PERSPECTIVES on Science and Christian Faith

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In this issue . . .

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

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Putting Things in Perspective

To many people, Christian or non-Christian, "science" and "religion" (and evangelical Christianity in particular) mean the truth or falsity of "creation" or "evolution." While this is certainly an area of conflict, there are many other areas—e.g., philosophical, intellectual, ethical, *etc.*—for which there is a need for an open discussion of evangelical "perspectives on science and Christian faith." In this issue we have papers dealing with creation/evolution, and some of these other areas in which there is a need for such open discussion; areas in which ASA is concerned.

In the first paper, physicist John Cramer examines David Hume's arguments against miracles. Cramer finds serious flaws in Hume's "proof" that there can be no such thing as a miracle. Cramer emphasizes that, if we took Hume seriously, we would have difficulty accepting any startling new discovery (such as high temperature superconductivity). Indeed, we do have some difficulty, but we are able to adjust because we trust competent scientists and we know that our present knowledge is tentative and incomplete. Cramer concludes that although miracles "are not *absolute* evidence" for our faith they "*are* evidence for the truth of Christianity." Moreover, Hume's "proof" is "as dead as its author."

As evidenced by the *Imago Dei* Symposium at Gordon College this past June, as well as numerous books and other publications, another critical area in need of Christian perspectives is the phenomenal advances in biomedical technology. Based in part on his own research with farm animals, Randall Prather examines some of the recent developments in reproductive biotechnology. Prather considers that the "cultural mandate" of Genesis One allows for the development of these technologies for laboratory and domestic animals. Such technologies can benefit humans by improving nutrition. Nevertheless, when applying such techniques to humans some caution is advised. We need to prayerfully consider when we are "playing God" and when we are faithfully carrying out the "cultural mandate."

Recent-creationists, who interpret Genesis with extreme literalism, hypothesize a young earth and explain the fossil record through the flood at the time of Noah. To adherents of this interpretation, humans and dinosaurs must have co-existed before the flood. With such an interpretive bias it is not surprising that some of these "creationists" should eagerly and naively accept "evidence" of this coexistence. Hence, when presumed human footprints were found in the same rock strata as dinosaur footprints there was considerable excitement and rejoicing. Alas, in a few short years it was shown that the "human" footprints were partly dinosaur footprints and partly forgeries. Ronnie Hastings provides us with a first-hand report of the "rise and fall of the Paluxy mantracks." This episode is another sad example of how humans—Christians, scientists, *et al.*—allow their preconceived ideas to blind them to reality. Hence, they discredit their faith and/or their science. We need to constantly and humbly reevaluate our interpretations of God's word and God's works. Hastings shows how uncritical acceptance of "evidence" can lead to embarrassment and disillusionment.

Reevaluation of evidence and theories is part of good scholarship. In our leading Communication in this issue, George Marsden gives us an evaluation of evangelical scholarship today. Marsden, after pointing out the dangers of secularization, emphasizes that "Protestant liberalism has flowered and seems to be dying on the vine." Furthermore, in evangelical circles there seems to be a growing awareness that the basic presuppositions of Christians are different from those who assume a chance universe. Thus, we cannot expect to win our case merely by rational arguments. He summarizes and discusses the major challenges to evangelical Christianity today as: 1) "the politicization of the scholarly enterprise," 2) "maintaining our momentum in defining the distinctives of evangelical Christian scholarship," and 3) keeping our internal pluralism from drifting into relativism on critical issues. Such challenges are important for interdisciplinary and interdenominational groups such as ASA. How do we avoid the narrow and ultimately sterile adherence to

one pet theory while at the same time keep ourselves from drifting into the pitfalls of a shallow relativism?

As an example of a nonproductive rigidity, Clarence Menninga discusses one attempt of Christians to deal with a biblical interpretation that implies a young earth and a fossil record that seems to indicate otherwise. Menninga evaluates the view that the fossil record indicates only "apparent age" rather than reality. After emphasizing that "time" is a creature of God, he points out that "apparent age" is inconsistent with the reality and meaningfulness of all history as well as the fossil record. Such a view certainly opens up other areas of distrust in the evidence of both the universe and Scripture.

Continuing in our presentation of *SEARCH: Scientists Who Serve God*, our third issue of this "laypersons" science insert focusses on ASA Fellow and council member Stanley Lindquist and his continuing work in the field of psychology, especially with Link Care Foundation.

Most of our readers will be aware of at least some of the negative comments that have been published regarding ASA's *Teaching Science in a Climate of Controversy* (*TSCC*). Some of these criticisms from professional biologists and geologists reflected an honest and reasonable concern that our booklet did not go into greater detail on the mechanisms of biological change, molecular genetics, and paleontology. These professionals were looking more for an exhaustive treatise on evolutionary theory. However, they overlooked the audience to which *TSCC* was directed: the public school/high school science teachers whose clientele are not scientists, whose parents are often without a college education, and who have to deal with the emotion elicited by words like "evolution," "creation," "religion," and "God." A publication to help them be honest and fair had to be simple and could only direct itself to the issues that concerned the general nonscientific, and often anti-scientific, public.

On the other hand, some criticisms of *TSCC* were from biologists and geologists with firm philosophical commitments to materialistic and atheistic explanations of the natural world. These professionals, though competent in their own specialties, often seem more interested in promoting their anti-religious biases than good science—at least when it comes to theories of origins. The mere hint of a "Creator" stirs up visions of and antagonism toward a 4004 B.C., six 24-hour day special creation. (In this they are very much like their Fundamentalist opposites who see atheism in even the slightest reference to an evolutionary process.) Such scientists, therefore, tend to read publications like *TSCC* as "creationist" plots, and they engage in much prejudiced reading between the lines.

John Wiester, one of the members of ASA's Committee for Integrity in Science Education and a key person in the writing and editing of *TSCC*, responds to some of the criticism. He addresses the objections to the handling of two of the four "open" questions covered in *TSCC*: Did the universe have a beginning, and where did the first animals come from? He refers to criticisms of Juliana Texley in *The Science Teacher* and *The Scientist*, to D.B. Wake in *The Scientist*, and to W.J. Bennetta *et al.* in *The Science Teacher*, as well as to W.J. Bennetta, N.A. Wells, and S.D. Schafersman in articles in the *Creation/Evolution Newsletter*. Wiester chides these critics for their expectation of a text on evolution and for their unwillingness to see the lack of documentation in the fossil record for the origins and the earliest evolution of the invertebrate phyla.

One of the attacks on *TSCC* referred to by Wiester was published in *The Science Teacher* for May 1987. Edited by William Bennetta, "Scientists Decry a Slick New Packaging of Creationism" elicited a comment by your editor in my editorial in the September 1987 issue of *Perspectives on Science and Christian Faith* (p. 125). In that comment I referred to this criticism of *TSCC* as "distorted history, bad science, and misleading attempts to read between the lines," and the "preconceived and prejudiced philosophical biases" of the authors. In November Bennetta asked me to provide him with "a list of specifics in this context." Since he indicated he wanted this information for an article he hoped to publish in 1988, and since I think it is important to be as open as possible in discussing controversial issues, I am publishing my reply to Bennetta. I encourage readers, if they have thoughtful and charitable observations on this important issue, to write to us and/or other involved publications.

WLB

Miracles and David Hume

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David Hume believed he had found an "everlasting check" against belief in miracles, "useful as long as the world endures." Indeed, Hume's proof has been a major skeptical influence. Careful consideration, however, uncovers a number of serious flaws in the proof which render it useless. In particular, Hume's confidence that a miraculous explanation is always less probable than a naturalistic one turns out to be misplaced.

In the introduction to his *Everlasting Man*, G.K. Chesterton remarked that many people "live in the shadow of the faith and have lost the light of the faith."[1] This sad state is not, I think, unrelated to the fact that the Christian faith itself has necessarily lived in shadows since the Enlightenment. There was unbelief before that time, but not until the Enlightenment was that unbelief intellectually respectable. A major contributor to this change was David Hume. Known more in his own time for his writings on English history, Hume is best known today as the greatest of skeptics.

It is not primarily his skeptical view of human knowledge that has damaged people's view of theology. Undoubtedly, the longest shadow Hume cast over theology came from his devastating critique of miracles. Almost single-handedly, he deprived the theology of the supernatural of its status as an intellectually respectable category of thought.

Hume's attack on miracles appears as a chapter in his primary exposition of skepticism, *An Enquiry Concerning Human Understanding*, published in 1748. Although this work is strongly associated with his skepticism, it is quite separable from it. In fact, in ways it is in conflict with both his empiricism and his skepticism, as we shall see.

Hume's Argument Against Miracles

Hume's argument, which he judged would be "an everlasting check to all kinds of superstitious delusion . . . useful as long as the world endures,"[2] can be briefly summarized: A miracle is necessarily less probable than *any* alternative explanation, so the alternative is preferred to the miracle. He concluded:

> Upon the whole, then, it appears, that no testimony for any kind of miracle has ever amounted to a probability, much less to a proof; and that, even supposing it amounted to a proof, it would be opposed by another proof; derived from the very nature of the fact, which it would endeavor to establish. It is experience only, which gives authority to human testimony; and it is the same experience, which assures us of the laws of nature. When, therefore, these two kinds of experience are contrary, we have nothing to do but subtract the one from the other, and embrace an opinion, either on one side or the other, with that assurance which arises from the remainder. But according to the principle here explained, this subtraction, with regard to all popular religions, amounts to an entire annihilation; and therefore we may establish it as a maxim, that no human testimony can have such force as to prove a miracle, and make it a just foundation for any such system of religion.[3]

Hume's argument depends on the definition of a miracle as "a violation of the laws of nature," but these laws are established by "a firm and unalterable experience" against the occurrence of such violations. As he said:

> . . . it is a miracle, that a dead man should come to life; because that has never been observed in any age or country. There must, therefore, be a uniform experience against every miraculous event, otherwise the event would not merit that appellation. And as a uniform experience amounts to a proof, there is here a direct and full *proof*, from the nature of the fact, against the existence of any miracle; nor can such a proof be destroyed, or the miracle rendered credible, but by an opposite proof, which is superior. . . . When anyone tells me, that he saw a dead man restored to life, I immediately consider with myself, whether it be more probable, that this person should either deceive or be deceived, or that the fact, which he relates, should really have happened. I weigh the one miracle against the other; and according to the superiority, which I discover, I pronounce my decision, and always reject the greater miracle. If the falsehood of his testimony would be more miraculous than the event which he relates; then, and not till then, can he pretend to command my belief or opinion.[4]

Men of the eighteenth and nineteenth centuries shared Hume's post-Newtonian view of the "laws of nature," so his critique of miracles appeared unanswerable. Certainly no response to his arguments from those centuries has had an enduring influence. Anti-supernaturalism, both in and out of theology, flourished.

It was C.S. Lewis who first responded adequately to Hume. In his book *Miracles*, Lewis uncovered several serious defects in Hume's argument. The first is question-begging:

> The question, "Do miracles occur?" and the question, "Is the course of Nature absolutely uniform?" are the same question asked in two different ways. Hume, by sleight of hand, treats them as two different questions. He first answers, "Yes," to the question whether Nature is absolutely uniform: and then uses this "Yes" as a ground for answering, "No," to the question, "Do miracles occur?" The single real question which he set out to answer is never discussed at all. He gets the answer to one form of the question by assuming the answer to the other form of the same question.[5]

To be fair, whether or not Hume himself understood the implications of his procedure, there is nothing wrong with answering a difficult question by recasting it into a form more easily answered. Possibly Hume would defend himself by claiming to have been following such a plan. Lewis' complaint is, however, that the answer to the "easier" question is *assumed* so that, in effect, the answer to the more difficult question is also assumed rather than discovered by reasoning.

Hume's reason for "assuming" that the laws of nature are absolutely uniform was that "a firm and unalterable experience has established these laws."[6] In other words, experience confirms that the laws of nature are absolutely uniform. The laws of nature are absolutely uniform because, otherwise, they would never have been discovered as laws of nature. The process of determining what is and what is not a law of nature includes this absolute uniformity as a criterion.

The Laws of Nature & the Possibility of Miracles

These serious deficiencies of this post-Newtonian view of the laws of nature were overlooked by Hume. On the philosophical side, this is an inductive view of the laws of nature. Suppose, for example, we have never observed a swan that is not white. Therefore, we conclude by induction that all swans are white. Induction, however, is never sufficient to establish a generalization absolutely. It is always possible that, after a string of thirteen thousand fifty-one white swans, the thirteen thousand fifty-second swan examined will not be white. Laws of nature produced in the manner envisioned by Hume can *never* be determined to be absolutely uniform. All one can say is they have proven uniform to date. That is hardly the absolute uniformity required for Hume's "proof."

The irony of the situation is that Hume knew very well that there was a problem with inductive thinking.

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Lewis noted, "The odd thing is that no man knew this better than Hume. His *Essay on Miracles* is quite inconsistent with the more radical, and honorable, scepticism of his main work."[7] For example, commenting on the problems of human understanding, Hume said:

> For all inferences from experience suppose, as their foundation, that the future will resemble the past, and that similar powers will be conjoined with similar sensible qualities. If there be any suspicion that the course of nature may change, and that the past may be no rule for the future, all experience becomes useless, and can give rise to no inference or conclusion. It is impossible, therefore, that any arguments from experience can prove this resemblance of the past to the future. . . .[8]

Thus, Hume's empiricism conflicted with his view of the laws of nature. If past experience cannot be an absolute guide to the future, then no laws of nature derived from our experience of nature can be absolute. That he retained an absolutist view of the laws of nature in defiance of his own empiricism and skepticism is probably not so much evidence that he was truly a naturalist (rather than an empiricist) at heart, as it is evidence that he was an anti-supernaturalist at heart.

The scientific side of the deficiencies of Hume's view of natural law is not entirely his fault (though, here again, following his own skepticism should have restrained him from this error). Scientists of his time did nothing to discourage (indeed, many actively encouraged) the belief in absolute laws of nature. Nonetheless, even a student of introductory physics who has tried the experimental confirmation of Newton's second law of motion should be suspicious of absolutist formulations of the laws of nature. Certainly research scientists who have been actively involved in the discovery of laws of nature should know how difficult it can be to verify those statements we call the "laws of nature."

For example, in order to conclude that all swans are white, we will need to examine and classify swans. Getting down to the details immediately embroils us in unexpected difficulties. Here is a group of rather dingy gray swans. Do we classify them as white or gray swans? No, we wash them all. Most of them turn out quite white, but a few persist in their grayness and a few turn out yellowish. Now what should we do? Classify them all as white and assume the off-colors are due to some contaminant that cannot be washed off? Is the law of white swans absolute? Not on this showing, and Hume, the skeptic, should have anticipated it.

How relevant is the requirement that the laws of nature be absolute? Cannot Hume's proof be reformulated without absolute laws of nature? Essentially, that has been done by Antony Flew, a modern-day disciple of Hume. An immediate result of relaxing the requirement of absolute laws is that if the laws of nature are not uniformly and absolutely opposed to the occurrence of miracles, one cannot claim that miracles *never* happen. However, Hume's revised argument now deprives anyone of the intellectual right to believe any putative miracle has happened because *any* other explanation is still more probable than a miraculous one.

The revision of Hume's argument costs the naturalist little for the difference between an absolute prohibition on miracles, and an absolute prohibition against believing in miracles is a small cost. The consequences are still disastrous for the supernaturalist who remains deprived of any intellectual right to exist.

Fortunately, some of the deficiencies of Hume's argument remain to be uncovered. In particular, attention needs to be focused on Hume's use of probabilities.

Scientists of his time did nothing to discourage (indeed many actively encouraged) the belief in absolute laws of nature.

Again, it was Lewis who first complained that Hume used probabilities just at the point where they necessarily break down.

> Probabilities of the kind Hume is concerned with hold inside the framework of an assumed Uniformity of Nature. When the question of miracles is raised we are asking about the validity or perfection of the frame itself. No study of probabilities inside a given frame can ever tell us how probable it is that the frame itself can be violated. Granted a school time-table with French on Tuesday morning at ten o'clock, it is really probable that Jones, who always skimps his French preparation, will be in trouble next Tuesday, and that he was in trouble on any previous Tuesday. But what does this tell us about the probability of the time-table's being altered? To find that out you must eavesdrop in the master's common-room. It is no use studying the time-table.[9]

Lewis is actually reformulating Hume's own remarks in this complaint. We have already noted Hume's observation that, "If there be any suspicion that the course of nature may change . . . all experience becomes useless, and can give rise to no inference or conclusion."[10] Once again, Hume's anti-supernaturalism overcomes his skepticism. Lewis' criticism is devastating, coming, as it does, almost from Hume's own mouth. The original prohibition against miracles, weakened into a prohibition against believing in miracles, has slipped yet

further. In Hume's own words, the situation gives "rise to no inference or conclusion."

Nevertheless, we have reached a still very unsatisfactory state of affairs. The possibility of miracles cannot be denied but neither can it be affirmed. The supernaturalist has been allowed elbow-room at least, but the space allotted is airless and cannot sustain life. The naturalist is not much better off (though after his attempted murder of the supernaturalist his sadly reduced estate may not distress us overly much). There are other unsatisfactory features. As Lewis noted, "we cannot say that uniformity is either probable or improbable. . . . This result is equally disastrous for the scientist and the theologian; but along Hume's lines there is nothing whatever to be done about it."[11]

An immediate result of relaxing the requirement of absolute laws is that if the laws of nature are not uniformly and absolutely opposed to the occurrence of miracles, one cannot claim that miracles never *happen.*

Despite this unsatisfactory situation, Lewis considerably improved the logical status of miracles. Hume's "everlasting check to all kinds of superstitious delusion," once regarded as the devastating and final argument against miracles, is palpably in error. We are not, however, quite back to where we started from before Hume. The doubts unleashed by the "proof" are not easily recalled. After all, even though the "proof" has turned out to be less than airtight, aren't miracles really *very* improbable? Isn't there some sense to the thought that explanations which avoid supernaturalism are *always* more probable than those that have recourse to the supernatural?

There are several things to be said in response to these doubts. The first is that, as has already been said, the probability of a miracle cannot be calculated because miracles are not a category amenable to such calculations. Hence, any argument which even estimates the probability of a miracle (an infinitely or very improbable event) is incoherent on the grounds that it is attempting to apply a procedure beyond its natural limits. Our calculations of probabilities are based on experience of natural events, but such experience cannot be applied with any confidence to supernatural events.

While strictly fair and proper, this response is likely to sound much like special pleading. It would appear we are establishing a favored category of explanations immune to the ordinary criteria by which we judge events. For example, while it might be emotionally satisfying to call the ordinary birth of a normal child a "miracle," doesn't this response reinforce a supernaturalistic account of childbirth (if one were foolish enough to advance one)?

In my opinion, this response does indeed offer reinforcement of such an improvident claim. That, however, is not a measure of its foolishness or weakness but of its strength. Only a very strong position can overcome the deficiencies of a weak idea. That is not to say that a supernaturalistic account of childbirth is true; it can be ruled out on other grounds related to the nature of miracles, rather than because it is improbable.

The force of the first response is so great that it might appear we need proceed no further, but there are good reasons for continuing. It is by no means clear yet that we have any respectable reason for believing miracles have occurred. So far we have only prevented the enforced conclusion that we cannot call anything a miracle. Also, the right to believe in a general uniformity of nature has not yet been established.

There is simply no way to estimate the probability of a supernatural event.

Examination of a Miracle

The right to believe in the uniformity of nature is important to me, as a physicist, but I will not pursue it here. Rather, I want to take a closer look at the problem of whether or not one can *ever* conclude a miracle has occurred. Considering the revised form of Hume's argument where the laws of nature cannot be regarded as absolutely uniform, and—for the hope of eventually improving the stalemate we have reached—setting aside the first response that the probability of a miracle can never be properly calculated, what happens when we examine a particular putative miracle?

Hume's proposal was, supposedly, to calculate the probabilities, compare them, and make a decision in favor of the more probable event. In actual fact, no such calculation has ever been attempted (to my knowledge). The results have always been assumed without

substantiation. Why not try to carry out Hume's full program once just to see what happens? Since no event is more crucial to Christianity, I suggest we look at the Resurrection event and, as the alternative explanations, we take the orthodox, miraculous explanation and the explanation that the disciples and witnesses simply lied.

We must calculate the probabilities of the two explanations being true. The probability of drawing the red marble from a bag containing one red marble and forty-nine white marbles is 1:50 (one out of fifty). This probability was found by assuming that the one outcome has occurred and dividing that number (1) by the number of possible outcomes (50 different marbles might have been drawn). To find the probability that a man has come back from the dead, we assign that one event the value (1) and divide that number by the number of possible outcomes. Now, what is the number of possible outcomes? This was just Lewis' point: that number is inherently indeterminant because we have no other events or other experiences to draw on in constructing the number of possible outcomes.

The probability of a miraculous explanation is not *certainly smaller than the probability of a naturalistic explanation for an event. Hume was wrong.*

We have, however, decided to set aside Lewis' perfectly valid complaint. The only experiences to which we can then compare the Resurrection must be all other human deaths. Demographers say that the number of people alive today is equal to half of all the people who have ever lived. Thus, the number of human deaths since the world began is about the same as the number of people presently alive, say, about 5×10^9 deaths. Hence, the probability of the Resurrection is $1{:}5 \times 10^9$, a small but certainly not infinitely small probability.

Quite likely someone will wish to complain, at this point, that the probability I have deduced is far too large. This probability is about one one-thousandth of the probability of winning the Readers' Digest Sweepstakes! The Resurrection is *surely* an extremely improbable event. Wouldn't $1{:}10^{100}$ be closer to the mark? As I have said before, there is simply no way to estimate the probability of a supernatural event. The probability that a natural event will be unique is similarly incalculable (though every natural event *is* unique in some way). All that can be done, then, is to try to find a class of similar events that can correspond to the drawing of individual marbles from the bag. There are no set rules for this procedure. All I can say is that this seems a reasonable way of handling this particular event as a *natural* event. If a critic finds it unsatisfactory we can argue about it, but it is unlikely we will ever reach complete agreement. The stalemate is Hume's fault, not mine. It was *his* idea to calculate the probabilities.

As to the other explanation, there are five primary sources for the Resurrection: the four Evangelists and St. Paul. What is the probability that all these sources lied? First, we calculate the probability that one lied, and then we make a proper combination of five probabilities for the final result. How shall we find the probability that one source lied? Presumably, the ratio we want is 1 divided by the number of possible outcomes—but what outcomes should we count? Do we want the number of times witnesses lie when the lie will cost them their lives? Perhaps we should use the number of times pathological liars occur among normal people? Should we be looking for the frequency at which lies appear in legal testimony?

In fact, there is no clear way to proceed. Nothing in Hume's program guides us in this matter. Obviously, Hume never worried about the problem because he never seriously intended to do real calculations. We have seen that Hume's program is incoherent because it requires the use of a procedure beyond its proper limits. Now we find that the program cannot be carried out unambiguously; hence, it is additionally incoherent in the sense that one can never be certain just how the program is to be followed.

This new defect is serious, but, in any particular case, we may be able to get agreement on a *range* of probabilities. Suppose we find in a range between 1:100 and 1:10,000 the probability that one of the sources lied (numbers I regard as very generous to Hume). When we now ask how we are to combine the five probabilities to get a total, further uncertainties arise. *If* the five accounts are independent, the proper procedure is to just multiply the five probabilities together. If they are not independent, we will need to know more of the nature of their relationship before we can proceed. Between the naturalist and the supernaturalist, it is unlikely we can even get agreement on which way to turn here and, again, Hume's program gives no guidance whatsoever.

Since the four Gospels all actually disagree in several details, I regard them as four independent sources, but possibly the naturalist, recognizing an advantage when

he sees one, will insist on only two independent traditions. Also, is the Pauline information independent of Luke? If we decide Luke and Paul are not independent, then Mark and Matthew each form at least one other independent tradition. Thus, we have three to five independent sources. In the case of five independent sources, the total probability ranges from $1{:}10^{10}$ to $1{:}10^{20}$. For only three independent traditions, a rough calculation gives the range $1{:}10^{6}$ to $1{:}10^{12}$. Hence, we have the $1{:}5 \times 10^{9}$ probability of a miracle, compared with a final estimate for the probability that all five sources lied ranging from $1{:}10^{6}$ to $1{:}10^{20}$. It is, of course, a very broad range. That breadth is a reflection of the deficiencies of Hume's program.

The concept of probability cannot apply to miracles because the use of probability requires a context (of repeated events) which does not characterize miracles.

In fact, it is hard to see how meaningful numbers can ever be generated for probabilities such as Hume claimed to consider. Anyone familiar with the calculation of probabilities for real events—for example, an accident at a nuclear power plant or (as Lewis suggested) the whole history of the Earth—should have been able to anticipate this difficulty. Hume lived before the development of most probability theory, so he could not have attempted this calculation (though that does not explain how he could attach such importance to an idea he only vaguely understood).

The final comparison is inconclusive. The probability of the Resurrection fits pretty much into the middle of the range of probabilities on the other side. Beyond further demonstration of the failings of Hume's program, the final calculations allow one last moral: The probability of a miraculous explanation is *not* certainly smaller than the probability of a naturalistic explanation for an event. Hume was wrong.

* * * * *

Taking stock of our progress thus far, we have found four serious flaws in Hume's proof that miracles do not occur. The first was that the proof begs the question by assuming the answer to the question in one form in order to get the answer to the question in another form. Contributing to the confusion here was a false idea of the laws of nature. If the proof is recast, using a better concept of natural law, it is reduced in force to a prohibition against believing miracles occur. A second flaw, that of using experience in one category to estimate probabilities of events proper to another category, undermined that proof, leaving us unable to say anything at all about the probability of a miracle.

On closer examination, we found that the entire program of calculating probabilities of the truth of explanations of an event is ambiguous and cannot be carried out coherently for two reasons. Firstly, the concept of probability cannot apply to miracles because the use of probability requires a context (of repeated events) which does not characterize miracles. Secondly, even treating miracles as part of a class of non-supernatural events does not lead to an unambiguous, disagreement-free conclusion, because there is no certain way to estimate the probabilities of many of the relevant natural events. Lastly, we found that it simply is not true that the probability of a miracle will surely be less than of any naturalistic alternative account of an event. In fact, we found a number of possible estimates (remember, all these numbers are very uncertain) in which a miraculous Resurrection proved considerably more likely than reasonable, naturalistic alternatives.

Natural laws just don't seem to be absolute, and nothing can be done about that.

Thus, Hume's "proof" is so reduced in power that it is no longer the "everlasting check . . . useful as long as the world endures," which its originator expected it would be.

It will do not good to respond, as I imagine someone may be tempted to do, that "you can prove anything with numbers." The complaint really rebounds to further damage Hume's case. If the charge is correct, it shows that Hume made a poor choice of the terrain over which to mount an assault. Whether the response is valid or not, raising the issue at all is surely poor sportsmanship. Hume and his followers have crafted an argument, using probabilities, in a way they thought guaranteed them a win. It is hardly reasonable to complain of the rules after having lost at a game *you* invented.

Further Problems With Hume's Logic

There is a problem with Hume's argument that is quite unrelated to miracles. In Flew's revised form, it

seems to me that the argument can be used to prevent a scientist from believing another scientist who announces a major discovery where a break with previous thinking is involved.

The recent announcement of high temperature superconductivity was received with great astonishment by the physics community. Indeed, the discoverers themselves reacted with considerable caution. The important point is that the announcement was *not* greeted with rejection and disbelief, although all that we know suggested at the time that the phenomenon was impossible. Even as I write, no explanation has been found.

If physicists still took Hume seriously, we would have no logical right to react as we did. Hume's logic would compel us to disbelieve the announcement because it claimed a wildly improbable thing really occurred. Scientists have been mistaken many times, and the new superconductivity claim was incredible. Therefore, Hume's argument implies, it would be illogical to believe the announcement because it is much more likely that a mistake had been made.

I think, based on my own reactions and speculating on the reactions of others, that the response was due to two things. First, we really believe and trust other physicists. That is, our estimation of the probability that a physicist would lie or be mistaken about such an important thing is very low. We judge it highly or even extremely improbable. Second, we judge our current wisdom and understanding of the laws of nature as tentative and incomplete. That is, we judge something that is wildly improbable by current understanding, not certain to be wildly improbable forever. In a sense, then, we physicists do follow Hume's advice.

It is not safe to try to draw incontrovertible conclusions from the behavior of scientists in these matters. It does seem fair to say, however, that the behavior of scientists can hardly be interpreted as supporting the drift of Hume's argument. The hidden agendas of Hume and Flew, a willingness to call others fools or liars and a wish to establish skepticism about claims for highly unlikely occurrences, are simply not generally shared by scientists. Physicists have a fairly well-deserved reputation for hard-headedness and rationalism. Thus, it would seem that the route Hume and Flew advocated is not the only one deserving intellectual respect.

One final problem grows out of Hume's argument. Antony Flew noted that weakening the claim that natural law is absolute has repercussions for apologetics. Specifically, attempts to argue that miracles, like the Resurrection, "prove" that Christianity is true, are jeopardized.

> It is only and precisely in so far as it [a miracle] must involve an overriding from outside and above—an event which, so to speak, Nature by herself must be unable to contrive—that such an event would force the conclusion that a transcendent Power is revealing itself.
>
> This being so, it will get the apologist nowhere fast to urge that such a notion of the miraculous [as Hume's] is somehow quite unsound. He is the one who needs it, if, that is, the occurrence of a miracle is to serve as the credentials of his candidate revelation.[12]

Flew's point is that, if natural laws are absolute, a violation of natural law is an absolute sign of transcendence. If, however, natural laws are not absolute, as Hume's empiricism and the history of science indicate, then miracles cannot become invincible or absolute proofs of anything. I don't think we have much choice here. Natural laws just don't seem to be absolute, and nothing can be done about that. Flew, of course, wants apologists to retain absolute law so that he may further badger and flummox them. There is no reason to oblige him.

The point is significant, nonetheless. Miracles simply cannot be used as an absolute proof; a sort of cudgel with which to bludgeon infidels into silence, if not into belief. It never has been possible to use them so. The chief priests and Pharisees witnessed the natural consequences of the Resurrection and did not believe. The Athenians, hearing the preaching of Paul, were not absolutely compelled either into belief or disbelief.

Miracles *are* evidence for the truth of Christianity. They are not *absolute* evidence, but that is really nothing new. The early Church got along well without absolute evidence. This later Church, set in a culture more sophisticated about logical distinctions, will need to be more sophisticated too, but for all that, I see no reason it should not get along well without absolute evidence. At least, we do not have to contend with Hume's "proof." It is as dead as its author.

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[3]*Ibid.*, pp. 140, 141.
[4]*Ibid.*, pp. 127, 128.
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[7]Lewis, *op. cit.*, p. 106.
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[9]Lewis, *op. cit.*, p. 106.
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Reproductive Biotechnology: An Animal Scientist's Perspective

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This paper questions the extent of the "cultural mandate" given humankind in Genesis. How far does the authority granted to us extend? With the emergence of new biotechnologies that deal with reproduction come new questions of what science should and should not do. These questions are of added concern because techniques for human medicine are first developed in animal laboratories. It is suggested that new technologies should be developed for use in laboratory and domestic animals since they can benefit humankind, but that more restraint and prayerful consideration of each technological advance should be made before its application to human medicine.

The "cultural mandate" implied in the first chapter of Genesis grants authority to humankind over the creation. Although authority was granted, how far does it extend and how far should we extend it? New technologies are being developed that manipulate the normal reproductive patterns of laboratory and domestic animals. These include changing the genetic composition of the genome, freezing embryos, *in vitro* fertilization, and even cloning of early stage embryos. The question of "how much manipulation should humankind be allowed to do on animals?" is then raised. This is a relevant question since most human medical advances are first developed in laboratory and domestic animals prior to their human application.

The Cultural Mandate

In the first chapter of Genesis, God tells the man and the woman to "... Be fruitful, and multiply, and replenish the earth, and subdue it; and have dominion ... over every living thing that moveth upon the earth" (Genesis 1:28, KJV). These well-known words have been called the "cultural mandate,"[1] and indicate that humankind was originally given a large measure of authority over God's creation. This is readily seen in two key words of this passage. The Hebrew word for subdue, *kabash*, means literally to bring into bondage.[2] The same word is used in II Samuel 8:11 in describing all of the nations which King David had brought under subjection. The Hebrew word for dominion, *radah*, means literally to reign over or to rule over.[2] It is used in I Kings 4:24 to describe the geographical extent of King Solomon's sovereignty, and is used in Psalm 110:2 referring to the Messiah's absolute authority. Additionally, in ancient times the very act of naming something (i.e., naming the animals, Genesis 2:19) implied dominion or ownership.[3] In short, these words indicate that humankind was evidently entrusted by the Creator

with what appears to be almost absolute authority over all that was created.

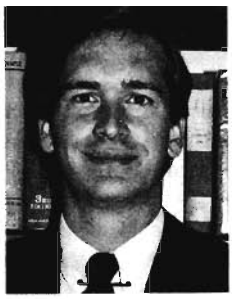
Reproductive Biotechnology

Biotechnology, the application of chemical, physical and engineering principles and techniques to biological systems, offers potential for significant benefits in medicine and agriculture. But does biotechnology sound as if it could be unbiblical, evil, or an enterprise with which we Christians should not associate? Should we abhor emerging technologies that deal, for example, with *in vitro* fertilization (test tube babies), or embryo transfer (the use of surrogate mothers), both of which are presently applied in human medicine? Is this a form of "creating a new life," tampering with something sacred, somehow playing God? Both secular and Christian scientists have already begun to deal with these issues.[4]

The new biotechnologies that are being applied in domestic farm animal production and in research on reproduction are nothing short of amazing. Artificial insemination with frozen semen, introduced in the 1950's, permits high quality bulls to be bred to cattle throughout the world. More recently, technologies related to the early embryo have emerged. Embryos may be split at early stages to produce identical twins.[5] Production of two identicals can be very valuable to research scientists (a near-perfect control for experiments) as well as doubling the number of embryos for transfer from a genetically valuable mating. Another technique is that of freezing embryos for later transfer to surrogate mothers who may be located anywhere in the world.[6] This ability is very valuable when an excess of embryos are produced for the available recipients. The sex of embryos can also be determined prior to transfer to a recipient.[7] With some techniques the sex determination occurs after transfer or freezing, and the embryos of the undesired sex are then aborted or just never thawed. Newer technologies include altering the genome of animals by injecting the pronucleus of a one-celled egg with a gene[8], or by using replication defective viruses to deliver the gene[9]; creating large numbers of identical individuals by nuclear transfer or cloning.[10] The cloning procedure entails transferring nuclei from a pre-implantation stage embryo back to enucleated one-cell eggs. These eggs are then allowed to develop to the pre-implantation stage for transfer to a surrogate, recloning, or freezing for future cloning. *In vitro* fertilization, only recently well-developed in the cow and not in commercial practice, offers potential for the production of large numbers of eggs all fertilized with the same amount of semen usually required for a single cow, thus extending the possible genetic impact of a single bull many times.[11]

These techniques can be used to both increase genetic gain, by extending the selection pressure, and provide a broader genetic base, by freezing large stocks of genetic material. All of these relatively new technologies are currently being researched and applied with success in livestock. Are these new technologies inherently evil?

If we understand Genesis 1 to actually mean that humankind has absolute authority over "every living thing," then we have the authority to develop and perform these techniques on domestic animals. But should we? These new techniques are all designed in some way or another to increase animal production. Do we need more production from our livestock species? With the current glut of agricultural products and depressed commodity prices one does wonder. More efficient agriculture may not be what the United States needs, but it is what the world needs. Self-proclaimed prophets have been predicting famine if agricultural production does not increase. Have we had famine? No, not in the U.S. Here we have seen the "Green Revolution." In 1800, 94% of the U.S. population was directly involved in agriculture. Dramatic increases in agricultural production have since occurred so that now less than 3% of the U.S. population is directly involved with agriculture, while the U.S. supplies about 30% of the world's agricultural exports.[12] What about other countries? An occurrence in some underdeveloped



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countries is low agricultural output. Politics or religious beliefs may contribute to this low level of output, but technology could help raise it. If plenty of food were both available and justly distributed, then time and resources could be spent developing other industries. This would in turn offer potential for improving living standards, such as constructing better housing, improving sanitation, transportation, and communication. Should new technologies be used to increase animal agricultural production?

It is difficult to find a biblical parallel to reproductive biotechnology. Two examples are found in Genesis 30:27–43, where Jacob bargains with Laban for all of Laban's imperfectly colored sheep and goats. Jacob uses techniques based upon superstition to change the ratio of offspring that are imperfectly colored. Later, to his credit, he acknowledges God's hand in controlling this ratio (Genesis 31:9). The second example is illustrated within the passage where Jacob selectively uses this technique when the strong animals are mating and not when the weak are mating (Genesis 30:41–42). This shows that Jacob mated the best males to the best females, and therefore imposed selection pressure on the matings that would result in imperfectly colored offspring. This selection pressure resulted in Jacob acquiring, although imperfectly colored, strong livestock.

It is interesting to note in the context of selective breeding (i.e., breeding the strong with the strong) that God's command for sacrifices would result in a negative selection pressure. The animals for sacrifice were required to be without defect (Genesis 12:5; Exodus 29:1; Leviticus 1:3; 3:1; 4:3; 5:15). Since the animals without defect were offered as sacrifices, a larger percentage of the animals that were allowed to mate would be imperfect, and thus the resulting offspring would more likely be imperfect. Thus, by God's command the Jews likely maintained herds of livestock that had a broader genetic base than if only the strong were mated with the strong.

Should reproductive biotechnologies be used on domestic animals? Since God does not command against it, and it can increase the quality of life and help prevent famine and human suffering, the answer is then: "Yes, these technologies should be perfected and applied in animal agriculture!"

Human Applications

Now for the more difficult question of the application of some of these techniques in the human. Most advances in human medicine are first developed and perfected in laboratory and domestic animals. Some say that a number of these technologies ought not be applied in the human, and therefore should not be perfected in livestock. In some respects, human embryos would be easier to manipulate. Human embryos have relatively transparent cytoplasm, and they develop *in vitro* more readily than do livestock embryos.[13] Should this research in animals be permitted? In other words, does the "cultural mandate" of Genesis 1 include reproductive biotechnology with human applications?

Often the answer too-quickly returns: "NO! Human life is sacred! You're playing God!" With current technologies this may be the best biblical answer. But as technologies improve and become more efficient the answer may change!

For example, suppose a couple has a genetic disorder such as hemophilia. Persons with this disease lack coagulation Factor VIII in their blood, and therefore have problems with spontaneous or traumatic subcutaneous and intramuscular bleeding. This trait is genetically passed through generations and affects only males; although it is carried by females, they do not exhibit hemophilia. Suppose also that the DNA (Deoxyribonucleic Acid) sequence for Factor VIII were known and could be injected into embryos to correct this problem—not only for their children, but for their grandchildren and forever, never again to show up in their descendants. The potential is great. But to do this, with current technologies, over 50 fertilized human embryos would have to be surgically collected from the female, and the fertilized embryos surgically injected with the DNA or "gene" under a microscope.[14] This should yield a single embryo that will incorporate the DNA and correctly produce Factor VIII. This resulting child would have the DNA sequence in his or her cells, but the DNA sequence, or gene, would probably not be in the correct place on the chromosome, much less even the correct chromosome. You say "Great, but what about the other 49 embryos?" Some of the embryos would be destroyed by the injection procedure and those that survived, later transplanted and developed into adults, would not produce Factor VIII. With

In 1722 Cotton Mather . . . urged Bostonians to undergo immunizations for smallpox, but many resisted because it was somehow "playing God."

current biotechnical techniques this alternative is neither biblical nor practical.

Suppose, that in the future it would be possible, with new techniques, to construct a replication deficient virus to inject the DNA sequence, and the DNA sequence could be specifically directed to the right place on the right chromosome every time. Don't think that it cannot be done. God said " . . . nothing will be restrained from them [man], which they have imagined to do" (Genesis 11:6, KJV). The techniques using viruses to inject the DNA or RNA are already developed, and techniques are being developed to direct the exact site on a certain chromosome with which the DNA will be incorporated. This is being done in laboratories here at the University of Wisconsin-Madison and in laboratories on campuses across the nation.[15] This technique, if applied in the human, would require only one more step in the already-used *in vitro* fertilization programs, and could be very efficient, but most importantly it would not destroy any embryos as does the surgical injection procedure. A physician would then be able to treat the patient at the earliest possible moment, when he or she is still a single cell.

God's Will

If the answer still returns, "You're playing God!" or "What if it is God's Will for you and your descendants to have hemophilia?", then the question to be asked of you is, "Are you not already playing God?" For example, in 1722 Cotton Mather, a leading minister in New England, urged Bostonians to undergo immunizations for smallpox, but many resisted because it was somehow "playing God."[16] Have you ever received any vaccinations for smallpox, flu, mumps, tetanus, polio, measles, whooping cough, diphtheria, *etc.*? In 1752 one of our founding fathers, Benjamin Franklin, invented the lighting rod and proposed to save countless buildings from burning to the ground from lightning strikes. This was opposed by some because it was felt to interfere with Divine Providence.[17] But is this interfering with God's Will? Are we changing the directed path of lightning sent from heaven (Job 37:3, KJV: "He [The Lord] directeth . . . his lightning unto the ends of the earth")? Today does anyone even give a thought as to whether a building has a lightning rod on it or not before he or she enters?

The purpose of this article is not to persuade people that all biotechnology should be readily embraced and that genetic engineering offers only good, but to inform the reader of emerging technologies and to show an example of some good that can come of biotechnology and genetic engineering research. The above example of gene transfer via viral vector may be a futuristic ideal and does not address the questions raised with other applications of reproductive biotechnologies. These include: "What happens to frozen human embryos that are no longer desired?", "What happens to human embryos that are of the undesired sex?", and "Is making two or more identicals by splitting or cloning wrong?" To use some of these new technologies in human medicine for the sake of convenience is not consistent with the "cultural mandate."

Some of these new technologies, however, should not be automatically rejected. Many new technologies are not accepted at first because of the fear of the unknown. We simply do not understand how they work, and therefore fear them. Or, because they could be used for evil purposes we do not accept them. Many feared the computer because they didn't understand how it worked, and/or because it could be used by the Antichrist. Some still have reservations about using their bank card to make automatic withdrawals from savings or checking accounts to pay for groceries every week. This would be giving too much control to the banking industry, and could be used for evil as predicted in Revelation—where it speaks of the Antichrist's rule: "And that no man might buy or sell, save he that had the mark, or the name of the beast, or the number of his name" (Revelation 13:17, KJV). However, many of these technologies, such as the computer, have been used to help spread the gospel worldwide (for a review of objections to high technology see D.W. Aycock[18]). It should also be pointed out that these technologies, as all types of technology, will be used for evil. Man is inherently evil and without Christ will do evil. Already there is a published report in scientific literature of an attempt at cloning by nuclear transfer and a fictional book on the subject.[19]

Many new technologies are not accepted at first because of the fear of the unknown.

Humankind's Responsibility

Since humankind was given the "cultural mandate," we have the authority to use these technologies on animals, but we also have the responsibility of caring for them as implied in Genesis: "And the Lord God took the man, and put him into the garden of Eden to dress it and to keep it" (Genesis 2:15, KJV). The two key words of this passage are "dress" and "keep." Dress, also translated "cultivate," is derived from the Hebrew

abad which means to serve or till, or to labor on behalf of.[2] This word is also used in Deuteronomy (28:39) in describing the care of vineyards. The second word, translated keep, is from the Hebrew *shamar* which means to watch, to preserve, to take care of.[2] Therefore, humankind is a steward of the garden. A steward who must give account of and be responsible for his or her actions. As stated by F. Schaeffer: "We have dominion over nature, but it is not ours either. It belongs to God, and we are to exercise our dominion over these things not as though entitled to exploit them, but as things borrowed or held in trust. I am to use them realising that they are not mine intrinsically. Man's dominion is under God's dominion and God's domain."[20]

Since Adam and Eve were created in the image of God, more restraint must be applied when considering the use of new technologies which will be directly used on humans. Although we know that any technology could be used for evil, we as Christians need to prayerfully evaluate technological advances and their possible positive uses: the spreading of the Gospel and the good of humankind. Remember: "And we know that all things work together for good to them that love God, to them who are called according to his purpose" (Romans 8:28, KJV)—even new biotechnology!

ACKNOWLEDGMENTS

I would like to recognize the many stimulating discussions and helpful suggestions provided by R.L. Stiling and my wife J.L. Prather.

NOTES

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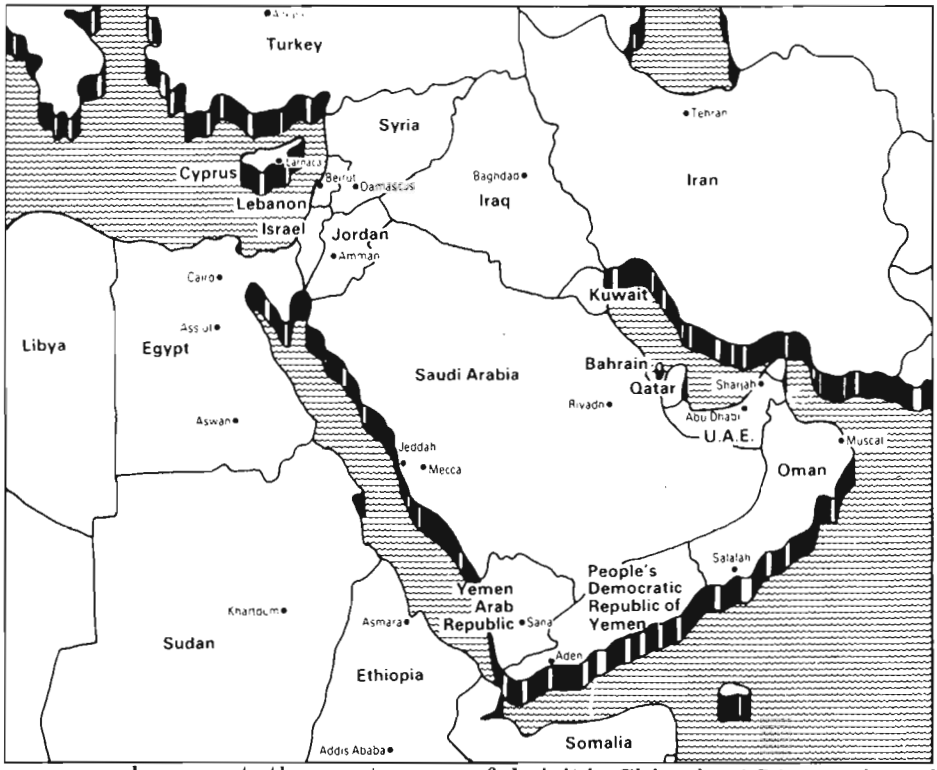
TO ALL ASA MEMBERS AND FRIENDS...

LOOKING AHEAD TO A POSSIBLE MIDDLE EAST SEMINAR... AFTER OUR ANNUAL MEETING IN THE EAST IN THE '90s... TO PROBE WITH SCIENTISTS IN CYPRUS - EGYPT - TURKEY - OTHERS



Bob Herrmann, who reports the most successful visit in China by ASA members following the '87 Annual Meeting in Colorado Springs, has suggested that we explore the possibility of such a post meeting in Nairobi, Kenya, followed by a tour of several cities in the Middle East (not as dangerous as some of our inner cities!) after the Annual Meeting in the East in 1990. *To me, a GREAT IDEA!* If you have suggestions let Bob or me know so we can begin to plan.

NOW, here is my pitch: To prepare for such a jaunt, you must (?) purchase one of the following at a reduced price (so I can afford to go!)

Jennings, **Welcome Into the Middle East** (1986) **$10.00***
20 chapters, 325 large format, double-columned pages, over 100 illustrations inc. maps.

Hadith: A Composite Middle Eastern Village under a Missions Consultant's Gaze (1983) **$3.50***
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The Rise and Fall of the Paluxy Mantracks

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A history of the creationist claims that mantracks exist alongside those of dinosaurs in lower Cretaceous limestone along the Paluxy River near Glen Rose, Texas, is a record of revolutionary claims with questionable evidential support, to say the least. Often fraught with non-scientific motives, mantrack enthusiasts have exhibited irresponsible and inexplicable methods. The scientific investigations of the mantrack claims, which began as early as 1980 and which culminated in strict "young-earth" creationists "backing off" from their claims in 1986, have resulted in unexpected insights into dinosaurs and dinosaurian trace fossils.

The story of creationist claims of human tracks alongside those of dinosaurs in Lower Cretaceous limestone exposed by the Paluxy River near Glen Rose, Texas, is important to anyone interested in the issues of the so-called creation/evolution "controversy." The reasons include:

(1) Paluxy creationist mantrack claims are mostly unambiguous and are scientifically investigable. Unlike so many issues involving origins, some paleontological scenario is not necessary in order to determine if observable mantracks presently exist.

(2) The mantrack claims include one of the few positive examples of research carried on by anti-evolutionary, young-earth creationist adherents of flood geology. They therefore constitute a refreshing respite from the deluge of anti-evolutionary "library research" so characteristic of modern, strict creationism; a deluge often fraught with irresponsible or, at least, questionable practices.

(3) Claims of mantracks are not shrouded in a high degree of technicality, nor dependent upon mathematical sophistication. Therefore, the issues and even many details of the claims can be appreciated and understood by scientists and interested laypersons alike.

(4) It is abundantly clear that the Paluxy mantrack claims reach into the intersection of science and religion, and as such involve the relation between science and Christian faith. The plethora of scientific areas involved, including paleontology, geology, and anthropology, is mixed with the religious issues of biblical interpretation, flood geology, and, for fundamentalists, the "threat" of "evolutionary philosophy."

(5) As a result of the point above, the mantrack claims can be seen as a concrete, paradigm case addressing a wide variety of issues associated with the creation/evolution "controversy." In turn, insights into the nature of scientific inquiry and its unexpected directions can result, as well as insights into the rela-

tionship of that inquiry with religious beliefs in an anti-evolutionary context.

I will give a very brief history of the mantrack claims, showing how they were scientifically resolved and recently laid to rest for most observers. Though opinionated commentary will be kept at a minimum, questions concerning the curious combination of reluctant participation and widespread interest in the mantrack "saga" will be addressed.

Outline of the Mantrack Claims and Early Investigations

Though known in the early part of the twentieth century (Schuler, 1917), dinosaur tracks in the river bed of the Paluxy River near Glen Rose, Texas were given scientific notoriety by paleontologist Roland T. Bird (1939, 1954). While working for the American Museum of Natural History in the late 1930's, Bird reported the presence of unusually elongated tracks among those of dinosaurs in the Paluxy River southwest of Ft. Worth (Bird, 1985). Primarily stated to keep high the interest of his benefactor Harry Sinclair (Bird, 1985; Godfrey & Cole, 1986; Farlow, 1987), Bird had no idea his words would be taken by creationist Clifford Burdick as a guarded admission that there were mantracks in addition to those of dinosaurs (Burdick, 1950). Bird saw all genuine fossilized tracks along the Paluxy as saurian, no matter how unusual, as he could account for the unusual ones through natural track distortion or through dinosaurs wading through deep water. To Burdick and other creationists advocating flood geology and a young earth (as earlier espoused by George McCready Price), these alleged "mantracks" contemporaneous with dinosaurs were the death knell to the evolutionary consensus and geological column of the scientific community. What had led Bird to the Paluxy River near Glen Rose, Texas was a set of carvings of human-like prints and a dinosaur print. Bird had dismissed the human likenesses as nothing more than carvings, but the dinosaur carving convinced him that the artist had to have a real saurian footprint as a model (Godfrey & Cole, 1986). Burdick, who failed to find genuine mantracks along the Paluxy, obtained the human-like carvings, considered them genuine, and their photos appeared in creationist literature, such as Whitcomb and Morris' *The Genesis Flood* (Whitcomb and Morris, 1961).

Despite the years of work by Bird and other scientists which suggested the variety of shapes into which dinosaur tracks could be eroded or distorted, and despite the fact that Burdick's carvings were indicative of other carvings that local Glen Rose residents were known to have carved during the years of the Depression and beyond, the mantrack claims apparently lived on among creationists upon the basis of local testimony which described the curious isolated depressions and some trails as "mantracks." Apparently any oblong depression of roughly human proportions, natural or carved, was considered human by early anti-evolutionary mantrack enthusiasts.

Upon the basis of this testimony, the Reverend Stanley Taylor investigated the early mantrack claims, as did chiropractor Dr. Cecil Dougherty (1971). These claims featured the unveiling, in the early 1970's, of new "mantracks" close to one of the earliest examples of "mantracks," a trail of elongated depressions known as the Ryals trail (S. Taylor, 1968, 1970b, 1971). In addition to isolated depressions called human tracks on a ledge in Dinosaur Valley State Park, four "human" trails were claimed—the Giant Run, the Turnage trail, the Ryals trail, and the most famous one, the Taylor trail. These were featured rather fleetingly in Taylor's film "Footprints in Stone," distributed by Films for Christ (formerly Eden Films) (S. Taylor, 1970a). This film brought notoriety to the creationist mantrack claims throughout the community of anti-evolutionists and set the precedent of avoiding the criticism that the "mantracks" were carved fakes, fraudulently altered dinosaur tracks, or erosion marks by uncovering previously unexposed tracks.

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Many creationist organizations such as the Institute for Creation Research (ICR), the Creation Research Society (CRS), and the Bible Science Association (BSA) seized upon "Footprints in Stone" as a primary vehicle for promoting their views during the 1970's (J. Morris, 1976). Some creationist investigators such as Beierle (1974, 1977) and Fields (1980) attested to most of the claims of the film and added a few claims of their own. But others, such as Rusch (1971) and an investigative team from Loma Linda University featuring Berney Neufeld (1975), indicated that the Taylor trail tracks (of which casts were taken) were more likely dinosaurian than human, and that the park ledge tracks were merely erosional features. One group of witnesses at the filming of "Footprints in Stone" refused to be filmed attesting to the humanity of the prints of the Taylor trail because of indications of saurian digits at the front of some of the prints (Westcott, 1987). Nonetheless John Morris of the ICR, son of Henry Morris, compiled a history of pro-mantrack claims in his book *Tracking Those Incredible Dinosaurs, and the Men Who Knew Them*, (*TTID*, 1980) which became the other primary vehicle of the mantrack claims. It is not clear why, in the creationist community, the claims were not presented with more balance, recognizing more criticisms such as those of the Loma Linda investigations. Nor is it clear why, in the absence of such balance, the critical creationist investigations did not seek to be heard within the creationist community to offset the positions of the ICR, CRS, and BSA.

In 1980 independent investigators Glen Kuban and Tim Bartholomew studied several sites along the Paluxy. They took some castings of the Taylor trail tracks but did not initially publish their conclusions and observations. Kuban had come to the Paluxy in 1980 hoping to find clear evidence of human prints, and planning on more carefully documenting them than Reverend Taylor had done (Golden, 1986a). But he soon saw in the dry river bed at the Taylor site, thanks to the unusually hot and dry summer of that year, measurements and other puzzling features of the tracks. The tracks measured like dinosaur prints, only they had heel-like depressions and were too long for normal dinosaur tracks. Moreover, there were often shallow indentations where saurian, not human, toes would be. The more he documented these observations, the more Kuban felt frustrated when he saw creationist maps of the site incomplete, inaccurate, and non-correlating. In subsequent years of writing and talking to creationist investigators of the Taylor site, Kuban found more discrepancies than clarifications. No one had seemed to ask the questions he had about the "too long" tracks that looked saurian. Before long, Kuban was inquiring into dinosaur rather than human locomotion. By 1982 Kuban had developed the idea that the elongated tracks of the Taylor trail could have been made by dinosaurs walking with their soles and/or heels touching, rather than in the more usual manner upon their toes.

Meanwhile, mainstream scientists who had studied in Bird's footsteps throughout the years along the Paluxy tended not to address the mantrack claims because they did not want to be associated with the questionable scientific work of many of the creationists; also, because many interactions with the mantrack enthusiasts soon showed that they wanted from the scientists only verification of what they believed to be the case, not a discussion of the evidence. Often such relative silence was interpreted as assent to the mantrack claims, which played into the hands of the "mantrackers," who presented themselves to creationist sympathizers as "Galileos" shunned by the scientific establishment's "priesthood"—"priests" who could not dispute the mantracks.

This film ["Footprints in Stone"] brought notoriety to the creationist mantrack claims throughout the community of anti-evolutionists.

The mantrack claims of Taylor and Morris were not addressed as a major issue in the *Journal of the American Scientific Affiliation* during the 1970's and early 1980's. Aulie dismissed the claims upon professional testimony (1975), and LaBar analyzed some of their photographic evidence (1973). But it was clear that some readers of the *Journal* thought the mantrack claims were legitimate issues to be addressed by the ASA (Vosler, 1975; Bradley, 1979). Such ambiguity fitted Nelkin's analysis of the ASA as reluctant to take positions, specializing in "compromise" and "moderation" (Nelkin, 1982, pp. 77–78).

The early 1980's marked creationist efforts to entrench their eroded coverage of evolution in public school textbooks (Skoog in Zetterberg, 1983) which were focused in states such as California and Texas, the latter of which had seen such erosion since 1974 (Schafersman, 1982). Efforts to dilute coverage of evolution in texts, such as the Biological Sciences Curriculum Study (BSCS) series, were in reaction to improved textbooks produced in the wake of Sputnik (Hastings, 1983). Though sometimes not directly described in creationist positions, the mantrack claims as extolled by "Footprints in Stone" and *TTID* were

cited as the "smoking gun" evidence justifying "equal time" for both evolution and "creation science" in public school science classrooms.

In reaction to these efforts, the mainstream scientific community began a long list of publications covering the plethora of issues involving the creationist assault on evolution and the geologic column. Those dealing with these issues included excellent collections of essays (Godfrey, 1983; Wilson, 1983; Zetterberg, 1983; Montagu, 1984; Awbry & Thwaites, 1984; Hanson, 1986), and works of individuals concentrating on mostly one, or a few, of the issues (Ruse, 1982; Eldredge, 1982; Futuyma, 1983; Kitcher, 1983; McGowen, 1984). The mantrack claims were dealt with as issues easily dismissed, based upon professional observation to which the "mantracks" were peripheral. Nelkin (1982, p. 76) considered them an example of limited creationist research. If mentioned at all, chief among the lines of argument for dismissal of the claims was the history of carved prints (Langston & Pittman, 1987), which tainted the whole issue as obviously unworthy of pursuit. The "mantracks" were mentioned in *JASA* only if they had been subjects in books reviewed (Mixter, 1983; Fayter, 1985).

Inspired by the work and influence of Taylor and Morris, the Reverend Carl Baugh moved to Texas from Missouri to take up the mantrack pursuit as early as 1981 (Golden, 1986a). Though of dubious scientific background, Baugh avoided the carving critique by finding freshly exposed "manprints" along with dinosaur prints beneath large limestone slabs on a ledge above the river, called the McFall site (Cole & Godfrey, 1985) or the Baugh/McFall ledge (Kuban, 1986a). He was soon supported by Clifford Wilson of Australia and by Walter Lang, then of the BSA. Using volunteer labor, Baugh claimed the exposure of tens of "mantracks" at this site (Bartz, 1982a, 1982b; Dougherty, 1982), and received media coverage to that effect (Turner, 1982). Baugh's support grew into the establishment in 1983 of a Creation Evidences Museum near the Paluxy and Dinosaur Valley State Park outside Glen Rose, in which he gathered evidence for his alleged mantracks (e.g., Burdick's carvings) as well as other "out of place" fossils such as a "hammer in Ordivician or Silurian stone," human bones "from Cretaceous rock," and a trilobite fossil "from the Paluxy river bed" (*Bible-Science Newsletter*, 1983, 1984; Lang, 1983a, 1983b).

Recent Scientific Investigations of the Mantracks

By 1982 the influence of creationist efforts in science and science education, partly fueled by the Paluxy mantrack claims, could no longer be ignored. Not knowing of Kuban's earlier work, many scientists felt they had to deal with the claims directly. Anthropologist Laurie Godfrey critiqued Taylor's "Footprints in Stone" (Godfrey, 1981) and Weber did the same for the past mantrack claims in the journal *Creation/Evolution* (*CE*) (Weber, 1981), a journal created to scientifically counter the growing number of creationist claims and influences. For myself, I had become involved in creationist claims through their misuse of ideas from my own area of physics (e.g., the Second Law of Thermodynamics) and through the urgings of creationist friends of mine, one of whom showed "Footprints in Stone" to interested congregations and who informed me of the details of Baugh's claims. Soon I was involved in helping to blunt creationist influences in Texas public school textbooks as a member of the Texas Council for Science Education, which was formed by Houston geologist and activist Steve Schafersman. This council is also the Texas section of the nationwide Committees of Correspondence (CC's), groups established by Iowa science educator Stanley Weinberg to monitor all creationist activities. As Texas CC members, Schafersman and I worked with the Texas chapter of the anti-censorship group People for the American Way, eventually resulting in Texas biology textbook improvements in the coverage of evolution (Hastings, 1984a, 1984b.) In 1983, Schafersman and David Milne published, in the *Journal of Geological Education* (*JGE*), a critique of the past mantrack claims, including the work of Taylor, Morris, and others, showing that often what were considered mantracks were actually erosion scours (e.g., the alleged tracks on the park ledge), distorted or eroded dinosaur impressions, or fraudulent carvings (Milne and Schafersman, 1983).

In subsequent years of writing and talking to creationist investigators of the Taylor site, Kuban found more discrepancies than clarifications.

Kuban continued his investigation of the origins of elongated tracks such as those of the Taylor trail. Using Morris' *TTID* as a guide to actual tracks, Kuban found some tracks apparently made in the manner he had hypothesized, with partial or full elongated depressions made by saurian metatarsals ("feet"). In 1982, while investigating mantrack claims of the Reverend Baugh, he was shown a site full of such tracks—the West site. The West site contained unequivocal elongated dinosaur tracks with toe impressions in varying degrees of

preservation, and very clear metatarsal impressions similar to those at the Taylor site.

The Investigations of Baugh's Claims

Also covered in Milne & Schafersman's *JGE* article (1983) was the excavation work of Reverend Baugh at the Baugh/McFall ledge. Schafersman and I were part of a scientific investigative team, which also included anthropologists Laurie Godfrey and John Cole. Collectively we were known as the "Raiders of the Lost Tracks," and part of our work in August of 1982 was sponsored by the *CE* journal. I had also observed Baugh's work in June of that year, and Schafersman and I visited the site extensively in October. Together the "Raiders" found that Baugh's "mantracks" were either erosional features, trace fossil patterns conveniently interpreted, or genuine depressions always associated with exposed dinosaur trails on the ledge. Nothing matched tracks of human-like bipedal locomotion (Godfrey, in Cole & Godfrey, 1985). No features such as the claimed toe impressions were seen in any of these "mantracks," and by 1983 it was clear that the "perfect" human features which always "disappeared" before any of us critics arrived on the scene had to be formed by the friable marl not completely removed from the limestone stratum in which the dinosaur tracks were impressed. No trail of "mantracks" was ever seen, despite Baugh's claims to the contrary (he tried to say that a "trail" was made of two narrow markings at the posterior of consecutive dinosaur tracks [perhaps made by the dinosaur's hallux or "dew claw"] coupled with an elongated depression without saurian toes alongside the dinosaur trail). About the only genuine depressions without clear saurian tridactyl (or three-toed) features were a few isolated depressions periodically alongside three of the longer dinosaur trails of the site. At first interpreted by the "Raiders" as mud-distorted dinosaur foot impressions, the work that Kuban and I did in 1985 verified, however, that these depressions were probably made by the creature's tail, snout, or forelimb occasionally contacting the then lime-mud in which they were walking (Hastings, 1986). During the work Kuban had done independently of the "Raiders" in 1982 and 1983 at the Baugh/McFall ledge, he had hypothesized this saurian appendage explanation. Other sites in the area contained dinosaur trails with such isolated depressions.

Together the "Raiders" found that Baugh's "mantracks" were either erosional features, trace fossil patterns conveniently interpreted, or genuine depressions always associated with exposed dinosaur trails on the ledge.

Many creationist observers began to privately criticize Baugh's claims as unsubstantial in 1982 and 1983. Curiously, there was a general reluctance to do so publicly.

The "Raiders" reported their findings of 1982 and 1983 in a series of articles compiled in the Special Issue *CE* XV (Cole & Godfrey, 1985). I had produced from our work in 1982 an amateur videotape called "Footprints in the Mind" (Hastings, 1982), which was in so much demand in early 1983 that Godfrey and Cole obtained just barely enough funding from the American Humanist Association, the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), *CE* journal, the Iowa Freedom Foundation, and others to produce a professional version suitable for classroom use entitled "The Case of the Texas Footprints" (Cole, 1983), produced by Cole and directed by Pia Nicolini. My amateur production (mentioned a couple of times in the ASA *Newsletter* (ASA *Newsletter*, 1983a, 1983b) featured Baugh making some of his claims, including a "human handprint," and the later professional version emphasized the impact of the footprints upon science classrooms. Baugh's hammer-in-stone was seen to be a concretion of Ordivician or Silurian material from southwest Texas around a nineteenth-century miner's mallet. The "handprint" was merely a selected pattern of trace fossils on the often still marl-laden surface. His "Cretaceous" human skeleton (Moab bones) was part of material clearly documented to be intrusive into Cretaceous strata in Utah. The trilobite "from the Paluxy" was correlated with Silurian deposits in Illinois, fossils which were known to be part of an annual fossil show at Glen Rose, or which were brought by trading Indians known to have frequented the Paluxy watershed prior to the twentieth century (Hastings, in Cole & Godfrey, 1985; Godfrey & Cole, 1986; Hastings, 1986, 1987b).

Even before the publication of *CE* XV, Baugh's support began to wane. Many creationist observers

began to privately criticize Baugh's claims as unsubstantial in 1982 and 1983. Curiously, there was a general reluctance to do so publicly. Russell Bixler and a TV crew from a Christian station were hard pressed to film anything of substance to show eager audiences back home in Pittsburgh (Hastings, in Cole & Godfrey, 1985). Newspaper coverage began balancing Baugh's claims with criticisms from the "Raiders" (Barrineau, 1983; Krebs, 1985). Though Baugh continued voicing his grandiose plans for a multi-phased expansion of the Creation Evidences Museum (Golden, 1984), none materialized, resulting in the museum becoming static and often unvisited (Hastings, 1986). Not even his finding of genuine dinosaur bones upriver from the "mantrack" ledge, most of which were destroyed in their extraction, could claim for Baugh the scientific credibility he so earnestly sought. In September 1984, one of Baugh's former workers, Al West (for whom the West site was named), went public with the observation that Baugh had never had the human evidence upon which he was soliciting funding from a few congregations and other mantrack enthusiasts (Potter, 1984; Hastings, 1986). In support of West, Glen Kuban wrote a letter to Texas newspapers mentioning Kuban's metatarsal explanation (Kuban, 1984a, 1984b). Baugh's poor and sometimes embarrassing evidence at creationist meetings and conferences, particularly in 1984, eroded his credibility so that by 1985 he was not invited to speak at the national meetings (Schadewald, 1984a, 1984b, 1986c; Cole, 1986; Wakefield, 1986), and only a small faction of the Bible-Science Association and the Genesis Institute, represented by Walter Lang, continued public support. Baugh's case was not helped by indications that there were deliberate alterations of evidence in his later work (Potter, 1984).

Perhaps the best publicized item displayed in Baugh's museum was a copy of the so-called Caldwell print, the most human-like of Baugh's relics and whose original was cited by Baugh and others as having been removed from the Paluxy river bed. Casts of this print were given in exchange for contributions to Baugh's museum or to Louisiana's Creation Legal Defense Fund. By the end of 1985 contacts with local Glen Rose residents, with Caldwell himself, and with people associated with "Footprints in Stone," revealed that no one had actually seen the print removed from the river bed, as Baugh claimed, that it had been sold in the 1960's as a carving, and that Baugh's copy was identified as a copy of a footprint carved decades before by a well-known footprint "artist" (Hastings, 1986; Godfrey & Cole, 1986). Kuban has recently located the original Caldwell print at Columbia Union College, which had been cross-sectioned over 15 years ago by the Loma Linda team investigating mantrack claims, clearly showing it to be a carving. To their credit, many creationists such as John Morris have maintained this print to be a "probable carving" rather than a genuine manprint.

Another mantrack enthusiast, John DeVilbiss, criticized Baugh's work as did the "Raiders," but maintained that there was yet reason to continue searching for mantracks beneath the limestone slabs (ASA *Newsletter*, 1985), as if lack of evidence was a positive indication of their existence. His exchange with "Raider" John Cole in *Origins Research* (Cole, 1985; DeVilbiss, 1985) revealed DeVilbiss' zeal to gather funding for extravagant future work and his superficial acquaintance with mantrack claims other than Baugh's. The ASA *Newsletter* reported Kuban's metatarsal explanation as a vital explanation of the saurian origin of many claimed mantracks, listing Gerhard Nickel and myself as Kuban's assistants (ASA *Newsletter*, 1985). This report alongside a statement of DeVilbiss' position showed the ASA readership a wide disparity in conclusions concerning the mantrack claims, but little more.

However, and perhaps significantly, if one interpreted these as mantracks, one of the omitted tracks would have its "big toe" on the wrong side of the foot, as the outside digit of the dinosaur did leave a significant depression at this track's anterior.

Investigations of the "Best" Mantracks

As Baugh's work had become more questionable by 1984, mantrack enthusiasts returned to the "mantracks" of Stanley Taylor's "Footprints in Stone" and John Morris' *TTID*. One creationist friend of mine agreed with the criticisms of Baugh's claims, but would respond with, in effect: "Yes, but what about the Taylor tracks?" Among the strong negative reactions to my "Footprints in the Mind" were references to the "best" mantracks—those at the Taylor site (Hinterliter, 1984a, 1984b). About the time I found the Taylor site in August 1984, which is usually under water, silt, and debris year-round, I finally met with Glen Kuban—who, of course, had been studying mantrack claims since 1980—and we soon saw the advantages of collaborating our efforts (Golden, 1986a). Though I took castings of the Taylor trail (the best known of the four

"human" trails at the Taylor site), they proved unnecessary for a close analysis, for in September 1984 the site dried up as part of an unusually dry weather pattern, allowing a thorough cleaning and a rare opportunity to identify the many tracks on site (Hastings, in Cole & Godfrey, 1985; Golden, 1986a). Other investigators had taken advantage of such rare times also (e.g., Kuban in 1980), or, as in the case of Reverend Taylor, employed extensive sandbagging (S. Taylor, 1970a).

The measurement of the paces and strides of the Taylor trail showed them to be of dinosaurian dimensions, despite their unusual elongation and shallowness, when compared with dinosaur trail data from tens of trails made available by Jim Farlow, a paleontologist at Purdue/Indiana at Ft. Wayne. Kuban and I independently took these measurements, and I sent my data to Godfrey and Cole for inclusion in *CE* XV in order to indicate that the Taylor trail cannot be definitely declared human. The numbers definitely did not fit human proportions no matter how gigantic humans can get (S. Taylor, 1970a; Hastings, Cole, in Cole & Godfrey, 1985; Kuban, 1986a). Kuban and I verified, as had been done by Kuban and Bartholomew in 1980, that on the map of one of the creationist pro-mantrack investigators, a total of four prints on the Taylor trail were omitted. In my opinion, this is hard to justify, given that once the pace is known the position of the next print can be predicted, and given that these were not drastically obscure prints in the trail. However, and perhaps significantly, if one interpreted these as mantracks, one of the omitted tracks would have its "big toe" on the wrong side of the foot, as the outside digit of the dinosaur did leave a significant depression at this track's anterior. In addition, the combination of several other phenomena showed unequivocally that the Taylor trail was dinosaurian in origin.

The anteriors of the Taylor tracks splayed to the sides as other obviously dinosaurian tracks; and, traces of saurian digit depressions could be seen upon close inspection of some of these track anteriors.

First, dinosaurs made unusually elongated tracks of "giant human" proportions by at least partially dropping down on their metatarsals (plantigrade mode, as opposed to the more normal digitigrade mode, or "on the toes"), sometimes including their "heels." This was the explanation developed by Kuban based upon his work from as early as 1980. Elongated tracks could also be formed by the metatarsals placed in very soft mud at a small angle to the horizontal. It was the rounded "heel" depression at the posterior of many of the Taylor trail tracks that had been interpreted as human, while there was little or no depression at the anterior. Such elongated tracks were seen at other sites along the Paluxy (such as the Baugh/McFall ledge or the West site) and have been seen at track sites worldwide (Kuban, 1986a, 1987a; Hastings, 1987a). I had found such elongated tracks just downstream from the Taylor site that verified for me that Kuban's plantigrade idea explained most of the elongated tracks he and I had seen. Second, the anteriors of the Taylor tracks splayed to the sides as other obviously dinosaurian tracks; and, third, traces of saurian digit depressions could be seen upon close inspection of some of these track anteriors, all of which had been noted by Kuban as early as 1980 (Kuban, 1986b).

Most dramatic of all, however, was evidence that the Taylor tracks had, at some time subsequent to their making, been filled with a material whose geochemistry was sufficiently different from the outlying limestone to oxidize the surface to a reddish-brown color upon recent exposure or to simply contrast with a blue-gray color in an outline of the original depression. This contrast was called "discoloration," "color distinction," or later, simply "coloration." At the anterior of each of the tracks of the Taylor trail, these colorations showed the unmistakable shape of at least one of the three tridactyl dinosaurian digits; sometimes two or all three were seen. The colorations corresponded to other similar phenomena Kuban and I had independently seen previously (Hastings, 1986, 1987a; Kuban, 1986a, 1986b, 1988c; Golden, 1986a; Price et. al., 1987, pp. 20–21).

The colorations further confirmed that the Giant Run and the Ryals trail were also dinosaurian—and plantigrade dinosaurian at that—by revealing the outline of the one or more tridactyl digits on each of the trails' tracks (Hastings, 1986, 1987a; Kuban, 1986a, 1986b). The colorations similarly confirmed the Turnage trail to be unequivocally saurian also. Even Baugh agreed (in 1984) that the colorations made the Taylor site tracks even more obviously dinosaurian. All "mantrails" at the Taylor site were clearly made by dinosaurs.

Kuban attempted to get the ICR to send someone to look at the high and dry phenomena of the Taylor site in 1984, but no one came from ICR. It is hard to understand scientifically why such an opportunity was lost, considering the importance of the mantrack claims

to ICR in the past (Saladin, 1985; Schadewald, 1986a). Kuban and I had documented in August 1985 the dinosaur trails exposed by Baugh's work (Baugh had never been interested in the dinosaur data). We had concluded, as previously mentioned, that Kuban's hypothesis of the "man-like" depressions alongside the trails being made by an appendage of the dinosaur, possibly the tail, was essentially verified (Hastings, 1986). Also at this time I saw for the first time the West site's many elongated dinosaurian depressions, verifying for me still further the plantigrade explanation's ability to account for almost all the elongated saurian prints at both the Taylor site and the Baugh/McFall ledge. Now Kuban, with my encouragement, decided to force a response from ICR by sending them photos and other evidence of the obvious dinosaurian origin of the Taylor site tracks, which Kuban made clear he was about to publish. Mere invitations which Kuban had made to ICR or to the BSA in previous years to revisit the Paluxy and look at Kuban's findings on the "man-tracks" had never been accepted. However, in 1985 the response was uncharacteristically prompt.

In October 1985 John Morris, Paul and Marian Taylor (son and widow of Stanley Taylor), and others who had helped in the production of "Footprints in Stone" saw the Taylor site with only a few centimeters of clear, relatively calm water over the tracks. Kuban had swept clean the site in preparation and had previously taken this group of visitors to the West site to "prep" them for what they were about to see at the Taylor site. The colorations were even more vivid than in 1984, due to some additional oxidation, and even the Ryals trail was showing the outlines of anterior dinosaurian digits more than ever before (Hastings, 1986, 1987a; Kuban, 1986a, 1986b; Golden, 1986a). After considering various degrees of capitulation, the "official" position of ICR was to admit the dinosaurian appearance of the Taylor trails and be very reserved about the other "human" trails, despite Kuban's on-site demonstration that they all were unequivocally dinosaurian. In an *Impact* article, Morris implied the colorations might be fraudulently painted, and he dwelt upon questions of no consequence to the dinosaurian origins of the tracks (J. Morris, 1986). However, in that same article he did state that it would be "improper for creationists to continue to use the Paluxy data as evidence against evolution," and in an interview he was quoted as saying, "As much as it hurts me, it is very likely that my original interpretation was wrong" (Jones, 1986). Paul Taylor announced a similar position for Films for Christ, deciding to stop new distributions of "Footprints in Stone" (P. Taylor, 1985). It was expected that other films of the company citing Paluxy mantracks would also be edited, but this has not been verified. (A creationist friend of mine who had shown "Footprints in Stone" to various congregations ceased doing so in late 1984 when he saw my photos and videotape of the Taylor trail.)

To lessen the impact of the origins of the "man-tracks," Henry Morris in a letter to friends of ICR described the alleged human tracks as being always "illustrative, not definitive," not affecting the "over-all case against evolution" (H. Morris, 1986). Such statements are belied by the ICR logo for their museum, which shows the superimposition of a human track and a dinosaur track, and by the curriculum which includes mantracks with dinosaur tracks still taught to children nearby (Schadewald, 1986b). By late 1986, John Morris was using his "inconclusive" description about cores taken at the Taylor site (to learn something about the origins of the coloration phenomenon itself) to question the dinosaurian origin of the tracks, and he was hinting still at a hoax by citing ways limestone could be stained. The cores to which Morris had access were taken sometime between October 1985 and mid-1986. I had taken some flakes from the surface of one of the coloration tracks and from the adjacent surface outside it in October 1985. Subsequent analysis by Wann Langston, Jr. at the University of Texas at Austin showed no surprises in the sample content, but did not aid in distinguishing between the geochemistry inside as compared to that outside.

It is certainly true that both Piltdown and Paluxy represent cases in which the lack of critical judgement, not the evidence itself, fitted the respective sets of preconceptions involved. But differences as well as similarities between Piltdown and Paluxy can be at least equally instructive.

To deal with the suggestion of purposefully staining the surface, evidence against which was given to Morris from the beginning (Kuban, 1986a; Hastings, 1987a), Kuban and I tried Morris' staining recipe on rock away from the river bed—to find little or no resemblance to the track colorations. In September 1986, with permission from the Texas Parks and Wildlife Department, we took seven cores—smaller than Morris'—at the boundaries of the colorations and found, as we predicted and in contradistinction to John Morris' statements, a clear subsurface boundary coinciding with the surface boundary. The boundary on the surface extends

several centimeters below, the blue-gray to gray material inside the track contrasting clearly with the ivory to tan limestone material outside (Hastings, 1987a; Kuban, 1988c). Therefore, the colorations, which have been seen also in dinosaur tracks in Colorado and New Mexico (Martin, 1986; Gillette, 1986), are definitely not hoaxes, as Kuban, others, and I knew since 1984.

The colorations were such strong visual evidence that the "best" of the creationist "mantracks" were clearly dinosaurian, that the media coverage of the altered ICR and Films for Christ positions on the mantracks peaked in the summer of 1986. Many of the articles were accompanied by photographs provided by Kuban, Cole, or myself (Boyer, 1986; Golden, 1986b; Lemonick, 1986; Long, 1986; Martin, 1986; Ogle, 1986; Pugh, 1986; Wilford, 1986). The dinosaurian identification of the most famous "mantracks" was used to illustrate points made in the Horizon BBC documentary based upon Richard Dawkins book *The Blind Watchmaker* (J. Taylor, 1987; Dawkins, 1986), in which both Kuban and I briefly appeared. I assisted Dawkins and producer Jeremy Taylor in filming this production in September 1986 (Hastings, 1987a), whereas Kuban had philosophical reservations about the conclusions of the production. I published an article in *JGE* covering the Taylor site exposé of dinosaurian origins, featuring many of Kuban's photographs (Hastings, 1987a). Kuban is now writing a definitive, detailed history of the Paluxy mantrack claims (Kuban, 1988a).

Commentary

Despite every reason to do so, very little has been done by the ICR to rectify the conclusions of John Morris' book *TTID*. Sometimes John Morris' *Impact* article on the mantracks (J. Morris, 1986) is inserted as a disclaimer, and sometimes not. There has been no announcement that printing *TTID* will be discontinued, though Morris indicated to a reporter that the book would be discontinued (Jones, 1986). The actions of Paul Taylor of Films for Christ in removing "Footprints in Stone" seem more responsible than those of ICR; although, again, other FFC films mentioning the Paluxy mantracks may still be unaltered. The BSA formed a "Task Force" in 1986 to investigate the "new evidence," but since then little more than silence comes from them as they allegedly verify Kuban's and my findings. Strangely enough, Kuban has been contacted very little by the Task Force, and I never.

However, Students for Origins Research (SOR) in the journal *Origins Research* seems very willing to publish the events on the "mantracks" (Cole, 1985; DeVilbiss, 1985; Kuban, 1986a). ASA's Committee for Integrity in Science Education wrapped up the dinosaurian origins of the Taylor site tracks rather succinctly, using information from Kuban and revising an earlier version on my suggestion to square more with the facts (Price et al., 1987, pp. 20–21). Given as an example of how science works, along with Piltdown man, the Paluxy mantracks are cited for their educational value. It is certainly true that both Piltdown and Paluxy represent cases in which the lack of critical judgement, not the evidence itself, fitted the respective sets of preconceptions involved. But differences as well as similarities between Piltdown and Paluxy can be at least equally instructive. Despite some evidence of deliberate deception in Baugh's later work (Potter, 1984), creationist mantrack enthusiasts seem not to have sought in the beginning to deceive anyone; Paluxy mantrack claims were not hoaxes as was Piltdown. However, the overlooking of some lines of evidence, the lack of close-up views and published photographs, and the long list of groundless rationalizations after seeing the evidence in 1985 does suggest, if not a series of cover-ups, at least some obscurantism (Hastings, 1986, 1987a; Schadewald, 1986a; Kuban, 1986a, 1986b). Nor were the Paluxy mantrack enthusiasts exactly in the mainstream of science today, as allegedly were the Piltdown hoaxer(s) in their day, whatever their identity. Mantrack enthusiasts, along with seekers of Noah's ark in eastern Turkey, are seen as fringe users of science toward vindication of their non-scientific beliefs, not as practitioners of science searching for the truth about nature.

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Few, in my opinion, are as shocked over the resolution of the mantrack claims—despite the laudable "mantracker" goals of literally "uncovering the truth"—as they were in the unraveling of the Piltdown affair, with its motives of apparent petty jealousy and/or a prank-gone-awry (Gould, 1980, 1983; Blinderman, 1986). In other words, the distinction between the self-delusion of the Paluxy mantracks and the hoaxing of the Piltdown man seems equally as clear as any parallels.

The exposure of erroneous information or of unethical practices in science is, historically, part of the scientific enterprise—long though it may take, as in the

case of Piltdown. There were surprisingly few critiques of the early mantrack claims, however, despite early evidence to merit such. Some creationist observers of Baugh's claims privately criticized them, but would not do so publicly. As we critics of Baugh's (and, later, of J. Morris' and P. Taylor's) work came forward with our conclusions, then we thought we might hear somewhat more vocal criticism from these same observers. The situation seemed similar to that which Richard Dawkins pointed out to me, when the great evolutionary scientist J.B.S. Haldane was reluctant to criticize the pseudoscientific atrocities of Soviet Lysenkoism because of his political preferences for communism. Negative reactions from many of Baugh's supporters to "Raider" investigations were very prompt, however, with little or no reluctance.

Though unnecessary to show the scientific failure of the evidence to substantiate the mantrack claims, I think it instructive to point out the broken promises and discourtesy on the part of some of the mantrack advocates. Evidence specified repeatedly by Baugh and promised to be shown to the "Raiders" and Kuban (e.g., photos, maps, etc.) never materialized. Kuban's contacts with some mantrack investigators, and especially with John Morris and Paul Taylor, were characterized with promised lines of evidence that were often never fulfilled, despite Kuban's consistent permission for them to use his evidence—as Morris did in the August 1986 Creationist Conference (Cole, 1986; Schadewald, 1986c; Wakefield, 1986.). Rather than meet me in October 1985, John Morris requested of Kuban that I not be present at the Taylor site (Hastings, 1986). In the summer of 1986 in Glen Rose, John Morris failed to meet an appointment he and I had verbally confirmed, with no subsequent explanation. The very next day Morris also failed to keep his appointment with a newspaper reporter from Dallas, but the reporter happened to find him working in the river with Reverend Baugh.

Incidentally, the resolution of the Paluxy mantrack claims is still another concrete example of the unexpected and exciting turns scientific research can take. Our pursuit of the mantracks has led to new insights into dinosaur locomotion and, perhaps, dinosaurian behavior. Kuban has made the world of dinosaur ichnology very aware of the two previously unaddressed phenomena of plantigrade locomotion and tracks defined primarily by colorations (Kuban, 1988b, 1988c).

Conclusions

It is abundantly clear that there is no positive evidence that mantracks are found in the Lower Cretaceous limestone along the Paluxy River, regardless of how such a discovery would be welcomed or dreaded. This seems true for all investigable phenomena labeled as mantracks in the past. Questions do remain about the exact mechanisms and geochemistry of the colorations on the "best mantracks" that made dinosaurian origins clear for most of the mantrack enthusiasts (Kuban, 1988c; Hastings, 1987a), but these have nothing to do with what made the tracks. (Preliminary laboratory analyses and on-site observations of the cores Kuban and I took suggest an infilling of the tracks soon after they were made by a clay-like material, possibly a mixture of terrigenous and marine sediments. Selective diagenesis within the tracks at low tide after the infilling, in addition to the original infilling's distinction from the lime-mud substrate on which it was deposited, could have played a part toward producing, after lithification, the more dolomitic nature—higher content of magnesium carbonate—of the material inside the tracks compared to the more typical dolomitic limestone outside.)

Our pursuit of the mantracks has led to new insights into dinosaur locomotion and, perhaps, dinosaurian behavior.

It is undoubtedly unrealistic to say that the pursuit of mantracks has ended, as creationist zeal for out-of-place fossils has been unquenchable. In 1987 Baugh began work at a new site upriver from his old excavations. In a somewhat related project, John DeVilbiss has begun assigning human characteristics to depressions just across the river from Baugh's new site (*Acts & Facts*, 1987)—depressions similar to the ones Kuban, the other "Raiders," and I have already described on Baugh's excavation sites on the Baugh/McFall ledge. Baugh seems to be making the same misinterpretations as before, but DeVilbiss apparently does not recognize any value in his newly documented depressions for mantrack enthusiasts (DeVilbiss, 1988). However, ICR has given these activities some support that will undoubtedly kindle new mantrack hopes and perhaps new Baugh support (*Acts & Facts*, 1987).

Surely much could be said about the factors driving the mantrack enthusiasts, but these factors now must be seen as having little or nothing to do with the evidence. The summer of 1987 has seen a resurgence of support for Baugh brought on by the alleged find of a "human tooth" in Cretaceous deposits, which apparently is a

fossilized fish tooth (Hastings, 1987b, 1987c). Concern must be raised over why there was not more persistent "in-house" criticism of the mantrack claims among creationists, why some evidence was overlooked, and why alternative explanations were not pursued. Methods such as sparse and incomplete documentation, as well as the pro-mantrack conclusions, were in a scientific sense very questionable.

To conclude that there are no mantracks in Cretaceous limestone along the Paluxy River in Texas is to take no necessary ideological stand; it merely is stating matter-of-factly the results of an evidence-based scientific position. From a variety of viewpoints among the careful and probing mantrack investigators came our common scientific conclusions. That variety includes both conservative and liberal Christianity, atheistic humanism, and agnostic skepticism. Though we differed on some details of interpretation, we have come to the same or very similar overall conclusions concerning creationist mantrack claims along the Paluxy. The absence of mantracks is not necessarily a pro-evolutionary statement, although none of the research in pursuit of them does harm to modern evolutionary conclusions. Nor is it anti-creationist for the myriad of philosophical and theological positions embodying the concept of a Creator. It is, however, a devastating indictment against scientifically irresponsible claims fueled by an anti-evolutionary zeal notable among many fundamentalist Christian believers—a zeal sufficient to obscure or diminish sensitivity to the scientific irresponsibility of the claims.

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Communications

The State of Evangelical Christian Scholarship

When talking about evangelical Christian scholarship, we should avoid lapsing into the kind of rhetoric that seems to presume that the scholarship in our own communities is coextensive with all of Christian scholarship. We want to avoid the sort of parochialism suggested by a remark attributed to one of the promoters of Liberty University, who said that one of Liberty's goals was someday to show that a Christian university could have as good a football team as Notre Dame's.

I am not the person best qualified here to comment on Notre Dame as a Christian university, but I have seen their football team play, and I can say that they are in fact downright unchristian. They are almost always selfish, mean, and uncaring, not to mention brutal—which I did just mention. It will be interesting to see if the more rigorous Christian perspective at Liberty University will produce an alternative. I can warn them, however, that the last real attempt to have a Christian football team was at my alma mater, Haverford College. Haverford is a Quaker school, and for years the Haverford football team practiced passive resistance. They had great practices; but that never got them anywhere. As Woody Allen once said of his experience at an interfaith camp, he got beaten up by boys of every race, creed, and color. So with Haverford on Saturday afternoons in the fall. And so they abandoned their football program entirely.

We do not want, then, to claim too much when we talk about "Christian" this or that and we do not want to claim that evangelical scholarship and Christian scholarship are coextensive.

When we talk about evangelical scholarship, we are talking about an international movement that, to the extent that it has been organized, has had largely American and British leadership. Moreover, in America evangelicalism is a complex transdenominational movement that cannot be reduced to any of its subtypes. Nonetheless, to the extent that there have been efforts to mobilize transdenominational evangelical scholarship, the leadership has been drawn disproportionately from the Reformed side of the American fundamentalist-evangelical movement. This is not to say that other evangelical traditions—Holiness, Pentecostal, Anabaptist, black, Lutheran, Southern Baptist, and so forth—have not produced significant scholars. It is only to say that those Americans who have attempted to build evangelical scholarship into a movement have come mainly from the Reformed side of American evangelicalism (usually with British allies).

One of the striking features of the state of Christian scholarship today is that this relatively small community of mostly North American and British scholars is one of the few groups in the world who would sponsor a conference on this topic. There must be some Catholic counterparts; but in this country, at least, there is considerably less talk about Catholic scholarship than there was a generation ago. Essentially the same is true of old-line Protestant groups. If they were to talk about Christian scholarship, they would be talking about theological disciplines only. Their scholarship is pretty well confined today to theological seminaries. I think that not many communities exist today where one would find interests such as many of us share in the relationships of Christianity to the sciences, the arts, and the liberal arts.

Since most of the Christian scholarship of previous generations has died out or been secularized, perhaps the principal question we should ask concerning evangelical Christian scholarship today is whether it represents simply a transitional stage in the secularization of our community. Are evangelical academics today simply introducing secular standards to our community, but doing so by giving them the gloss of Christian education? Or is what we are seeing the emergence of an evangelical Christian renaissance?

Signs of the Times

Evangelical scholarship today presents some moderately encouraging signs. Today evangelicalism (broadly defined) is a recognized, even if fragmented and not always welcomed, force in American Protestantism. Evangelicalism even has some basis for claiming to be the wave of the future. Evangelicalism's strength in scholarship, however, is much less than its strength in other areas. Nevertheless, it is much stronger than it was a generation ago, and it is strong relative to most other Christian groups. A nonevangelical friend tells me that when he lectures in his American religious history survey on neo-evangelicalism, he always points out that this is the most literate group of American Christians, writing and selling relatively more serious Christian books than any other major American Christian group. Such serious Christian literature still tends to come disproportionately, though far from exclusively, from more or less Reformed evangelicals, both British and American. In America today there are also scores of evangelical colleges, representing the scores of evangelical subtraditions. These colleges include some with fine faculties, and several can be classed in the upper ranks of American liberal arts institutions. The discouraging dimension is that the total enrollment of all evangelical colleges is equivalent to that of only about two major universities; so evangelical Christian higher education makes up only a tiny proportion of American higher education today. Also, of course, a number of self-consciously evangelical scholars are in university positions, but they make up a tiny fraction of the whole.

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In theological education, the situation is more encouraging. There, the largest and perhaps the best American seminaries are evangelical, a vast revolution from forty years ago. Another encouraging sign is in numbers of young evangelicals seeking graduate education. At least at a place like Duke Divinity School, where I teach, a disproportionate number of the degree candidates and applicants in the field of religion (at least half, I would guess) are identifiably evangelical. People from strongly religious backgrounds may be more likely to think that beliefs, and hence intellectual pursuits, are important. Hence they may be overrepresented in some fields of graduate education. In the long run this should have an important impact. It is too bad, in my judgment, that we have hardly any graduate institutions for training these young people. This problem is difficult to resolve since at present it is still almost necessary for gaining credibility to get credentials from a leading secular institution. I think two parallel strategies are important. Evangelical scholars should remain involved in university higher education, and at the same time evangelical educators should be building their own institutions with such standards of academic excellence that eventually they will gain wide academic recognition. I think this has already happened at the liberal arts level and there is no reason it cannot happen higher up.

These mostly promising signs in evangelical scholarship are, of course, part of a larger picture of evangelical growth. This growth, we should keep in mind, is a mixed blessing. Religious movements flourish for a combination of reasons that include the disturbing along with the admirable. In the case of the growth of evangelical scholarship, for instance, one of the trends it reflects is the growing suburbanization and affluence of our communities. More and more evangelicals, like others in their social classes, are interested in higher education and so our academic enterprises have grown.

If we describe what is happening from this perspective, we are driven back to our central question: Is the growing interest in higher education among evangelicals a step on the way to the secularization of the movement? The growth of evangelical wealth and the rise in status among many white evangelicals have been important contributors to the rise of evangelical scholarship and educational institutions. Clearly we need that wealth for evangelical scholarship to flourish, but we do face the danger that the growing affluence of our communities could do us in. This is especially true if we do not take a prophetic stance toward usual American attitudes toward wealth.

This social-economic factor is related to the larger issue of whether our community is simply secularizing. A number of observers from all sides recently have noted that progressive evangelicalism, such as that which dominates our higher education, is at about the point where mainline Protestants were a century ago. William Hutchison of Harvard has made this observation. So has Leonard Sweet from a more sympathetic viewpoint. Critics to the right often make similar suggestions. So does James Hunter in his recent survey, *American Evangelicalism: The Coming Generation*, which well documents moderate changes in some traditional beliefs among a minority of students at evangelical colleges and seminaries and emphasizes the secularization theme. Are the changes taking place signs of a healthy tolerance for diversity and recovery of balance, or symptoms of decline?

So here is the important question for us today. Evangelical scholarship has so far grown to only modest proportions. These look considerable, however, if we compare the situation to, say, forty years ago. In 1947 evangelicalism was still part of fundamentalism, and all the substantial scholars in the movement would have fit in one train car. The movement may be poised for continued geometric growth in the next forty years. But is this growth we are experiencing the sign of the emergence of a major new movement or is it a step toward secularization?

Two Counterforces

I see two major counterforces to the possible secularization. First, I think it is immensely important that we are now living in a post-liberal age. The intellectual atmosphere is very different from forty years ago. Protestant liberalism has flowered and seems to be dying on the vine. It is difficult to see it as the exciting promise for the future. We can hope that we have learned enough from the fundamentalist-modernist era to retain our resolve to stay on the distinctly evangelical side, even if we reject the overstated emphases of fundamentalists in defending that side. We have perhaps an opportunity to exercise intellectual maturity, not being swept away by the pressures from either fundamentalism or liberalism. Part of being on the evangelical side means that, unlike modernism, which tried to defend Christianity by wedding it to the prestige of modern scholarship, we see our scholarship as providing an informed critical alternative to the prevailing intellectual trends of our day.

The other counterbalancing hope I see comes from within our intellectual life itself. That is in the triumph—or nearly so—of what may be loosely called Kuyperian presuppositionalism in the evangelical community. Perhaps we could call this Augustinianism, if that does not conjure up too many specifics. In any case, I refer to a style of Christian thought which emphasizes that crucial to the differences that separate Christian world views from non-Christian ones are disagreements about pretheoretical first principles, presuppositions, first commitments, or basic beliefs. Thus, without denying the value of human rationality, it denies the autonomy or competence of reason alone to adjudicate some of the decisive questions concerning the context within which rationality itself will operate. This viewpoint can be contrasted with the older common sense, Baconian tradition that once dominated American evangelical thought. This tradition assumed that only one objective science existed for all people, and hence, that ultimately there should be no real distinction between Christian thinking and clear thinking. Christianity, they thought, should therefore be able to win its case on rational or scientific grounds alone.

The prevailing view now emphasizes that Christian thought and non-Christian thought, being founded on some opposed first principles, reflect wide differences in total world views. So those who presuppose that the universe was created by the God of Scripture are going to have many

differences in viewpoint from those who suppose we have a chance universe. Since Christian principles will thus relate to all of thought and life (though not to all in the same degree), an important activity for such scholars is to define a Christian world view in contrast to the prevailing outlooks of our day. Though such emphases are not the only ones found among evangelical scholars today, they describe what I think is the dominant outlook.

One of the encouraging dimensions of the present state of evangelical scholarship is that this approach, which grew largely out of the Dutch Protestant thought of a century ago, can speak effectively to some of the principal intellectual trends of our day. In the era since Thomas Kuhn and of anti-foundationalism in philosophy, few claim today that there is just one world view that can be demonstrated as superior on rational grounds alone. Even in the hard sciences, it is now widely recognized that the prevailing assumptions of communities play a role in what they count as true science. I would think that the Kuyperian versions of this insight, which add a chastened realism that is essential both to historic Christian belief and day-to-day human behavior, should be crucial in shaping the style and strategy of evangelical intellectual life.

Early in this century most American intellectuals seemed to believe that ultimately one enlightened and scientific view would triumph for all educated humankind. Liberal Protestants shared in this view and so generally believed that eventually all Christians would have to be convinced of their views of religion and of Scripture. Almost all conservative Protestants held to the same principle, expecting that a triumph of rationality would lead to the universal vindication of their views. In both cases their outlooks reflected the combination of certain Enlightenment assumptions about rationality and Protestantism's long habit in America of thinking of itself as the cultural establishment, whose views ought to ultimately prevail for all properly assimilated Americans and ultimately for the whole world.

Today's intellectual environment is far more pluralistic, and we are fortunate to have available a developed intellectual tradition that is suited to taking account of the implications of that pluralism. Today, I think, it is much clearer than it was a generation ago that evangelicals do not have to take over the old Protestant agenda of dominating Western civilization or world civilization. Rather, we should give up our vestigial establishmentarianism and accept our status as one community (or a coalition of communities) within civilization. This, it seems to me, is a healthier position for the church anyway.

Our Agenda

For us as scholars this means that our agenda ought to be directed toward building for our community as solid a place in the pluralistic intellectual life of our civilization as is consistent with our principles. Helping to establish the intellectual viability of our world view and pointing out the shortcomings of alternatives can be an important service to our community and an important dimension of our witness to the world. To perform this task properly requires a delicate combination of modesty and assertiveness. Our intellectual life must display the Christian qualities of self-criticism and generosity to others. Richard Neuhaus puts it well when he says we should have "reverence for those with whom we disagree." At the same time, we properly attempt to establish for others the attractiveness of our world view.

Establishing the attractiveness of a world view, however, is not strictly or even primarily an intellectual enterprise. Rather we should hope that evangelical Christians will demonstrate the attractiveness of our world view by the way our communities address the whole range of human experience. This involves the way we live and not just the way we think. As Nicholas Wolterstorff has reminded us in various contexts, action is the goal of Christian intellectual life. This does not mean that action is identical with intellectual life or can be substituted for it. These are important provisos in our pragmatically inclined communities, where, as Mark Noll has observed, "to urge activist evangelicals to get more active is like pointing an addict toward dope." Unfortunately, there is considerably more danger today of intellectual and artistic life being overwhelmed by various kinds of activism than there is danger of the reverse. Nonetheless, our ultimate goal is not primarily intellectual. Our role as scholars is to play one modest part in building and enriching communities that are models of a balance of piety, worship, intellect, art, charity, and social concern.

What are the major challenges we face today? I see three, two of which I shall mention just briefly. The first is that of the politicization of the scholarly enterprise. Politics, broadly conceived, constitutes one of the operative religions for most people today. It is also the operative religion for many evangelicals. Sheer political partisanship could easily take over our scholarship, so that we could become fragmented into competing ideological camps. One antidote to this trend is to emphasize that Christian scholarship should always be self-critical scholarship, even though inevitably partisan to some extent.

A second challenge is simply that of maintaining our momentum in defining the distinctives of evangelical Christian scholarship. As I observed at the outset, one of the most striking features of Christian scholarship today is that so few communities are enthusiastic about promoting it. So one of our most important challenges is simply that of vindicating, for secular audiences but especially for Christian communities, the significance of our enterprise itself. Our communities must gain a vision of the primary importance of critically assessing the prevailing world views of our day, and of intelligently defining the distinctive characteristics of Christian views of reality.

The third of the challenges will perhaps be the most difficult to meet. Though we are in a far stronger position than forty years ago to deal with pluralism in the larger scholarly community, the corollary is that we have to deal with more pluralism from within. In one sense this is a strength. Today there is wide recognition that "evangelicalism" is not a simple entity but a loose coalition of subgroups who share similar traits and traditions. Our presuppositionalism helps us to deal with such internal pluralism, to be less

dogmatic than has been traditional in insisting that there is only one "evangelical" view of an issue. But how do we keep that recognition from drifting into a relativism? This has always been the problem for Protestants, as their Catholic critics were quick to point out. Typically Protestants have responded with assertions that we have rational and scientific procedures for determining the one definitive meaning for Scripture. So Baptists thought they could rationally demonstrate that adult baptism was a requisite church ordinance, and non-Baptists thought they could demonstrate just as certainly that infant baptism was permissible as well. Today, with a clearer recognition of the limits of science and rationality, we should be in a position better to tolerate differing readings of the same texts.

But what if such disputes concern more central issues? Certain views surely go beyond the bounds of evangelicalism into something else. So I do not think you could have an evangelical who denied the bodily resurrection of Christ. Or that the Bible was uniquely inspired and authoritative. Or the atonement. Or the necessity of the atoning work of Christ. Or a fair number of other doctrines. But how do we set such boundaries for evangelicalism?

Finding the answer to such questions is especially perplexing for communities that have so little regard for the visible church or churches. Nonetheless, I see two steps in the right direction. First, whatever presuppositionalism we might have should not entail entirely abandoning traditional categories of common sense rationality in adjudicating disputes. Contrary to some 20th century mythology, some interpretations of texts are more reliable than others, and I see no reason to suppose that God has created us without the ability often to tell the difference between the relatively better interpretation and the relatively worse.

But let me put the point in broader terms. I think that a central starting point of evangelical thought must be the Incarnation. A foundational premise in any coherent evangelical world view is that we can know Jesus, the Jesus of history. We affirm that God has entered into real history and that we creatures can know something about God through this revelation in history. Moreover, this implies that we affirm that God has created us with sufficiently reliable mechanisms for knowing about reality, even on the basis of testimony by others, so that we can know what we need to of the historical Jesus through revelation as it has come to us through Scripture. So a knowledge of the incarnate Christ among our fundamental principles excludes much of the historical and hermeneutical relativism of our day.

The other step in the right direction I would propose is that we American Protestants, lacking much sense of the authority of any church, try to recover some sense of the value of tradition. This will always be an imperfect and not wholly reliable authority, but it could provide an important confirmatory test of our beliefs. Our sense of being part of a community of faith should involve a sense of being part of an *historical* community of faith.

Twentieth-century intellectual life has the peculiar bias that the newer an idea is, the better it is. When you reflect on it, this is an astounding bias, especially in an age when we are unusually conscious of the social-cultural origins of ideas. This bias for the latest idea seemed to make sense in the 18th century, when it first became common. Then the faith in one universal science supported a faith in simple intellectual progress. But today, with the wide abandonment of the myth of a single science for humanity and with a high awareness of the importance of the sociology of knowledge, one would suppose that twentieth-century thinkers should be especially suspicious of new ideas (including strong emphases on the sociology of knowledge). Just to the contrary, however, today's scholars rush after the latest fads in much the same way that as children they rushed out to get Davey Crockett coonskin caps or hoola hoops (I use these examples since the world has been taken over by baby boomers). Evangelical scholars, by contrast, should benefit from the wisdom of many times and cultures. Though the antiquity of a belief is far from decisive evidence of its truth, it may provide reason to give that belief preferential consideration, especially if that belief has long been held by the communities we consider to well represent the church through the age.

* * * * *

Let me conclude with a very brief summary. It is conceivable that we are witnessing the beginnings of a renaissance in evangelical scholarship. Even if so, evangelical scholarship has a long way to go. Compared to forty years ago, we seem to have made great strides. Compared to the wider intellectual community, we still represent a tiny minority enterprise. Assuming we do not lose sight of our primary task of building a strong sustaining community that witnesses to the gospel by action as well as belief, it seems to me that we could sustain a healthy geometric growth in our enterprise if we maintained these three emphases: (1) a willingness not only to assert the superiority of our traditions, but to be self-critical and generous as well; (2) a continued emphasis on building critical analyses of the presuppositions dividing our thought from that of other world views of our age; and (3) a healthy respect for the mainstreams of the Christian tradition as an antidote to the parochialisms both of our subcommunities and of our century. If we can maintain at least these three emphases, in addition to the fundamentals that define evangelicalism, then evangelical scholarship should not quickly drift into either a liberal Christianity or into the merely secular. Truly evangelical scholarship can flourish.

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Creation, Time, and "Apparent Age"

During the past two centuries there has been a growing accumulation of evidence that the Earth and the universe are very old. The Bible does not give us any explicit information about the age of the universe, but either a casual or a highly literalistic reading of the Bible seems to indicate that the universe was created at a relatively recent time. The notion that the Earth and the universe are young was commonly held in the Western world where the influence of Christian thought was strong, although Christian theologians had suggested long before then that the "days" of the creation narrative in Genesis 1 need not be understood as days of 24 hours length, and that the age of the universe was not given by the Bible. Nevertheless, until about two centuries ago, most people in the Western world thought the Earth and the universe to be only several thousand years old.

In the face of mounting evidence that the Earth and the universe are billions of years old, some Christians have tried to preserve the traditional notion of a recent creation of the universe by appealing to Scripture, with a highly literalistic understanding of the early chapters of Genesis, and a view of the genealogies found in the Bible as being fairly strictly continuous. Meanwhile, the conclusion that the universe is very old has become more and more firmly established on the basis of consistent and persuasive evidence from the study of our world carried on in several diverse fields of science. In an effort to preserve an interpretation of the Bible as telling us that the universe really is young and still recognize the existence of the scientific evidence of the age of the universe, some Christians have suggested what has become known as the "apparent age" view. That view holds that the universe was created recently with a built-in appearance of age, and so it looks old by whatever means of age measurement we apply to it, but in reality it is young. That idea has persisted in the thinking and writings of Christians for some time, although I do not know when or by whom that idea was first suggested. At the present time also, the "apparent age" view is sometimes brought into the discussion of science and Christian faith in a wide range of Christian publications. Consequently, this view deserves another careful evaluation from a Christian perspective.

The concept of a universe which was created with "apparent age" must be considered in the context of the time framework of history. We are creatures who are bound by time and space. Those limitations are so much a part of the fabric of our being that it takes some effort to think about any other possible condition.

In his book *Maker of Heaven and Earth* (New York: Doubleday, 1959), Langdon Gilkey refers to time as "a creature of God." Time and space, as well as the entities which occupy space in time, are created. Therefore, God is independent of time, as He is independent of space. God alone is eternal. The eternal is *above* time, or *outside of* time, or *surpassing* time, or some such term which denotes a qualitative distinction in kind; the eternal is unbound by time, rather than being merely everlasting in time. To speak of a universe which is billions of years old does not mean that the universe thus approaches being eternal; the eternal is qualitatively different from time, rather than being merely an infinitely long time. (See how we struggle even to grasp the idea of the eternal!)

Gilkey notes that many non-Christian philosophies have had concepts of time and of our time-bound existence which are different from the Christian concept; commonly, as in the Greeks, they have had a notion of endless cycles. Gilkey continues: "One of the most significant and dramatic turning points in the development of Western culture was the victory over this deadly view of circular time achieved by the biblical understanding of history. As important culturally as the destruction of the pagan gods was the overthrowing of the endless cycles . . . " (p. 300, Anchor Books edition, 1965). Gilkey quotes from Augustine, then rephrases Augustine in identifying "three fundamental Christian ideas that were in direct conflict with the conception of endless cycles, in the order of their importance: 1) the eternal God sent Jesus Christ into the world and time, to save men from sin and death, and for an eternal destiny. This was a completely new event in history and had results for men which were both new and eternally significant, not to be rescinded by any further turns of the wheel of time. 2) Men are in the course of history really saved, and thus to each of them, as to history as a whole, a new, irreversible, and eternally significant event can occur. 3) God, who is eternal, has created time with a beginning and an end. Time is thus finite, giving to each of its moments the possibility of being unique and unrepeatable" (*The City of God*, Book 12, Chapter 13). The eternal God has reached down to touch us who are in time, and has made it possible for us time-bound creatures to make contact with eternity in Jesus Christ.

Gilkey affirms further that "this new view of time was made possible because of the new framework for time which the idea of creation established. As Augustine insisted, at creation time itself began. This meant first of all that from that point onward every moment in history was in a real sense new, occurring for the first and only time. . . . Time and its development were, moreover, within the power and purposes of God, because it was God who had created and begun this linear time series. Time was not an enemy to meaning, nor alienated from God's eternity. Rather it was the intentional creature of God, made by Him and directed and controlled by His will" (p. 304ff).

The concept of time being created by God at the beginning of His creating activity is also found in the thought of John Calvin. In an article entitled "Calvin's Doctrine of Creation," published in *Princeton Theological Review* (April, 1915) and reprinted in *The Princeton Theology 1812–1921*, edited and compiled by Mark A. Noll (Grand Rapids: Baker Book House, 1983), B.B. Warfield states: "With Calvin, while the perfecting of the world—as its subsequent government—is a process, creation, strictly conceived, tended to be thought of as an act. 'In the beginning God created the heavens and the earth': after that it was not 'creation' strictly so called, but 'formation,' gradual modelling into form, which took place. . . . he was inclined to draw a sharp distinction in kind between the primal act of creation of the heavens

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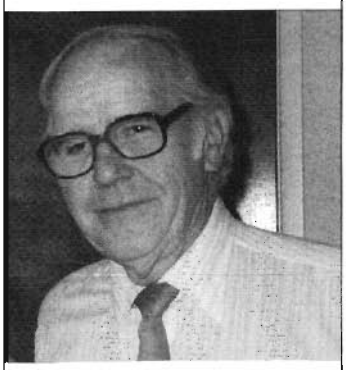
SEARCH

Scientists Who Serve God

HE PUT PSYCHOLOGY TO WORK FOR MISSIONS



When Stanley E. Lindquist was growing up, he met a lot of foreign missionaries. That's because many of them traveling across the country to speak in churches stayed with his family. Stan's father was an Evangelical Free Church pastor, generally serving small congregations of Scandinavian immigrants. Although Stan became a professional psychologist rather than a missionary, he has helped many others serve Christ on the foreign field.

After graduating from Fresno State College in California, Stan was teaching school when the U.S. entered World War II. He soon found himself in the army medical corps. In France, going to the aid of a wounded soldier, he stepped on a land mine. Both of his badly damaged feet were surgically reconstructed, but he lost his right eye.

Out of the hospital and the army, Stan began graduate work at the University of Chicago. He was interested in clinical psychology, which in those days wasn't considered very scientific. As a Christian, Stan wanted to get the best possible training, so he majored in physiological and comparative psychology, minored in experimental psychology, and took a second full major in clinical psychology. The founder of behavioral psychology, John D. Watson, had been awarded Chicago's first Ph.D. in psychology. Stan Lindquist was their first student to combine clinical work with "scientific" psychology. For his research on effects of loud noises, which related hearing loss at certain frequencies to injuries in the inner ear, he was granted a Ph.D. in 1949.

Discovering a need

Lindquist's first college teaching job was at Trinity College in the Chicago area. There, a missionary suggested that the Lord might want to put Stan's training to use in secular education. Stan went back to what is now Fresno State University as a professor of psychology.

In 1961, Stan took his wife Ingrid and their three sons to Europe on a sabbatical leave. Besides the French hospital where he had spent nine long months, he visited many institutions where innovative treatments such as group therapy were becoming established. There in France, a number of missionaries discovered a Christian psychologist in their area. They began bombarding Stan with their problems. Through those contacts, Stan says, "the Holy Spirit seemed to be telling me that my training and experience were in direct answer to missionaries' needs, and challenging me to do something about it."

Doing something about it

In addition to his teaching, Professor Lindquist began developing a private clinical practice in psychology. Drawn into business activities, he became knowledgeable about real estate. When the builders of a large apartment complex in Fresno went bankrupt, he was able to purchase the property in 1969 for far less than its value. Using that property as a base, Lindquist founded Link Care, a center where professional psychological services could be made available to missionary candidates preparing to go overseas, to seasoned missionaries on furlough, and to missionaries returning home as "battlefield casualties." Missionary families could live in the apartments while taking advantage of Link Care's ministry of "helping, training, listening, counseling, serving," or, in a word, *caring*.

Stanley Lindquist, who is now 70, answered God's call by taking up a career in psychology. Through his profession he found a unique way to enhance the Christian missionary enterprise.

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Scientific Investigation

WHAT MAKES AN EFFECTIVE MISSIONARY?

To the listening psychologist, a young missionary poured out his feelings of frustration, failure, anger, and anxiety. After years of preparation he was heartbroken at having to leave his field of service. In spite of a strong "calling" from God, he now felt that his life was a total loss. What could he do? Where could he go?

In 1965, Stan and Ingrid Lindquist made a special trip around the world to interview 350 career missionaries about their needs. After gaining firsthand knowledge of the devastating personal cost of missionary failure, they talked to mission agencies. Firm statistics weren't easy to come by, since institutions prefer to appear successful. One Bible college discovered that 90 percent of its missions alumni had not continued beyond their first term overseas. Overall, it is estimated that between 15 and 50 percent of new career missionaries fail to stick it out, at a staggering cost to their agencies (approaching 20 million dollars a year). Intentional "short-termers" aren't counted in figuring that dropout rate.

To assess failure requires a clear picture of what it means to succeed. Judging their effectiveness in a foreign setting is one of the hardest problems new missionaries face. Add language difficulties and other cultural adjustments, plus overly high expectations, and you have what looks like a system "cunningly devised to promote psychological breakdown."

An experiment in caring

Stan Lindquist set up Link Care Center to attack the problem on three fronts: assessment, prevention, and rehabilitation. Standard seminary programs seldom address the "real" problems new missionaries will face. Many mission agencies have been unable or unwilling to do the kind of careful evaluation that would pinpoint potential problems before appointees are sent overseas. Missionaries suffering emotional trauma need a place to "come home to" where they will be both accepted and helped.

Link Care's long-term goal is prevention. Candidates undergo a detailed evaluation process while they live with experienced missionaries in a supportive environment and receive cross-cultural training. By 1987, some 500 missionary candidates had gone through Link Care's "controlled-stress" program. In 1987 alone, of 75 early returnees in the restoration program, 70 percent were able to go back to the field. During their residency, they provided another touch of realism for the new recruits.

To be sure its programs are on the right track, Link Care is working on a large-scale research project on "Measuring and Predicting Effectiveness in Cross-Cultural Work." Until quantitative data are available, Stan Lindquist has to rely on what the missionaries themselves, and the over 50 agencies that have sent people to Link Care, have to say. It may not add up to hard scientific evidence, but a growing collection of anecdotal evidence convinces Stan that the Link Care approach is the way to go.

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While adult missionaries attend classes at Link Care....

LINK CARE CENTER

Link Care Center seeks to equip missionaries with "personal living skills for effective lifelong ministry." The staff includes eight doctoral-level therapists and one linguist, eight masters-level counselors, a pastor to missionary families, and a support staff of seventeen more, with a combined total of more than 100 years of missionary experience. The center provides evaluation, counseling, and pre-field orientation to new missionaries in a three-week program. That program features such topics as anthropology, linguistics, stress-management, teamwork, family relationships, marital communication, and health issues. The center also offers a flexible program of restoration for those in emotional distress. Link Care is engaged in long-term research on "What makes an effective missionary?"

The eight-acre campus contains 107 apartments and 28 motel-type rooms, plus a large counseling center, kitchen and dining rooms, offices, classrooms, a library, swimming pool, and even a playground for "MK"s. Link Care is set up on the "tentmaking" principle with income from outside counseling practice and from rental of apartments to retirees. With 65% of Link Care's budget earned and 35% contributed, missionaries are charged only half the cost of the services provided (1988 fee for the three-week program, including lodging and all meals: $725 per adult).

Heartbeat, a quarterly newsletter, is free on request from Link Care Center, 1734 W. Shaw Ave., Fresno, CA 93711.

Theological Reflection

PSYCHOLOGY AS A HUMAN SCIENCE

When Stan Lindquist first went to his university teaching job, the head of the psychology department knew the young Ph.D. had done research on hearing. Jokingly, he asked: Which ear did Stan specialize in, the right or the left? Scientists try to discover general principles or laws describing the widest possible range of phenomena. At the same time, though, science becomes more and more fragmented as its disciplines become more specialized.

In the 1940s Lindquist was considered almost schizophrenic to take a complete major in clinical psychology while preparing himself to do solid research. The combination is now fairly common, but some psychologists still want to pattern their discipline after the natural sciences, especially physics, where mathematics reigns. Some physicists, however, regard psychology as too "soft" to be much of a science at all.

Are people objects or subjects?

Theology has a definite stake in debates about scientific boundaries. Science is usually defined as dealing exclusively with the natural world accessible to our physical senses. Yet within ourselves we experience phenomena not measurable or even observable from outside, such as our emotions and beliefs. Behavioral psychology tries to exclude inner attitudes from consideration, focusing only on external "behaviors."

Some Christian scholars, emphasizing the biblical understanding that we are made in the image of God, argue that sciences of the human person should not be modeled after physics, which would require ignoring the spiritual qualities that make us distinctively human. Other Christian scholars prefer to retain the narrow definition used for "hard" sciences, but with the reminder that science can provide only a limited perspective on the world. Such "perspectivalists" argue that a scientific description is always incomplete. It must be balanced by a religious perspective, and vice-versa.

The human sciences also face another dilemma. Should psychological therapy be included as part of their discipline, even when clinical work cannot be put on a firm scientific footing? Medical schools teach a mixture of medical science and medical practice. Psychiatrists (who have M.D.s), psychotherapists trained in psychology, and seminary-trained pastoral counselors are all mental health workers, but where should the professional lines be drawn?

What psychologists learn about human behavior can be used to help people or hurt them. The world needs more Christians trained in the human sciences who will care for hurting people. Christian theology sees the human person as a physical, mental, and spiritual whole, even if for now our knowledge of the parts has to come from different disciplines.

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.... the "missionary kids" (MKs) have their own activities.

IN GOD'S IMAGE

Several Christian professional organizations deal with the human sciences and their application. The Christian Association for Psychological Studies (CAPS), for members in "the helping professions," publishes the *Journal of Psychology and Christianity* (26705 Farmington Rd., Farmington Hills, MI 48018). Dr. Lindquist was guest editor of a special issue devoted to "Assessment of Missionary and Minister Effectiveness" (Winter 1983). Dr. Dean Kliewer, Link Care's director of research, was guest editor of an issue on "Management of Feelings: Anger, Sex, and Depression" (Winter 1986).

The American Scientific Affiliation (ASA), founded in 1941, now numbers some 2,500 members trained in all branches of science, including the human or social sciences. ASA publishes a scholarly journal, *Perspectives on Science and Christian Faith* (P.O. Box 668, Ipswich, MA 01938). Dr. Lindquist was elected to ASA's executive council in 1986 and will be president in 1989.

The Christian Medical Society (CMS), includes many psychiatrists among its members from all branches of medicine and dentistry. It publishes the *CMS Journal* (P.O. Box 830689, Richardson, TX75083-0689). As a Ph.D. in psychology, Dr. Lindquist is an associate CMS member.

In June 1988, ASA and CMS cosponsored a symposium relating the human person as *Imago Dei* ("Image of God") to the health sciences. Several hundred scientists, physicians, and theologians wrestled with various questions raised by the Christian view of personhood. The symposium, held at Gordon College in Massachusetts, featured seventeen workshops on clinical applications.

Thoughtful Worship

COPING WITH DEPRESSION AND STRESS

Psychology is obviously important to Dr. Lindquist, but he thinks of it as "the handmaiden of Christianity: it exists to serve us in our Christian walk by helping us understand how God made us." Some people distrust psychology for fear it may reveal things we prefer to hide—especially from other Christians.

In a 1975 *Christianity Today* article, "Dishonesty on Cloud Nine," Lindquist wrote that God lets all Christians go through "low points in life" to teach us what couldn't be learned any other way. Emotional dishonesty about those low points can produce deep, lonely despair, sometimes leading to psychosis or suicide. Confessing his own experiences of failure and defeat, he wrote: "Knowing that others have conflicts too and are coping with them gives hope to Christians who are in the midst of depression."

Link Care reminds Christians of the apostle Paul's honesty: "We are afflicted in every way, but not crushed; perplexed, but not driven to despair" (2 Cor. 4:8). Guided by God's love, we can uncover sources of stress in our lives, see what stress does to our bodies, and learn to cope with the "distress" it causes us.

Most coping skills are based on Scripture and common sense. Simple things like ordering our priorities, setting reasonable goals, practicing a positive attitude, talking out problems with a trusted person, and taking an occasional "mental health break" can mean the difference between a down time and total despair. We must learn to distinguish "neurotic guilt," to be confronted as false and then forgotten, from "real guilt," to be confessed (1 John 1:9) and set right (Matt. 5:24).

Missionaries in training at Link Care

God requires faithfulness, not "success." But he requires it of all of us, not just of missionaries overseas.

The Lord is my shepherd, I shall lack nothing.
He makes me lie down in green pastures,
he leads me beside quiet waters,
he restores my soul.
Psalm 23:1-3 (NIV)

For God did not give us a spirit of timidity, but a spirit of power,
of love and of self-discipline.
II Timothy 1:7 (NIV)

Ω

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SEARCH brings scientific questions to the attention of pastors and the Christian public by focusing on the work of Christians in science. SEARCH is an occasional publication of the American Scientific Affiliation (ASA), Robert L. Herrmann, executive director. Multiple copies to one addres: 15¢/copy plus $1.50 postage and handling charge (check or money order only). Quantity prices available. Be sure to state the number of the issue being requested. Prepaid orders only, please.

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and the earth out of nothing, and the subsequent acts of moulding this created material into the forms it was destined to take; and to confine the term 'creation,' strictly conceived, to the former." Calvin, too, held a concept of time being created "in the beginning," and the "acts of moulding this created material into the forms it was destined to take" taking place in time.

Except for "in the beginning," Genesis 1 depicts the universe as being formed within a time framework. Thus, the Christian concept of time as God's creature rules out the concept of an "apparent age" of the universe. All time is of one piece; there is discontinuity only at the beginning, when "in the beginning, God created the heavens and the earth." The rest of creation took place in time; there is no discontinuity within nor at the end of the "six days."

This Christian concept of time as God's creature also means that there is one and only one kind of time. It rules out a concept of two different sorts of time: one which held for the period of God's creating activity, and a different sort of time which holds for history since then. This sort of suggestion—namely, that there was "creating time" and there is now "creation time," and that these two times were different and incommensurable—was proposed by Gordon Spykman in the December, 1985 issue of *Dialogue* (published at Calvin College, Grand Rapids, Michigan). But such a suggestion must be rejected. While inserting a discontinuity into history in a somewhat different way than the "apparent age" view does, such a suggestion is inconsistent with the scriptural view of time as having been created by God "in the beginning." In the words of Gilkey, "at creation the first moment of time appears in existence. Time itself has an absolute beginning; the series of moments in time is finite, going back to a first moment, before which are no other moments, but only God's eternity."

There are other objections to the concept of "apparent age" which have to do with our understanding of history and the meaning of history. The Scriptures portray God as being the active Director of history, and the telling of that history assures us that God is faithful to His covenant. We cannot go back in time to observe that history-in-the-making, so our view of that history is from where we stand in time, the present, called by our calendar Twentieth Century, A.D. How do we "see" history? We look into the past, step by step, as follows:

1. We stand in time at the present. Our perception of history is from this present time perspective. As we "look at" the past from the present, we pass through recent history as it is recorded in our memories, then through more ancient history which is recorded in written records, then through still more ancient history as it is recorded in non-written artifacts of human culture, then through even more ancient history as we find it preserved in evidences of chemical-physical processes of the past. As we look at that history from our perspective in the present, no discontinuity imposes itself into our study.

2. As we "look at" the past from the present, it seems unlikely that we would be able to perceive any discontinuity, even if there had been one. Therefore, we have no way of identifying at what point in history such a discontinuity occurred, even if there were one. (Our inability to perceive a discontinuity in history is precisely the basis for and the aim of the "apparent age" view of the universe, but in achieving that aim it also destroys history, as we shall see.)

3. Of course, we cannot restrict the application of a concept of "apparent age" only to history that is learned from astronomy and geology; such a concept must apply to all history. If we accept the concept of "apparent age," we cannot save human history from the mere appearance of age, not even by appealing to the history of the evidences of human culture. We obviously cannot declare the beginning of history to be identified with the first known written records, because there are many artifacts from earlier times which are undoubtedly the products of human activity. Historical dates based on radioactive decay and other time-dependent physical-chemical processes tell of an unbroken sequence which overlaps both with written history and with earlier history based on non-written artifacts of human culture. No discontinuity shows up in the sequence of those physical-chemical dates, either. Thus, we do not see any discontinuity through our study of history, and so we cannot assign any of history to "pre-discontinuity" except in a purely *ad hoc* way. (We have already established that there is no theological basis for assigning any of history to "pre-discontinuity.") Therefore, if we accept the concept of "apparent age," we are left with no assurance of the reality of any history whatever. We have no assurance that the history of last week or of last moment is any more real than the history of dinosaurs or the history of the 3.8 billion-year-old Archean rocks of southwestern Greenland.

At this point I object to the concept of "apparent age" on the basis of my Christian faith in God's promises. That concept takes away my assurance of the reality of the history of God's love and grace in His dealings with His covenant children. The concept of "apparent age" leaves us with no reason for confidence in His promises to care for us and to forgive us in Jesus Christ. For God could have created great libraries full of theological books with "apparent age" just as easily as He could have created great mountains full of fossilized creatures and radioactive isotopes with "apparent age." Thus, the concept of a universe created recently with a built-in "apparent age" is completely inconsistent with Christian belief based on the meaningfulness of history.

Of course, I cannot prove that God did or did not make the universe with an appearance of age. When people ask me, as they quite frequently do, "Don't you believe that God *could* have made the universe with an appearance of age?", I sometimes try to get them to think a bit more deeply about that by asking them to think about a different part of God's creation rather than about His creature time. I ask them, "Don't you think that God *could* have made the Earth so that it appears to be round (spherical), but it really is flat?" The answer to that is: "Yes, of course. God can do what He chooses to do in whatever way He chooses to do it." Then I ask: "Do you think that God *did* make the Earth so that it merely appears to be round, but it really is flat?" Some

people hesitate at that point, but most say: "No." Then I ask: "Why don't you think so?" They answer by telling about observational evidences such as photos from space, and by giving scientific reasons for concluding that the Earth is round. There are many observed evidences which support the conclusion that the Earth is old also, so I reject the concept of "apparent age" of God's creation for the same reasons that I and most other people reject the concept of "apparent roundness" of the Earth. Would God "fool" us about the shape of His Earth? Would God "fool" us about other aspects of His creation?

Apparently there are a significant number of Christians who want to insist on a physical-mechanical-literal interpretation of the early chapters of Genesis, in spite of the many scientific evidences that the Earth really is old. Rather than accept alternative interpretations of Scripture which have been suggested by Bible-believing theologians, they have invented the concept of a universe created with an "apparent age" in order to escape the force of the evidence of great age which is obtained from the study of God's world itself. I do not know of any Christians who promote a concept of an Earth which was created with "apparent roundness," although such a concept would allow us to hold onto a similar physical-mechanical-literal interpretation for certain other passages of Scripture, such as those that refer to the "ends" and the "corners" of the Earth, in spite of scientific evidences that the Earth really is round. However, both concepts of "apparent but not really so" are contradictory to the affirmation which we share with the Psalmist in Psalm 19; namely, that "The heavens declare the glory of God; the skies proclaim the work of his hands." When we consider God's handiwork in His universe, concepts of "apparent but not really so" are contradictory to our confession that God is made known to us "by the creation, preservation, and government of the universe, which is before our eyes as a most elegant book. . . ." (from the *Belgic Confession of Faith*, Article II).

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Response to Reviews of Teaching Science in a Climate of Controversy: *"Did the Universe Have a Beginning?" and "Where Did the First Animals Come From?"*

The questions in the title above were two of four "open" questions covered in *Teaching Science in a Climate of Controversy* (*TSCC*), a 1986 booklet distributed by the American Scientific Affiliation (ASA) to 50,000 high school science teachers.[1] This article is a response to the scientific content of seven critical reviews (references 2a–2g) of the two questions in an attempt to ascertain what corrections or additions should be made in this section of ASA's booklet.

One critic, Juliana Texley, compares *TSCC* unfavorably to two other publications for teachers, both of which are recommended in the second printing of *TSCC*.[2a] These are the 1984 National Academy of Science (NAS) booklet *Science and Creationism*, and the 1986 National Science Teachers Association (NSTA) booklet *Modern Science and the Book of Genesis* by James W. Skehan. Texley also recommends the 1986 book *Origins* by Robert Shapiro. The authors of *TSCC* also endorse her recommendation of Shapiro's book, which is subtitled "A Skeptic's Guide to the Creation of Life on Earth."

A recurring criticism of the "open questions" posed in *TSCC* is that they are selective; that is, they emphasize the *unknown* rather than the *known* areas of evolution. Although the questions are clearly labeled as "open," the criticism of selectivity is valid if one expects *TSCC* to stand by itself as a text on evolution. That was not the booklet's intent, however. It was intended as a supplement to biology textbooks and to the NAS publication, in which the relatively well-established areas of evolutionary biology are adequately covered. The NAS booklet is especially helpful in presenting evidence from biogeography and biochemistry which we saw no need to duplicate.

Most teachers on the firing line of the creation/evolution controversy seem to have little trouble recognizing the supplemental nature of *TSCC*, as indicated by the 70% A and A-plus grades on reader response cards. Nevertheless, it would have been wiser for us to label *TSCC* as a "supplement" to avoid misunderstanding on the part of some scientists concerned with the defense of evolution.

The authors of *TSCC* believe that unsolved problems and "open questions" deserve an important place in science education. Unsolved problems are an integral part of science and can be used to provide stimulation and inspiration in the classroom. The primary reason the authors chose the questions on the beginning of the universe and the origin of the first animals was that these areas are not covered in high school biology textbooks or in the NAS booklet.

Did the Universe Have a Beginning?

In scanning the critiques by nine prominent scientists assembled by William Bennetta, we note that not one of them presents a scientific criticism of this question.[2d] The

following scientific criticisms have been made by others:

1. Bennetta states that our discussion contains "the implicit notion that time exists independently of the universe."[2e,6] What we actually say is: "Although the idea of an eternal universe has satisfied many thinkers, modern discoveries have made that idea more difficult to accept. Today the best scientific evidence points to a real beginning, not only of the matter and energy of the universe but of time and space as well."

2. David Wake asks, "What do they accept as evidence? On the very day I read [in *TSCC*] that 'no trace of newly appearing or extinct galaxies' had been detected, the discovery of a spectacular new supernova was announced."[2c] We think Wake (a professor of zoology) has mistakenly confused stars with galaxies. Supernovas signal the death of stars and provide the material for new stars and planets *within* galaxies. The question being addressed in *TSCC* is whether Hoyle's model of continuous creation is valid; we say no, for the reason that astronomers see no evidence of new galaxies. In other words, the universe is evolving from an initial beginning; it is not being continuously created.

3. Steven Schafersman says that "the Big Bang was not the beginning of matter and energy, only of its present form in our Universe."[2g] He gives no scientific evidence to back up such a firm conclusion. In *TSCC* we point out that "The vacuum from which Guth's universe theoretically arises, however, is not a true vacuum; it contains energy. Attempts to derive a truly *ex nihilo* origin for the universe by what is known as 'quantum tunneling' have so far been frustrated. Quantum mechanics places severe limitations on 'virtual particle production,' and general relativity places demanding limits on the origin of time and space."

Schafersman (a geologist) cites no source for his statement that "much empirical evidence supports it [the oscillating universe hypothesis] over the hypothesis that the universe had only one origin." Although an oscillating universe is very appealing to some people for religious reasons, current scientific evidence and theory argue not for it, but against it. At the present time the observed density of the universe is at most only three-tenths of what is needed to force a collapse. Further, the density implied by the inflationary model will not force a collapse. Even if the universe were to collapse, a bounce would be unlikely, if not impossible, because of the huge entropy in the universe. Further, there is no known physical mechanism that can reverse a cosmic contraction. In final response to Schafersman's assertion that the oscillating universe hypothesis is "strongly supported," we note Tony Rothman's statement in the July 1987 issue of *Discover*: "There are models of the universe that bounce without resorting to quantum gravity, but they're not very realistic in their details. To date, all reasonable models of closed universes end in singularity."

* * * * *

Hence, the authors of *TSCC* see no basis on which to make changes in the section "Did the Universe Have a Beginning?" although we remain open to new discoveries and constructive scientific criticisms.

Where Did the First Animals Come From?

Several criticisms have been leveled at this "Open Question."

1. A major objective of *TSCC* is to teach students and teachers that scientific conclusions should be based on evidence. We are therefore concerned when Juliana Texley, editor of *The Science Teacher* magazine, accuses us of "inaccurate misrepresentations" and "no balanced discussion," citing as evidence for her accusation our "ignoring the relatively recent evidence for the great variety in Precambrian life."[2b] We invite interested readers to examine the booklet for themselves, and note the illustrations and caption on page 34. Further, a full paragraph entitled in bold print "The Known" contains a summary description of the late Precambrian Ediacara fossil complex. In addition, *TSCC* readers are given sources in footnotes 14 and 15 for more extensive reading on these relatively recent Precambrian discoveries. Perhaps Texley has confused our booklet with her alternative recommendations, which make no mention of these exciting discoveries.

2. William Bennetta accuses us of virtually ignoring "the whole post-Cambrian record, its overwhelming demonstration of evolutionary succession, its transitional forms, and the knowledge it has yielded."[2e] Again, we invite readers to examine the evidence for themselves. With regard to transitional forms required by evolutionary theory, we state that the " 'reptilian bird,' *Archeopteryx*, is one of many exciting discoveries that seem to fit the general picture. Further, in following the succession of fossilized life from ancient layers of rock to more recent ones, we see that, in general, increasingly complex life-forms have appeared" (p. 34). Also, we devote an entire page (25% of the space for the First Animals section) to an illustration of these increasingly complex life-forms as they appeared over the last 500 million years of geologic history (the post-Cambrian). This hardly squares with Bennetta's charge that we "virtually ignore the post-Cambrian" and his further accusation in the *California Science Teacher's Journal* that, "As far as the A.S.A. is concerned, the past 500 million years seem not really to have happened at all."

3. Bennetta claims that *TSCC* affirms that: "Scientists cannot reasonably infer 'where' animals came from, because the fossil record is sparse until the Cambrian period."[2d] We cannot be held responsible for an inference made by Bennetta which we never intended or made. To clear up any misunderstanding on this score, we hereby affirm that it is indeed a logical scientific inference that the first animals as well as subsequent ones evolved from previous life-forms. The problem is that the origins and earliest evolution of the metazoan phyla cannot be currently documented from the fossil record. It is this missing evidence and the parameters of the unsolved problem that *TSCC* addresses.

4. Neil Wells charges that "the reader is deliberately left with the impression that everything in the Precambrian was blue-green algae and that 'real animals' suddenly appeared

at the start of the Cambrian."[2f] The following items from *TSCC* are in direct contradiction to Wells' assertion. After our description of the blue-green algae in the caption on page 34, we say that "The first cells with a nucleus (*eukaryotes*) appeared perhaps 1 billion years ago. Life was very simple until about 700 million years ago." In our text on pages 34 and 35 we say that "A few [of the earliest animals] have left their mark in rocks of late Precambrian time about 700 million years ago. Impressions found between sedimentary layers define some simple animals that had neither shells nor skeletons. Those earliest fossilized animals were first discovered in Australia about twenty years ago." We describe these first fossilized animals as the Ediacara fossil complex, date them as far back as 100 million years before the Cambrian, identify them as fully formed, soft-bodied animals many of which are unlike later animals. We cite two reference sources for further study by those interested. If this information about the general sequence of life between the blue-greens and the Cambrian animals constitutes deliberately leaving the reader with the impression Wells describes, somebody has a serious communication problem.

We are grateful to Wells for his helpful criticism that we improperly identified *stromatolites* as being formed by "floating mats." We should have said "algal mats," or more completely, "mats of blue-greens, properly called cyanobacteria, growing on the sediment surface." Our mistake is especially embarrassing to one of the co-authors, John Wiester, who has the correct description in his 1983 book *The Genesis Connection* (pp. 77–79).

5. Schafersman states that the authors of *TSCC* "conclude that the argument that the transitional forms were not preserved because they were soft-bodied is not convincing because numerous well-preserved soft-bodied fossils from Precambrian and Cambrian rocks have been found."[2g] We did not say the argument was "not convincing." We said the argument was "less convincing than it once was" because of the numerous recent discoveries of soft-bodied preservation from the Cambrian and Precambrian.

Schafersman also says that we make the "incorrect claim that transitional forms linking the Cambrian invertebrate phyla that *did* have hard parts should have been found since they 'should have contained hard parts.' " He then says that we are "wrong" because "the adaptive radiation that led to the appearance of the Cambrian phyla occurred in the late Precambrian before the various phyla had developed hard parts." The latest information shows that both we and Schafersman have made incorrect statements. Schafersman is incorrect to insist that the adaptive radiation that led to the appearance of the Cambrian phyla had to have taken place in the Precambrian. It could have taken place at the base of the Cambrian following the mass extinction of the Precambrian animals. He is also incorrect in his assumption that the adaptive radiation that led to *all* the Cambrian phyla would have been entirely without hard parts. We are wrong in assuming that *links between* invertebrate phyla should exist that contain hard parts.

The real issue in dispute is whether there should have existed transitional forms with durable parts leading to at least some of the phyla and subgroups that make their appearance in the Cambrian. We note that James W. Valentine and Douglas H. Erwin state that "The Echinodermata particularly, and the Mollusca as well, contain classes that are, to the level of certainty possible in such cases, descended from durably skeletonized ancestors that were not usually minute. Yet we have no intermediates in these cases. The missing intermediates may be regarded as data, and these data indicate that ancestors of high-level taxa may be missing even if they are not soft bodied or minute."[3] They also state that "The evidence presented concerning the brachiopods suggests that the phylum could not have gradually evolved without hard parts and then acquired them, leading to the rapid appearance of these groups in the fossil record; rather the hard and soft parts of these groups are intimately coevolved."[4] A key point of the Valentine and Erwin paper is that it is time to regard the missing intermediate forms as real data and to look for "mechanisms of genome change that do not operate at the same intensity or with the same results today."[4] It is this type of approach to unsolved problems that leads to the advancement of science.

6. We feel that Stephen Gould's charge that we have quoted him out of context is based on his inference concerning our motives.[2d] Our motive is not to throw doubt on the record of the subsequent evolution of invertebrates, as Gould states. We agree that we should have avoided misunderstanding by clarifying his intent, which was to explain (in Gould's words) "why we should not expect progress as a major feature of the fossil record." Our objective in using his quote was to emphasize the importance of this pivotal point in biologic history (the origin of major body plans). Roger Lewin has also emphasized the importance of the origin of the major body plans: "Around 600 million years ago multicellular organisms appeared, and within a few tens of millions of years all the basic designs for complex life forms had been established. Since then life has again and again consisted of variations on a theme" (*The Thread of Life*, 1982, Smithsonian Books, p. 70). Gould and his co-workers have more recently called the base of the Cambrian a "crux in life's history" when "nearly all basic designs of invertebrate life entered the fossil record for the first time" (*Science* 236:1437–1441, 12 June 1987).

* * * * *

In conclusion, the section of the *TSCC* booklet dealing with the "open question" of "Where did the first animals come from?" concludes that the origins and earliest evolution of the invertebrate phyla remain essentially undocumented in the fossil record. The amazing amount of diversification that took place in the early Cambrian, producing almost all the animal phyla, is seldom appreciated by students as a major feature of evolutionary history. The booklet neither proposes an explanation nor accuses researchers of covering up our current lack of information regarding the origin of the invertebrate phyla. But why should high school textbooks inadequately depict this "crux in life's recorded history" (in the words of Gould et al.)? It is an excellent place not only to explore the role of mass extinctions and subsequent radiations in evolutionary theory,

but also to present unsolved problems—all of which deserve an important place in science education.

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"Scientists Decry a Slick New Packaging of Creationism"

A Response to William Bennetta by Wilbur L. Bullock, Editor, Perspectives on Science and Christian Faith, *the Journal of the American Scientific Affiliation.*

Since I don't think either you or your "noted scientists" were fair or scholarly in your emotional response to *Teaching Science in a Climate of Controversy* (*TSCC*), I would rather not continue the discussion at that level. Therefore, my remarks will be as specific as possible. My response is in three parts: I. to your editorial introduction, II. to each of the nine scientists, and III. a concluding summary.

I. Your Editorial Introduction

(A) The title is emotional journalism: "decry," "slick," and "creationism" are pejorative terms and not scientific. "Slick" is a derogatory term and a headline grabber. By flaunting "creationism" you immediately conjure up textbook censorship and court cases. That has never been an objective or method of the ASA. But more of that later. . . .

(B) The major inaccuracy in your editorial and by most of the scientists quoted is a refusal (stubborn or careless?) to define your terms. Just a little library research would indicate that the "creationism" which is "a fundamentalist political movement" is a small (but aggressive) fringe which maintains a strictly literal 24-hour day creation and a young earth. That was not the stance of *TSCC*. You should read the excellent AAAS Symposium volume, *Science and Creation* (Macmillan, 1986). Most of the participants in that symposium clearly differentiated these extreme claims—quick-creationism, recent creationism, young earth, and creation-science—from a multiplicity of alternate views. Craig Nelson, in Chapter 9, did a commendable job in differentiating the extremes of recent creationism from atheistic evolutionism and the *numerous* other views, views that reflect the diversity among scientists and others. ASA members, as all Christians, recognize a Creator, but that neither makes us "creationists" in the pejorative sense in which you use that word nor are we "anti-evolutionists."

(C) You and Lynn Margulis castigate ASA as "a religious group." Since we are all committed Christians that is true, but most of us are practicing scientists and, in addition, have an interest in integrating our faith and our science. From a historical perspective ASA was organized primarily to explain science to the Christian community. Yes, we accept the Bible as the inspired and unerring word of God as our "*guide of faith and conduct.*" (Why did you leave that out?) The "fundamentalists" with which both you and I have problems try to make the Bible a textbook of science. We in the ASA have serious reservations about this.

(D) You refer to "ASA's rejection of evolutionary biology." That is completely *false*. If you have read any of the real "creationist" literature you would have found out that they consider ASA to have capitulated to theistic evolution. I recently retired after 39 years in teaching and research at the University of New Hampshire, and I am currently an honorary Research Affiliate of the Harold Manter Laboratory of Parasitology, University of Nebraska. One of my research interests has been in parasite systematics. I am *not* an anti-evolutionist. I have absolutely no problems with "microevolution" and I readily accept macroevolution as the most logical working hypothesis in biology today. Therefore, I too have problems with the "creation scientists" who do not accept any possibility of macroevolution.

(E) You say that *TSCC* "is an ordinary exercise in creationist pseudoscience," then a few lines later recognize that we reject the young earth concept. It is the young earth, recent creationists who are suing school boards and writing laws in favor of the teaching of creation science on an equal time basis. That is *not* what *TSCC* is about. Other authors make the same error. Just as you object to the dogmatism of the "creationists" (and I likewise), I object to the dogmatism of a "science" that preaches that we know all the answers.

I could go on and on with criticisms of the emotional, unscientific reaction on the basis of *assuming* the ASA authors were "pamphleteers" using "innuendo." Now let me just give a list of the statements that I find objectionable as they unjustly, on the basis of the prejudices of your commentators, impugn the motives of the authors of *TSCC*.

II. Comments on Other Authors

(A) Futuyma (and others) complain about "selective omission." The booklet was to help public school teachers deal with an emotional situation in a calm way. It was not to *oppose* evolution; neither was it a *textbook* of evolution.

Comparison of the Piltdown and Paluxy episodes may have been a bit overdrawn, but when I was an undergraduate 50 years ago, Piltdown was one of the "facts" that proved human evolution. It is not one of the episodes in science of which we can be proud, except that it was scientists that exposed the hoax, but some "extreme creationists" were involved in the discrediting of Paluxy.

Futuyma complains that *TSCC* does not "mention the complete absence of evidence for special creation." That's really beating a dead horse, since very few of even the "extreme creationists" defend that long discarded concept. ASA does not support "special creation"!

Futuyma in the next sentence refers to "creationists' unquestioning commitment to beliefs that must exclude biological evolution." Here again he is attacking an imaginary position that is NOT found in *TSCC* or in the ASA. I have no problem with his statements "that evolution is a fact," that "organisms have descended, with change, from common ancestors." However, to say "all organisms," *though it may be true*, is not a careful scientific statement. I am sensitive on this concept, not because of any anti-evolutionary bias, but because I had a major professor who used to remind us that "two words good biologists should never use and always avoid are 'always' and 'never.' " Our theory may be true, but even all biologists together can't be familiar with all organisms. Or, as a UNH colleague of mine used to remind his ichthyology classes: "Fish don't read books."

The emphasis on the problems of the origin of life, the origin of the invertebrate phyla, and the origins of humans are *the* areas in which the general public is most interested. These are also the areas in which the atheistic evolutionist loves to pontificate in the same dogmatic manner as the most ardent "creation scientist." As I look back on my years as a university zoologist, I shudder when I think of some of the things I taught as "fact" which are now *wrong*. And I'm not talking about nebulous, theoretical things but concrete, descriptive details of the malaria parasite life history, the basic structure of the mammalian liver, the nature of the intercalated discs of the heart, etc., etc. (I taught parasitology and histology all those years.)

(B) Maxine Singer complains that molecular genetics was ignored. Perhaps it should have been mentioned, but again *TSCC* was not written as a complete, technical treatise on evolution. I wonder if, competent research biologist that she surely is, she has ever tried to explain molecular genetics to the typical pleasure-oriented high school student whose parents may not care what they learn, although a small minority might get upset if evolution is mentioned. And many of those parents are not the least bit religious!

(C) Michael Ghiselin follows the same line by assuming that *TSCC* is out to disprove evolution. Yes, it emphasizes (but "belabors"?) some inadequacies of evidence in some areas, but nowhere does *TSCC* "deny" evolution nor does it intend to. He, too, uses that word "innuendo" which reveals his "preconceived and prejudiced philosophical biases" that I find unscientific. He, as others, decided that *TSCC* was a "creationist pamphlet" before he had actually read it. That is not what a true, open-minded scientist is supposed to do. He would never be the outstanding scientist that he is if he handled his research data like that. Ghiselin also refers to "telling lies." I challenge him to give specific examples of "lies"; and I mean deliberate falsehood, not just a different opinion from his evaluation of evidence.

(D) Niles Eldredge is a bit more restrained in his criticisms but he, too, assumes that, just because a few areas of at least some uncertainty are mentioned, *TSCC* is against evolution. Certainly, the specific models of human evolution have differed substantially over the last 100 years. I doubt that we are the truly privileged generation that has arrived at ultimate truth in this area.

(E) Lynn Margulis approached *TSCC* with the same prejudices as the other writers. She used the emotional word "insidious" in her opening statement. She seemed particularly disturbed by our religious commitment. Obviously, she makes the unwarranted assumption that to be scientific and religious are mutually exclusive. I am a Christian *and* a biologist. Because I am the former does not mean that my "belief in the Bible, in Jesus Christ, and in God as the creator and sustainer of the physical universe" makes me a recent creationist or an anti-evolutionist. On the other hand, just because your writers and I are biologists does not require that we be anti-religious atheists. That is a philosophical, not a scientific, conclusion. *TSCC* was not trying "to impose [our] particular religious beliefs" on anybody. A majority of the American people, and not just the "fundamentalists," have at least some allegiance to the Judeo-Christian heritage. Yes, we should teach evolution in biology, but there is no justification for the high school science teacher to dogmatically tell a student that evolution has disproved Genesis. That kind of anti-religious bias is just as unethical as it would be to preach one narrow interpretation of the Bible in a public school.

(F) Vincent Sarich "reads between the lines" less than any of the other authors but he, too, lumps everyone who raises a question into THE "creationist" camp. The *specific* hypotheses (models) are constantly changing. That's the nature of science, and it does not disprove the general hypothesis (evolution). However, it should make us a little more humble and conciliatory when dealing with nonscientists who raise questions. Likewise, gaps do not prove "special creation" as a few of the more extreme "recent creationists" have claimed. The authors of *TSCC* do not believe that, but certainly the history of science would tell us that "gaps" frequently yield surprises. That's certainly been true in relatively noncontroversial subjects (like my own field of parasitology), but that is one of the things that makes science exciting.

(G) Robert Jurmain accuses ASA of false motives. Our motives were religious only in the sense that the hub of the present controversy is because *some* religious people propagate a literal recent creationism (NOT the position of ASA)

and *some* scientists try to use evolution as an argument for their philosophical positions. Such extremes are not the only options, and the history of science proves this. (Read, for example, James Moore's *The Post-Darwinian Controversies*.) More importantly, the American high school is a pluralistic community. If we do not want a fundamentalist minority teaching their interpretation of Genesis in science classes then we must not have scientists, untrained in theology, insisting that Genesis is wrong. We must learn to be more understanding of the people with whom we disagree or, worse yet, see fundamentalist plots (like they see communist or secular humanist plots) behind everything that doesn't fit our neat little world view.

Professor Jurmain also objects to the use of the quote taken out of context. It seems to me that the quote was used in a complimentary way. It certainly strikes me as an example of acceptable scientific accuracy, and I don't see where the statement was distorted in any way by using the principle in a more general application in a mildly questioning manner.

It is true that none of the "pamphleteers" were "professional biologists," but they are or have been professional science teachers at either the high school or the college level. Furthermore, I am one of many biologists in the ASA. We are not anti-evolutionists and we are not "creationists" in the derogatory, distorted way in which that term is used in your publication, in the media, and even in the courts. Most of us are convinced that much—and for some of us, maybe all—of creation could have been accomplished through natural selection and other evolutionary processes. In contrast to your writers, we further believe that recognition of natural laws—in this case evolution—does not give us the right to tell people who believe in a Creator that they are inferior human beings, or accuse them of innuendo and dishonesty without cause.

(H) Stephen Gould complains that his work was misused. He would be correct *if* the introductory statement, presumably written by the editor, was correct. *TSCC* was interested in defending supernaturalism as a valid *philosophical* premise, but more importantly we were attempting to help science teachers be honest and fair to all of their public. Science neither proves nor disproves the supernatural. *TSCC does not suggest* "that scientists have no worthwhile ideas about the origins of animals." That is absolutely false! The thrust of the booklet was to emphasize that good scientists such as Gould can be people who recognize that part of the excitement of science is that each new discovery raises more questions for us to work on. There was no intention of misusing or misquoting. Perhaps there may have been some misinterpretation, but Gould misrepresents the authors when he assumes that all who believe in a creator are the extreme "creationist" types he has experienced in his debates.

(I) Alan Portis gives an admirable description of the role of the teacher. However, he is naive when he thinks teachers can or should be "above the battle." Many fine teachers are able to handle controversial subjects in a nonthreatening way; many cannot. It is important for teachers, especially biology teachers, to discuss the basics of evolutionary theory. In American public schools, that means we have to realize that many pupils and parents have some religious views. For many this means (rightly or wrongly) a "creation" that they think is opposed to "evolution." I agree with Portis that the teacher is not to offer "a synthesis of science and religion," and *TSCC* was not an attempt at synthesis. Rather, it was designed to show that there were more than two alternative syntheses possible.

III. Concluding Summary

(A) Our public schools are in trouble in many ways, but especially in the way in which those of us who believe in good education and balanced, informed presentations of controversial issues face the problems of pluralism. We should be working together.

(B) There are some religious people who are not acting in a responsible—or Christian—fashion when they oppose views they ignorantly disagree with, or when they seek to monopolize the public schools for their particular religious beliefs.

(C) There are scientists who allow their philosophical biases to dominate their teaching and their public pronouncements and, in the name of science or separation of church and state, make anti-religious statements.

(D) Such irresponsible actions by both extremes cause controversies to become emotional, stimulate polarization, drag each other into the legal process, and damage the cause of both science and religion.

(E) *TSCC* was not an anti-evolutionary pamphlet. It was an attempt to face the reality that, although someone's pet theory may be a literal interpretation of Genesis and someone else's an atheistic interpretation of evolution, there are countless numbers of people out there who are in neither camp and, in fairness, shouldn't be.

(F) Therefore, science at the public school level must be taught in an even-handed manner, just as we should teach current events without slanting toward the Republicans, the Democrats, or Lyndon LaRouche.

(G) Above all, we need to stop witch-hunting, looking for communists, evolutionists, creationists, secular humanists, or whatever group about which we have become paranoid.

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YUKAWA: Naturalist, Traveler

Hideki Ogawa was born in 1907 in Tokyo, the third of five sons. His father Takuji was head of the geology research center, but became Professor of Geography at Kyota Imperial University (1897) when the boy was one. (Kyota had been the capital of Japan until 1869). His archaeological interests led to close connections with the Institute of Chinese Culture. He had the boy's maternal grandfather, a samurai with great learning in Chinese classics, teach Hideki to read the classics at five years of age. The next year Hideki entered the Kyogaku Primary School, where he developed a distaste for science. At twelve he went to the Kyota Prefectural First Middle School, where he developed a fondness for mathematics, but did not like physics. He also learned English and German. During the next year or two he read Taoism and Chuangtse, which he found in his father's voluminous library.

At sixteen, he entered The Third High School where he read the then-popular Tolstoy, though he gravitated towards Dostoevski later. He lost his interest in mathematics because of his teachers: the one in algebra emphasized memorizing, the one in geometry insisted upon verbatim repetition of the notes given. Engineering, too, was not attractive, owing to his poor draftsmanship. Although somewhat clumsy in a laboratory, he became fascinated by theoretical physics. He particularly enjoyed Jun Ishihara's *Theory of Relativity* and *Fundamental Problems in Physics*. He bought Planck's *Introduction to Theoretical Physics I* (General Mechanics, in German). He later remarked that the 1900 Leyden talk on "The Unity of the Physical Universe" was the "most outstanding" of Planck's lectures. He was intellectually stimulated, above all, by Fritz Reiche's *Quantum Theory*. At nineteen Hideki entered the Kyota Imperial University to study physics, graduating three years later. He spent the next three years there as an unpaid research assistant; his primary interests were the little-known fields of the atomic nucleus and of cosmic rays.

At twenty-five he married Sumi Yukawa, two years his junior, and was adopted by her family (taking on their name). He was made a lecturer at the Kyota Imperial University and then also at Osaka Imperial University the following year. A turning point in his life probably occurred when he met Professor Hidetsugu Yagi, head of the new Osaka Physics Department.

At twenty-seven, he presented a paper "On the Interaction of Elementary Particles I" at a meeting of the Physico-Mathematical Society of Japan. The paper predicted a new elementary particle, the meson, for which he received the 1949 Nobel Prize in physics at the age of forty-two (cf., the experimental discovery of the muon and of the π meson). At twenty-nine he was made Associate Professor at Osaka, and received his Ph.D. from the University three years later. At thirty-two, he became Professor at Kyota. On his way back from a Solvay Conference in Europe, cancelled on account of WWII, he visited the United States. At forty-one he became Visiting Professor at the Institute for Advanced Study in Princeton, and the following year Professor at Columbia University. Four years later, he was appointed Director of the new Kyota University Research Institute for Fundamental Physics. He was made a member of the Japanese AEC at forty-nine. He died at the age of seventy-four in 1981.

He was awarded in 1940 the Imperial Prize of the Japan Academy, and in 1943 the Order of Decoration of Cultural Merit of Japan. He was made an Honorary Citizen of Kyota. Yukawa also received an honorary doctorate from the University of Paris. He was a Foreign Associate of the U.S. National Academy of Sciences and a member of the American Physical Society. He was an honorary member of the Royal Society of London, the Royal Society of Edinburgh, the Italian Academy of Science, and the Pontifical Academia Scientiarium, among others.

He founded and edited the English journal *Progress of Theoretical Physics*. He published two books, including *Creativity and Intuition* (1973). An autobiography, *Tabibito* (the Traveler), written when he was fifty, was published posthumously in 1982. As a scientist from 1932 to 1934, he said: "I felt like a traveler carrying a heavy burden and struggling up a slope. . . . Those who explore an unknown world are travellers without a map; the map is the result of the exploration."

Early on, Yukawa set himself a daily schedule. Although docile in temperament, he had tenacity of purpose, perhaps even stubbornness. He continually sought new, difficult challenges. In later life, however, he deplored the plethora of miscellaneous information and the multitude of expected tasks. When young he was asocial; he never became quite adept in dealing with other people.

As he grew older, he appreciated more and more how science is intimately linked with society. He was anxious about thoughtless applications of science and fearful of "scientific wars." As a scientist, a Japanese, and a human being, he regarded the production of atomic energy as a turning-point for mankind. He was himself one of the eleven signatories of the Russell-Einstein Manifesto (1955) which was against the use of nuclear weapons and for the abolition of war. In view of the impotence of the United Nations, he favored a World Federation to insure peaceful coexistence by scrapping all armaments. In 1961, he was President of the World Association of World Federalists (made Honorary President in 1965). Although he attended the first Pugwash Conference on Science and World Affairs (1957), he became disappointed with the Association's increasingly bureaucratic operations.

He was discouraged also with the growing cultural estrangement of physics from other disciplines. Yukawa himself did not neglect the humanities, particularly, philosophy, history, and literature. He said, "I have always believed that literary beauty is not so far removed from the beauty that is revealed to us by theoretical physics." The novels he preferred early in life were of a melancholic mood, even pessimistic. His later appreciation of Lady Murasaki's *The Tale of Gengi* lightened the generally dark atmosphere of his literary tastes with only occasional flashes.

Looking backwards, he felt that "modern physics carries an echo of ancient philosophies" (e.g., Democritus' atom). In Epicurus' letters, he believed he saw the interesting current idea of the universe as nonborn and nondestructible. He admitted, however, that the old distinction between existence and nonexistence is becoming increasingly unclear in modern physics. The "chaos" of the Chinese philosopher Chuangtse (4th century B.C.), he felt, "is much akin to the world of elementary particles."

Yukawa had an open world view: the great unknown touching the ever-changing known. He wondered about an invisible mold that apparently produces all electrons alike, and about DNA that chance may have caused but that reproduces itself. In it all, however, he felt the mystic unity of nature emphasized by Planck: "To strive towards such a goal is surely, even today, the most essential justification of physics." He believed, however, that our perception of nature is diminishing owing to the increasing alienation of theory from human senses: "I have felt more and more strongly my estrangement from contemporary physics in spite of the fact that I myself am a physicist." He preferred the simpler general relativity to the more abstract quantum mechanics: "When one turns back to one's own views on life and endeavors to relate physics to some sense of purpose, one begins to have the greatest doubt. Indeed, one wonders if they have any reference to the purpose of life at all."

Yukawa bemoaned the lack of any adequate metaphysics "to discover the truth." He noted the plentifulness of professors of philosophy, but the dearth of any philosophies. In his own case he found that the ideas of the Chinese philosopher Laotse (604-531), the father of Taoism, and of his follower Chuangtse seemed "most modern." Both placed nature at the center of their thinking, man being unhappy apart from nature and puny in attempting to resist it. In the case of the atomic bomb, he found man actually subservient to nature. A favorite quotation was from Laotse: "Heaven and Earth are without compassion; they see all things as straw dogs" (i.e., ceremonial objects destroyed after their use). "Man's efforts on behalf of man are all the more meaningful. Here . . . . lies the only purpose in life that makes life worth living." He felt that Laotse had unknowingly given a scathing indictment of scientific culture—long before its advent. Yukawa admitted, "We today . . . have come to cherish very fundamental doubts as to where scientific progress is leading." For him both Laotse and Chuangtse suggested a fatalistic naturalism, "like that to which the scientific view of nature may ultimately lead."

On the other hand, Yukawa seemed at times to favor another more helpful Chinese mentor, Motse (480-390?), who was a rationalist and a pacifist. His doctrine of "Chien-ai" ("dual love"—close to the second great commandment of Christ) is that one should love one's self and others—not self-sacrifice. Yukawa believed that "no approach could be better suited to mankind today, for whom survival and prosperity is peaceful coexistence." Motse showed a strong theistic tendency; his Heaven is anthropomorphic, where there are demons and spirits.

Yukawa represented a strange interfusing of the old East and the new West—where the 'twain now meet—in science.

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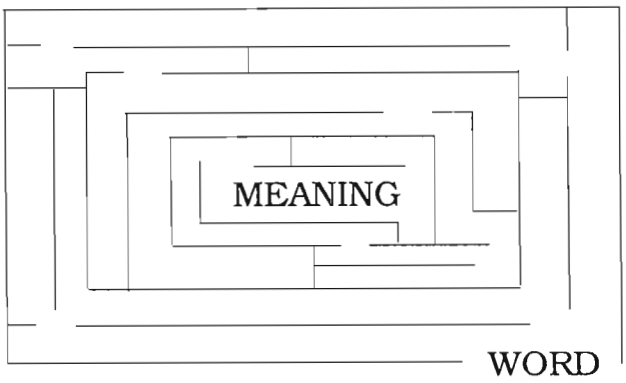
Twenty-second in a series by Raymond J. Seeger about scientists and their religion.

Penetrating the Word Maze



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

Today's words are: "DESCRIBE/EXPLAIN."

The Dictionary definitions: ***describe:*** *"to represent by a figure, model, or picture"* **/** ***explain:*** *"to give the reason for or cause of"* [Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Springfield, MA (1987)].

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Two words that seem to get inextricably entangled in discussions of science and religion are "describe" and "explain." Typical of remarks that one may hear are: "Science has passed from the descriptive stage to the explanatory stage: from telling us what things look like to telling us what causes them to be the way they are." Or, "People used to believe mythological explanations for natural phenomena until science explained them. Now, of course, there is neither need nor room for supernatural categories." We will be able to come to grips with such statements better if we reflect on the meaning and use of these two words.

Perhaps it is most helpful to realize that both of these words have a bi-level set of meanings. Trying to match meanings of the two words from different levels always leads to confusion. Let us call the two levels, "soft" and "hard."

To describe in a "soft" way means essentially to catalogue. We note what meets the eye: the color and shape of objects, whether the objects be leaves, rocks, or animals. We tell what they look like "to the eye." We may make groupings such as large leaves, medium-sized leaves, and small leaves; magnetic rocks and non-magnetic rocks; animals that lay eggs and those that do not. We give "names" to the various kinds we see and we arrange these names in ordered sequences. It is the kind of activity found prominently in classical biology and botany, before biochemistry and genetics

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

came on the scene. Science starts with "soft" descriptions, but it does not end there.

To describe in a "hard" way means to follow the dictionary definition given above: to come up with a model or a picture of the thing or event being described, using phenomena with which we are familiar to describe phenomena with which we have not previously been familiar. It is the language of mathematics, simile and metaphor, of conceptual models that seek to produce properties that are similar to those that we see. We say that "an atom is like a miniature solar system with the electrons going around the nucleus like planets around the sun." There are differences, because the electrons are held by electromagnetic forces whereas the planets are held by gravitational forces. Then we ask, "If the atom can be modelled as a miniature solar system, what predictions can we make from our knowledge of solar systems that we might then test to see if their analog is exhibited by the electrons around an atom?" Later we find that the model of a miniature solar system is not adequate to quantitatively describe some of the properties of the atom that we can observe. We are led to try to come up with some other model that will be more completely consistent with known properties of the atom, and, if possible, be successful in predicting properties that we have not previously known. In all of these activities, science is fundamentally engaged in the process of "hard" as well as "soft" descriptions.

The "soft" use of "explain" arises from our ability to say the following: If we have come up with a reasonably reliable model (a "hard" description), then this model tells us accurately in a variety of ways what the thing or event *is like* and how it behaves. Whereas before the description we had no idea of "how it worked," now we have an idea of "how it works"—and hence, we have a kind of explanation (a "soft" explanation). Whereas at one time I did not know why an apple fell to the ground, now I can "explain" it by invoking the model of gravity. I am provided with immediate (sometimes called "proximate") mechanisms for how things work. Lunar eclipses are not totally mystical events that defy human understanding; I can "explain" them by noting the optical phenomena involved in the casting of the earth's shadow on the moon when the configuration of the earth, moon and sun are appropriate. In fact, I can with great precision predict future eclipses, since they depend rigorously on fairly simple geometrical properties of the solar system. My "hard" description has provided me with a "soft" explanation.

A "hard" explanation seeks to go further—it claims that the knowledge of only immediate mechanisms ("proximate causes") is all that is meaningful, necessary, or relevant, not only within science but for all of life. It denies that the concept of "ultimate cause" has any relevance. Once we have provided knowledge of a physical mechanism, then we have "explained *away*" any other interpretation. This use of the concept of "hard" explanations is based on the assumption that all meaningful answers are scientifically obtainable answers, and that therefore once a scientific answer has been obtained, there are no other relevant considerations. In this view the development of a "hard" explanation in terms of a mechanistic model that works does away with the meaning of any other kinds of "soft" explanations in terms of other models or categories of human experience.

To speak of "soft" descriptions does not do justice to the nature of modern science in seeking for ever more sophisticated and representative models of the world—for "hard" descriptions. To speak of "hard" explanations is to introduce a faith commitment that proximate causes are the only causes.

If we speak about science providing us with "explanations," we run the risk of being misunderstood by those who interpret what we say as referring to "hard" explanations rather than "soft" explanations. What science does is provide "hard" descriptions that serve as "soft" explanations.

Remember to let the Editor or Author know whether or not this column describes your explanations.

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Book Reviews

EINSTEIN AND CHRIST: A New Approach to the Defense of the Christian Religion by R.G. Mitchell. Edinburgh: Scottish Academic Press, 1987 (distr. by Longwood Pub., Wolfeboro, NH). 231 pages. Hardcover; $21.95.

Readers of this journal are conditioned to discussions of science/Christianity issues framed in the language of Protestant (reformed) theology. It is refreshing to find a work which deals with these themes from an Australian-Catholic Thomistic perspective. Mitchell offers an apologetic for Christianity buttressed by the thought of prominent 20th century scientists whom he senses increasingly recognize the limitations of science, and who wish to reestablish dialogue with theologians. He desires to reach non-Christian seekers, those who have lost contact with the Church and students who are facing questions of faith without the familiar props of home and church.

Chapter 1 offers a historical sketch of science-faith interaction which suffers by brevity and overgeneralization. The author argues for an openmindedness on the part of scientist and theologian which can move beyond fundamentalism in both camps. Chapter 2 brings together an eclectic set of scientific and theological topics including love, infinity, salvation, eternity and the cosmos. Mitchell warns of the danger of overspecialization which overlooks the results that "the new found knowledge may have on humanity." He insists that a relevant Church must relate the significance of modern knowledge to Christian faith; a continuing theme in the Scottish Academic Press series "Theology and Science at the Frontiers of Knowledge," of which this book is the fifth offering.

Chapter 3 develops a picture of mankind created in a *directed* evolutionary process whose metaphysical component (the soul) is infused (not imposed) by God at conception. The eye of faith sees the cosmos as the result of an "intelligently conceived plan to provide an ecosystem in which man can live, procreate and prosper." Mankind's opportunity to be a co-creator is distorted by his choice to sin, but he has been given the chance for restoration through Christ.

A chapter on revelation argues the case for God's witness to Himself in nature, in scripture and the Incarnation. The author finds ideas in Christ's coming and references to Himself that parallel the language of Einstein's relativity. Topics such as space, time, light, mass-energy and field theory provide a point of contact for physics and metaphysics. In the latter part of the book, the author reviews books by Charles Sherrington (physiology), Edwin Schrodinger (physics), Karl Popper (philosophy) and John Eccles (brain science) which he finds point to or unconsciously support the claims of Christianity. Each writer recognizes the incompleteness of modern physics as falling short of ultimate explanation.

Chapter 8 discusses Rupert Sheldrake's *New Science of Life* (1981) which he concludes as applying the perspectives of the previous authors to an analysis of creative process in the universe. For Mitchell: "break-throughs in the solution of many of life's riddles may come from research into the phenomenon of fields and their interactions. If fields are the link (or at least part of it) between God and his creatures and between creatures themselves, they must affect all creation."

In a concluding chapter, Mitchell winsomely states a case for the Christian faith and closes appropriately with the Nicene Creed.

Mitchell views his subject with the lens of Thomistic philosophy, an approach which casts ideas and topics in forms which seem strange to readers more familiar with analytical thinking. He is not unwilling to offer "unconventional" speculative ideas. The writer is a man of God with a deeply felt passion to communicate the Gospel to modern man. One can only hope that this interesting work will find its way to the right audience.

Some readers may fault the author's tendency to wander from the role of apologist to preacher. An "outsider" to much of the science that he describes, he may have unwittingly built some analogies on ground that may be prone to rapid change; a traditional difficulty with natural philosophy. While the author cast his book toward the uncommitted young adult, I would see it as a worthwhile and creative conservative Catholic view of science and Christian faith of interest to a wider audience.

Reviewed by J.W. Haas, Jr., Department of Chemistry, Gordon College, Wenham, MA 01984.

COSMIC JOY AND LOCAL PAIN: Musings of a Mystic Scientist by Harold J. Morowitz. New York: Charles Scribner's Sons, 1987. 303 pages. Hardcover; $18.95.

Harold Morowitz is professor of biophysics and biochemistry at Yale. He is a scientist with a poet's heart who has written two previous works aimed at the general reader. Compared favorably with other successful popularizers, he strives to make science accessible and visionary. His latest book is a heartfelt attempt to "bridge the gulf between religion and science," to offer a description of god, purpose and hope by pondering a wide range of scientific knowledge.

To accomplish his task Morowitz places himself on what must be an academic's dream sabbatical: in splendid isolation on a sailboat off the Hawaiian islands. Surrounded by dramatic natural beauty and by a personal library—along with just enough mundane goings-on to give his meditations a folksy tone (like loose wires in the engine room and "harbor rats" on the docks)—the scientist shares with us his "spiritual odyssey," a conceptual search to find "meaning within science."

The result is a well-arranged tautology. At the outset, Morowitz "goes on record as a pantheist." He has rejected the Personal God of his Jewish heritage in favor of the god of nature as described by 17th century philosopher Benedict Spinoza—a boyhood hero for Morowitz. In the end he finds, predictably, god *in* nature. He confirms thereby an initial hope: "an intuitive feel that these studies will end up with a friendly view of the universe."

In between, the author provides a good deal of basic science in terms generally accessible to the lay reader: from principles of thermodynamics to the intricacies of molecular biology; from galaxy formation to weather forecasting; tectonic shifts and quantum leaps; photosynthesis and electromagnetism. Morowitz paints a picture of an "exquisitely" unified cosmos of interlocking "geospheres"—lithosphere, atmosphere, hydrosphere, biosphere and noosphere—which he lyrically compares to the ancient categories of Earth, Air, Water, and Fire. His analysis indeed reveals a marvelous "interconnectedness" of all things, an awe-inspiring "fitness of the environment," an obvious design in nature.

The physicist finds religion. In the process, he provides the answer to a prevailing question: what kind of god do you get from science? Clearly it is a god of theory, most easily found on idyllic sabbatical, as detached from real life as is the musing philosopher. Ironically, Morowitz recognizes the impersonal character of his personal vision. He attempts to include the "harbor community" in his story. But the nameless sailors, fishermen, tourists and acquaintances come in and out of his treatise like shadows—used as a means to make the technical a bit more palatable, but never a part of his religion of "cosmic joy."

This disjointedness (of theory and life) characterizes a spate of popular books which now find purpose in evolution, intelligence in the atom and mysticism in nature—attempts to return divinity to the abstractions of science which we all accept as real, but which, by the end of the twentieth century, appear fraught with ambiguities, false promises and real dangers.

Inconsistencies emerge in these arguments and are evident in *Cosmic Joy and Local Pain*. While Morowitz warns of the "tentativeness" of all scientific knowledge, he nevertheless concludes that practicing science is equivalent to becoming "partners with god in making the future." While he warns of the moral dangers of reductionism (of seeing life and man as "nothing but" physical process), he builds an entire natural theology on just such a frame of reference. And a self-effacing style cannot hide an implicit elitism in which the scientist knows best the mind of god.

The book concludes with Morowitz literally and figuratively getting stung by a bee, tripping and skinning his knee. The "local pain" leads him to consider the ethical side of faith. His conclusions here come across as an afterthought and smack of a familiar secular utopianism ("having the power

Books Received and Available for Review

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

I. Asimov, *The Story of Origins: Of Mankind, Life, the Earth, the Universe*, Walker

V. Booth, *Communicating in Science: Writing and Speaking*, Cambridge

S. Chandrasekhar, *Truth and Beauty*, Chicago University Press

R. Costa, *One Faith, Many Cultures: Inculturation, Indigenization and Contextualization*, Orbis Books

P. Diel, *Journal of a Psychoanalysts*, Shambhala

J. Fahey and R. Armstrong (eds.), *A Peace Reader: Essential Readings on War, Justice, Non-Violence and World Order*, Paulist Press

J. Geddes, *The Better Half of Life*, Broadman Press

F. Grinnell, *The Scientific Attitude*, Westview Press

A. Hertzke, *Representing God in Washington: The Role of Religious Lobbies in the American Polity*, Tennessee University Press

D. Kevles, *The Physicists: The History of A Scientific Community in America*, Harvard University Press

R. Larmer, *Water into Wine: An Investigation of the Concept of Miracle*, McGill-Queen's University Press

E. Mayer, *Love and Tradition: Marriage Between Jews and Christians*, Schocken

R. McBrien, *Caesar's Coin: Religion and Politics in America*, Macmillan

H. Myra, *Leaders: Learning Leadership from Some of Christianity's Best*, Word

P. Parsons, *Inside America's Christian Schools*, Mercer

L. Propst, *Psychotherapy in a Religious Framework*, Human Sciences Press

R. Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*, University of Chicago Press

P. Rossi, *The Dark Abyss of Time*, University of Chicago Press

M. Stackhouse, *Public Theology and Political Economy*, Eerdmans

L. Sweet, *The Lion's Pride: America and the Peaceable Community*, Abingdon

H. Thompson, *Biblical Archaeology*, Paragon House

D. Van Ness, *Crime and Its Victims*, InterVarsity Press

V. Volosinov, *Freudianism: A Critical Sketch*, Indiana University Press

R. Walters, *Counseling for Problems of Self-Control*, Word

G. Wehr, *Jung: A Biography*, Shambhala

J. Whitehead, *The End of Man*, Crossway Books

within us to move the local world toward more cosmic joy and less local pain").

The resolution is not likely to satisfy the average reader, to say nothing of the harbor rat. The book bears reading by the Christian, however, who may see here the pitfalls of moving too easily from our knowledge of nature to a knowledge of God; simultaneously recognizing opportunities for ministry among peers unable, yet in some way ready, to reconcile the God of their fathers with a faith in human reason.

In the end, Morowitz leaves his island retreat—to "return from cosmic concerns to the responsibilities ahead"—stung by the philosopher's desire to reduce religion to science and tripping against an old stone that assumes knowledge is virtue.

Reviewed by William A. Durbin, Jr., freelance writer, 308 Oakridge Rd., Cary, NC 27511. This review first appeared in Christianity Today, *May 13, 1988.*

DARWIN'S FORGOTTEN DEFENDERS: The Encounter Between Evangelical Theology and Evolutionary Thought by David N. Livingstone. Grand Rapids: Eerdmans, 1987. 210 pages, index. Paperback; $10.95.

David N. Livingstone, Research Officer in the Department of Geography, The Queens University of Belfast, has written this unique, interesting, and informative book. *Darwin's Forgotten Defenders* is primarily a historical analysis of the people and events surrounding the publication of Darwin's evolutionary theory.

Beginning with "Pre-Darwinian Britain," the author proceeds to the early 20th century. He discusses the lives and views of numerous scientists and theologians of the time. Included are people such as Thomas Chalmers, Richard Owen, Louis Agassiz, Georges Cuvier, James Dana, William Dawson, Charles Hodge, B.B. Warfield, and A.H. Strong, just to mention a few. Special emphasis is given to the response of these persons to the theory proposed by Darwin. Numerous other topics are also explored by the author, such as natural theology, the argument from design, and the rise of religious fundamentalism.

The book is well written and scholarly in approach. The author provides extensive footnotes and a lengthy bibliography. A complete and useful index of persons and subjects is also provided for the reader.

The author's primary thesis is that the evangelical community was not as opposed to the new evolutionary theory as is sometimes supposed. The author's analysis of the persons mentioned above seems to support this viewpoint. This is, however, a complex subject and some questions seem to remain unanswered. For example, a question which remained in my mind was the degree to which these people accepted Darwin's theory. If they accepted evolutionary change on the species level, did they also accept change on higher taxonomic levels? This seems to be a valid question since the real problem was the concept of "fixity of species." In some cases the author was able to clarify this question from the writings of the person; however, others were not so clearly explained.

I found the book to be interesting reading, and feel that it would make a valuable reference work as well. Anyone interested in the present creation/evolution debate should find this book a useful and informative discussion of the history of this controversial area.

Reviewed by Phillip Eichman, Biology Department, Harding University, Searcy, AR 72143.

THE COLLAPSE OF EVOLUTION by Scott M. Huse. Grand Rapids, MI: Baker Book House, 1983. 178 pages, index. Paperback; $7.95.

Huse, a teacher and principal of Pinecrest Bible Training Center, wrote this book to "expose the scientific fallacies of the theory of organic evolution," "present scientific evidence for Biblical creationism," and "prove that evolution and Biblical creationism are mutually exclusive and cannot be reconciled." He states that most of our current problems are caused by evolutionary philosophy, but does not explain why these basic problems plagued mankind for centuries *before* evolution was widely taught.

The Collapse of Evolution is in many ways a typical young-earth, 24-hour day "creation-science" book, but with several helpful features that some books lack. The first five chapters attempt to point out the "weaknesses and errors" in evidences for evolution and show strong support for scientific creationism from geology, physics, mathematics, biology, and anthropology. The chapter "Commonly Cited 'Proofs' of Evolution," a three-page chapter on scientists who believe in biblical creationism, and a final chapter on biblical considerations add little to what he has already said. The rather detailed table of contents, scripture, name and subject indices, enable the reader to easily find or return to points of particular interest. A 12-page glossary contains several atypical definitions such as "*evolution*—An imaginary process by which nature is said to continually improve itself through gradual development." Unlike most evolutionists and creationists, he does not recognize real population changes as evolution (microevolution), which he calls "horizontal variation." A list of 75 creation-science organizations in 14 countries is also included.

Huse's dogmatism and frequent "all or nothing" expressions such as, "the irony of this whole situation is that *the very concept of organic evolution is completely absurd and impossible*," seem inappropriate in discussions of scientific matters. His statements about science and evolution indicate a narrow, superficial understanding of scientific and evolutionary theory as held by most scientists and evolutionists. Polyphyletic evolution is ignored. Huse does consider two other creationist interpretations—the Day-Age and Gap or Ruin-

Reconstruction Theories—but quickly discards them in less than two pages of discussion. His discussion of time could have benefited from consideration of widely held views by other Christian creationists, such as Davis Young and Dan Wonderly. Less than one-third of his literary citations are from primary sources; most are from newsletters and books written by authors in the Creation Research Society.

Huse does point out many well-known problems facing organic evolutionists, but falls far short of achieving his other two goals for this book. Because of the very dogmatic, unbalanced views of science, evolution and creation, I hesitate to recommend this book even to one interested in learning only about scientific creationism.

Reviewed by Duane Thurman, Professor of Biology, Oral Roberts University, Tulsa, OK 74171.

SCIENCE AND CREATION by Robert W. Hanson (ed.). New York: Macmillan, 1986. 213 pages, index. Hardcover.

The eleven chapters in this book are based on a symposium sponsored by the American Association for the Advancement of Science, held in Washington, D.C. in January, 1982. The authors are a diverse group of educators with expertise in biology, geology, history, sociology, and theology. All have been involved in the controversy over the teaching of "creationism" in public schools.

Robert W. Hanson has done a superb job of editing. The 1982 papers appear to be well updated and the individual chapters are well cross-referenced. Each author has written clearly and with a minimum of polemic even though they disagree with the "recent creationist" position. Hanson sets the tone in his introductory chapter when he writes, "What is needed, we believe is to engender a better understanding of the limitations of science and of the nature of religion wherever either is taught" (p. 4).

James Skehan (Chapter 2) gives a readable summary of the evidence for the long age of the earth, of life, and of mankind, but unfortunately puts a heavy emphasis on the documentary hypothesis "explanation" of Genesis; a view that has been largely discredited by competent, conservative Bible scholars. Dorothy Nelkin (Chapter 3), Wayne Moyer (Chapter 4), and Stanley Weinberg (Chapter 5) come closest to a confrontational position with "creationists," and yet they do it with a low key and fair approach. Moyer urges teachers to remind parents and others "that there is nothing about science, or evolutionary theory, which precludes a deep and abiding belief in a creator God" (p. 53). Nelkin chides scientists for some of their inaccurate and naive tactics.

Chapters 5 through 8 center on case histories of specific teaching experiences in Iowa, Kentucky, California, and Georgia. Weinberg, while discussing the Iowa Academy of Science Panel on Controversial Issues and the Committees of Correspondence, treats creationism as a fundamentalist threat to public schools. William Ellis (Chapter 6) reports on a survey of Kentucky high school biology teachers which indicates that, for the most part, evolution is taught as theory (not fact), that opposing views of students are encouraged, and that outside interference is undesirable. Perhaps his most important point is that teachers vary in their ability to handle controversial subjects. William Thwaites (Chapter 7) describes a two-model creation/evolution college course in which equal time was given, in lecture and in the making of exam questions, to creationist speakers from ICR and elsewhere. Kenneth Saladin reports on a study of the students in a non-major, freshman biology course in which evolution and creation were discussed after a survey to indicate their understanding and their views. A most significant finding, and one that corresponds with less organized surveys made by this reviewer, is that even students who are abysmally ignorant of the most elementary biology, can have strong views (pro and con!).

Craig Nelson's chapter is probably the best in the book. In "Creation, Evolution, or Both?" (Chapter 9) he aims to encourage scientists and educators to teach controversial issues fairly. He emphasizes such often overlooked themes as uncertainty in science, decision making within the framework of uncertainty, and the application of such decision making to the origins controversy. Quoting from ASA member Duane Thurman (*How to Think about Evolution*), Nelson emphasizes the wide spectrum of choices, the several Bible-based creation models, and how "quick" and "gradual" creationists of various types respond to key origins questions.

After Stephen Brush (Chapter 10) recommends skepticism in both science and religion, theologian Langdon Gilkey (Chapter 11) discusses the creationism issue as, in part, a confusion of science and religion. He emphasizes the limitations of science and the tendency of science to expand into naturalistic philosophy and humanistic religion. He makes an important point when he says:

> It should, moreover, be recognized that this widespread identification of religion with primitive myth, and of modernity and science with naturalistic humanism, has been one of the "breeders" of the creationist reaction. All too often, when a student in high school comes home and says to his or her parents, "Well, we learned today in science class that Genesis is wrong," two new converts to creationism are created. (p. 185)

In the same manner, all Christians, committed as we must be to the God who is the Creator of heaven and earth, need to avoid emotional commitment to our own pet interpretation of Genesis lest students "throw out the baby with the bath water" when they see that interpretation threatened.

The only mention of ASA in this book is in Appendix B, a reprint of Judge Overton's opinion in the Arkansas case, where we are mentioned only in reference to the origin of the Creation Research Society "from a schism in the American Scientific Affiliation (ASA)" (p. 196). Hopefully, *Teaching Science in a Climate of Controversy* has given us a little more basis for our existence!

Science and Creation is recommended to all who are concerned with the many issues in the creation/evolution controversy and especially the present problem of how to

teach origins in our pluralistic public schools. We need to teach in a manner that is fair to the fundamentalist recent-creationist, to the atheistic materialist, to those who hold one of the numerous alternative positions, and to the vast majority who simply don't care.

Reviewed by Wilbur L. Bullock, Professor of Zoology, Emeritus, University of New Hampshire, Durham, NH 03824.

SELLING SCIENCE: How the Press Covers Science and Technology by Dorothy Nelkin. New York: W.H. Freeman and Co., 1987. 224 pages. Hardcover; $16.95.

For many years, much of what happened within the scientific community stayed there. The public was informed of only the most astounding achievements of science in the popular press. This began to change in the early part of this century when a few newspapers and magazines dubbed a handful of journalists, "science writers," and charged them with the task of informing the public of the many mysteries of which science is made. *Selling Science*, by Dorothy Nelkin, is an analysis of the evolution of science writing since that time. It is also, more importantly, a critical review of the sometimes uneasy alliance that exists between those who do science and those who act as the public's messenger.

Nelkin is a professor in the Program on Science, Technology, and Society at Cornell University and a board member of the American Association for the Advancement of Science, Medicine in the Public Interest, and Council for the Advancement of Science Writing. Her analysis of the presentation of science in the print medium should be recommended reading for all scientists who desire or require press coverage of their work.

Selling Science has several strong points. First, it is a historical analysis. Nelkin describes early science writing as naive. Science writers tended to view scientists with awe. Science was pure, objective, and truth-seeking. Scientists, on the other hand, tended to view science writers as a nuisance: oversimplifying the significance of research at best, misquoting them or distorting their work at worst. However, as competition for grants and government contracts increased, and a "publish or perish" mentality developed, this situation changed. Scientists hired public relations officers to represent them to the press. The press, feeling manipulated at times, began to develop a more critical attitude toward science. Nelkin's presentation of this evolution is fascinating.

Selling Science is also an informal study in semantics. Nelkin shows how two groups of individuals, scientists and science writers, pursuing the same goal—truth—clash over their verbal descriptions of the same phenomena. For example, scientists may prefer the term "waste disposal facility" to "toxic dump." Or, what is meant by the term "epidemic"? For the scientist, an epidemic may be a slight increase in cases above the normal background level. However, the term "epidemic" in the popular press may connote to the public a rampantly spreading disease. Nelkin shows how these semantic problems facilitate the mistrust scientists and science writers often have for each other.

Another positive aspect of *Selling Science* is the objectivity that Nelkin brings to her analysis. Neither science nor science writing are left unscathed by her critical inquiry. Her approach is objective, fair, and balanced.

If Nelkin's book has a weakness, it might be the disparity between her methodology and presentation. At the beginning of the book, she states that her conclusions are based on a content analysis. However, she does not elaborate. If readers forget this, they may get the impression that Nelkin is trying to prove a point by using selected anecdotes. Readers' confidence in her analysis will have to be based solely on her word.

In summary, *Selling Science* is a well-written, readable book that both scientists and science writers will find provocative. Its balanced presentation may cause many of us to rethink our biases and stereotypes of these two groups of individuals.

Reviewed by David E. Johnson, Department of Psychology, John Brown University, Siloam Springs, AR 72761.

PROGRAMMING AND METAPROGRAMMING IN THE HUMAN BIOCOMPUTER by John C. Lilly. New York: Julian Press, 1987. 160 pages. Paperback; $10.95.

This is a publication of material that is about twenty years old. The publisher says of it:

> Starting from the position that man is essentially a biological computer, Lilly explains that we are all born with some "programs"—such as eating, sleeping and feeling pain—ingrained in our genetic code. Our ability to take in new information and to develop ideas beyond these innate programs depends on our capacity for "metaprogramming," or learning to learn. Here Lilly documents both the methods and results of his famous experiments with expanding the mind's metaprogramming power with LSD and sensory deprivation. By altering the brain's normal operations with psychotropic substances or freeing it of the need to create a safe environment, the range of human thought, Lilly contends, can be increased beyond any previous expectations.

The book also includes some reflections based on the author's work with dolphins and his attempts to communicate with them, together with a plea for funding such activities.

The style of the book is difficult. Short, unrelated chapters and sections are presented with no apparent integrating structure. The language is loaded with jargon, much of which seems to have an interpretation known only to the author or, at least, not communicated well to his readers. It is also strongly biased—the author is "scientific," while anyone who objects to his methods is not.

Interesting ideas about the functions of the human brain are interwoven with details of "experiments" with LSD.

These "experiments" appear to be uncontrolled and, although the contrary claim is made, not scientific in any real sense.

A great deal of reflection and scientific work has taken place in the last twenty years on the human brain as computer. If this book has any value, it seems to be as a record of the experiences on which it is based, rather than as a useful contribution to this larger debate.

Reviewed by David T. Barnard, Associate Professor and Head, Department of Computing and Information Science, Queen's University, Kingston, Ontario, Canada K7L 3N6.

THE MIND'S NEW SCIENCE: A History of the Cognitive Revolution (2nd edition) by Howard Gardner. New York: Basic Books, 1987. 430 pages, bibliography and index. Paperback; $12.95.

Even someone not interested in cognitive science and artificial intelligence would profit from reading this book. This is because the center portion of the book (almost 250 pages) contains excellent amounts of each of the "six separate disciplines, which collectively constitute the cognitive sciences of today" (p. 291). These are philosophy, psychology, artificial intelligence, linguistics, anthropology, and neuroscience. Each account is knowledgeable, readable and up-to-date. His overall history of the cognitive revolution exhibits similar qualities.

Part I covers the history of philosophical concern with the mind and its nature, and the early history of cognitive science. Gardner defines cognitive science as "a contemporary, empirically based effort to answer long-standing epistemological questions—particularly those concerned with the nature of knowledge, its components, its sources, its development, and its deployment" (p. 6). He says the foundation for cognitive science was laid by a number of modern events, including the 1948 Hixon Symposium at Cal Tech, which included papers by Warren McCulloch, John von Neumann, and, most importantly (because of his attack on behaviorism in psychology), Karl Lashley. Other significant factors leading to the birth were the decline of logical positivism in philosophy; the development of symbolic logic by Gottlob Frege, Bertrand Russell, Alfred North Whitehead, and others; the work of Alan Turing, including his insight into the use of binary code for programming; the development of information theory by Claude Shannon at M.I.T.; and the wartime need for number crunching and code breaking.

The actual birth date of cognitive science was 1956, Gardner says, and he is sympathetic to the claim that the actual day was September 11th. This was the day of the M.I.T. Symposium on Information Theory during which Noam Chomsky set out his "Three Models of Language"—claiming mathematic-like precision for the rules of grammar. 1956 was also the year of John McCarthy's Dartmouth Summer Research Project on Artificial Intelligence, often seen as the birth date of artificial intelligence.

The final section of the book deals with "cognitive science as if it were a single coherent field," and covers "several research efforts that qualify for the label *cognitive-scientific*" (p. 291). The first issue discussed is that of human perception as it is studied by workers in neuroscience, psychology, and artificial intelligence. The second concern is with studies in philosophy, artificial intelligence, and psychology of visual imagery. The third topic, naming and classification, focuses on issues of philosophy, linguistics, psychology and anthropology. The final topic is that of human rationality, and Gardner uses the work of Philip Johnson-Laird as the central point of discussion. I found this critique of man as a logical animal particularly interesting as it is about *me* and about the students *I* teach, and also because it deals with diverse disciplines such as philosophy and logic, psychology, anthropology, linguistics, and artificial intelligence.

In his concluding chapter, Gardner focuses on the present state of affairs in cognitive science and the challenge and prospects for the future. He sees a "computational paradox" emerging (p. 384). As a result of applying logical and computational models and machines to the issues of the nature of mind, we are discovering the ways in which humans are not very much like computers after all. This will be comforting and not too surprising to those who have always believed that man is more than a biological or mechanical creature.

Gardner's doubts about the computational model of human behavior come from two convictions. The first is that the community surrounding the individual is crucial to his or her development. It is here that we learn what views are considered acceptable, correct, and true. Such standards of right and wrong do not enter into the computer's "judgement." The programmer simply dictates to the computer. The second factor in Gardner's doubts about the computational model is rooted in the difference between biological and mechanical systems. "To the extent that thought processes reflect these bio-developmental factors and are suffused with regressions, anticipations, frustrations, and ambivalent feelings, they will differ in fundamental ways from those exhibited by a nonorganic system" (p. 388). Gardner, of course, does not consider the possibility that man is more than a biological *and* mechanical system.

The epilogue, which is new to this 1987 paperback edition, gives an updated account of the field. The central topic in this epilogue, reflecting the limits of the serial digital computer account of cognition, is the "parallel distributed processing" (PDP) approach. "The PDP approach typically posits thousands of connections among hundreds of units" (p. 394). Since the brain must work, at least in part, by parallel processing, and since the PDP approach has been extremely successful in modeling such things as "completion" of patterns and finger movements involved in typing, many researchers see this as extremely hopeful and exciting. But, as Gardner says, "cognitive science has a very long past but a relatively short history" (p. 9). Much remains to be seen, and much remains to be done.

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

THE CONSTRUCTION OF REALITY by Michael A. Arbib and Mary B. Hesse. Cambridge: Cambridge University Press, 1986. 286 pages, references, author and subject indices. Hardcover; $53.25 (Can).

Michael Arbib is a theist interested in artificial intelligence, brain theory and cognitive science. Mary Hesse is a Christian interested in the history of physics and the structure of scientific inference. This book was written as a basis for the Gifford Lectures in Natural Theology at the University of Edinburgh in November 1983, which they jointly gave.

They define a "schema" as a "unit of representation" of a person's world, and want to use this concept as a basis for a multi-level description of the human being. A basic question they pose is: "What can schema theory contribute to an epistemology that can analyze the interaction of each individual and society in the construction of the individual's view of reality?" The book is an impressive demonstration that schema theory, as they understand and manipulate it, can contribute a great deal to our understanding of ourselves.

The book takes as its premise that artificial intelligence research has given us the view of man as an information processor. While the achievements of artificial intelligence to date are limited, Arbib and Hesse argue that there is no limitation in principle (even though our embodiment in human bodies and as members of societies are taken to be important aspects of our existence) to what this approach might discover about us. They are not uncritical of current approaches in artificial intelligence research, but they do not see their criticisms as fundamental ones. Because of the potential here, cognitive science will have a profound effect on how we think about reality. The implications and suggestions of cognitive science may even change the nature of the debate between theists and atheists as it changes our views of reality and knowledge.

Schema theory is a theory of human knowledge that "makes contact with" artificial intelligence concepts and with the concept of the embodied self. One of the very interesting aspects of this theory is its way of dealing with the mind-brain problem. Although there may be no problem in principle with explaining the mind in terms of physical activity in the brain, the authors point out that the claim by some neuroscientists that this can be done involves them in the same kind of existential leap of faith that is required by accepting the theory of evolution without intervention of a special creation. Much brain research remains to be done.

In discussing the issue of personal freedom in this theoretical setting, Arbib and Hesse make a number of helpful observations. We must not accept a definition of humanity that only exploits the gaps in our knowledge of human behavior and brain functions, any more than we can accept a definition of God that exploits the gaps in what we know of the space-time universe. They ask whether the development of robots might not mean the creation, in an admittedly different form, of individuals "who from the religious point of view have an eternal destiny and potential for communion with God." These comments strike me as one of the most significant and important aspects of this book, doubtless, in part, because they echo some of my own speculations. The Bible presents man's relation to God as his uniqueness (this is explicitly addressed in the book, being affirmed as part of the religious schema and denied by the secular schema). If there is no difficulty in principle with a cognitive science description of man, there may be no difficulty in principle with God-machine relationships. After developing some of these general points, the middle part of the book turns to discussions of Freudian thought in this context, a consideration of the social nature of human existence, discussions of language and hermeneutics, and a consideration of religions as social schemas.

The final two chapters reflect the different constructions of reality of the two authors. Hesse describes the Bible as the "great schema" (echoing Northrup Frye's "Great Code"). She sees considerable flexibility in the schema with respect to such things as the origin and destiny of the universe. She uses an image drawn from modern science to suggest that the "spatiotemporal is embedded within a larger Reality." One point that seems to require further thought is her suggestion that the Bible does not see failure on the part of believers as a potential falsifier of its message. While in some sense this is true, it also seems that Jesus expected his disciples to be known by their love for each other. Would not the absence of this love, for example, be a potential falsifier?

Arbib's chapter describes a secularist schema, or schemas. He sees the relation to God as embodying what is specifically human in the Christian approach, but does not attempt to define what is specifically human in his own schema; he presents a simple creed of learning and continuing to try. There is no ultimate reality for him, all is contingent. But this he sees as consistent with the schema theory approach.

This is an extremely valuable book. Some of the ideas discussed here are presented in more detail than I have seen them elsewhere, the argumentation is careful, the writing is good, and even though there are two authors with two perspectives there is a substantial unity to the book. I recommend it highly to all engaged in thinking about what it means to be human in an age when thinking machines are a much-discussed possibility.

Reviewed by David T. Barnard, Associate Professor and Head of Department, Computing and Information Science, Queen's University, Kingston, Ontario, Canada K7L 3N6.

THE AIDS COVER-UP? The Real and Alarming Facts about AIDS by Gene Antonio. San Francisco: Ignatius Press, 1987. 253 pages. Paperback.

POWER IN THE BLOOD: A Christian Response to AIDS by David Chilton. Brentwood, TN: Wolgemuth & Hyatt, 1987. 234 pages. Paperback.

THE AIDS PLAGUE by James McKeever, Ph.D. Medford, OR: Omega Publications, 1987. 177 pages. Paperback.

"An Outbreak of Sensationalism" was the headline used by *TIME* (March 21, 1988) to discuss the recently published book of William Masters, Virginia Johnson, and Robert Kolodny (*CRISIS: Heterosexual Behavior in the Age of AIDS*). To a considerable extent, the three books considered in this review could be characterized under that same "sensationalist" category. Two of the three books approach AIDS, as indicated by their titles, in an alarmist fashion. However, these three books were the only books on AIDS on the shelves of a local Christian bookstore, and they do attempt to give some theological/moral perspectives on this current epidemic.

None of the books provide any information about the qualifications of their authors to discuss medical problems, although McKeever is described as "Scientist, Researcher, Futurist, Economist, Bible Historian, and Speaker." None of these books has an index. Their bibliographies include references from medical journals, but many of their assertions are supported by quotes from the popular press.

All three authors give a reasonably accurate description of the current status of our knowledge of the basic biomedical features of AIDS, and there are only minor factual errors. McKeever, in discussing AIDS-related diseases refers to the fungus infections, cryptococcosis and histoplasmosis, as "parasitic," a term usually reserved for infectious organisms of an animal nature (pp. 24,25). More importantly, while the status of *Pneumocystis carinti* is a bit uncertain (although considered Protozoan-related) it is *not* a virus. Antonio refers to bubonic plague as involving "rats carrying infected ticks," but the biological vectors for plague are *fleas* (p. 142). Both Antonio and Chilton (chapter one of each book) make much of the biological classification of the HIV virus as "lentivirus." While it is true that we can often predict the pathology and/or epidemiology of an infectious organism from the biology of its "relatives," there are many instances in which closely related organisms (sometimes only strains) show marked differences in their biology. To conclude that, because a lentivirus of sheep can be transmitted by sneezing, the AIDS virus can likewise be transmitted is an unjustified analogy.

All three authors correctly emphasize the primary role of homosexual activity and IV drug use, but they exaggerate the danger of infection by "casual contact" (kissing, food handling, *etc.*). We do know from the study of the disease in Africa that AIDS can be transmitted heterosexually as well as homosexually. We also know that perinatal transmission is a common occurrence when the pregnant woman is infected. However, studies to date of the friends and relatives of AIDS victims, even when living together in close quarters (but without sexual contact or IV drug use), have shown that transmission is exceedingly rare. Likewise, the reports of the disease in 15 health care workers needs to be taken within the context of the multitude of such workers who have been involved in the most intimate care of 50,000 AIDS patients. To ignore such rare infections or to emphasize them unnecessarily is equally unhelpful.

Antonio and McKeever stress, as they try to stimulate alarm for casual transmission, the extremes to which doctors, dentists, hospitals, and emergency medical teams have gone to protect themselves. What is overlooked in the hysterical response to these threats is that these health-care workers are at special risk because of blood contacts, and they have special responsibilities to protect other patients even from extremely unlikely circumstances.

When the authors of these books discuss means of prevention, they do a commendable job describing the hazards of drug use and homosexual practices. Then, not surprisingly, they get bogged down by their concern with casual transmission. McKeever, especially, when he discusses "How You Can Protect Yourself" provides us with a list of 15 "do's" and "don'ts," most of which are unnecessarily alarmist and reflect a self-centered survivalism that does not relate well to his Christian emphasis in Chapter 10 and his two appendices.

Antonio has little to say that is an avowedly Christian evaluation of the AIDS problem. However, his discussion of homosexual practices under the word "sodomy" is frank and deliberating revolting; his evaluation is biblically moral without quoting Scripture. McKeever anticipates a revival of morals in our society and a turning of many to God. His closing chapters and appendices end the book as an evangelistic tract that may be useful in causing some people to turn to Jesus Christ. (There are a few sections here that are confusing, because they are obviously taken from his previous writings. For example, on page 160 he refers to God and prayer "In Chapter 8," but in this book Chapter 8 is devoted to the need for a national AIDS test.)

Chilton's book gives us the most challenging and thought-provoking Christian evaluation and discussion of our response to AIDS. On my first reading I found myself reacting somewhat negatively to what he seemed to be saying. His extreme belittling of legal, political, medical, and educational solutions appears to imply that such approaches are bound to fail and, therefore, worthless (Chapter 3). His four-page (pp. 93–98) condemnation of Everett Koop as a compromiser angered me, as it fails to reflect any understanding of a Christian in a governmental role in a sinful, unjust society. As he went deeper into his theology, I, as a premillenial (moderate and non-dispensational) Baptist, became a bit confused.

However, as I reread the book I was able to look on the positive things that Chilton is saying. He, more than McKeever, develops the case for Bible-based Christian compassion (with specific examples of churches and others working with AIDS patients). This case for compassion includes a clear recognition that we are responding to a disease that has developed out of a flagrant disregard of God's order in His creation. Chilton's emphasis on firm but loving church discipline and his plea for a revival of the healing ministry of the church—physical as well as spiritual—is a much needed exhortation in a society where even the church has been contaminated by materialism, loose moral standards, lack of discipline (self or corporate), and an overconfidence in biomedical technology. We need to be reminded that our basic resource as Christians is the Creator God who send His Son to redeem sinful human beings.

No doubt our knowledge of AIDS will continue to increase as over 500 research articles are being published each month. Our attitudes will change depending on that knowledge, but

also with the effectiveness of the recommendations made by health and educational agencies as well as popular writers, such as these books and the media. Let us hope that neither the sensationalism of McKeever and Antonio nor the "cover-up" they fear will prevail. It is most important that Christians should be accurately and nonsensationally informed and should prayerfully consider what our attitudes and our actions should be. With that in mind as I review these three books, I would recommend *Power in the Blood* for a thoughtful, although at times dogmatic, perspective on the serious medical, moral and spiritual crisis presented by the AIDS epidemic that must concern us all.

Reviewed by Wilbur L. Bullock, Professor of Zoology, Emeritus, University of New Hampshire, Durham, NH 03824.

IN THE LAND OF THE LIVING by Karin Granberg-Michaelson. Grand Rapids, MI: Zondervan, 1984. 160 pages, appendices. Paperback; $4.95.

The healing of disease in our twentieth-century Western medical system has become largely a process of selecting the right chemical substance or appropriate surgical procedure. This approach, while powerful for curing many illnesses, contrasts sharply with other successful medical traditions in which treating the spiritual and psychological state of the patient is as important as treating physical symptoms. As an antidote to our overzealous compartmentalization of human health, we have recently seen the advent of holistic medical teams. These include psychological counseling and stress prevention in their health care packages. Unfortunately they sometimes also use ideas picked up from Eastern religions and the occult.

In reply to both forms of modern medical practice, Karin Granberg-Michaelson's *In the Land of the Living* examines health care in the context of the church community. She argues that whole-person or holistic health care is properly the domain of the church since spiritual unrest underlies most illness. Through church-related health care, people can explore their beliefs and inner conflicts in a way that allows God's grace to be experienced.

The book is framed by a case history of Helene, a pastoral counselor with an incurable, painful immunological disorder. Her search for physical wholeness required going beyond our fragmented medical system to discover the mental and spiritual dimensions of her disease. Christian counseling, confession, prayer, and dedicated fellowship led her to experience God's acceptance and, ultimately, physical healing.

Granberg-Michaelson's chapter on theological roots of healing makes it clear that Helene's health is not simply a matter of dispelling physical symptoms. Instead, health, in the light of scripture, is envisioned as a wholeness, harmony, or *shalom* akin to that which God originally bestowed upon the Creation. This kind of health is shattered by sin, but is gradually restored as we grow in harmony "with ourself, with others and with the Creator." In seeking *shalom*, "miraculous" healings may and do occur. However, Granberg-Michaelson emphasizes that our "growth in Christlikeness and the love of God are the ultimate purposes of our lives."

In the Land of the Living describes several church health care centers—one in Washington, D.C. and the other in Vellore, South India. Both of these have a faith community at their core and employ pastoral counselors as a key part of their care. Both also have strong outreach to those suffering from economic poverty and unfamiliar with God's love. They beautifully exemplify the potential benefits of integrated health care.

Can local churches respond as agents of healing? *In the Land of the Living* provides practical guides for developing whole-person health care ranging from actual health care facilities to small health care ministry teams. These ministries involve lay people as well as health experts in the important goal of being a "healing church."

This short book concludes with several useful appendices. These include study questions suitable for workshops and discussion groups, stress evaluation instruments, and a review of books on health care and divine healing. *In the Land of the Living* is recommended as a balanced and insightful guide to Christian health care.

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

TO LIVE OR DIE? Facing Decisions at the End of Life by C. Everett Koop. Ann Arbor: Servant Books, 1987. 46 pages. Paperback; $1.95.

This little slip of a thing is really a booklet; so brief that it can easily be read during whatever time busy people have available. The writings are a (condensed?) transcript of a 1986 conference address. The author is "Koop the controversial." C. Everett Koop came into the consciousness of most Christians through his association with Francis Schaeffer in prolife endeavors. In spite of his long career as one of the world's foremost pediatric surgeons, Koop's nomination as U.S. Surgeon General was resisted by various liberal groups. After confirmation, his views on AIDS prevention have tended to flip the poles on his popularity, alienating some conservative factions and gaining the respect of some earlier detractors. Whatever else he may be, Dr. Koop always appears as straightforward and honest. His commentary here is a professional state-of-the-movement evaluation of euthanasia. Herein are woven together salient facts, figures and illustrations. I hesitate to summarize too many points; this review could approximate the book in length.

To Live Or Die has no real subdivisions, only headings where major changes in thought occur. A few questions with answers follow the text. The reader is initially challenged by some of the more volatile issues pertaining to dying. Koop

quickly progresses from the background of our graying society, through the active euthanasia perspective of Joseph Fletcher, to euthanasia in Holland and the Hemlock Society. The fact that active euthanasia was supported by over 75 percent of those surveyed by the Associated Press in 1985 is reason enough for concern. Americans today generally demonstrate more interest in their own quality of life than any other pursuit. Does this attitude we share with prewar Germany truly make us susceptible to equivalent evils? Reality is that attitudes, some laws, and practices are already moving the U.S. deeper into a "Right-to-Die" ethic.

Koop speaks of confusion, a pervasive lack of understanding characterizing the "debate." He desires to clarify the meaning of euthanasia by a definition that shines light upon motives, not methods. The essential distinction is between allowing a terminally-ill person to die (mercy-dying, *not* euthanasia) and causing someone to die by whatever means (mercy-killing, or euthanasia). Both the administration of a lethal injection, with or without the patient's consent, and the withholding of fluids and nourishment, causing death by dehydration/starvation, are considered euthanasia. The former is active, the latter passive; but the latter is perhaps even more frightening. Not initiating extraordinary medical treatment or the cessation of such treatment do not constitute euthanasia where death is imminent. The circumstances surrounding the last days of Francis Schaeffer are cited as an example of mercy-dying that followed all of Koop's ethical guidelines (pp. 32–36).

The Surgeon General is deeply concerned about the progression of euthanasia here and now. Motives behind the "Freedom of Choice" doctrine, "living wills," and recent policies of the American Medical Association run counter to the "stewardship of life" as a Christian ethic espoused by Koop. His motive in delivering this address and its publication is to alert us to this issue and its ramifications.

Reviewed by Jeffrey K. Greenberg, Associate Professor of Geology, Wheaton College, Wheaton, IL 60187-5593.

THE AMAZING BODY HUMAN: God's Design for Personhood by Mark P. Cosgrove. Grand Rapids, MI: Baker Book House, 1987. 198 pages. Paperback; $7.95.

This book begins with the absolute statement, "Man is the only creature who cannot drink and breathe at the same time," and continues with similar absolutes throughout the text. Cosgrove states in the prologue the purpose of his book: "to examine in detail the fascinating anatomical differences between humans and animals," to appreciate God's design for us. He then proceeds to discuss various physical features, searching for those that set humans apart as unique and special in all God's creation—features that prove humans have "personhood." Unfortunately, he looks too hard and as a result makes absolute claims that in at least some cases are easily proved wrong and in many are questionable due to their exclusive phrasing.

For example, he states that "man is the only creature who keeps his cool by sweating." Sweating is the primary means of cooling for most ungulates, including cattle, llamas, and horses. "Man is the only creature with both hands and feet"—by which the author means to stress that our extremities are adapted to two different tasks. What about birds, whose two pairs of limbs are so superbly adapted to their two different tasks? The theropod dinosaurs, who had both hands and feet as we do, managed very well. As a final example, Cosgrove devotes an entire chapter to the point that humans live longer than any other creature on the planet—"except an occasional tortoise." Well, what about that tortoise (and I suspect it's more than an occasional one!)? Does anyone know with certainty the life expectancies of the great whales? The author ignores the entire class Aves, but large parrots such as macaws can be expected to live well over 100 years! In deliberately seeking to emphasize differences between man and other animals, Cosgrove has overlooked or ignored conflicting evidence. Because of this, I find it hard to accept the thesis he is trying to support.

Cosgrove, a psychology professor at Taylor University, is reacting to what he sees as an overemphasis on human similarities with the rest of the animal kingdom. His prologue argues well that there is much in humanity—in our intelligence and culture—that other animals do not share. However, the book proper is devoted to showing that human physical features—such as the face, skin, throat and upright stance—demonstrate that humankind is specially designed for social interaction on a higher plane than that on which other animals operate. But the uniqueness of the human throat and vocal apparatus really says nothing about our social interactions. The African grey parrot also has a unique (and totally different) vocal apparatus, but it accomplishes the same end, in fact, surpassing the human voice in many ways! Our physical features for the most part do not confer on us humans the status of "personhood," as Cosgrove puts it—they are merely the tools for an extremely agile and highly developed brain. The realm of the psychological seems to me to hold much more evidence of our special relationship with the Creator, different from that of all the other animals. We have minds to grasp the existence of God and to worship Him. In venturing out of his field of expertise, the author has overstated a case he could have supported far better with facts from his own discipline. Instead, he has missed out on an important aspect of creation.

Cosgrove wants to prove that we are special creations of God by finding those special physical characteristics that set us apart from His other creations. But are not all of God's creatures special? We have an entire classification system based on the unique characteristics of every species of living thing. If his favorite animal had been, say, the bee, Cosgrove could certainly have found as many special and brilliantly adapted features of that creature as he has for us. No matter how our Lord chose to make His wonders, whether instantaneously or gradually, they are all fearfully and wonderfully made, each uniquely suited to its role on this earth. We humans are in God's image, yes—we have a mind to see Him, a spirit to worship Him, the foresight to long for Him. To me

this is a book written to a good purpose but in the wrong direction.

Reviewed by Ruth Douglas Miller, doctoral candidate in Bioelectrical Engineering, University of Rochester, Rochester, NY 14627.

COUNSELING THE DEPRESSED by Archibald D. Hart. Waco: Word Books, 1987. 271 pages, index. Hardcover; $12.95.

Archibald Hart, Dean of the Graduate School of Psychology, Fuller Theological Seminary, has presented us with a book about depression that is considerably above the quality of most of the recent pop-books about self-help with depression. It is refreshing to discover that such a subject can be treated with clarity and at the same time with depth and helpful understanding. My only criticism relates to my personal bias—a greater need for cognitive treatment. Beck's work is cursorily dealt with, and a reference to his original, rather technical book is made. Simple behavioral treatment, I have found, is very effective in cognitively treating depression and could be considered as well.

The book is divided into five headings with several chapters in each. Hart first discusses understanding depression with chapters on misconception, problems, definitions, diagnosing, and discusses the differences between reactive and genetic causes.

The following sections relate to counseling the depressed person, with emphases on age-relationships, specific life problems and the pitfalls in counseling. These chapters can be helpful to the younger therapist or one who has had little experience in counseling those who are depressed. The problem I had in reading the book was that Hart seemed to me to give more assurance than is merited about cause and treatment research. This positive evaluation might raise unrealistic expectations about the results of this type of therapy.

There is a bibliography with 19 citations after 1983; 18 from 1980; and 24 prior to 1979. There are several drawings and charts. The chart of the diagnostic classification of depression by etiology gives the impression that endogenous and exogenous causes are discoverable, which may not be the case. The table on symptoms of differing types of depression may lead the reader to make diagnoses based on limited information. However, both of them, if used with the reservation that a clinician is trained to practice, can add a dimension of understanding. The counselors I worry about are those who are inadequately trained and take these formulations as fact, and act on the concepts erroneously. I would wonder about a "pitfall" that he mentions in the last chapter of the book; of diagnosing and treating someone according to these charts, failing, and then a person bringing suit against both the book publisher and the therapist! This potential for abuse underscores the problem of bringing more technical data to the lay-type counselor who will no doubt be the main audience for this series of books. However, if the reader is careful in following the suggested procedures, this possibility is lessened.

Hart makes cogent comments relating to some of the misconceptions about depression. He quotes a pastor who said, "If you walk close to God you will never get depressed." The author is most effective when he relates some of the errors which are commonly perpetrated over the radio, T.V., and from some pulpits. For instance, depression is the result of sin, due to lack of faith, God's face against you, or that healing is a spiritual exercise. He explicates the reasons that such ideas are inadequate or wrong. He follows this up with the recognition that there are conditions where depression may be related to sin in the person's life. Practical suggestions are made for the treatment of these conditions.

Hart has chapters on depression in childhood, adolescence, the elderly, women, the mid-life crisis, bereavement, and the suicidal person. These are practical discussions. He also points out some of the legal problems, citing recent cases where a pastor may not be protected by the concept of separation between church and state.

This is an excellent book for the beginning counselor, or someone trying to understand depression from many viewpoints who wants to be of help. The difficulties have been noted. With care, this book makes a definite contribution to the literature on depression.

Reviewed by Stanley E. Lindquist, Professor of Psychology, California State University, Fresno, and President of Link Care Foundation and Missions, Fresno, Ca 93711.

REAL LIFE MARRIAGE by Lucy Guernsey and Dennis Guernsey. Waco, TX: Word, 1987. 202 pages. Paperback.

The primary thesis of this book is that the reality of marriage is quite different from the promise of marriage. The promise of marriage is that each spouse will have a fuller life because of the possibility for intimacy which marriage creates. The reality is that as spouses come to know each other better, the personal qualities which they once found so attractive in each other start to grate on their nerves.

What can be done? The Guernseys lay out a plan which includes facing reality, increasing intimacy, understanding mapmaking, handling temperaments, coping with dual careers, facing the double-minded dilemma, helping parenting self-destruct, and trusting God for real marriage.

Lucy and Dennis Guernsey have been married to each other for 25 years, and in this book they share many insights on how to strengthen the marriage bond. They are candid in exposing their own shortcomings, knowledgeable in pinpointing important marriage issues, and succinct in clarifying how marriages can improve. It is refreshing to find such candor in a book; it is helpful to know that the authors are describing a road over which they have travelled.

Both of the authors are employed at Fuller Theological Seminary in positions which bring them into contact with people who have problems. Their professional roles, family experience (they have two daughters), and academic backgrounds qualify them to speak on marriage. They do it well. This book will be helpful because it is about "real" instead of "idealized" Christian marriage. The institution of marriage in America needs help, both inside and outside the Church. The Guernseys have provided a valuable resource for those who in marriage seek authentic relationships rather than romanticized ones.

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

GROWING OLD AND HOW TO COPE WITH IT by Alfons Deeken. San Francisco: Ignatius Press, 1986. 192 pages. Paperback.

Growing Old was first published in the U.S. by Paulist Press in 1972. Although it is new to me, I am not surprised that it has been published again some fourteen years later. It is well written and addresses a topic that affects a growing number of people every year.

The book is divided into three sections and an appendix. The sections are headed: "On Growing Old," "Coming to Grips With Old Age," and "How to Grow Old Gracefully." The appendix deals with "Man's Immortality and Eternal Life."

Deeken methodically examines many aspects of the reality of aging and death. Illustrations from the Bible and from his own experiences enrich the discussions of each topic. He also uses an impressive number of quotations and illustrations from art, literature, drama, and philosophy. This might be a show of erudition, but I felt that the numerous allusions gave depth and authority to the exploration of a topic that often is treated simplistically or superficially. This strength might also be a weakness in that it may restrict the audience. I am not sure that most people who become severely depressed as they realize the inevitable is getting closer would appreciate the scholarship which I found helpful. Also, the person who desperately needs help may be insulted if he or she thinks that Deeken implies that a Christian believer should have no problems with death. After all, Deeken indicates, a home in heaven with Christ is what every Christian looks forward to.

Probably the book will appeal most to individuals who can look at aging objectively. As I read the book, I felt that I was looking over Deeken's shoulder as he counselled individuals in need. I will probably borrow some ideas from him if I find myself doing some counselling. Certainly the book should be valuable to the Christian student of gerontology who is looking for biblically sound observations to share with those whom he or she may be counselling.

Deeken's central point may be that "in the light of a trinitarian spirituality one would see heaven and eternal life as the highest creative possibility of man" (p. 142). To make this point in his counselling, Deeken has found a statement by Mozart to be helpful. In a letter to his father, Mozart wrote: "Since death is the true end purpose of our life, I have made it my business . . . to know this true, the best friend of man so well that the thought of him . . . brings me great comfort and peace of mind" (p. 141).

One may not agree with everything Deeken says, but the book is definitely stimulating and worth reading.

Reviewed by Ralph Kennedy, emeritus professor of English, John Brown University, Siloam Springs, AR 72761.

LIFE IN THE AFTERNOON by Edward Fischer. Mahwah, NJ: Paulist Press, 1987. 230 pages. Paperback; $8.95.

This book has the subtitle: "Good Ways of Growing Older." It is essentially that; a book of hints on how to live life, from start to finish.

In nineteen chapters, Fischer writes of such things as spirituality, death, loneliness, walking, and journaling. The chapters do not seem to be chosen with any overall plan of organization as much as by what Fischer has found to be important about life as he looks back at his 71 years.

His writing style is similar over his lifetime. I often felt that he lined up note cards filled out over 71 years of experience, turned each into a paragraph, and then strung the paragraphs together to make a book. The end result is one of jumping from one interesting idea to another. While some of the individual paragraphs read well and have wonderful things to say, the effect is a little disconcerting. This is not a treatise on aging, it is some "good ways of growing older."

Fischer's formula for successful aging is to be an activist, extrovert, and participator in life. Aging is not something you do at 65, 60, or at any other magic marking point. One is always aging, and one just continues on with as much grace, art, and style as possible. Fischer seems to say that you become more of whatever you are as you age.

The only discomfort I felt while reading this book was that Fischer presents as elitist formula for aging. He is well educated and has lived in the utopia of the University of Notre Dame community. His formula for life requires one to be highly educated, moderately comfortable in terms of finances, and of reasonably good health. For those many older persons who do not fit this description, this book does well at building a sense of failure. Surely, not everyone can retire into authorship. Certainly, failing health is a reality for many older persons. Fischer exhorts us to live life with a sense of wonder, a willingness to work hard, a positive and open attitude, and an inquiring mind. Well done. But as I think of some of the people with whom I have sat and talked about life's increasing difficulty as their health fails, finances disappear, and friends and family stop calling, this does not seem enough. What is missing is that charge to the Church to be the

healing, loving community for all ages. There are times when personal resources fail and the community needs to be there for the older person.

Yet, this book is fun. Every chapter provides good material and reminders for living life with more grace and meaning. In particular, Fischer reminds us that spirituality is hard to come by in the whirl of career building in one's earlier years; it takes time. This is a good reminder.

Although not a theological powerhouse or analysis of aging, *Life in the Afternoon* is for anyone who needs to sit down and think about life. The book and the sitting will be time well spent.

Reviewed by Harley Schreck, World Vision International, Monrovia, CA 91016.

COUNTING THE COST: The Economics of Christian Stewardship by Robin K. Klay. Grand Rapids: Eerdmans, 1986. 187 pages. Paperback; $9.95.

This is a book which presents and inspires discussion of responsible economic policy. The goal is not so much to lay down definitive conclusions, as to present information aiding the reader's formulation of a position. Klay takes several issues and analyzes arguments on both sides, although there is a rather quiet yet unmistakable tilt towards political liberalism.

The first three chapters resemble a mini-course in economics for interested laymen. The rest each address a major topic area such as domestic poverty, land use, trade policy, the hand of government, and military spending. I found the chapter on environmental policy to be of particular interest. Each of the ten chapters is concluded with a short list of questions for further deliberation. The bibliography is quite limited.

Economic philosophy plays a dominant role in this work; the Christian aspect is not particularly emphasized. Perhaps one could more accurately term the book a moral study of economic issues; I would not expect ethically oriented agnostics and atheists to quarrel with her presentation.

I was hoping to discover a more vigorous use of the Bible. For example, the economic subject figuring most prominently in Scripture is that of tithes and offerings. Because both partial and complete disobedience are rampant (Mal. 3:8–9) this issue may be considered microeconomic, but just imagine what macroeconomic effects there could be! Along similar lines, none of the verses on divine economic intervention were cited.

Another area overlooked is righteousness as an economic value (Prov. 10:20, Ps. 37:16). The scarcity of the same is however very costly, as seen in the prison system, drug abuse, AIDS, usury, divorce, envy, wars, *etc.* When a number of people are unwilling to submit to internal control, most signally through Christ Himself, then society must yield money and freedom for external control (I Sam. 8:6–17).

A few other omissions could be cited. Discussion of Third World poverty did not include the unstable condition of the U.S. financial system. Deficits, inflation, medical insurance and pension funds, public and private, might be of interest. When the author does address a topic, not every contact with conventional wisdom is necessarily met with a challenge.

In this book we are offered a fine collection of thoughts on economics that will be much appreciated by those interested in the same issues as those selected by the author.

Reviewed by Philip F. Rust, Department of Biometry, Medical University of South Carolina, Charleston, SC 29425.

THEOLOGIANS UNDER HITLER by Robert P. Ericksen. New Haven: Yale University Press, 1987. 236 pages, index. Paperback; $8.95.

It is difficult from our standpoint to understand how competent theologians could have supported the Nazi regime. The fact that some did raises questions about the natures of theological and political commitment. *Theologians Under Hitler* is a detailed study of three German theologians who, in varying degrees, supported Nazism: Gerhard Kittel, Paul Althaus, and Emanuel Hirsch. All believed themselves to be operating within the Christian tradition. The degrees to which they adhered to the Nazi regime differed. Althaus became disillusioned with it years before the war's end, while Hirsch was rumored to have kept a picture of Hitler in his basement until his death in 1972. Kittel tried to distinguish his scholarly opposition to Judaism from "vulgar antisemitism."

Ericksen begins with a chapter in which he sketches the background of liberal theology in the nineteenth century, the German crises of defeat in World War I and the Weimar Republic, and the theologies of Barth, Bultmann, and Tillich. He argues that rapid changes in German society in the early part of this century were especially threatening to academics and theologians, and that conservatives with a deep attachment to their country were eager for ways to stem and perhaps reverse the tide of change.

Separate chapters are devoted to Kittel, Althaus, and Hirsch. Their upbringings, theological work, reactions to crisis, response to Hitler's rise and the German church conflict, and attitudes near the end of Hitler's regime and after the war are detailed. They were major theologians, and the problems their careers posed cannot be dismissed lightly.

It is easy to say that these men were wrong. It is harder to criticize the intellectual theological rationales with which they justified their positions. On page 26, Ericksen sets out several theses which he illustrates in the following chapters. Kittel, Althaus, and Hirsch were well-meaning, intelligent

people who developed intellectually defensible reasons for supporting Hitler. Their judgments were ultimately based on existential "leaps of faith," Ericksen argues. Their "leaps" were opposite in direction to those of Tillich, Barth, or Bonhoeffer, but since they *were* leaps of faith, this cannot be attributed to differences in insight or intelligence. "Stated another way," the author says soberingly, "We cannot rely upon intelligence or rationalism to protect us from political error."

Interactions between religion and politics today remind us that the general issues dealt with in this book continue to be important. Ericksen concludes by pointing out the possibility that crises in our society could provoke fascist-like "law and order" responses, and that intelligent and well-meaning people again might support them. But there are other dangers, too. The popularity of liberation theology shows that an alliance between Marxism, with as many atrocities to its credit as Nazism, and some parts of the church is a real possibility. (Barth's argument, cited on pages 17–18, for different Christian responses to communism and Nazism, is unfortunate.)

There are also concerns which extend beyond the political realm. A fundamental question of the thirties was whether or not there is an *Ur-Offenbarung*, a general revelation of God in creation which is secondary to, but in some sense separate from, God's revelation in Christ. This is connected with the issues of "Orders of Creation." *Ur-Offenbarung* was championed by Althaus over and against the Barthian denial of it made explicit in the Barmen Declaration. While history has vindicated the Barmen confessors' opposition to Nazism, the theological question about "primitive revelation" has not really been settled. Gustaf Wingren has argued that the use of the doctrine of creation by theologians associated with Nazism tainted it and led to an unfortunate post-war deemphasis of the First Article. These questions are important for the way we understand God's relationship with the world and, specifically, the science-theology interface.

Ericksen has limited his topic carefully, and discusses it clearly and thoroughly within those limits. (Copious reference notes and a twelve-page bibliography are provided.) *Theologians Under Hitler* is not intended to be a complete history of the church and theology under Nazism. It does show how intelligent Christians could come to cooperate with powers ultimately seen to be evil. In doing that, it presents us with significant questions about our own theological and political situation.

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

BETWEEN FAITH AND CRITICISM: Evangelicals, Scholarship, and the Bible in America by Mark A. Noll. San Francisco: Harper & Row, 1986. 255 pages. Hardcover.

Mark Noll is a professor of history at Wheaton College and an authority on American evangelical history. He has authored five books, including two which are related to the present volume: *The Princeton Theology, 1812–1921* and *The Bible in America*. The present study is a volume in the Confessional Perspective Series which has been commissioned by the Society of Biblical Literature. These volumes attempt an assessment of the place of the Bible within varied confessional perspectives.

More than half of the book traces the history of conservative biblical scholarship from 1880 to the present. The last chapters raise questions about the proper course for evangelical scholarship and suggest some possibilities for the future. But this book is more than a summary of scholarly effort, it is really an exciting unfolding of the way in which Christian scholars who were committed to a high view of scripture responded to a wave of biblical criticism that confronted America after the Civil War. The story of that reaction is actually an intellectual history of biblical conservatism, of fundamentalism and the evangelical movement. This book is also an example of how the historical craft can provide guidance for grappling with current issues. As believers today face questions of biblical inerrancy and criticism, they can better examine the present alternatives by examining the record of how their spiritual forebears handled these issues. The book is well documented, has a bibliography, and provides an appendix and six tables which help to document in a numerical manner the resurgence of evangelical scholarship, beginning as early as the 1930's but becoming more apparent in recent decades. Incidentally, those who have wondered how to define the elusive term "evangelical" will appreciate Noll's attempt to define his terminology in the introduction.

This book deals with a question that should interest scientists as much as those concerned with biblical scholarship: How can a believer with a childlike faith and an *a priori* commitment to scripture as God's Word also be a scholar with a commitment to objectivity and a desire to be a part of the practicing academic community? The Christian scholar really lives in two worlds, and often there is a gulf separating the two. Orthodox scholars in America during the early 1900's met (or avoided) this challenge by retreating from the academic world. Conservatives began to write only for conservative Christians. They no longer were accepted by the scholarly community. Their books dealt with liberal biblical scholarship only by way of negative attacks without any real possibility for dialogue. Thus, the university biblical scholar and the conservative seminary professor moved in two different worlds. They seldom interacted, and Noll thinks both sides lost in the process. The British evangelicals never developed the fortress mentality of fundamentalism. They found it easier to adjust to the new ideas without surrendering basic convictions. Thus, the British conservatives never experienced the rejection that American fundamentalists experienced from the university community. After the 1930's evangelicals in America were beginning to gain greater academic respectability. They profited from the aid and example of British evangelical scholars. By the 1970's and 1980's, a surprising number of seminary and Christian college biblical studies professors in the evangelical community had earned doctorates from the most prestigious universities in the United States and abroad.

Noll believes the most urgent goal for the future should be to further narrow the gap of separation between the university community and conservative biblical scholars. He does not think this has to mean a surrender of theological principles, but in fact the opposite. As conservatives develop more fully a serious and well-formulated theological underpinning, they will be better able to deal with the biblical research and conclusions of their secular university counterparts. Conservatives could then do more than carp at the heels of critics or utilize only the most peripheral findings of liberal Bible scholars. They could begin on a wider scale to make use of the biblical scholarship of the university by discovering its implications within the evangelical theological framework. Also, larger numbers of American evangelical biblical scholars might begin to find acceptance into the ranks of secular university faculties.

Some conservative believers will probably criticize Noll for being too eager to make concessions to the practitioners of biblical criticism. This book takes as a premise the view that criticism has valuable insights to offer those who hold to biblical authority. A different approach can be seen in Harold Lindsell's *Battle for the Bible*. But even those who think that the critics have little to teach conservatives certainly should be willing to ponder some of the lessons that Noll draws from our evangelical heritage.

Reviewed by Richard L. Niswonger, Professor of History and Bible, John Brown University, Siloam Springs, AR 72761.

THE EVIDENCE FOR JESUS by Richard T. France. Downers Grove, IL: InterVarsity Press, 1986. 168 pages. Paperback; $6.95.

New Testament scholars often stress the fact that writers of the New Testament lived in a particular geographical setting and in a specific historical and cultural milieu. To understand Jesus and the gospels properly, their time and space context must be observed. Richard T. France, Professor of Biblical Studies at London Bible College and author of *Jesus and the Old Testament*, agrees. In *The Evidence for Jesus* he finds bothersome, however, the recent proliferation of popular and scholarly articles, books, and television programs which depict the "real historical Jesus" as no more than a product of his times: a Jewish rabbi in Roman controlled first-century Palestine. "The times" produced Jesus and his contemporaries rather than the other way around.

Historians have long recognized the importance of historical context and continuity for understanding historical change, but few would deny the presence of uniqueness, genuine creativity, and the importance of individual initiative and choice. Issues of determinism, "chance," and providence are basic to historical philosophy, but historical events are not all inevitable, intrinsic, or incipient in the historical context. Jesus *was* different, quite different from his contemporaries. What those differences were and where they came from is a major area of inquiry. Not only so, the Christian community was a distinctive movement, not at all identical with any other first-century cultural group. France cautions against ignoring the cultural/historical setting or failing to see the uniqueness of Jesus in the "just one among many" assumption. Even worse is to "read into the early church the values of quite alien cultures, not least that of twentieth-century existentialist philosophy" (p. 106).

After outlining the body of extant non-Christian evidence and Christian evidence outside the New Testament, France examines the evidence of the New Testament itself, which, after all, is our principal source of knowledge for that era. France finds that those who reject the New Testament evidence as reliable history do so on presuppositional rather than on historical grounds. The problem is in the attitude of the reader, not in the evidence itself. An anti-supernatural bias exists among many theologians today, not because of the evidence, but because of their own naturalistic biases.

It is often *assumed* that the gospel narrative is "encrusted" with mythology and embellishment which block the view of the "real Jesus of history." Similarly, form criticism builds its system not on the extant documents available, but upon the mental assumption of certain non-existent documents as primary sources—such as a prior-existing "Q" corpus, alleged to have provided the basis, along with the gospel of Mark, for the writing of Matthew and Luke.

Others seek to eliminate by categorization. By putting the gospels into the same category as Hellenistic myths and fables, they then *assume* the gospels should be examined in the same way. On what basis are they thought to be of that genre? The decision to treat them as myths is not based on evidence linking the two, but on a philosophical decision.

Christian sources should not automatically be "suspect" or assumed to be distorted and inaccurate. Why should the fact that an eyewitness' belief in the truthfulness of that which he saw and heard (I John 1:1–3) be used to bring into doubt the accuracy of what he saw and testified to? The burden of proof is on those who deny the accuracy of the historical records and the very long tradition of respecting that accuracy. Skepticism is not proof. "By what logic," France asks, "does a concern to preach a message about a historical person exclude a concern to give an accurate account of what he said and did?" (p. 103).

France also questions the validity of an argument which assumes the existence of "mythical alterers of the text" during the Christian centuries. Different versions must be dealt with as emended texts, but in the absence of such versions it is mere conjecture to assume the text has been changed. It is more honest to take the text as handed down through the centuries. Comparing extant copies from different centuries corroborates the accuracy of each.

C.S. Lewis warned that the danger of "reading between the lines" was to fail to read the lines themselves. There are alternatives to the "skeptical approach" towards ancient texts. France urges historical realism to let the texts speak for themselves and historical honesty to avoid reading into the record more than is there. It is equally dishonest to seek to expunge the supernatural element from the historical records. Naturalists with *a priori* assumptions may question the exis-

tence of the supernatural, but they do violence to the historical record if they ignore the fact that the writers of the New Testament were convinced of the reality of the supernatural and the miraculous. The modern reader then must choose whom to believe: the first-century eyewitnesses or their twentieth-century critics.

This book should be appealing to intelligent laymen who are concerned with the importance of evidence as a basis for faith. The absence of a bibliography is a weakness, but footnotes are extensive. *The Evidence for Jesus* is the eighth in *The Jesus Library* series, edited by Michael Green and published by InterVarsity Press.

Reviewed by William H. Burnside, Professor of History, John Brown University, Siloam Springs, AR 72761.

WISDOM AS A LIFESTYLE: Building Biblical Life-Codes by David Wright. Grand Rapids: Zondervan, 1987. 151 pages. Paperback.

David Wright is involved in mission work in Haiti, and his practical pastoral orientation is evident throughout this book. He is a lover of the Proverbs, and he has written this book from his concern to change lives. Its insights are based on his own meditations.

It is neither a commentary nor a systematic study of the sayings or their forms. It is instead a topical study that seeks to find practical help for daily living from the Proverbs. Since this is what Solomon evidently had in mind for his collection, the book is faithful to the text. There are many illustrations drawn from the author's own experience, his observation of others, and hypothesized situations. Some of these are helpful, some seemed to me not to fit well with the point being made.

The author is concerned with using Proverbs to point unbelievers to faith in Christ, and to challenge believers to be open to the work of God in the details of daily living. Such a motivation means that different parts of the book will speak more strongly to different readers, depending on their own spiritual situation. He deals with righteousness, friendship, wealth, and speech, and includes some other material showing what wisdom is good for, and what it is not good for, and how it should be dealt with in general. I found the material on "Wisdom and the Way we Talk" to be most helpful. This book is a useful supplement to commentaries on and structural studies of the Proverbs.

Reviewed by David T. Barnard, Associate Professor and Head, Department of Computing and Information Science, Queen's University, Kingston, Ontario, Canada K7L 3N6.

WHAT YOU KNOW MIGHT NOT BE SO: 220 Misinterpretations of Bible Texts Explained compiled by David C. Downing. Grand Rapids, MI: Baker, 1987. 215 pages, indices. Paperback; $8.95.

This book was compiled "in concise, nontechnical terms" for the unsophisticated lay reader by a professor of English at Westmont College in Santa Barbara, California. While he doesn't have the scholarly or ecclesiastical credentials one normally expects, he credits six scholars in Bible and church history for reading and criticizing parts or all of the manuscripts. The result is a quite reliable popularization that also contains much of value for the more mature student.

Entries range from only a few lines to more than two pages in length, and are arranged in a dictionary format. Approximately half of the entries are listed in the endnotes, referencing a bibliography of thirty works. There is a five-page index of Scripture references. Illustrations include a map of the Exodus geography, a diagram of the ark, many black and white reproductions of art, and a few pictures of artifacts.

The subtitle is misleading; topics covered actually vary from a simple explanation of the origin and meaning of B.C. and A.D. to a discussion of textual criticism in connection with the Last Supper. The heaviest emphasis is given to hermeneutical problems, translation problems, and erroneous ideas of what the Bible says, but space is left to deal with a broad range of other topics. There is even an entry on "Hezekiah, Book of"; the trick "Biblical citation" frequently used to embarrass people who should know that there is no Book of Hezekiah in the Bible. At times one is amazed to think a particular entry rates inclusion, at other times one is driven to the Bible to see if Downing is really correct.

Downing states in his introduction, "A deliberate effort has been made to avoid doctrinal disputes, sectarian controversies, or perennial questions still open to scholarly debate." In general, he achieves this very difficult goal. However, many entries will unavoidably jangle some nerves. "Immaculate Conception" and "Saints" are accurate, but they sound like they were written by a Protestant. "Deaconess" is also accurate, well written and apropos to this book, but it will be unsettling to many from denominations denying church leadership roles to women. "Sabbath vs. Sunday" will be perhaps unsettling to those looking for explicit scriptural evidence to use against Seventh Day Adventists.

Downing also underestimated, in a few cases, the extent to which uncertainties in matters of interpretation can result in "perennial questions." For instance, it is difficult to defend the idea in "Saul becoming Paul" that Paul and Saul are just equivalent names in different languages. Cranfield in the ICC revised commentary on Romans presents a much more likely explanation of Roman names for Jews who were also citizens of Rome, but he claims no certainty for his judgement. Also, two or three entries left me with a very unsatisfied feeling. "Elisha's curse on the children" simply can't be handled within the format of this book. Downing does a very good job of delineating the problem of interpretation and debunking past attempts to eliminate the problem by superficially explaining it away, but he does not solve it nor give us

an approach to its solution. These lapses are rare, however, and Downing is to be commended for his effort and the unflinching courage with which he approached the task of destroying fond illusions where we are more inclined to axe the debunker than the bunk.

This is a fun book as well as an instructive one. It will start everyone to thinking, warn them to be more careful in reading the Bible, and make them more reluctant to unthinkingly accept "common knowledge" and even some teaching from lectern and pulpit. The perceptive reader will be embarrassed, disturbed, and gratified.

Reviewed by Eugene O. Bowser, Technical Services Librarian, University of Northern Colorado, Greeley, CO 80639.

THE HEALINGS OF JESUS by Michael Harper. Downers Grove, IL: InterVarsity Press, 1986. 194 pages, index. Paperback; $6.95.

Michael Harper, a leader in the charismatic movement, and a canon in the Church of England, is convinced that the modern church can and should have the same kind of healing ministry Jesus had.

This volume is a part of *The Jesus Library*, of which Michael Green is editor. Although a primary focus of the book is on what took place during Jesus' earthly ministry, there is constant transfer to the present, giving great emphasis to the author's conviction that healing is an integral part of the Gospel of the Kingdom. Harper begins his book by recounting his own pilgrimage from skepticism to the faith that God can and does heal today.

Over half the book is devoted to comments on the passages which relate Jesus' healings. The passages are grouped according to the type of healing involved—overcoming Satan, overcoming the results of sin, overcoming death, *etc.* Although each healing is given only brief treatment, the groupings help give unity to the book and breadth to the development of the author's thesis. Remaining chapters deal with the nature and purpose of miracles, why Jesus did not always heal the afflicted, and with the meaning of the expression "Kingdom of God." It concludes with brief comments on the greatest miracle: the death of Christ on our behalf.

As a part of his thesis that Jesus' ministry on earth is an exact model for the church's ministry today, Harper refers repeatedly to the limitations of our Lord's humanity. He did nothing in his own power. He accomplished his Father's will in the power of the Holy Spirit. Since he acted as a man in his healings, humans today can minister in the same way as they are led by the Father and empowered by the Spirit.

One interesting part of this argument is that Jesus was given knowledge in each instance, so that he always knew who could be healed. Thus, he avoided attempts to heal all people. Thus, also, he never failed in a healing effort. Harper apparently believes we can act today with the same certainty when we receive divine guidance in each case.

The Healings of Jesus is a clear exposition of Harper's position. It does not, however, deal with and answer the exegetical and theological questions of those who differ with him. He assumes the validity of his position and that others disagree with him because they are victims of the secular world view from which he escaped. I am sorry he did not adopt a more apologetical approach, though I appreciate his comments.

Reviewed by Joseph M. Martin, Professor, Edward Lane Bible Institute, Patrocinio, Minas Gerais, Brazil.

A PLACE TO DIG IN by William H. Hinson. Nashville, TN: Abingdon, 1987. 139 pages. Hardcover.

The title of this book suggests it might be about archaeology. That is not the case, although there are some obvious similarities between archaeology and evangelism, the subject of this volume. The place to dig in is the local church, and the person who should dig in is the church member.

Hinson is the successful pastor of the First United Methodist Church in Houston, Texas, which has a membership exceeding 13,000. How does a church get so large? Hinson tells all, and there are no surprises here. The well-known secret is hard work by skilled leaders and involved lay people.

Church growth, says Hinson, does not typically come about because people just walk into a church and like what they see. It comes about by careful planning which identifies, nurtures, and eventually wins church prospects to Christ and His church. Hinson's formula for a growing church is not based on any scientific approach to mass appeal. Rather, it is based on biblical principles which have been brought to life by a dedicated pastor motivated by the Great Commission. In the crucible of life, through prayer and guidance by the Holy Spirit, Hinson has discovered what works and what does not.

This is a short book written with fervor, based on experience, and succinct in recommendations. It contains a message needed by all Christians who are called to do evangelism in the local church.

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

THE CROSS OF CHRIST by John R.W. Stott. Downers Grove, IL: InterVarsity Press, 1986. 383 pages, bibliography, indices. Hardcover; $14.95.

A book by John Stott is always a reason for rejoicing. His

mixture of scholarship and pastoral concern, of world-awareness and scriptural depth, of profound thinking and clear expression have become a hallmark through his extensive writing. A book about the cross catches the Christian's attention, because the cross is central to the faith. *The Cross of Christ* satisfies the expectations aroused by its publication.

This book deals with the atonement but goes far beyond that doctrine. First, Stott approaches the cross, emphasizing its importance and necessity. Then, he deals with the atonement *per se*—what it means that God provided our forgiveness through Jesus' death. Next, he describes the results of the cross in saving sinners and conquering evil. Finally, he outlines what it means to live under the cross, in worship, service, love and suffering.

Stott contends that the heart of the doctrine of the cross is that God, in Christ, took our place on the cross. He stresses the unity of the Father and the Son, so it is not the second person of the Trinity who rescues us from the wrath of the first person. It is, rather, the one true God who takes upon himself the results of our sin. He denies that this commits him to the heresy of patripassionism—saying that the Father suffered for our sins. But he does believe the Father is an active, loving participator in our salvation, not an impassive spectator. As a matter of fact, he develops a theodicy based on this. "I could never myself believe in God;" he says, "if it were not for the cross. . . . In the real world of pain, how could I worship a God who was immune to it?"

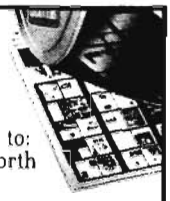
Stott discusses at some length the views of Anselm and Abelard, views which are usually mentioned in any book on the atonement. He suggests that, although these views are usually presented as contradictory, they both contain elements of biblical truth. He also analyzes the writings of Karl Barth, Emil Brunner and many others. In fact, although the book is not heavy and technical, it has a twelve-page bibliography which lists only those books mentioned in its chapters!

InterVarsity Press is to be commended for asking Stott to write this book to commemorate its Golden Jubilee. Stott is to be commended for the years of labor he gave to writing it, plus the years of study of the Bible and other books which gave him the background for this volume. It is broader in scope and more thorough in its development than any other evangelical work on the subject in this generation.

Reviewed by Joseph M. Martin, Professor, Edward Lane Bible Institute, Patrocinio, Minas Gerais, Brazil.

DID JESUS RISE FROM THE DEAD? by Terry L. Miethe (ed.). New York: Harper & Row, 1987. 190 pages. Hardcover; $14.95.

The subtitle is "The Resurrection Debate"; the book written by Gary R. Habermas and Antony Flew. The former is professor of apologetics and philosophy at Liberty University, where this debate was held in 1985; the latter for many years a professor of philosophy at Reading University in England.



The debate was timely in view of the repudiation of the resurrection by such important persons as David Jenkins of Durham, a Senior Anglican Bishop.

The debators had agreed to limit their discussion to the historicity of the resurrection without any regard to the existence of God, the deity of Jesus, or the significance of the resurrection *per se*—an unfortunate restriction in view of its artificiality. There were two panels of five academic judges: one consisting of philosophers to judge content, the other debate experts to evaluate solely argumentation techniques. In view of the breadth of the topic, I would have preferred representation of literature, linguistics, history, theology, and science, including psychology.

Part one, "The Formal Debate," begins with "the negative statement" by Flew, a self-confessed dogmatic agnostic and so-called "expert on the impossibility of miracle." More evidence, of course, is required for a miracle than for an ordinary event. He notes "the absence of any truly contemporary documentation of the life and death of Jesus." I would add that natural wonders may seem miraculous to the uninformed. He deplores the time lapse between the event itself and any record of it.

"The Affirmative Statement" by Habermas, professedly an expert on historical evidence, is concerned with the so-called first Christian creed (in Corinthians), which he regards as originating from eyewitnesses, even though this is probably only hearsay. He stresses four primary facts: the crucifixion itself, the disciples' own experience, their transformation, and Paul's vision. The empty tomb appears as verification of the creed. He stresses the questionable Shroud of Turin again and again. His later citation of so-called "scientific study of near deaths" leaves much to be desired. The common reader may be bothered by such unsubstantiated claims by Habermas such as "virtually all scholars agree"; "accepted as knowledgeable by virtually all scholars, virtually all scholars recognize." He resorts to needless repetition throughout the debate.

Each speaker has a "Rebuttal," followed by a "Head to Head" confrontation. There is considerable speculation about the body of the human Jesus compared with that of the risen Christ. An unending argument takes place about the difference between vision and hallucination.

Part two, "The Continuing Debate," consists of discussion between the debators with Miethe and David Beck, chairman of the Liberty Philosophy Department. "Responses to the Debate," are given by three distinguished scholars: Wolfhart Pannenberg, Professor of Systematic Theology, Munich; Charles Hartshorne, Professor of Philosophy, University of

Texas; and J. Packer, Professor of Theology, Regent College, Vancouver.

Part four, "A Final Response," consists of "Some Final Thoughts on the Resurrection" by Habermas, who summarized his own views with some added footnotes and comments about the remarks of the commentators. Why was he alone given this privilege? Perhaps because the content judges had given him four votes (one draw), and the skill judges had selected him three to two—hardly fair to his opponent, whom one speaker criticized for his casual, conversational style of Oxford in contrast with the formal American lecture style of Habermas.

This is an interesting presentation of an artificial game of logic, but hardly evocative of religious conviction. The obvious cordiality of the contestants seems more suitable for the social parlor than for the serious arena.

Reviewed by Raymond Seeger, 4507 Wetherill Road, Bethesda, MD 20861.

UNDERSTANDING JESUS by Alister McGrath. Grand Rapids, MI: Zondervan, 1987. 184 pages. Hardcover.

Alister McGrath is a member of the Oxford Faculty of Theology and at present is lecturer in Christian Doctrine and Ethics at Wycliffe Hall, Oxford. He also has a Ph.D. from Oxford in molecular biology. His numerous writings include *Luther's Theology of the Cross* and *The Making of Modern German Christology.*

This book is subtitled "Who Jesus Christ is and Why He Matters," and admirably answers both questions. Part 1 has three chapters on "Getting Started" and the rationale behind the book. Part 2 talks about "The Person of Jesus Christ," the resurrection and the incarnation, as well as the New Testament witness to the person of Jesus. Part 3 deals with the "Work of Jesus," with chapters on New Testament witness to the work of Jesus, the loving God, the victorious God and the forgiving God. Part 4 concludes with a chapter on the identity and significance of Jesus Christ.

Understanding Jesus includes a foreword by Michael Green, now at Reagent College, who enthusiastically endorses and praises the author. I most heartily agree with his endorsement. Alister McGrath is one of those people who, along with stellar academic credentials, is able to make complex things simple and writes with a style which is full of clarity and depth. Long may his type increase. The author writes for the student, pastor, teacher, and serious layperson. The text doesn't contain long footnotes and complex charts. In reading this book on Christology and Soteriology I am favorably reminded of my favorite British authors, such as John Stott and C.S. Lewis. This book is very much recommended to all as an excellent, readable, enjoyable book on understanding Jesus.

Reviewed by Fred H. Walter, University of Southwestern Louisiana, Lafayette, LA 70504-4370.

Sweete Jesu, whom maid Mary bore,
Know that we are hard prest by war,
Yet peace desiring—
Though our enemies do shake their spears,
We trust in thee to banish our fears
Of hate conspiring.
Jesu Christ, we beseech thy pity,
And for our foes, beg charity;
Make the battle cease.
Lord save us from all worldly cares,
Have mercy, hear thy mother's prayers
For our dire need, peace.

Medieval Prayer

Letters

Coping with Controversy

I want to express my appreciation for the comments by D. Gareth Jones on "Coping with Controversy" (*Perspectives*, March 1988). I confess that I have not consistently lived according to the right Christian standards which he listed there. I repent, and I will try to do better.

There are some situations, both real and potential, which were not treated in that article, and which deserve our careful consideration from a Christian perspective. Consider the following cases:

1. Suppose I have a sharp disagreement with a claim or idea which has been published by my fellow Christian, and I contact that fellow Christian in an effort to establish personal communication by letter or face-to-face, and I am rebuffed or ignored. Meanwhile, the claim or concept with which I disagree continues to be affirmed and proclaimed publicly. What alternatives are open to me to deal with that matter in a Christian way?

2. Suppose I disagree with a claim or concept which has been published by a fellow Christian, and I express my disagreement with that claim or concept in a book review or in a published response. I frame that disagreement in the proper Christian way, taking care to address the issue and not condemn the person. It is not possible, however, to completely dissociate an idea from the person who has originated or promoted that idea, and the idea is necessarily identified as That Person's idea. Suppose, now, that That Person takes my disagreement with his idea to be a personal affront to him. In response, That Person launches a personal attack on me in a very public manner. What alternatives are open to me to deal with that matter in a Christian way?

3. Suppose that I find an error in a claim or concept which has been published by my fellow Christian, and suppose the error is of such a nature that it will seriously mislead the uninformed reader. Suppose I point out that error in personal correspondence, and my fellow Christian acknowledges the error. Suppose further that the publication which contains that misleading error continues to be distributed with the error uncorrected. What alternatives are open to me to deal with that matter in a Christian way?

4. Suppose that my very best efforts to handle a disagreement with a fellow Christian in a Christian manner are met consistently with a response of personal attack and seeming refusal to discuss the issue at hand in a context of mutual Christian respect. Suppose further that such personal attack on me is made repeatedly and in widely distributed publications. What alternatives are open to me to deal with that matter in a Christian way?

I'm not asking Brother Jones to respond to all of these tough questions, but I think it is a matter worthy of consideration by all readers of *Perspectives*. I will certainly appreciate any words of wisdom which any reader sends to me.

Thank you.

Clarence Menninga
Professor of Geology
Calvin College
Grand Rapids, MI 49506

Einstein and Torrance

J. W. Haas' article, "Relativity and Christian Thought: The Early Response," [*Perspectives* 40(1):10–18, March 1988] should suggest some key themes to be found in Thomas F. Torrance's "Integration of Judeo-Christian Theology and Einstein's Relativity Theory."

1. Relativity theory emphasizes the unitary character of scientific knowledge at all stages of development: Empirical and theoretical factors are inseparably integrated together representing a unitary epistemological structure that should be characteristic of good physics and good theology! (Torrance refers to this unity in physics of theoretical and empirical as *the homoousion of physics.*)

2. Relativity theory primarily stresses the invariant nature of physical law which, secondarily, results in the relativism of observational details with respect to different laboratory systems. Torrance suggests that the invariant character of physical laws arises from the faithfulness, constancy and utter dependability of God's love manifest through his sustaining care of the Creation.

3. Relativity theory understands the space-time continuum (space-time) from a relational, as contrasted to a container, perspective. Torrance argues that Einstein's relational understanding of space-time shares congruences with that of some Patristic Church Fathers (Hilary, Athanasius) who were responsible for the Christological truth contained in the early creeds. Such relational, as contrasted to container, understanding of space-time makes far more tractable the problem of how the Creator of the space-time Universe entered into his own Creation (the Incarnation Event in space-time; i.e., Jesus Christ).

4. General relativity is a field theory. Torrance argues that field theories, constituting a relational understanding of physical reality, have a number of structural elements that are analogous to concepts in Judeo-Christian theology. Personhood understood in a relational context and an elementary particle as a relational (field) entity is one possible analogy.

5. Physical theory at its best develops "invisible" conceptual "objects"; i.e., the space-time metric of general relativity, that explains the behavior associated with observable, "visible" phenomena. In creative scientific theories the "invisible" explains the "visible" rather than the "visible" explaining the "invisible." The same is true in creative theology.

6. Strictly speaking, Torrance develops his multi-level view of reality primarily from the thought of M. Polanyi and I. Prigogine's irreversible thermodynamics, not from relativity theory by itself.

7. A general comment. The *Enduring Themes* section of Haas' article might have as a subheading Einstein's remark: "Science without religion is lame, religion without science is blind." (a) Einstein's notion of religion was impersonal with an element of transcendence, but the remark is applicable to Judeo-Christianity/science interrelations. (b) Schematically Einstein's remark could be represented in terms of Religion-Science integration:

(Religion) sharpens, clarifies, explicates ⇔ motivates, gives meaning to (Science)

W. Jim Neidhardt
Physics Department
New Jersey Institute of Technology

I said to my soul, be still, and wait without hope
For hope would be hope for the wrong thing; wait without love
For love would be love of the wrong thing; there is yet faith
But the faith and the love and the hope are all in the waiting.
Wait without thought, for you are not ready for thought:
So the darkness shall be the light, and the stillness the dancing.

T.S. Eliot, *The Four Quartets*, "East Coker."

Founded in 1941 out of a concern for the relationship between science and Christian faith, the **American Scientific Affiliation** is an association of men and women who have made a personal commitment of themselves and their lives to Jesus Christ as Lord and Savior, and who have made a personal commitment of themselves and their lives to a scientific description of the world. The purpose of the Affiliation is to explore any and every area relating Christian faith and science. *Perspectives* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community.

INDICES to back issues of *Perspectives* are published as follows: Vol. 1–15 (1949–1963), *Journal ASA* 15, 126–132 (1963); Vol. 16–19 (1964–1967), *Journal ASA* 19, 126–128 (1967); Vol. 20–22 (1968–1970), *Journal ASA* 22, 157–160 (1970); Vol. 23–25 (1971–1973), *Journal ASA* 25, 173–176 (1973); Vol. 26–28 (1974–1976), *Journal ASA* 28, 189–192 (1976); Vol. 29–32 (1977–1980), *Journal ASA* 32, 250–255 (1980); Vol. 33–35 (1981–1983), *Journal ASA* 35, 252–255 (1983); Vol. 36–38 (1984–1986), *Journal ASA* 38, 284–288 (1986). Articles appearing in *Perspectives* are abstracted and indexed in the CHRISTIAN PERIODICAL INDEX, RELIGION INDEX ONE: PERIODICALS, RELIGIOUS AND THEOLOGICAL ABSTRACTS, and in GUIDE TO SOCIAL SCIENCE AND RELIGION IN PERIODICAL LITERATURE. Book Reviews are indexed in INDEX TO BOOK REVIEWS IN RELIGION. Present and past issues of *Perspectives* are available in microfilm at nominal cost. For information write University Microfilms, Int., 300 North Zeeb Road, Ann Arbor, Michigan 48106.

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A closely affiliated organization, the **Canadian Scientific and Christian Affiliation,** was formed in 1973 with a distinctively Canadian orientation. The **CSCA** and the **ASA** share sponsorship of the publication. **CSCA** subscribes to the same statement of faith as the **ASA** and has the same general structure. However, it has its own governing body with a separate annual meeting in Canada.

LOCAL SECTIONS of the American Scientific Affiliation and the Canadian Scientific and Christian Affiliation have been organized to hold meetings and provide an interchange of ideas at the regional level. Membership application forms, publications and other information may be obtained by writing to: AMERICAN SCIENTIFIC AFFILIATION, P.O. Box 668, Ipswich, Massachusetts 01938, or CANADIAN SCIENTIFIC AND CHRISTIAN AFFILIATION, P.O. Box 386, Fergus, Ontario, N1M 3E2.

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ARTICLES

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BOOK REVIEWS

"Upholding the Universe by His Word of Power" Hebrews 1:3

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