often "restricted to those branches of study that relate to the phenomena of the material universe and their laws, sometimes with implied exclusion of pure mathematics." This usage is now almost universal in English, so that the older senses require qualification. It is usually necessary to specify *formal* science if the reference is to mathematics and logic. Otherwise the reference of 'science' is to the empirical sciences, to what Geisler tries to denigrate as "operational science." One is obviously free to stipulate an alternative definition if the common one is inadequate or imprecise. But such a change usually has a penalty—one communicates only to a limited group or within a restricted context. As a consequence, Young speaks to the membership of ASA and to the secular members of the Philosophy of Science Association equally. But Geisler restricts himself, barring lengthy explanations, to those committed to "creation science."

Geisler claims that Jastrow gives creationists "a right to conclude there was a cause (Creator) of the beginning of the universe." He overlooks, first, the overwhelming philosophic evidence that the First Cause is not a cause among causes, but involves a shift of meaning, an analogical rather than a univocal usage. Second, he ignores the complexity of the concept of causality, which tends to confuse, rather than to clarify, most problems. One need only note that Mario Bunge wrote a book, and William A. Wallace a two-volume work, on the topic.

Third, Geisler papers over the equivocal nature of the evidence given by science relative to the origin of the universe. I too like to

think that the current version of Gamow's cosmology points to a creation *ex nihilo*. But science has not, the last I heard, been able to extrapolate before 10^{-43} second after the initiation of the "big bang." There is the scientific possibility that the universe is cyclic, that a "cosmic crunch" preceded the universal expansion. Indeed, I have been told that, even if the universe is now expanding without the possibility of future collapse, it could have reached this state by a series of expansions and contractions, whose number is not ascertainable. And there may be just enough matter in the universe to produce yet another cycle. These possibilities point out anew, if the warning is still needed, that one cannot base theology on the current state of science.

There is, however, another way in which Geisler may be read. It is not explicit, but seems to underlie his statements. Is it implied that scientists cannot, or must not, discover the universe to be cyclic? If Geisler has not forgotten the lesson taught by Galileo, his language is acceptable to those who have.

It seems to me that Geisler goes too far in ascribing a counter-scriptural motivation to Young (par. 10). The full context of Young's statement (*JASA*, September 1984, p. 157) reveals a total commitment to Scripture. The declaration of the glory of God by the heavens is not the product of science, but antedates science by millenia. David sang Psalm 19 more than twenty-five centuries before Galileo fathered science. And I doubt that one is likely to find God in

$$v = at \qquad s = \tfrac{1}{2} at^2$$

or other scientific formulas. Perhaps Young could have written more carefully, but he has a point. Further, Romans 1:18–20 needs to be interpreted in the light of verses 21 and following. Does Scripture warrant the claim that every pagan had adequate knowledge of the Father until he personally suppressed it? Is it not possible for the suppression of truth to be a product of the ungodly environment in which one grows up? Does missing the mark (3:23) entail a deliberate personal rejection of God's revelation in nature? It seems that Geisler's paragraph requires that each question be answered with a "yes." Perhaps he too could have written more carefully.

Finally, I tentatively suggest that there may be a correlation between "creation science" and the description of "science" by the successors of John Dewey. Many of us remember the four to six step "scientific method" that was presented in elementary science texts for decades, despite protests from the scientists who knew better. I trace its origin to Dewey's *How We Think*. But his version was more complex than the science-by-the-numbers pushed primarily by the education department members. I feel that they wanted the prestige of science but could not approach the rigor and precision of the recognized sciences. So they cut science down to a procedure within their capacity. That is, they "redefined" science as a puerile and jejune exercise requiring neither intelligence nor skill. (Perhaps I give Dewey too much credit for his version, for in *Reconstruction in Philosophy* he wanted to make philosophy *scientific*.) It seems to me that some people are presenting theological speculations as "creation science" in the hope that some of the prestige of science will rub off on their efforts. Before I am taken to task for ascribing a lack of principle to these parties, I note that I am not commenting on motivation. Noble intent is not proof against a subconscious need to produce a set of predetermined results. And I repeat that this is a suspicion, not a demonstration.

David F. Siemens, Jr.
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Reply to "A Biologist Examines the Book of Mormon"

May I call the attention of your readers to certain corrections which need to be noted in Dr. Key's presentation. Dr. Key is an esteemed friend and my former professor while in chiropractic school.

There was a reason for the choice of Egyptian as the vehicle for recording the Book of Mormon, as the Egyptian language expressed extensive concepts with fewer characters than the Hebrew. Moroni in Mormon 9:33 says, "If our plates had been sufficiently large we should have written in Hebrew." The prophets who kept the record which became the Book of Mormon knew it was intended to last for centuries and was to come to the attention of their descendants. The scriptures that they took with them from Jerusalem were engraved on metal plates. They continued this practice in recording their own current history. Because of the difficulty in melting ore, preparing thin plates, and thereafter engraving on them, the more concise Egyptian was chosen for these particular records. That is not to say that Egyptian was the spoken language. Dealings with Egypt, cultural, political, and commercial, were important before the Babylonian captivity, as later with Greece and Rome, when Greek and Latin became the dominant languages. As you know, language does change over time, Italian differing from Latin and our English from Chaucer's English. Moroni called the later form "Reformed Egyptian."

Nephi says that the group gave proper names to geographic entities, such as Shazer, Irreantum, the river Laman, etc. These were for their own temporary convenience and found their way into no geographies. In view of the infinite variety of proper names, would all of them have come down in history?—especially in the form of a dictionary of Semitic or Egyptian! And would an isolated body of people be limited therafter just to names familiar to them?

"Deseret" is mentioned by a Jaredite prophet, dating from the period of about 2000 B.C. to 600 B.C., antedating the people of Lehi. Their language, not having been confounded at the Tower of Babel, would have been neither Egyptian nor Semitic. Again, these people were isolated from the Eastern Hemisphere.

The Liahona was a unique instrument bestowed by God. It served as a compass but worked only when used with faith in God. As far as we know, it was the only one of its kind and so would have been unknown to any other people. A term had to be coined for it.

Articles have been written in our Latter Day Saints' *Ensign* magazine by those who have followed the approximate route taken by Lehi and his party. As I recall, there was from early times and there still is today a spot on the coast of southeast Arabia that is fertile and wooded. Spices and timber were brought from there over the ancient Spice Route. The articles, I believe, made mention of a small river flowing into the Red Sea about three days' journey by camel from Jerusalem. Whether that is in present-day Arabia, I do not know.

Some scholars have postulated that it may not have been the Red Sea that the Israelites crossed. The King James has 'Red Sea.' My French bible prefers *la mer des Joncs*. I doubt whether the exact site of the crossing has been definitely established to the satisfaction of scholars. Apparently, the plates that Joseph Smith translated gave it as the Red Sea. One seems to have a choice between plates dating back at least to 600 B.C. or the Bible dictionary which you consulted.

The people of Lehi, to judge by the frequent reference to the "narrow neck of land," settled chiefly in Central America and northern South America. It is thought that the Lehites correspond to the people known today as the Mayans, who appeared in history about 600 B.C. and flourished for about a thousand years. The Jaredites correspond probably to the Olmec civilization. They

appeared to have crossed the Atlantic and been confined to North America. Some non-Mormon archeologists use the Book of Mormon as a guide in locating ruins.

Given that the Lehites came via the Pacific and settled in tropical regions where there were also highlands, we can see how the crops of the Near East could be grown there. Right here in Oakland and farther south in California all of those crops are growing in abundance. While it gets very cold here, it does not freeze, as it does in Florida and Georgia. I have seen oranges and lemons on the trees from October, when I arrived, to now, in June. Olive trees grow on the Mormon Temple grounds and 30 miles inland.

Archeological finds, which were just beginning when the young Joseph Smith was trying to elude persecutors long enough to do the work of translation, have tended to confirm the Book of Mormon as to the existence of articles, crops, animals, and so on, formerly thought not to have existed in the early Americas. Archeologists, both Mormon and non-Mormon, have a hard time convincing some of their colleagues of new evidences that come to light. In view of previous upsets, would it be well to use caution in stating flatly that something did not exist at some dim period of history? Much more is coming to light about our own western civilization, for example, than that being taught when I first studied it.

Can one really object to the expression that a seed "swells?" Soak some beans overnight and see what they do. Better still, you who delight in experiments (I especially prize the one about feeding the cereal *carton* to the white rats!)—sprout some mung beans, lentils, or alfalfa seeds. The mung beans in particular swell and split their outer coating.

Once more, remember that the Lehites inhabited primarily the regions just south and north of the narrow neck of land. And we do need to be careful about stating positively that certain animals, etc., did not exist at a particular early period shrouded in distant time. Animals, fish, and plants are subject to mutation and/or extinction. Consider the La Brea tar pits. And at one time Bible critics would have thrown out most of the Bible on the scanty archeological evidence they had at the time.

Is it correct to say that an author "plagiarizes" when he frankly states that he is quoting word for word? Nephi says that he delights in the words of Isaiah, and he makes them known to his people, as he is the only one who has access to the brass plates which were brought from Jerusalem. He quotes from them because many of Isaiah's prophecies pertain to his people and to the "Gentiles," whom he knew would one day read the book. It is clear that Isaiah in speaking of an asp and a cockatrice was referring to the Millennium, expressing himself in his own idiom of the 7th century B.C.

Ether 9:18–19 lists cattle, oxen, and cows but not as separate species. Ancient writings often seem quite redundant to us. The Bible is replete with repetitious expressions. It was Joseph Smith's commission simply to translate what the ancient authors had written, and translate he did. How much, after all, is known about what existed in North America from 2000 B.C. to 600 B.C.? American settlers have been too busy with workaday affairs and covering the landscape with concrete dwellings and high-rises to dig down that deep—at least until recent years. A comprehensive profile of what lies under present-day United States has yet to be projected, as far as I know—a spotty profile, perhaps, yes.

The Jaredites were not Jews and were not forbidden to eat pork. Jews began to be distinguished by that designation when the Israelitish kingdom was divided after the death of Solomon about 900–800 B.C. The Jaredites dated from about 2000 B.C. and were unknown to the rest of the world. The Israelites were given their dietary restrictions by Moses about 1300 B.C. in the wilderness of Sinai.

If neas, sheum, cureloms, and cumoms are not further identified, it is that there are no known equivalents today. Joseph Smith was simply translating.

Concerning poisonous snakes, this seems to have been one of the ways that the Lord punished those who had made a covenant with Him to keep His commandments and then proceeded to break the covenant. You are familiar, I am sure, with the fiery serpents sent as punishment to complaining Israelites (Numbers 21:5ff). The remedy against the snakebite was scarcely in accordance with natural law.

Concerning books among pre-Columbian Indians—when I took my degree in library science at Columbia University we learned that the Spanish priests, considering them heretical, endeavored to destroy all of the books and records that they found among the natives. However, a few have survived and are on exhibit in various libraries over the world. Pictures of them have appeared in journals, etc. The pages are arranged in accordion style. Stone pillars with inscriptions abound, but, the last I knew, few had been deciphered. There are many indications of a high degree of civilization—brain surgery, calendars, cement, and metal plates with engravings—as well as the legends of the visit of a white God.

Ether 2:2 says only that the Jaredites carried with them the fish which they found in those particular waters in the valley where they were.

I agree about that second hole in the "bottom" of the Jaredite barges. We are not enlightened as to how it was to aid in ventilation or otherwise. Also that the beheaded Shiz raised up and struggled for breath! *Ca fait un drôle d'un effet, quand meme!*, as the French would say. If Joseph Smith had been composing rather than translating, do you think he would have written those statements thus?

The environs of Jerusalem could well have been referred to by the people of Lehi's time as the "land of Jerusalem," just as New York may be either a city or a state. When Joseph reached the point in translation which referred to a wall around Jerusalem, he said to his scribe, "I did not know there *was* a wall around Jerusalem."

It is true that other racial strains entered into the Indian race as it existed at the time of Columbus. I attended an unusually rich exhibition of pre-Columbian archeological findings from Mexico at the Metropolitan Museum of Art in New York City. The facade of a temple there bore female statues that looked distinctly Chinese. Also, newspaper articles over the years have mentioned the finding of Phoenician and Scandinavian artifacts. Then of course there was Thor Heyerdahl's feat of crossing the Atlantic in a reed boat from Egypt. Yes, the Book of Mormon does not pretend to be a comprehensive history. It concentrates on two migrations only, just as the Old Testament concentrates largely on the history of the Israelites. I believe blood type studies have been made which would not discredit Hebrew extraction for at least some Indian strains.

Some grammatical errors still persist in the Book of Mormon. The first draft was the subject of much scorn on the part of the printer. The prophet's wife, Emma, who had been a school teacher, stated that Joseph was incapable of writing a correct sentence at that time. Nor did he succeed later in improving his personal writings very much. He had learned the rudiments of reading, writing, and arithmetic from an itinerant tutor who, after the custom of the day in rural pioneer America, boarded with the family for awhile to teach the children. My own grandfather, born in 1845 on a Florida orange grove, received his schooling in that way. As one compares the personal letters and diaries of Joseph Smith with the exalted truths and noble language of the revelations as they came from the Lord to this humble man whom He called from his farm duties to be the first prophet of the latter days, one is struck anew by the divinity of the work.

I know of no contradictions between the Book of Mormon and other official Mormon writings nor between the Book of Mormon and the Bible. The Lord brought forth the Book of Mormon in direct fulfillment of certain prophecies in the Bible that fit the Book of Mormon with peculiar exactness.

As Moroni counseled, "And now, if there are faults, they are the mistakes of men; wherefore, condemn not the things of God, that ye may be found spotless at the judgment seat of Christ."

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Dr. Key Responds . . .

I appreciate very much the response of Ellis Davis to my June, 1985 Communication on "A Biologist Examines the Book of Mormon." Dr. Davis is a Mormon, a former student of mine, and a good friend. I have many good Mormon friends.

"Irreantum" does not mean "many waters" (I. Nephi 17:5) in Hebrew, Egyptian, or any other Semitic language.

While it is certainly natural for travelers to give temporary names to places, yet the names unique to the Book of Mormon simply are not Hebrew, Aramaic, Egyptian, or of any other known languages.

Regarding Dr. Davis' explanation that "Deseret" (Ether 2:3) was from the Jaredites about 2,000–600 B.C., antedating the people of Lehi, and living prior to the confusion of languages at Babel—Ussher dates Babel at 2,247 B.C. and Abram's moving from Ur at 2126 B.C. And, Ussher is very conservative.

I would be interested in knowing more about the wooded spot in Arabia. My brother lived in Arabia for four years, and knows nothing about it even though he traveled widely. It was a geologist friend that told me that Arabia has possessed no rivers since the Pleistocene. It was he who said that the nearest thing to a river that Arabia ever had since the Pleistocene was certain intermittent wadis, certainly not "continually running" (I. Nephi 3:9).

I would be interested to know some specific names of non-Mormon archaeologists who use the Book of Mormon as a guide in locating ruins in North America. While a student at University of California at Berkeley, I walked into the Office of the Department of Archaeology, and started asking questions like "Did North American Indians use swords, plows, highways, head-plates of metal, sickles, cement, chains, etc.?" The woman archaeologist answered my question with a question: "You are a Mormon, aren't you?" I said "No, but several of my good friends are, and they encouraged me to read the Book of Mormon." She said, "Well, I am a graduate of B.Y.U., and I was a Temple Mormon in Salt Lake City. When I saw how far off the Book of Mormon is in archaeology, I left the Church." She said that the answer to all of my questions is "No."

I asked the archaeologist if it is true that non-Mormon archaeologists rely on the Book of Mormon as a guide. She said that most are aware of it, but because of its numerous errors, none take it seriously.

While it is true that lemons, oranges, olives, pomegranates, figs, and other Middle Eastern plants thrive in parts of North America, all such plants are derived from those brought over by the Spanish and other modern Europeans.

Regarding Nephi's quotation of Isaiah, why would he pick the KJV of Isaiah among all the English translations? Mormons rightly say they accept the Bible where it is correctly translated. However, the KJV wrongly translated many things, e.g., unicorns, satyrs, fiery flying serpents, apple tree, mulberry tree, Red Sea, barrel, raven and others too numerous to mention. But the Book of Mormon quotes the KJV errors without correcting them. What an excellent opportunity Joseph Smith would have had to prove he was a true prophet! Mormons insist that the B. of M. is correctly translated. Why did it not correct the errors of the KJV?

I cannot agree that Isaiah's terms, *asp* and *cockatrice*, are idiomatic names of North American snakes during the Millennium. They are too specific. He could have said "serpents" or "vipers"—something more general.

It seems hardly likely that anything so common and so useful as neas, sheum, cureloms, and cumoms were said to be would be allowed to become extinct.

The rabbis I talked with said that the ancient Jews did not refer to their country as "the land of Jerusalem."

I would be interested in more specific information on blood types among certain Indian tribes that are similar to those of Hebrews.

I am puzzled about why my Mormon friends insist that the Book of Mormon is translated correctly when the original, a copy of which I read, had so many grammatical, spelling, and punctuation errors. If the Hebrew and Greek manuscripts of the Bible had these, I would flatly reject the Bible as not inspired. Can any Mormon help me here?

We have no Middle Eastern fish or birds in North America that have not been brought here since Columbus.

The implied reproductive rate in the B. of M. is astronomical. The placement of animals of Asia Minor in the Americas is inexcusable as is the assertion that America's plants are from Asia Minor.

I appreciate the attempts of my former student and my good friend in answering the many scientific problems in the Book of Mormon, but as I see it all of the ones not discussed and practically all of the ones discussed still stand.

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Correction:

In the book review of Henry Morris's *History of Modern Creationism*, by Jerry Bergman, published in the September 1985 issue of JASA (p. 187), the name *Henry Riemer* should read *Harry Rimmer*. We extend our apologies to Dr. Morris and to our reading public.

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