PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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

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Perspectives on Science and Christian Faith

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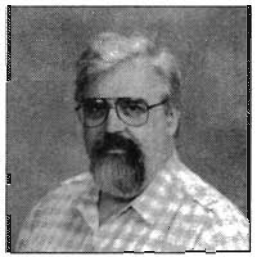

Before Technology Falters

"Remember him ... before the wheel [is] broken at the well" Ecclesiastes 12:6 (NIV).

The beginning of 2003 marked a new technological influence on my life, when I purchased my first electronic datebook, a "personal digital assistant" (PDA). Shortly after Christmas, one of my colleagues at Eastern Mennonite University, Dr. Joseph Mast, an ASAer of long standing, was demonstrating the nifty features of his new PDA. I thought, "That's neat, maybe it's time for me to 'move to the next level' and engage a technology that has the potential to enhance my personal schedule and help me set priorities!" So a few days later I pleasantly interrupted my normal school preparation time by learning the features of my new PDA (a Palm m130) and programming its database with essential information.

Technology is grand when it works. It allows us to output higher quality and greater quantity of work in a shorter period of time. That is true whether the technology is a "well-wheel" or pulley that eases the task of raising and lowering a bucket to draw water from an open well or if the technology is a good word processor computer that expedites writing and re-writing a manuscript by allowing the author to edit and delete sections of text with ease and efficiency or check word spelling and grammar usages. That's the "up-side" of technology. The down-side is that sometime the pulley breaks, the computer hard drive crashes, or the battery of the PDA fails forcing us to resort to less-technologically driven methods to complete our tasks.

In Scripture, the wise counselor calls us to remember God, not only in the difficult times when the routines of life are disrupted, but in the good times when our technology seems stable. Our response to the Creator, who formed us with the ability to create new technologies, needs to be continual. Our Creator desires to be a central part of our everyday existence. Programming my PDA to remind me to encounter God at discrete points in my schedule is one way of blending the functionality of technology with the call to "remember him."

Similarly as scientists and educators, we need to remember the importance and involvement of our God in natural science. Consider the regular articles in this issue of *Perspectives on Science and Christian Faith.* J. P. Moreland describes his understanding of mind by promoting an autonomous theory of dualism dependent upon philosophy and theology rather than scientific data. David Lahti describes the African village weaverbird as a model of understanding the power of nature in guiding us to remember the Creator. By re-assessing understandings from Intelligent Design and miracles, Jack Collins attempts to avoid a "God-of-the-gaps" while reminding us that "special revelation" is needed to understand the identity and will of God. Finally, Richard Thornhill considers the issue of optimality and design both in historical philosophy and in the example of the panda's thumb. Other articles, including a Communication, an Early Career Scientists' article, an essay book review, numerous book reviews, and letters responding to current issues or prior published comments, conclude our issue. ❁

Shalom,
Roman J. Miller, *Editor*

As scientists and educators, we need to remember the importance and involvement of our God in natural science.

Akan knowledge symbol: *Nea onnim*, "The one who does not know"

Article

A Christian Perspective on the Impact of Modern Science on Philosophy of Mind

A Christian Perspective on the Impact of Modern Science on Philosophy of Mind

Today it is widely held that, while broadly logically possible, dualism is no longer plausible in light of the advances of modern science. My thesis is that once we get clear on the central first- and second-order issues in philosophy of mind, it becomes evident that stating and resolving those issues is basically a (theological and) philosophical matter for which discoveries in the hard sciences are largely irrelevant. Put differently, these philosophical issues are, with rare exceptions, autonomous from (and authoritative with respect to) the so-called deliverances of the hard sciences.

To promote this thesis, I shall (1) clarify certain preliminary notions; (2) defend my central thesis by focusing on select paradigm cases that are representative of the actual dialectic in the literature in philosophy of mind; and (3) respond to two defeaters.

Most philosophers agree that the vast majority of people throughout history have been substance and property dualists.

In his excellent defense of agent causation, *Persons & Causes*, Timothy O'Connor lays out his project in this way:

> Philosophers want to do more than paint a commonly held picture of ourselves. We also want to put forth a vision of human beings and their place in the wider scheme of things ... There is at present a widespread trend in English-speaking philosophy toward "deflationary" analyses of most traditional targets of philosophical inquiry ... The general, if vague, impetus is to analyze philosophical notions in a way that makes them hospitable to a "naturalistic" view of human beings that has apparently been handed down to us by "Science."[1]

In context, O'Connor's remarks are applied to questions about human action, and his approach is to counter the "fashion for apologies on behalf of 'Naturalism'" by giving, among other things, pride of place to pre-philosophical intuitions and philosophical arguments about human agency. Setting aside for the moment the issue of the relationship between science and "Naturalism," I believe O'Connor's insights apply with equal force to the main issues and options in the contemporary literature in philosophy of mind. In the pages to follow, I shall clarify this belief and offer my reflections about the proper way to view the impact of modern science on these main issues.

Most philosophers agree that the vast majority of people throughout history have been substance and property dualists. Some form of dualism appears to be the natural response to what we seem to know about ourselves through introspection and in other ways. In this regard, Jaegwon Kim's concession may be taken as representative: "We commonly think that we, as persons, have a mental and bodily dimension ... Something like this dualism of personhood, I believe, is common lore shared across most cultures and religious traditions ..."[2]

Moreover, the overwhelming majority of educated and uneducated Christians throughout history have been dualists in two senses:

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they have embraced interactionist dualism regarding God and the material world, and they have accepted the reality of the souls of men and beasts, as it used to be put. Thus, theologian H. D. Lewis felt free to say without qualification: "Throughout the centuries Christians have believed that each human person consists in a soul and body; that the soul survived the death of the body; and that its future life will be immortal."[3]

Today it is widely held in the academic community that, while broadly logically possible, dualism is no longer plausible in light of the advances of modern science.

Today it is widely held in the academic community that, while broadly logically possible, dualism is no longer plausible in light of the advances of modern science. This attitude is especially prominent outside Christian circles. Thus, John Searle says that it is an obvious fact of physics that "the world consists entirely of physical particles in fields of force ..."[4] He goes on to say that much of the justification for the various forms of physicalism that dominate philosophy of mind is the assumption that

> they represent the only scientifically acceptable alternatives to the antiscientism that went with traditional dualism, the belief in the immortality of the soul, spiritualism, and so on. Acceptance of the current views is motivated not so much by an independent conviction of their truth as by a terror of what are apparently the only alternatives. That is, the choice we are tacitly presented with is between a "scientific" approach, as represented by one or another of the current versions of "materialism" and an "antiscientific" approach, as represented by Cartesianism or some other traditional religious conception of the mind.[5]

This attitude is not limited to non-Christian thinkers. Indeed, while not all Christian physicalists appeal to science to justify their views, such an appeal is, in fact, widely employed by many Christian physicalists. To cite one example, Nancey Murphy claims that physicalism is not primarily a philosophical thesis, but the hard core of a scientific research program for which there is ample evidence. This evidence consists in the fact that "biology, neuroscience, and cognitive science have provided accounts of the dependence on physical processes of *specific* faculties once attributed to the soul."[6] Dualism cannot be *proven* false—a dualist can always appeal to correlations or functional relationships between soul and brain/body—but advances in science make it a view with little justification. According to Murphy, "science has provided a massive amount of evidence suggesting that we need not postulate the existence of an entity such as a soul or mind in order to explain life and consciousness."[7]

I find myself among the dissenters of this view of the impact of modern science on issues in philosophy of mind. My thesis is that once we get clear on the central first- and second-order issues in philosophy of mind, it becomes evident that stating and resolving those issues is basically a (theological and) philosophical matter for which discoveries in the hard sciences are largely irrelevant. Put differently, *these philosophical issues are, with rare exceptions, autonomous from (and authoritative with respect to) the so-called deliverances of the hard sciences.*

My main purpose is to clarify and defend this thesis. In this article, I shall (1) clarify certain preliminary notions; (2) defend my central thesis by focusing on select paradigm cases that are representative of the actual dialectic in the literature in philosophy of mind; and (3) respond to two defeaters of my thesis.

Clarification of Important Preliminaries Relevant to the Autonomy Thesis

Two preliminaries need clarification in light of the arguments to follow: (1) identification of the central first- and second-order issues in philosophy of mind and (2) the nature of the Autonomy and Authority Theses.

I doubt that any list of the proper issues within a subbranch of philosophy would be complete. Still, it is possible to provide a reasonably adequate characterization of the central first-order topics that are ubiquitous in the literature in philosophy of mind. Those topics tend to revolve around three interrelated families of issues constituted by the following kinds of representative questions:[8]

(1) *Ontological Questions*: To what is a mental or physical property identical? To what is a mental or physical event identical? To what is the owner of mental properties/events identical? What is a human person? How are mental properties related to mental events (e.g., Do the latter exemplify or realize the former?)? Are there (Aristotelian or Leibnizian) essences and, if so, what is the essence of a mental event or of a human person?

(2) *Epistemological Questions*: How do we come to have knowledge or justified beliefs about other minds and about our own minds? Is there a proper epistemic order to first-person knowledge of one's own mind and third-person knowledge of other minds? How reliable is first-person introspection and what is its nature (e.g., a non-doxastic seeming or a disposition to believe)? If reliable, should first-person introspection be limited to providing knowledge about mental states or should it be extended to include knowledge about one's own ego?

Article

A Christian Perspective on the Impact of Modern Science on Philosophy of Mind

Of the [Autonomy and Authority Theses], the Autonomy Thesis is less controversial and, in my view, clearly correct, at least in certain areas outside philosophy of mind. ... [O]nce we get before us the four families of questions ..., it becomes evident that scientific discoveries play virtually no role at all in formulating or resolving those issues.

(3) *Semantic Questions*: What is a meaning? What is a linguistic entity and how is it related to a meaning? Is thought reducible to or a necessary condition for language use? How do the terms in our common-sense psychological vocabulary get their meaning?

The main second-order topics in philosophy of mind revolve around a fourth kind of representative questions:

(4) *Methodological Questions*: How should one proceed in analyzing and resolving the first-order issues that constitute the philosophy of mind? What is the proper order between philosophy and science? Should we adopt some form of philosophical naturalism, set aside so-called first philosophy, and engage topics in philosophy of mind within a framework of our empirically best-attested theories relevant to those topics? What is the role of thought experiments in philosophy of mind and how does the "first-person point of view" factor into generating the materials for formulating those thought experiments?

These are the sorts of questions that form the warp and woof of philosophy of mind. To clarify the Autonomy and Authority Theses, I can do no better than cite advocate George Bealer's statement of them:

> I wish to recommend two theses. [1] *The autonomy of philosophy*: Among the central questions of philosophy that can be answered by one standard theoretical means or another, most can in principle be answered by philosophical investigation and argument without relying substantively on the sciences. [2] *The authority of philosophy*: Insofar as science and philosophy purport to answer the same central philosophical questions, in most cases the support that science could in principle provide for those answers is not as strong as that which philosophy could in principle provide for its answers. So, should there be conflicts, the authority of philosophy in most cases can be greater in principle.[9]

Of the two, the Autonomy Thesis is less controversial and, in my view, clearly correct, at least in certain areas outside philosophy of mind. Debates about universals, the status of the identity of indiscernibles, the merits of foundationalism, the appropriateness of naturalized epistemology, and so forth are carried out with virtually no regard whatever for the latest findings in chemistry or physics. Most of the first- and second-order topics in philosophy of mind are similarly autonomous, or so I shall shortly argue.

The Principle of Authority is more controversial, but in my opinion, not for the reason that may first come to mind. At first glance, ambivalence toward or rejection of the principle may arise from the idea that science is, in general, a superior guide to joint areas of exploration. I think this idea is wrong. In my view, the controversial nature of the Authority Principle derives from the fact that, in those cases where philosophical considerations carry more weight than scientific ones, it is usually open to someone to adopt an anti-realist depiction of the relevant scientific view, to operationalize the relevant terms that constitute it, and to avoid epistemic conflict by resorting to an autonomy depiction of the philosophical and scientific aspects of the disputed area.

As an illustration, consider debates about the nature of time. It seems to be widely accepted, perhaps on the basis of simplicity considerations, that the scientific factors are best captured by a B-series view of time. For the sake of argument, let us grant that this is correct. Let us also grant that there are powerful, overriding, uniquely philosophical considerations (e.g., from certain considerations about temporal indexicals) for an A-series view of time. In this case, one may hold that the Authority Thesis has been satisfied. However, it is also possible to advert to the Autonomy Thesis by claiming that science is merely interested in empirical or measured time, but philosophy is interested in the essence of time itself. Thus, it is tricky to make an authority claim stick, and I shall not attempt to do so here. Instead, my purpose is to defend the Autonomy Thesis as stated by Bealer and as applied to the central first- and second-order issues in philosophy of mind.

Two Paradigm Case Studies on Behalf of the Autonomy Thesis

Perhaps I am naive, but I think that once we get before us the four families of questions listed above, it becomes evident that scientific discoveries play virtually no role at all in formulating or resolving those issues. In

any case, I have selected, almost at random, two paradigm case debates in philosophy-of-mind literature to serve as illustrations of the Autonomy Thesis.

Case One: Churchland's *Matter and Consciousness*

Case one involves Paul Churchland's treatment of two different approaches to closely related semantic and epistemic issues.[10] According to Churchland, a popular physicalist approach to these issues—one which he favors—is the network theory of meaning for the terms in our psychological vocabulary. On this approach, one looks not for an ontological analysis of meaning itself, but rather for a theory about how psychological terms get meaning. The best way to embark on this quest is to start with a third-person perspective and focus on publicly accessible language to see how terms in folk psychology get their usage. These terms primarily function in a theory as theoretical terms used to explain/predict other people's behavior. Moreover, says Churchland, as theoretical terms, they get their meaning by their relationships to laws, principles, and other terms in the entire theory in which they are embedded.

In [Churchland's] Matter and Consciousness, *... scientific information comes in the second half of the book, and it plays absolutely no role whatever in presenting the core philosophical issues and arguments in the first half of the book.*

For Churchland, the epistemic approach most suited to this semantic theory is one which starts with third-person questions about knowledge of other minds and assimilates first-person to third-person knowledge. We are justified in applying a mental term to another creature just in case this provides the best explanation for and prediction of the creature's behavior. Churchland claims that one's justification here need owe nothing at all to one's examination of one's own case. According to Churchland, it follows that one could justifiably apply a mental term such as "pain" to a creature and, thus, know its meaning, even if one had never had the relevant experience himself.

Regarding self-consciousness and knowledge of one's own mind, Churchland characterizes self-consciousness as the ability to use a linguistic network to judge that one's various mental states satisfy the interlocking network of folk psychology. Thus, self-consciousness is largely something that is learned. Moreover, according to Churchland, all perception is theory-laden, including self-"perception," and self-consciousness is essentially linguistic behavior of a certain sort. Space considerations prevent me from presenting Churchland's largely accurate depiction of a dualist approach to these questions, but it involves a commitment to such things as irreducible self-presenting properties, first-person introspection and ostensive definition, epistemic movement from the first- to the third-person, non-doxastic mental states as temporally and epistemically prior to concepts and judgments, and meanings that are not essentially linguistic.

Who is right in this debate? And what factors are relevant to this question? The answers, of course, are complicated, and the dialog involves thought experiments that, in my view, derive their force from first-person introspection, debates about private languages, analyses of the relationship between thought and language, and so on. What is less complicated is that factual information in the hard sciences is virtually irrelevant to these issues. Almost no book in philosophy of mind where these issues are discussed contains any detailed scientific information that plays a role in the discussion. Curiously, while Churchland himself is a physicalist and an advocate of naturalism as a second-order methodological thesis, and while he does include scientific information in *Matter and Consciousness*, that scientific information comes in the second half of the book and it plays absolutely no role whatever in presenting the core philosophical issues and arguments in the first half of the book. Thus, his actual practice underscores the Autonomy Thesis.

Case Two: Kim's *Philosophy of Mind*

For my second paradigm case, I select Jaegwon Kim's discussion of type identity physicalism.[11] According to Kim, advocates of type identity physicalism are committed to at least three theses. They are:

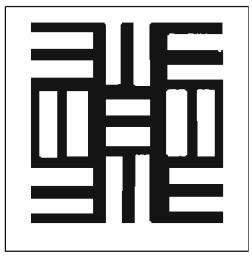
T_1: Lawlike mental type/physical type correlations exist.

T_2: Mental type/physical type identity statements are contingent, empirical, theoretical identity statements with non-synonymous yet co-referring expressions.

T_3: A property exemplification view of events, or something very close to it, is correct.

According to Kim, T_1 is justified on the basis of empirical evidence. Since my purpose here is not to evaluate directly type identity physicalism and to forestall objections to it from multiple realization, we may relativize the correlations it expresses to species or individual organisms or we may just grant it for the sake of argument. The important question for our purposes is this: Do scientific considerations play a role in assessing type identity physicalism and, if so, how important is that role relative to the one philosophical considerations play?

It seems to me that scientific considerations play little or no role at all in assessing T_1–T_3. Due to space consider-



It seems to me that scientific considerations play little or no role at all in assessing [Theses 1–3 in Kim's discussion of type identity physicalism]. ... [T]he question before us is whether the introduction of simplicity into the debate turns it into one in which scientific considerations are the relevant factors in resolving it.

ations, I shall limit my remarks to T_1 and T_2. The hard sciences, indeed, do play an important role in establishing the correlations in question, and it may well be that future discoveries will make them increasingly precise. Even here, however, we must not overstate the role of the hard sciences. In this article, I cannot enter a debate about methodology in the hard sciences, but that methodology seems essentially to employ a third-person approach to the relevant objects of study.[12] Since the correlations expressed in T_1 rely on first-person introspective reports, they are not as straightforwardly empirical as, say, the correlations between temperature and pressure in a gas. Moreover, establishing these correlations for complex mental states, such as one's view of modernist epistemology, is virtually impossible and will require, among other things, a decision about the proper criterion for property identity (e.g., a course- or fine-grained criterion).[13] Still, the hard sciences crucially are involved in establishing the data for which type identity physicalism is an explanation.

What about T_2? For three reasons, scientific considerations are virtually irrelevant for its assessment. First, it is far from clear that the alleged theoretical identities to which mental/physical type correlations are assimilated (e.g., color and wavelength) are identities and not correlations. Crucial considerations in that discussion are those relevant to assessing the nature and mind independence of secondary qualities, and the nature of intentionality is at the core of that debate. And even if these are taken as identities, Kripkean considerations (e.g., with color there is a difference between appearance and reality not present in, say, pain) are relevant for attempts to take them as proper analogies for mental/physical type identities.

Second, there are various ways to analyze the correlations, and these are not rival scientific paradigms nor are the central issues that divide them scientific. Kim himself lists seven empirically equivalent views: causal interactionism, pre-established harmony, occasionalism, the double-aspect view, epiphenomenalism, emergentism, and type identity physicalism.[14] No matter where one comes down on this debate, the reasons for one's choice will be philosophical, not scientific.

Third, what about the role of theoretical simplicity in this dispute? Kim claims that theoretical simplicity is a mark of a good theory and type identity physicalists assert that application of simplicity to this debate decides it in their favor.

Since my purpose is to assess the Autonomy Thesis and not type identity physicalism, the question before us is whether the introduction of simplicity into the debate turns it into one in which scientific considerations are the relevant factors in resolving it. For two reasons, a negative answer must be given to this question. For one thing, most dualists do not take their views to be primarily theories; rather, they see dualism as a report about what is known of mental properties/events and the self through first-person awareness. So simplicity is irrelevant to most dualist claims, and arguments about the role of simplicity will be distinctively philosophical ones.

Second, a good theory should exhibit several epistemic virtues: factual accuracy, predictive success, internal clarity, simplicity, ability to handle external conceptual problems, comportment with proper methodological rules, and so on. Often, debates between advocates of rival theories are debates about the relative merits of different epistemic virtues and, generally speaking, these debates are not scientific in nature. This is especially true of the debate about type identity physicalism. To see this, consider the following claim by Roderick Chisholm:

> Let us consider some particular psychophysical identity statement—the statement, say, that thinking about unicorns is the same thing as to have Q fibres that vibrate in manner N. One cannot understand such a statement, of course, unless one can grasp or conceive the property or properties that are referred to ... To the extent that we can understand the statement in question, we can see that the two properties referred to are not the same property—just as we can see that the property of believing that all men are mortal is different from that of wondering whether there is life in outer space. It has been held, not implausibly, that to deny the validity of such rational insights is to undermine the possibility of every type of reasoning.[15]

Underlying Chisholm's argument is an epistemic priority given to first-person introspective knowledge of the intrinsic features of mental properties over third-person knowledge of facts about other people. Now, just exactly what consideration from the hard sciences and for which scientists are the appropriate experts is the relevant one for assessing the strength of Chisholm's argument relative to the use of simplicity to justify type identity physicalism? It is hard to see what it could be.

In a way, the dualist is in a dialectical disadvantage because he or she takes his or her view to be obvious in light of first-person introspection. Thus, many dualist arguments, e.g., the Knowledge Argument or the Simple Argument, involve thought experiments that point to our direct knowledge of mental entities, and the dualist invites others to attend to what he or she believes is a matter of commonsense knowledge.[16] The dualist will be inclined to agree with Searle's remark that if one is unwilling to admit that one is conscious, one needs therapy not an argument.[17]

In a similar manner, an advocate of the Autonomy Thesis is in a dialectical disadvantage. He or she takes the thesis to be fairly obvious and invites others to attend to the actual dialogical issues as they pepper the pages of literature in philosophy of mind, believing that one will simply be able to see that those issues are largely philosophical and not scientific.

In my opinion, there is no straightforward scientific evidence for philosophical naturalism and, a fortiori, no such evidence for its employment to set the terms of debate in philosophy of mind.

This is precisely what I have tried to do in this section. If my claims on behalf of the Autonomy Thesis are persuasive, then it will not do for philosophers, such as David Papineau, to adopt philosophical naturalism prior to entering the debate in philosophy of mind as a way of limiting the relevant considerations to those in the empirical sciences and of shifting a substantial burden of proof onto dualists.[18] The simple fact is that those relevant issues are not scientific and, moreover, second-order arguments for or against philosophical naturalism are not themselves scientific. It is not science that says the world consists entirely of aggregates of particles standing in fields of force. It is philosophical naturalists who are making claims about the limits of ontology and epistemology, and those claims are themselves philosophical, not scientific.

In my opinion, there is no straightforward scientific evidence for philosophical naturalism and, a fortiori, no such evidence for its employment to set the terms of debate in philosophy of mind. If someone thinks I am wrong about this, he or she is invited to state the scientific evidence that a theist or dualist could not accommodate easily into his or her views.

Response to Two Counterarguments

There are two counterarguments to the Autonomy Thesis I want to consider. Both of them have been stated nicely by Nancey Murphy. First, Murphy claims that while substance dualism cannot be proven false, nevertheless, "biology, neuroscience, and cognitive science have provided accounts of the dependence on physical processes of *specific* faculties once attributed to the soul."[19] According to Murphy, "science has provided a massive amount of evidence suggesting that we need not postulate the existence of an entity such as a soul or mind in order to explain life and consciousness."[20] Thus, since advances in science have provided detailed accounts of mental/physical dependencies which make postulation of the soul otiose, the Autonomy Thesis is false, at least in this case.

I have three responses to this argument. First, many substance dualists do not believe in a substantial ego primarily because it is a theoretical postulate with superior explanatory power. Rather, they take the ego to be something of which people are directly aware. The point is not that they are right about people's awareness of the self. Given this dualist approach, the point is that advances in our knowledge of mental/physical dependencies are simply beside the point. The debate about which approach is the fundamental one for defending substance dualism is not something for which advances in scientific knowledge are relevant.

Second, in those cases where substance dualism *is* postulated as the best explanation for a range of purported facts, those facts typically are not the scientific ones Murphy mentions, but rather, are distinctively philosophical ones, usually surfaced from commonsense beliefs based in first-person non-doxastic seemings. Arguments from the unity of consciousness, the possibility of disembodied survival or body switches, the best view of an agent to support agent causation, the metaphysical implications from the use of the indexical "I" are typical of arguments offered by substance dualists, and the facts Murphy mentions are not particularly relevant for assessing these arguments. Those scientific facts or others lurking in the neighborhood (e.g., split brain phenomena) may provide difficulties for certain versions of substance dualism, but they are not decisive—dualists have provided reasonable responses to them—and, in any case, they are less important than the philosophical issues mentioned above.

Functional dependence on causal relations to the brain are of much less value in telling us what kind of thing a human person is than is a careful description of the kind-defining mental capacities (i.e., faculties) human persons as such possess.

Finally, contrary to what Murphy claims, the discovery of "the dependence on physical processes of *specific* faculties once attributed to the soul" does not provide sufficient grounds for attributing those faculties to the brain rather than to the soul. (After all, are dualists supposed to think that mental/physical correlations or causal relations are vague and unwieldy and not specific and regular?) To see this, it is important to understand how the term "faculty" historically has been used in discussions of substances in general and of the soul in particular.[21] Roughly, a faculty of some particular substance is a natural grouping of resembling capacities or potentialities possessed by that thing. For example, the various capacities to hear sounds would constitute a person's auditory faculty. Moreover, a capacity gets its identity and proper metaphysical categorization from the type of property it actualizes. The nature of a capacity-to-exemplify-F is properly characterized by F itself. Thus, the capacity to reflect light is properly considered as a physical, optical capacity. This fact about the proper categorization of a capacity is one reason why some philosophers, perhaps in reliance on simplicity considerations, have sought to reduce or eliminate dispositions to rid them from their ontology in favor of their associated categorical properties. According to property dualists, the capacities for various mental states are mental and not physical capacities. Thus, the faculties constituted by those capacities are mental and not physical faculties.

Now, arguably, a particular is the kind of thing it is in virtue of the actual and potential properties/faculties essential and intrinsic to it. Thus, a description of the faculties of a thing provide accurate information about the kind of particular that has those faculties. For example, a description of the (irreducible) dispositions of gold provide us with information about the sort of thing gold is.

It seems to me that a description of a particular's capacities/faculties is a more accurate source of information about what kind of thing that particular is than is an analysis of the causal/functional conditions relevant for the particular to act in various ways. This is because the causal/functional conditions relevant to a particular's actions can either be clues to the intrinsic nature of that particular or else information about some other entity that the particular relates to in exhibiting a particular causal action. For example, if Smith needs to use a magnet to pick up certain unreachable iron filings, information about the precise nature of the magnet and its role in Smith's action does not tell us much about the nature of Smith (except that he is dependent in his functional abilities on other things, e.g., the magnet). We surely would not conclude that the actual and potential properties of a magnet are clues to Smith's inner nature. Similarly, a description of the intrinsic features of a chemical compound is more relevant for getting at its essential nature than is a description of the features of a catalyst upon which that compound depends for causal interaction with other compounds.

In the same way, functional dependence on causal relations to the brain are of much less value in telling us what kind of thing a human person is than is a careful description of the kind-defining mental capacities (i.e., faculties) human persons as such possess. In this case, various forms of nonreductive physicalism and substance dualism are empirically equivalent theses and, in fact, there is no nonquestion-begging theoretical virtue (e.g., simplicity, fruitfulness) that can settle the debate if it is limited to being a scientific debate. But it should not be so limited and, indeed, paradigm case substance dualists such as F. R. Tennant approached the subject of the nature of the self and its relationship to faculties from a distinctively first-person introspective point of view. The choice to side with Murphy over against Tennant cannot be made on the basis of detailed scientific correlations. Rather, it must be made on the basis of factors such as one's evaluation of the strength of first-person awareness of the self and its conscious life.[22]

Murphy's second counterargument is that we should take physicalism not merely as a philosophical thesis, but primarily as the hard core of a scientific research program. According to Murphy, if we look at physicalism—in her case, a specific version of nonreductive physicalism—not as a philosophical thesis but as a scientific theory, then there is ample scientific evidence for it.[23]

If one follows Murphy's advice, then the Autonomy Thesis will have to be set aside. For at least two reasons, I think Murphy's

recommendation is ill-advised and question-begging. For one thing, it is entirely unclear as to how physicalism in any of its forms is actually used as the "hard core of a scientific research program" in a way relevant to debates in philosophy of mind. To see this, it will be helpful to get before us some important points made by Alvin Plantinga and Bas C. van Fraasen.

Plantinga contrasts Duhemian and Augustinian science derived, respectively, from the ideas of Pierre Duhem and St. Augustine.[24] According to Duhem, religious and, more importantly, metaphysical doctrines often have entered into physical theory. Many physical scientists have seen their job as offering an explanation of the phenomena, the appearances, in terms of underlying material causes. A proffered characterization of those causes often employs divisive metaphysical commitments as when Aristotelians, Cartesians, and atomists gave disparate accounts of the phenomenon of magnetism.

If the aim of physical theory is to explain phenomena in terms of the ultimate nature of their causes, says Duhem, then physical science becomes subordinate to metaphysics, and is no longer an autonomous science. In this case, estimates of the worth of a physical theory will depend upon the metaphysics one adopts. When practitioners of an area of physical science embrace different metaphysical schemes, progress is impeded because there is a compromise in the cooperation needed for progress. Successful science, if it is to be common to all, should not employ religious or metaphysical commitments only acceptable to some, including theism or physicalist naturalism.

For Duhem, it is not the absence of metaphysics as such that serves the prudential interests of science, but of metaphysical views that divide us. According to Plantinga, Augustinian science stands in contrast to Duhemian science. Roughly, an Augustinian approach to science eschews methodological naturalism, and employs religious or metaphysical commitments specific to a group of practitioners not widely shared throughout the scientific community. Among other things, Augustinian science sanctions the use of scientific data to justify a religious or metaphysical proposition specific to a group of practitioners, at least in principle.

According to Plantinga, Duhemian science will not "employ assumptions like those, for example, that seem to underlie much cognitive science. For example, it could not properly assume that mind-body dualism is false, or that human beings are material objects; these are metaphysical assumptions that divide us."[25] More generally, in my view, the fact that there is a distinction between Duhemian and Augustinian science and that the former can be practiced at all seems to justify the Autonomy Thesis by showing that the progress of and data derived in accordance with Duhemian science are not of fundamental importance for resolving the deeper metaphysical issues that divide practitioners into different Augustinian camps, at least in many cases.

For different reasons, some aspects of van Fraasen's philosophy of science lead to a similar conclusion. While one need not be an antirealist to appreciate the point, van Fraasen has argued that the theoretical postulates of a scientific theory typically go beyond the observational evidence and, strictly speaking, several different metaphysical characterizations are empirically equivalent.[26] Moreover, says van Fraasen, the primary goal of a scientific theory is to be empirically adequate, and acceptance of the unobservable metaphysical postulates of a theory is merely a pragmatic stance taken by advocates of a research program to continue searching for greater and greater empirical adequacy.

In my view, the fact that there is a distinction between Duhemian and Augustinian science and that the former can be practiced at all seems to justify the Autonomy Thesis ...

It seems clear that this is what is actually going on when scientists employ physicalism as the hard core of a scientific research program. They are simply proffering either physically detectable operational definitions of mental states or are straightforwardly searching for physical correlates/causal relations for those mental states. There is not a single discovery in neuroscience (or cognitive science) that requires or even provides adequate justification for abandoning property or substance dualism, since the main issues in neuroscience and philosophy of mind conform to the Autonomy Thesis.

In Plantingian terms, the actual success of, say, neuroscience is strictly due to its Duhemian nature. This is why in the last few decades three Nobel Prize winners in neuroscience or related fields were a substance dualist (John C. Eccles), an emergent property dualist (Roger Sperry), and a strict physicalist (Francis Crick). What divided them was not a difference of opinion about a range of scientific facts. Their differences were philosophical in nature.

In fact, in a recent article on consciousness and neuroscience, Crick and Christof Koch acknowledge that one of the main attitudes among neuroscientists is that the nature of consciousness is "a philosophical problem, and so best left to philosophers."[27] This posture comports perfectly with Duhemian science. Elsewhere, they claim that "scientists should concentrate on questions that can be experimentally resolved and leave metaphysical speculations to

I think that the truth of the Autonomy Thesis is what philosophers should have expected all along, and it constitutes philosophical self-understanding throughout the history of philosophy up to and including the present.

'late-night conversations over beer'."[28] Methodologically, Crick and Koch choose to set aside philosophical questions about the nature of consciousness, qualia, meaning and so forth, and study the neural correlates of consciousness and the causal/functional role of conscious states. If this is all it means to say that physicalism is "the hard core of a scientific research program," a dualist will heartily agree and, in any case, such a Duhemian appropriation of physicalism underscores and does not provide a counter-argument to the Autonomy Thesis.

The mistaken notion that progress in neuroscience requires an Augustinian commitment to physicalism as an essential component of that progress derives, not from the actual physical facts of neuroscience or the actual way neuroscience is practiced as evidenced by the Duhemian approach of Crick and Koch, but from the sociological fact that many contemporary neuroscientists just happen to be physicalists, and many people, including some philosophers, seem overly impressed with the cultural authority of science.

Second, when scientists study the causal correlates/functional relations between conscious states or the self and the brain, they must rely on first-person reports about those states themselves. To see this, consider the binding problem delineated by John Searle:

> I need to say something about what neurobiologists call 'the binding problem.' We know that the visual system has cells and indeed regions that are specially responsive to particular features of objects such as color, shape, movement, lines, angles, etc. But when we see an object we have a unified experience of a single object. How does the brain bind all of these different stimuli into a single, unified experience of an object? The problem extends across the different modes of perception. All of my experiences at present are part of one big unified conscious experience (Kant, with his usual gift for catchy phrases, called this "the transcendental unity of apperception").[29]

Scientists are seeking to find a region of the brain that "unifies" all the different stimuli that activate various parts of the brain. But exactly why would anyone think that such unification should be sought? Certainly not from an empirical investigation of the brain itself. Rather, we know from first-person introspection—in my view, of our own substantial selves and our conscious states—that all of our experiences are unified into one field of consciousness and, in fact, are possessed by one unified I, and it is on the basis of this knowledge that the scientific research program is justified and motivated. Moreover, William Hasker has argued that the phenomena which underlie this research is best explained by (emergent) substance dualism.[30] Whether Hasker is right or not is itself a philosophical matter that illustrates the Autonomy Thesis.

Given that (1) substance and property dualism are widely acknowledged to be the commonsense position based on first-person introspection, and (2) the task of arguing for or against dualism so grounded is a philosophical one, and (3) neuroscientific research must rely on first-person introspective reports, the Autonomy Thesis seems to capture adequately the role of pre-philosophical intuitions and distinctively philosophical issues in neuroscience. The debate between dualists and physicalists is not about scientific facts. It is about things such as the status of first-person introspection as a source of justification for commonsense beliefs about the self and consciousness, the status of philosophical knowledge, and the proper philosophical interpretation of the role of physicalism in scientific research.

I think that the truth of the Autonomy Thesis is what philosophers should have expected all along, and it constitutes philosophical self-understanding throughout the history of philosophy up to and including the present. In his 1886 lectures on the limitations of scientific materialism, John Tyndall claimed that "the chasm between the two classes of phenomena" is of such a nature that we might establish empirical association between them, but it

> would still remain intellectually impassable. Let the consciousness of love, for example, be associated with a right-handed spiral motion of the molecules in the brain, and the consciousness of hate with a left-handed spiral motion. We should then know when we love that the motion is in one direc-

> tion, and when we hate that the motion is in the other; but the 'WHY' would remain as unanswerable as before.[31]

Nothing substantial has changed since Tyndall made this remark. Specifically, no advance in knowledge of the specificity of detail regarding the correlations between mental and physical states provides any evidence against dualism or, more importantly, against the Autonomy Thesis. When philosophers write about or teach topics in philosophy of mind, they do not avail themselves of specific information in the hard sciences because it is not relevant to their issues. In evaluating functionalism, it does not matter if one claims that a functional state is realized by brain state alpha or by a more detailed description of the relevant brain state.

No advance in knowledge of the specificity of detail regarding the correlations between mental and physical states provides any evidence against dualism or, more importantly, against the Autonomy Thesis.

If one reads the literature in philosophy of mind, one will find that scientific data play virtually no role at all in the analysis or arguments. In fact, it is rare for a philosophical text in philosophy of mind to include any scientific information. As was mentioned above, a notable exception to this rule is Paul Churchland's *Matter and Consciousness*. Curiously, the scientific information is contained in the last half of the book, and it plays no role whatever in the semantic, epistemic, and ontological debates discussed in the first half!

The same cannot be said, however, of scientific discussions of topics in these areas. To cite one illustration, after claiming to set aside philosophical issues in order to focus on the more important empirical issues, Crick and Koch's discussion of consciousness and neuroscience is literally teeming with philosophical claims about topics philosophical and with which they qua scientists are inadequately equipped to deal. For example, they claim:

> Philosophers, in their carefree way, have invented a creature they call a "zombie," who is supposed to act just as normal people do but to be completely *un*conscious. This seems to us to be an untenable scientific idea, ...[32]

Relatedly, in considering whether two people in a similar brain state would experience the same quale, they say:

> One is therefore tempted to use the philosopher's favorite tool, the thought experiment. Unfortunately, this enterprise is fraught with hazards, since it inevitably makes assumptions about how brains behave, and most of these assumptions have so little experimental support that conclusions based on them are valueless.[33]

Crick and Koch seem to have a poor grasp on the role of thought experiments in philosophical argumentation (Does the Knowledge Argument advocate make assumptions about how brains work in the actual world?). In any case, when compared to philosophical treatments of topics in philosophy of mind, the discussion by Crick and Koch illustrates an assymmetry between neuroscience and philosophy of mind and, therefore, the Autonomy Thesis. Scientists cannot adequately discuss the central topics in philosophy of mind without making substantive philosophical claims, but philosophers need not discuss scientific data to treat adequately these same philosophical issues. This is true currently and throughout the history of philosophy, and it is what one would expect if the Autonomy Thesis were true.

Does the Autonomy Thesis mean that science plays no role in philosophical discussion? No, it does not. Science is especially important when it comes to studying details about the causal relations between mind and body, and when philosophers have erred in the past, they have done so when they have used philosophical theses to answer empirical, causal questions, e.g., using vitalism or animal spirits in an attempt to answer efficient causal questions about the precise nature of mind/body interaction. Again, on a certain view of agent causation according to which a libertarian act creates a small amount of energy, scientific investigation could, in principle, confirm or falsify this view, though I have argued elsewhere that the scientific role in this case is not as straightforward as one might think.[34] But the areas where science is relevant are not central to the main first- and second-order philosophical issues listed at the beginning of this article.

If I am right about all this, then if someone is going to be a mind/body physicalist, he or she cannot appeal to science to justify that commitment. It may well be that in first-person introspection one discovers one to be constituted by animality, or there may be overriding philosophical and theological arguments for physicalism, though I suspect that these concessions will be a hard sell to many of us. Explaining why I have these suspicions must be left for another occasion, but one thing seems clear. Whenever and wherever that dialog takes place, it will be a nice illustration of the Autonomy Thesis. ❁

Notes

[1]Timothy O'Connor, *Persons & Causes* (New York: Oxford, 2000), xi-xii.

[2]Jaegwon Kim, "Lonely Souls: Causality and Substance Dualism," in *Soul, Body and Survival*, ed. Kevin Corcoran (Ithaca, NY: Cornell University Press, 2001), 30.

[3]H. D. Lewis, *Christian Theism* (Edinburgh: T & T Clark, 1984), 125.

[4]John Searle, *The Rediscovery of the Mind* (Cambridge, MA: MIT Press, 1992), xii.

[5]Ibid., 3-4.

[6]Nancey Murphy, "Human Nature: Historical, Scientific, and Religious Issues," in Warren S. Brown, Nancey Murphy and H. Newton Malony, *Whatever Happened to the Soul?* (Minneapolis: Fortress Press, 1998), 17. Cf. pp. 13, 27, 139-43.

[7]Ibid., 18.

[8]Paul Churchland orders the first half of his book *Matter and Consciousness* (Cambridge, MA: MIT Press, rev. ed., 1988) around these families of issues.

[9]George Bealer, "On the Possibility of Philosophical Knowledge," in *Philosophical Perspectives 10: Metaphysics, 1996*, ed. James E. Tomberlin (Cambridge, MA: Blackwell, 1996), 1.

[10]Churchland, *Matter and Consciousness*, chaps. 3 and 4.

[11]Jaegwon Kim, *Philosophy of Mind* (Boulder, CO: Westview Press, 1996), chap. 3. Kim's own views are still developing and he seems to adopt a functional approach to mental states such as thoughts and beliefs. However, he appears to think that type identity physicalism is in the ballpark of the correct physicalist approach to mental states associated with debates about qualia. See his *Mind in a Physical World* (Cambridge, MA: MIT Press, 1998), chap. 4.

[12]The point is not limited to the hard sciences. The history of experimental psychology from the last third of the nineteenth century until the middle of the twentieth century is essentially the replacement of first-person introspection for third person measurements as central to psychological method. See William Lyons, *Matters of the Mind* (New York: Routledge, 2001), chap. 1.

[13]For more on criteria for property identity, see J. P. Moreland, *Universals* (Montreal & Kingston: McGill-Queen's University Press, 2001), 116-20.

[14]Ibid., 49-53.

[15]Roderick Chisholm, "Mind," in *Handbook of Metaphysics and Ontology*, ed. Hans Burkhardt and Barry Smith (Munich: Philosophia Verlag, 1991): II, 556.

[16]For a recent discussion of the Knowledge Argument, see J. P. Moreland, "The Knowledge Argument Revisited," *International Philosophical Quarterly* (tentatively scheduled for June 2003). For an exposition and defense of the Simple Argument, see Stewart Goetz, "Modal Dualism: A Critique," in *Soul, Body & Survival*, ed. Kevin Corcoran (Ithaca, NY: Cornell University Press, 2001), 89-104.

[17]Searle, *The Rediscovery of the Mind*, 8-9.

[18]David Papineau, *Philosophical Naturalism* (Oxford: Blackwell, 1993), 1-5.

[19]Nancey Murphy, "Human Nature: Historical, Scientific, and Religious Issues," 17. Cf. pp. 13, 27, 139-43.

[20]Ibid., 18.

[21]For example, see F. R. Tennant, *Philosophical Theology I: The Soul and Its Faculties* (Cambridge: Cambridge University Press, 1956), 1-138, especially pp. 33-43.

[22]The Autonomy Thesis and the epistemic authority of first-person introspective knowledge relative to scientific claims is powerfully woven into Edmund Husserl's practice of bracketing the world and proffering phenomenological descriptions of various intentional objects as experienced and of the intrinsic features of the various mental acts directed upon those objects. For a detailed description of a paradigm case of Husserl in this regard, see J. P. Moreland, "Naturalism, Nominalism, and Husserlian Moments," *The Modern Schoolman* 79 (January/March 2002): 199-216.

[23]Nancey Murphy, "Nonreductive Physicalism: Philosophical Issues," in *Whatever Happened to the Soul*, 127-48.

[24]Alvin Plantinga, "Methodological Naturalism," in *Facts of Faith and Science Vol. 1: Historiography and Modes of Interaction*, ed. Jitse M. vander Meer (Lanham, MD: University Press of America, 1996), 177-221.

[25]Ibid., 209-10.

[26]Bas C. van Fraasen, *The Scientific Image* (Oxford: Oxford University Press, 1980); "To Save the Phenomena," in *Scientific Realism*, ed. Jarrett Leplin (Berkeley: University of California Press, 1984), 250-9.

[27]Francis Crick and Christof Koch, "Consciousness and Neuroscience," *Cerebral Cortex* 8 (1998): 97-107.

[28]Cf. John Horgan, "Can Science Explain Consciousness?" *Scientific American* (July 1994): 91.

[29]John Searle, "The Mystery of Consciousness: Part I," *The New York Review of Books* (November 1995): 60-6. The quote is from p. 64.

[30]See William Hasker, *The Emergent Self* (Ithaca, NY: Cornell University Press, 1999), 122-46, 171-203.

[31]John Tyndall, "Scientific Materialism," in his *Fragments of Science* Vol. II.

[32]Francis Crick and Christof Koch, "Consciousness and Neuroscience," 3.

[33]Ibid., 15.

[34]J. P. Moreland, "Reply to Fales," *Philosophia Christi* NS 3, no. 1 (2001): 48-9.

"Bioethics of Genetic Technology"

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Looking to the Birds: A Perspective on the Interpretation of Nature

We often yearn to integrate or harmonize our understanding of nature and our understanding of God. I suggest forming such spiritual-natural connections in a subtle way, by donning a spiritual perspective and then looking at natural phenomena from a distinctly Christian point of view. In this spirit, I reflect on the natural history of the African village weaverbird, and draw connections to such notions as praise and accordance with the will of God, love of God, and human appreciation and responsibility. Such reflections are necessarily personal, which highlights the importance of the Christian's individuality in making spiritual-natural connections.

> *The created glory may be expected to give us hints of the uncreated; for the one is derived from the other and in some fashion reflects it. In some fashion. But not perhaps in so direct and simple a fashion as we at first might suppose.*
> —C. S. Lewis, *The Four Loves*, chap. 2.

Humans have [a need] to connect important aspects of our understanding, to merge somehow our spirituality with our science, our religion with our reason.

A large room crowded with people and their brown-bag lunches bustles with conversation about everything life-related, from brachiopods to brachiation, from polymers to pollution. By the scientists present, hundreds of new species have been found and described, some named after them. Two will have cover stories in *Science* in the next couple of years, one for a discovery of a fossilized ancestor of modern whales, and another for establishing a crucial connection between deforestation and tree seed production in Indonesian forests. Another two are in the National Academy of Sciences, the highest honor America gives to its biologists. All diminish their talking and crunching as a graduate student rises to give his presentation. He is a thoughtful young scientist whom a leader in his field would later describe as having been the brightest undergraduate he ever taught at Princeton. The young man waits for silence, and then tells the audience what they already know, having seen the advertisement: his talk will be on competition and facilitation in plant communities.[1] But in his opening remarks on the factors that influence plant survival and recruitment to adulthood, he opens a book and reads the following:

> ... some seeds fell on the path, and the birds came and ate them up. Other seeds fell on rocky ground, where they did not have much soil, and they sprang up quickly, because they had no depth of soil. But when the sun rose, they were scorched; and since they had no root, they withered away. Other seeds fell among thorns, and the thorns grew up and choked them. Other seeds fell on good soil and brought forth grain ...[2]

Then he explains that this ancient source has described the three major factors plant ecologists have found to influence seedling

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recruitment: seed predation, edaphic (soil-related) factors, and competition. He then continues his talk, its poetic and unorthodox introduction having achieved its purpose by gaining the attention of the scientists. After a few smiles demonstrate the audience's appreciation of its quaintness, the biblical allusion is forgotten and the presentation continues in a more characteristic manner.

Spiritual-Natural Connections

When the quotation was read, why did a few in the room, perhaps only three including the speaker himself (who considered becoming a Carmelite monk before his biological career began), feel a spark of spiritual elation? It was certainly not because the Bible "got something right" with regard to science, for none of these three Christian biologists believed that the *ecological* verity of Jesus' statements is at all what is meant when the Bible is considered by believers to be divinely inspired. Had these biologists had such views of divine inspiration, they would certainly have been disappointed that Jesus would follow this statement by apparently misleading his followers into thinking that the mustard seed was the smallest of all seeds and becomes the largest of all shrubs.[3] No, the scientific validity of Jesus' statement was not the reason they were moved by it. Perhaps there existed a trace of mischievous delight that something Christian was able to sneak its way into the secular discussions of the proponents of the scientific world view. Such an attitude might bring forth a chuckle or a secret feeling of triumph, but it would not touch a person profoundly.

I think the reason for the flash of joy in their hearts was the need humans have to connect important aspects of our understanding, to merge somehow our spirituality with our science, our religion with our reason. "All truth is God's truth," we hear said, but we want it really to *feel* that way. We want the various aspects of truth to display some kind of palpable harmony with each other. To take the spiritual truths we experience through our life of faith, together with their theological framework, and to connect these things somehow to natural objects, events, and processes that we understand through science, can be a joyful, holistic, godly experience. Jesus repeatedly used nature to teach Scripture, the earth to teach of heaven, and the created to teach of the Creator. In so doing, he took the theological truths as primary, and used nature as a tool to reflect or image them. This is not the only way such fulfilling connections can be made between the two types of truth, but it is certainly a way that has been moving and worship-inducing for humans throughout history. As proof of this are Jesus' beautiful parables and illustrations, many of which were drawn from nature. These tend to leave a mysteriously enduring impression on our minds. I know apostates for whom images of such things as lost sheep, fish, pearls, lilies of the field, and trees bearing fruit are among the last surviving conscious memories of the Bible. John Bunyan defends the value of these types of connections as follows:

> ... Were not God's Laws,
> His Gospel-Laws, in olden time held forth
> By Types, Shadows, and Metaphors? Yet loth
> Will any sober man be to find fault
> With them, lest he be found for to assault
> The highest Wisdom. No, he rather stoops,
> And seeks to find out what by Pins and Loops,
> By Calves, and Sheep, by Heifers, and by Rams,
> By Birds, and Herbs, and by the blood of Lambs,
> God speaketh to him. And happy is he
> That finds the light and grace that in them be.[4]

This process of interpreting nature for a spiritual end is different from classical natural theology, although they probably grow from the same motivation. Old-styled natural theology was the attempt to reason from natural facts on which everyone could agree, to conclusions about supernatural facts. Part of this involved looking to nature to discover the attributes of God. This, however, was usually fallacious as a philosophical exercise and crude as an exploration of spiritual-natural connections. Many people from the Christian perspective now realize that there is very little basis for assurance that lessons learned from nature will be the right ones. On the contrary, nature will teach whatever kinds of lessons one wants to learn, good or bad. As Calvin said: "If men were taught only by nature, they would hold to nothing certain or solid or clear-cut, but would be so tied to confused principles as to worship an unknown god."[5] Nature "red in tooth and claw" could be a lesson learned just as readily as nature the beautiful and harmonious; trickery and thievery can be seen just as readily as affection and aid. In fact, one of modern biology's most unsettling discoveries is that, in an important sense, struggle and competition are more fundamental in natural processes than peace and cooperation.[6]

It may be that some can say with Augustine, "Through the testimony of all of creation, I discovered you our Creator."[7] Indeed, Paul says this testimony leaves us with "no excuse."[8] But there are two features of this testimony which we should keep in mind. First is the simple fact that nature at its best can only lead us part of the way down the road to an understanding of God; the myriad religions and beliefs about the supernatural testify that many paths eventually diverge from it. Second, both Paul and Augustine agree that our attitude toward nature that interacts with its testimony is variable, such that the testimony is fruitful only in certain people. Paul talks of a darkening of the mind and futile thinking which can pervert nature's indication of God.[9] Augustine enlarges on this point. The minds of some might be "deaf" to nature, for instance, and so receive no message. Others "through their love of nature become subjected to it, and subjects lose their capacity for judgment."[10]

Article

Looking to the Birds: A Perspective on the Interpretation of Nature

The connections we yearn for ... must respect the different kinds of truth sought and apprehended by our scientific and spiritual modes of understanding. ... Our beliefs about God are not so much informed, as realized, *in the sense of* made real to us – *as Lewis says, "clothed" – in the images we receive from nature.*

The natural theologians often assumed that the way to connect our natural with our supernatural understandings would be by simple logical deduction, one from the other. Perhaps this method has its place; but in many, perhaps most cases, it results in either a dragging down of the spiritual into the realm of science (as when in our day people reduce Genesis 1–3 to scientific statements), or the equally damaging exaltation of science into the realm of spirituality (as when we are exhorted to "worship at the temple of science" or trust it for our spiritual fulfilment).

In reality, the connections we yearn for can be of a much subtler nature. And they must respect the different kinds of truth sought and apprehended by our scientific and spiritual modes of understanding. For instance, we might begin by donning our spiritual understanding as a pair of glasses, and then approaching those same old, seemingly secular natural facts with this new perspective. We may find that spirituality does not require us to deduce things from natural phenomena, but rather requires us to look at those phenomena in a certain way. The highest truth of Jesus' nature analogies is not in the natural objects or occurrences themselves, but in the way some humans ("those who have ears to hear") are able to perceive those things and connect them with a spiritual understanding. C. S. Lewis spoke of such a subtler type of spiritual-natural connection in *The Four Loves*. He writes:

> What nature-lovers ... get from nature is an iconography, a language of images. I do not mean simply visual images; it is the "moods" or "spirits" themselves – the powerful expositions of terror, gloom, jocundity, cruelty, lust, innocence, purity – that are the images. In them each man can clothe his own belief.[11]

Our beliefs about God are not so much informed, as *realized*, in the sense of *made real to us* – as Lewis says, "clothed" – in the images we receive from nature.

Here I would like to provide examples of these kinds of spiritual-natural connections from recent research I have undertaken with my wife on a species of African weaverbird. In this research, I take my spiritual ears and eyes to nature, rather than looking to nature for them. And I also unabashedly take my natural facts from ordinary science, rather than expecting my spiritual viewpoint to create them for itself. Within these ground rules, it may be that an important kind of harmonization can arise from this exploration. Such a harmonization could involve, for instance, the cultivation of an understanding or appreciation that is deeper, more holistic, or more personal.

The Village Weaverbird

We are to remember the Creator when we arise at the sound of a bird, says the writer of Ecclesiastes.[12] Among the compact villages along the wide flat river of The Gambia, this bird is likely to be the village weaverbird *Ploceus cucullatus*, widely known in the region because of its commonness, conspicuousness, and readiness to nest in the midst of human habitation.[13] These songbirds whistle, blabber, and squeal exuberantly throughout the day, certainly rousing some villagers to remember their Creator, if only to pray that the racket may stop. The weaverbirds nest by the dozens and even hundreds in large trees, often the central "meeting tree" of the village, although they almost always are found near water. "By the streams the birds of the air have their habitation; they sing among the branches."[14]

We can look at these birds in such a way that they point to something larger than themselves. Their incessant activity and song may jog our spiritual imagination, suggesting that we ask the question *why?* – Why does this bird even exist? Why is it so intent on performing its behaviors and living its little life? Before any biology or even physics comes to bear upon the matter, we may realize that at the most fundamental level, none of this diversity of life and forms was necessary. It is all an option, a gift. A bird lifts its head and sings, a bird that in an ultimate sense is here because it was deemed worthy of existence: it was loved into being. "And God saw that it was good."[15] Such a God, who looks at things in and of themselves and judges them good for their own sakes, loves them for what they are, is a broader and deeper God, we might say, than a god interested only in humanity. God has interests we do not understand, has loves that flow in other directions than our own. He is

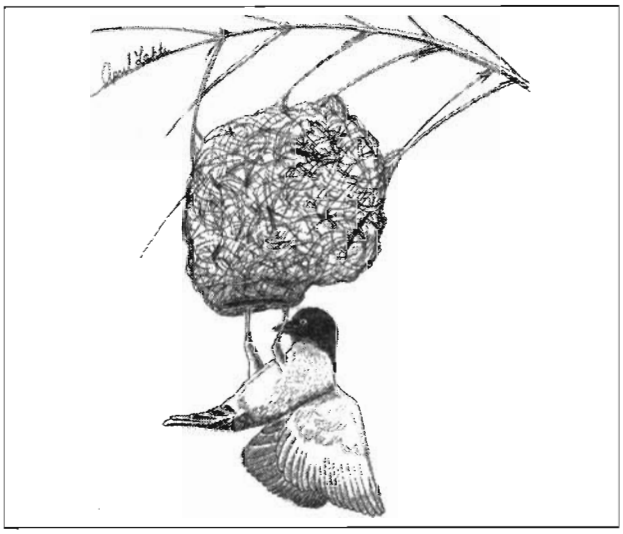
a God who loves living things, loves variety, loves activity. We, like Job, need to be reminded of the greatness of God and the breadth of his love, lest we treat him as if humans are the only created things, and challenge God in a way that betrays our arrogance. It is God who "provides for the raven its prey," God who put the proudly waving plumes on the ostrich, and it is by God's wisdom that the hawk soars.[16]

From this realization, one might venture in one of several directions. The creation is *we*: God produced the village weaverbird as he produced us, and both of us take part in this mysterious program of feeding and moving and reproducing. We are all in this existence together. We are all part of the community of those loved by God. But the creation is also *they*. God has other entities on his mind, objects of his love, which are not us, and have nothing to do with us.

Moving on from the we-they distinction, we might explore the concept of created things as reflections of their divine Maker. Any understanding we can gain about creation can be a startling and wondrous experience when we consider the fact that we are exploring the handiwork of a Master, examining the artistry of a divine Personality. Even a modest bird can be a bridge to God in the same way that a modest sketch is a bridge to its artist.

Here I will explore in still another direction, relating to created things' responses to the Creator. Since the flying birds, as all creatures, are commanded to praise God,[17] they, by the operations of their very nature, participate in praise, not having the alternative, as we do, to walk either in or out of God's ways. Matthew Henry, the biblical commentator, chose to view birdsong in this way: "They sing, according to their capacity, to the honour of their Creator and benefactor, and their singing may shame our silence."[18] On a walk in the Venetian marshes, Francis of Assisi was said to have encountered a large group of birds singing together. He recognized it as praise of their Creator, and with a fellow monk joined in with their own hymns.[19]

If the behavior of the weaverbirds represents their praise and obedience, they are responding most energetically to the command to "let birds multiply on the earth."[20] It is thought that the purpose of the dense coloniality in this species is for protection against natural enemies, increasing the survival of the colony members.[21] The complex, protracted songs of the males are directed toward potential mates. The songs reach a deafening din when a group of females return to the colony from nearby rice fields, where they have been building up nutritive reserves for the long period of nesting to come. The weaverbirds are as enthusiastic in multiplying as they can be, breeding continuously as long as climate (especially rainfall) permits. In fact, the command to multiply is reflected in this maximization of reproductive success throughout the natural world. The principle of natural selection assures this. Reproduction is as truly the primary objective of natural entities in a biological sense as it is the prime (first) directive of God to his creation. Moreover, those individuals of any species that are more effective at multiplying eventually replace those that are less effective. God through time develops the adaptation of his creations to their environments, thereby enabling them to adhere to his command to multiply.



The male village weaverbird *Ploceus cucullatus* sways beneath a freshly completed nest and flutters his wings to attract a female to it. Drawn by April Lahti.

Of course, this multiplication cannot continue for long without significant subtraction. If no village weaverbirds were to die, in just twenty-five years at current rates of reproduction, weaverbirds would be packed shoulder to shoulder across the entire land surface of the earth. So, in this world, even death is a necessary part of the reproductive success (the multiplying) of organisms. And living things of other species are sacrificed as fuel for the weaverbirds' multiplication. Insects constitute approximately 30% of their diet, and seeds (which contain living plant embryos) make up the rest. As Augustine said: "The land and the sea are organically replenished, growing things taking the place of those that are decaying."[22]

The weaverbirds, as their name implies, actually weave their nests, alternating strands of vegetation above and below other strands, rather than thatching them together as other birds do.[23] This unique ability has allowed them to build remarkably sturdy homes, resisting even the sharp claws of vervet monkeys and the talons of hawks. These birds tend to live in lands of torrential rains and high winds, yet they nest so densely in trees that they remove much of what would have been protective foliage. In fact, for the sake of visibility (first, females are attracted from a great distance to colonies with many visible nests; and second, the sentinels can more easily see approaching

predators), nearly all the leaves in a thickly settled tree can be removed. Yet, through the wild storms, the tightly woven nests usually remain dry inside, the eggs unbroken. The weaverbirds utilize up to eight different hitches or knots, using them in the same applications each time they build a nest. A sturdy ring is constructed first, and attached firmly to a branch with a specific series of knots. The shell of the nest is then built around this ring, incorporating a threshold so that the eggs will not roll out of the opening, which is in the bottom of the nest. Finally, a descending entrance tube is constructed. During nest-building, each strand end is invisibly woven into the structure until the nest looks like a firm basket hanging from the tree. Do these birds worry about how they will live in the shadow of harsh predators and thrashing storms? They do not have the ability to question or doubt the command to multiply. They can do nothing but attempt to survive and reproduce with the tools they inherited or learned from their parents and fellows. Their superior nest-building ability is without rival among the birds; their gifts are extravagant. Their adaptations are as praising as they are practical.

We could learn everything there is to know, scientifically speaking, about [the village weaverbird] – its evolutionary history, its ecological relationships, its anatomy, its behavior, its physiological mechanisms – and we would have advanced very little toward making any sense in our hearts about what it is like to be a weaverbird.

Below a colony, a young Wolof boy picks up a discarded nest from the ground. He squeezes it; it remains firm. He sticks his finger into the tube, and feels soft cottony grassheads behind the threshold, an almost unimaginably exquisite bed, nothing like his palm mat. He absently fills it with water from the river; it drips slowly. He tugs at the tight weave and cannot easily find the ends to the elephant grasses and eucalyptus leaves of which it is constructed. He wonders at the abilities of these weaverbirds, and is momentarily stunned by the realization of life beyond his understanding, and powers greater than his imagination. It confuses him, humbles him, and may bring him closer to an understanding of God and (what is more important) to a yearning for him.

We can explore further God's particular gifts to the village weaverbird. Solomon in all of his glory could not maintain such a vibrant coat of orange, yellow, and black as the males of the village weaverbird display, renewing it each year out of their very bodies, needing no servant or merchant to design it, and caring for no opinion on its beauty, though it is beautiful. The females will mate with the more brightly colored males, and by so doing will maintain and even increase such beauty in the population.[24] The males hang upside-down beneath their nests and frantically (and in unison among the colony) flap their wings to attract females. The colony appears to be on fire, or glittering, when such activity is viewed from a distance. If the rich king of Israel were caught in a storm of West African proportions for an evening, a bedraggled human with his ruined silks would trudge home the next morning for a lengthy overhaul of personal appearance. But the humble weaverbird preens for a few minutes and appears so smooth, healthy, and colorful that one is tempted to view the coat as a single fabric rather than a precisely ordered collection of thousands of feathers.

Take a weaverbird gingerly in hand, not merely as human holding bird, but as the powerful crown of creation caringly restraining a precious living thing over which we have been granted the awesome responsibility and right of stewardship. As the sage Agur could not comprehend the way of the eagle in the sky,[25] we cannot fathom this small being as it cocks its head, strong smooth bill tapering to a precise point, orange eye upturned gazing at us. Soft warmth flows into our hand, with the sensation of a rapidly beating heart. The scaly toes grip our fingers. We could learn everything there is to know, scientifically speaking, about this bird – its evolutionary history, its ecological relationships, its anatomy, its behavior, its physiological mechanisms – and we would have advanced very little toward making any sense in our hearts about what it is like to be a weaverbird. When it looks at us, we look back curious, dumbfounded, and ignorant despite any knowledge we may have. The living bird is a tangible reminder of the otherness of creation (and so, by reflection, the otherness of God), lest we be complacent or conceited.

A female cannot always remain in her nest when she is laying and incubating eggs. But when she leaves her nest to find food, the cuckoo strikes.[26] Possessed of an amazing ability to mimic the eggs of other species, the diederick cuckoo *Chrysococcyx caprius* waits in thick vegetation for a weaverbird to depart. Then the cuckoo flies into the nest, removes an egg, and lays one of her own. In less than a minute, she is gone. When the

cuckoo egg hatches, a day or two before the weaverbird egg or eggs, the cuckoo chick, while still blind, will bend over to create a depression between its shoulder blades. It will squeeze beneath any other egg in the nest, rolling it into this depression. Then it will lift the egg over the threshold and out the entrance tube, to fall to the ground below. The female weaverbird will have lost her entire brood to the cuckoo, and will be exploited further for feeding and protection until the cuckoo can leave the nest and fly.

The diederick cuckoo builds no nest. It relies on other species for its reproduction, as much as the weaverbird depends on the grasses and leaves to construct its nest. Both were created by God, both considered good, both commanded to multiply. They represent different strategies of reproduction, which would surely have a moral dimension in the realm of human society; but the strategies exist in the nonhuman world without an alternative for the respective species. The diederick cuckoo is designed as a "brood parasite."[27] The circuits in its brain associated with nest building and parental care have long ago disappeared, to be replaced with circuits associated with stealth and the determination of suitable nests to invade. In replacing the weaverbird egg with their own, they praise God in the only way they are capable, which is no less a praise than that which is accomplished by the weaverbirds.

We are naturally disturbed by this fact. Why must life be like this? Why must some animals have such a lifestyle? Why must one species kill another in order to live? Why must death exist at all? Is this how sin has corrupted the natural order? Is this what is meant by creation anticipating the end of its bondage?[28] We perhaps sense that a perfect world would be different, and think of visions where leopards lie down with kids.[29] We wonder what the meaning of such visions are, and what the world without human sin and its effects is like, and how we will find it to differ from the one we knew in this life. In this way, the cuckoo stimulates us, perhaps uncomfortably, to think of cosmic plans, the Fall, and Paradise. As the cuckoo, unaware of its spiritual effect on us, sits on a log and eats the insides of an egg it has stolen from a weaverbird's nest, we struggle and wonder. Perhaps we may simply attempt to be still and know that God is in control.[30] "Does a bird fall into a snare on the earth, when there is no trap for it?"[31] God will accomplish what he sets out to do.

Bird species can go extinct because of brood parasitism.[32] Some species are depleted such that they occupy only a portion of their former range, or enjoy only a fraction of their former population size. While some birds decline, the village weaverbird populations, however, grow and spread.[33] This species is blessed with an effective defense against the cuckoo. The eggs of female village weaverbirds are among the most variable of any bird species in color and spotting.[34] Each female lays eggs of similar appearance throughout her life, so her eggs bear a signature, or fingerprint. Village weaverbirds can distinguish foreign eggs by even tiny differences in color or spotting pattern.[35] Females pick up eggs that look different from their own, and throw them out of their nests. So whereas another weaverbird, the red bishop, must commonly suffer losses of whole nests of offspring when a diederick cuckoo parasitizes them,[36] the village weaverbird usually avoids the disastrous effects of raising a cuckoo instead of a weaverbird. Is this because of some intrinsic worth of the village weaverbird beyond that of the red bishop or those species experiencing declines due to brood parasitism? Certainly not. Birds can be no other than what they are; they have no alternative courses of action which would lead to differential merit. In this sense, God has "given them no share in understanding."[37] Whether and when adaptations arise in their populations to defend against natural enemies is unrelated to their goodness as God's creation. Moreover, birds sing, live, and reproduce, regardless of differences in success among individuals or species. They have no sense of unworthiness or injustice. The Potter molds these in one way, those in another way. "Will what is molded say to the one who molds it, 'Why have you made me like this?'"[38]

We who have tasted of the fruit of the tree of knowledge of good and evil live in no such state of automatic adherence to the will of God as does the village weaverbird.

To this point, we have considered a few aspects of the weaverbird, including its response to its Creator. Now, if we turn to look at ourselves in the context of nature, how can we fail to notice amid the several similarities (nature as *we*), an important aspect of sharp contrast? We who have tasted of the fruit of the tree of knowledge of good and evil live in no such state of automatic adherence to the will of God as does the village weaverbird. In our species, the clay can rebel against its Maker, and warp and bend to its own will. We are constantly plagued with responsibility, with alternatives of differential merit. Accordingly, our power is unmatched in creation, and is of profound significance in that respect. When we are granted dominion over the earth, we are granted the power to aid, modify, and even obliterate other vessels the Potter has created. To teach us humility, God asks, "Is it at your command that the eagle mounts up and makes its nest on high?"[39] And our answer is no—we must admit that we do not have that

power. Nevertheless, we can command that eagle to die, and all others like it, so that none remain.

Returning to brood parasitism, we note that our powerful actions of shaping the North American landscape to our needs and desires has resulted in a dramatic increase in this phenomenon's effect on many songbirds. It has happened at such an artificially rapid rate that the powers God has given to species of mutation and genetic recombination have not been able to produce defensive adaptations quickly enough.[40] Though questioning God's actions is fruitless and presumptuous, humans have the responsibility to question our own actions, and alter them when we believe that we have taken undue advantage of beings that we have not power to create, yet have power to destroy.

Duty is far from dry and burdensome, when accompanied by admiration and love. Together with God we can appreciate his handiwork. We can be impressed by the firm globular nests of the village weaverbird; watch the males in spectacular simultaneous display beneath them; enjoy the industry and exuberance of their foraging, building, competition, breeding, and parental care; realize the diversity and distinctiveness of their eggs; and wonder at the complexity and utility of the adaptations that allow them to be so successful. In all of this, we have played no role. We are simply observers and valuers.

A male weaverbird sits on an accustomed spot on an acacia branch, wings quivering as his mate has just entered one of his nests. He cocks his head to look at us with one eye as we walk by. He lets out a warning rattle, soon accompanied by those of dozens of his neighbors. Humans may be created in the image of God, but to this bird, we are merely intruders and a possible threat to his offspring. He is engaged in the fulfilment of God's creative will, and is doing so with boldness and panache. His beauty, vivacity, and remarkable lifestyle inspire us to appreciate and love the Creator. They also seem concordant with our understanding of God as Love. As Francis of Assisi said of birds he was observing, "Your Creator loveth you much, since He hath dealt so bounteously with you."[41] So, we need not be ashamed to enjoy creation for its own sake, having God for company in this act. Together with him we may exclaim, "Let birds fly above the earth across the dome of the sky!"[42]

In the end, each [person] must think and explore, and relate, and realize for oneself. If a meaningful harmonization of our Christian spirituality and nature is to be accomplished, it must be appropriated to the experiences and personality of the individual subject.

Inevitable Individuality

These thoughts are offered as a few reflections proceeding from one person's limited set of experiences. By no means am I implying that familiarity with animals benefits understanding or integration of faith in a way superior to other experiences of nature. I have no doubt that a microbiologist or a chemist, or a nonscientist for that matter, has experiences which can lead just as readily to the formation of spiritual-natural connections. I would enjoy reading of them, as they would likely provide perspectives and insights that are unavailable to me by direct experience. Moreover, even within the limitations of experience, my thoughts here have been restricted. I have been partial to the notion of obedience, but I could have concentrated more heavily on such things as love, holism, or mystery.

Reflections like these may be most beneficial to the person who entertains them in the first place. In the end, each must think and explore, and relate, and realize for oneself. If a meaningful harmonization of our Christian spirituality and nature is to be accomplished, it must be appropriated to the experiences and personality of the individual subject. Recall that the distinctive qualities and receptivities of each person are the very reason why nature is an unreliable spiritual guide, delivering different kinds of lessons to different people, or even to the same person in different frames of mind. As is perhaps often the case, something which is a potential stumbling-block to spiritual growth when out of proper context is, when in its rightful place, a key feature of it. Individual differences were an obstacle earlier—they make classic natural theology largely a pipe-dream. But we should not for that reason denigrate this variable and individualistic part of ourselves, for it is the only place where a harmonization or synthesis of our natural and supernatural understandings can take place. In an argument for an "inwardness" or "subjectivity" in our relationship with God, Kierkegaard writes:

> Nature, the totality of created things, is the work of God. And yet God is not

> there; but within the individual man there is a potentiality (man is potentially spirit) which is awakened in inwardness to become a God-relationship, and then it becomes possible to see God everywhere.[43]

The God-relationship lives and grows in that individually distinctive place the Bible calls the heart.[44] Therefore, our enjoyment of spiritual-natural connections will occur there as well. We do have a common foundation in the faith, and we may share an understanding of science as well. Nevertheless, each of us will look to the things that touch our respective hearts, and will learn from them in distinctive ways. The sage muses on nature, "Three things are too wonderful for me; four I do not understand"[45] —each of us can fill in our own list here, of natural things that point us to supernatural things. ❁

Acknowledgments

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Notes

[1]Facilitation is the incidental aiding of the survival of one plant by another, as when the shade of trees protects moisture-loving forest groundcover from the drying effect of the sun.

[2]Matthew 13:4b–8a (NRSV, *passim*).

[3]Matthew 13:31–32.

[4]John Bunyan, *The Pilgrim's Progress* (1678), "The Author's Apology for his Book." The words "pins" and "loops," neither of which feature in the King James Version of the New Testament, I would presume to refer to "needles" and "eyes"—not a connection with nature, but certainly an instance of the lower imaging or teaching of the higher.

[5]J. Calvin, *Institutes of the Christian Religion* (1536), trans. F. L. Battles, I.v.12.

[6]More individuals are born than the environment can support. This phenomenon underlies the differential survival that fuels evolution by natural selection. All instances of cooperation in nature, therefore, must have developed in the context of this struggle for existence. See, e.g., W. T. Keeton and J. L. Gould, *Biological Science*, 5th ed (New York: W. W. Norton, 1993), or other biology, evolution, or animal behavior texts.

[7]Augustine, *Confessions* (ca. 400), trans. D. C. Lahti, VIII.i.

[8]Romans 1:20.

[9]Romans 1:21–23.

[10]Augustine, *Confessions*, X.vi. For a critical look at natural theology from a contemporary of its heyday, see John Henry Newman's attitude as described in M. A. Kalthoff, "A Different Voice from the Eve of *The Origin*: Reconsidering John Henry Newman on Christianity, Science, and Intelligent Design," *Perspectives on Science and Christian Faith* 53 (2001): 14–23.

[11]C. S. Lewis, *The Four Loves* (1960; reprint, New York: Harcourt Brace Jovanovich, 1988), 36.

[12]Ecclesiastes 12:1.

[13]D. C. Lahti and A. R. Lahti. "The Village Weaverbird: A Common Bird of Uncommonly Great Concern," *Daily Observer* (Banjul, The Gambia, 25 May 2000): 11; D. C. Lahti, A. R. Lahti, and M. Dampha, "Nesting Associations of the Village Weaverbird *Ploceus cucullatus* With Other Species in The Gambia," *Ostrich* 73 (2002): 59–60.

[14]Psalm 104:12.

[15]Genesis 1:21.

[16]Job 38:41; 39:13, 27.

[17]Psalm 148:10.

[18]Matthew Henry, "Psalm 104: Verses 10–18," *Commentary on the Whole Bible*, vol. III (1710).

[19]Bonaventura, *Life of St. Francis* (1260), trans. E. Gurney Salter, viii.

[20]Genesis 1:22.

[21]N. E. Collias and E. C. Collias, "The Behavior of the West African Village Weaverbird," *Ibis* 112 (1970): 457–80.

[22]Augustine, *Confessions*, II.vi.

[23]N. E. Collias and E. C. Collias, *Nest Building and Bird Behavior* (Princeton: Princeton University Press, 1984).

[24]J. H. Crook, "Comparative Studies on the Reproductive Behavior of Two Closely Related Weaver Bird Species (*Ploceus cucullatus* and *Ploceus nigerrimus*) and Their Races," *Behaviour* 21 (1963): 177–232; N. E. Collias and J. K. Victoria, "Nest and Mate Selection in the Village Weaverbird," *Animal Behaviour* 26 (1978): 470–9.

[25]Proverbs 30:18–19.

[26]R. A. C. Jenson and C. J. Vernon, "On the Biology of the Didric Cuckoo in Southern Africa," *Ostrich* 41 (1970): 237–46; and M. A. MacDonald, "Observations of the Diederick Cuckoo in Southern Ghana," *Ostrich* 51(1980): 75–9.

[27]R. B. Payne, "Brood Parasitism in Birds: Strangers in the Nest," *Bioscience* 48 (1998): 377–86; S. I. Rothstein and S. K. Robinson, *Parasitic Birds and Their Hosts: Studies in Coevolution* (New York: Oxford University Press, 1998).

[28]Romans 8:20–22.

[29]Isaiah 11:6.

[30]Psalm 46:10.

[31]Amos 3:5.

[32]M. C. Brittingham and S. A. Temple, "Have Cowbirds Caused Forest Songbirds to Decline?" *Bioscience* 33 (1983): 31–5; T. M. Donovan, F. R. Thompson, III, J. Faaborg, J. R. Probst, "Reproductive Success of Migratory Birds in Habitat Sources and Sinks," *Conservation Biology* 9 (1995): 1380–95.

[33]D. C. Lahti, "A Case Study of Species Assessment in Invasion Biology: The Village Weaverbird *Ploceus cucullatus*," *Animal Biodiversity and Conservation* (in press).

[34]D. C. Lahti and A. R. Lahti, "How Precise Is Egg Discrimination in Weaverbirds?" *Animal Behaviour* (2002): 1135–42.

[35]Ibid.

[36]M. J. Lawes and S. Kirkman, "Egg Recognition and Interspecific Brood Parasitism Rates in Red Bishops (Aves: Ploceidae)," *Animal Behaviour* 52 (1996): 553–63.

[37]Job 39:17.

[38]Romans 9:20.

[39]Job 39:27.

[40]S. K. Robinson and D. S. Wilcove, "Forest Fragmentation in the Temperate Zone and Its Effects on Migratory Songbirds," *Bird Conservation International* 4 (1994): 233–49; S. K. Robinson, F. R. Thompson, III, T. M. Donovan, D. R. Whitehead, and J. Faaborg, "Regional Forest Fragmentation and the Nesting Success of Migratory Birds," *Science* 267 (1995): 1987–90; see also Brittingham, et al., "Have Cowbirds Caused Forest Songbirds to Decline?"; Donovan, et al., "Reproductive Success of Migratory Birds in Habitat Sources and Sinks"; and Rothstein and Robinson, *Parasitic Birds and Their Hosts*.

[41]*The Little Flowers of St. Francis* (anonymous Italian, ca.1322), xvi (trans. T. Okey).

[42]Genesis 1:20.

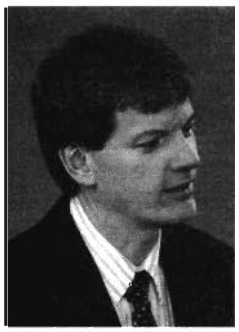
[43]Søren Kierkegaard, *Concluding Unscientific Postscript* (1846), "Truth is Subjectivity," in R. Bretall, ed., *A Kierkegaard Anthology* (New York: Modern Library, 1946), 225.

[44]Psalms 27:8; 51:10; Isaiah 29:13; Jeremiah 24:7; Mark 7:6; Luke 6:45.

[45]Proverbs 30:18.

Article
Miracles, Intelligent Design, and God-of-the-Gaps

Miracles, Intelligent Design, and God-of-the-Gaps*



Both traditional Christian miracle claims and the newer project of "intelligent design" have been held to commit the "God-of-the-gaps" fallacy: that is, they depend on our ignorance of the material processes that produced them and invoke supernatural action to explain the unknown. By this argument, scientific research will eventually reduce the "gaps," and hence the motive for believing in God. In reply, I argue that a proper treatment of this question requires careful definitions of such terms as "natural," "supernatural," "design," and "gap." An attentive consideration of the Christian scholastic metaphysic provides definitions of "supernatural" and "design" that give criteria for detecting such events without committing the God-of-the-gaps fallacy. We must distinguish between different kinds of "gaps": those that are simply gaps in our knowledge, and those that are genuine gaps between the properties of the components and the complex structure we are considering.

I shall outline the Christian scholastic metaphysic ..., that will lead to the definition of "miracle" and provide a context for discussing "design."

It is a curious fact that both traditional Christian miracle claims and the contemporary project of "intelligent design" face similar objections. For example, both may be ruled out *a priori* as incompatible with the modern scientific world view, or as outside the realm proper for scientific pronouncement; and both can be called "science stoppers" (i.e. they prevent further research). Both may be dismissed as exhibiting a flawed view of God's action in the world; or as involving their participants in the "God-of-the-gaps" fallacy; or as an improper use of "reason" to compel faith; or as incompatible with the existence of evil.

While I am far from claiming that one entails the other, I find the common opposition to these two claims to be striking. In this brief paper, it is impossible to cover the full range in any depth; so I shall focus on the problem of "God-of-the-gaps." I shall outline the Christian scholastic metaphysic (which I claim accurately represents the biblical one), that will lead to the definition of "miracle" and provide a context for discussing "design." This will allow us to say whether and when it is possible to make a miracle or design claim that is not liable to the God-of-the-gaps objection, which then will give some basis for discussing how this metaphysic might relate to natural theology.

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Definitions, Part 1: Nature and Miracle

To discuss our topic, first we need to define some terms: what is "ordinary" or "natural," and what is a "miracle"? Straightaway we face difficulties, since there is no technical biblical discussion of either of these notions. That, of course, is hardly evidence that the *concepts* themselves are foreign to the Bible. Rather than rely on etymologies[1] or on the various definitions of miracle that have been offered (often for polemical purposes, and often representing varied metaphysics),[2] I shall state the standard scholastic metaphysic of ordinary and miraculous events, and cite a few biblical texts that clearly support this position.[3]

Lutheran theologian Heinrich Schmid gives a representative description of divine Providence as having three elements: (1) preservation, (2) concurrence, and (3) governance.[4]

1. *Preservation* is the act of Divine Providence whereby God sustains all things created by Him, so that they continue in

being with the properties implanted in their nature and the powers received in creation ... Created things have no power of subsistence in themselves ... Therefore *preservation* is also designated as *continued creation*.[5]

2. *Concurrence*, or the co-operation of God, is the act of Divine Providence whereby God, by a general and immediate influence, proportioned to the need and capacity of every creature, graciously takes part with second causes in their actions and effects.[6]

3. *Government* is the act of Divine Providence by which God most excellently orders, regulates, and directs the affairs and actions of creatures according to His own wisdom, justice, and goodness, for the glory of His name and the welfare of men. ...

   The Providence of God ordinarily employs second causes, and thus accomplishes its designs; but God is by no means restricted to the use of those second causes, for he often exercises His Providence without regard to them, and operates thus contrary to what we call the course of nature, and hence arises the difference between *ordinary* and *extraordinary* providence.[7]

There is no doubt here that both ordinary and extraordinary (miraculous) providence are expressions of God's *active* power: it is never correct to refer to the miraculous as having God more "directly" or "immediately" involved. However, the mode of that expression of power is different, and, at least in principle, some of those differences are detectable by human observers.[8] God's activity in ordinary providence is not physically detectable, since it is not part of the order of the world we experience with our senses.[9]

Some sample biblical texts show that this is a good inference.[10] For example, James 3:11–12 supports the idea of "natural powers" by which a fig tree *cannot* yield olives; Col. 1:17 and Heb. 1:3 speak of all things depending on Christ's active power of upholding; Exod. 14:21 shows an extraordinary (miraculous) event that uses a means (the east wind); and Luke 1:34–35 describe the mechanism of a supernatural event (the conception of Jesus) as being due to the special agency of the Holy Spirit.[11]

This metaphysic allows us to see that it is more helpful for our purposes to speak of the "natural properties" of created things and their interactions rather than of the "laws of nature."[12] We may employ this to arrive at the following definitions:

Natural: God made the universe from nothing and endowed the things that exist with natural properties; he preserves those properties, and he also confirms their interactions in a web of cause-and-effect relations.

Supernatural: God is also free to "inject" special operations of his power into this web at any time, e.g., by adding objects, directly causing events, enabling an agent to do what its own natural properties would never have made it capable of, and by imposing organization, according to his purposes.[13]

It is inherent in this metaphysic that "miracles" (better, "supernatural events") are possible. Under what conditions they may be expected is another question. Christian theologians commonly add provisos about them not being capricious but related to God's pursuit of relationship with human beings. These provisos are quite appropriate. At the same time, Christian theism resists the notion that supernatural events are in some way unworthy of God. It is quite true that a doctrine of creation posits a created world that has all its necessary capacities built into it, needing no tinkering. But those capacities are the ones necessary for the world's assigned purpose: namely, of being the background for the lives and choices of rational agents.[14]

Definitions, Part 2: Design

How is "design" related to nature and providence? Historically, mention of design has involved purpose. For example, Aristotle's term for it was *heneka tou* "on account of something."[15] Paley defined it as "the several parts ... framed and put together for a purpose."[16] Thus the theistic design argument is also called the "teleological argument."[17]

But, as Paley himself acknowledged, there are different kinds of design, ranging from "a principle of order" to specific instances of "contrivance." Hence, we need a more careful definition. We may distinguish two different kinds of design:[18]

design-properties results in the production of a material with properties that will serve some purpose.

design-imposed results in the imposition of structure upon some object or collection of objects for some purpose, where the structure and the purpose are not inherent in the properties of the components but make use of these properties.

Examples of design from everyday life include: steel and plastic (both *design-properties*); a digital watch (combination of *design-properties* and *design-imposed*); and Stonehenge (*design-imposed*). Detection of *design-properties* is normally possible against a background of "non-designed" items, and thus a theistic inference from the properties of the natural world (e.g., the anthropic principle) is a weak one, since the properties of the whole are designed. The intelligent design program says, at its simplest, that it is legitimate to have as part of our tool-kit for scientific explanations for natural things, the option to say that they may contain instances of *design-imposed*.[19]

We might further notice that, as it applies to design in nature, there are different possible levels of *design-imposed*, ranging from the micro level of particular biological structures, to the larger level of an organism or an ecosystem, to the perception of purpose in the world as a whole. Paley includes arguments for design at all of these levels, but does not discuss whether they are conceptually distinct.

Finally, it should be clear that, given the definitions of "natural" and "supernatural" above, the detection of a

There are different possible levels of design-imposed, ranging from the micro level of particular biological structures, to the larger level of an organism or an ecosystem, to the perception of purpose in the world as a whole. ...The detection of a supernatural event is analogous to the detection of design-imposed, because it detects a gap between the result and the properties of the components.

supernatural event is analogous to the detection of *design- imposed,* because it detects a gap between the result and the properties of the components.[20]

Detecting ***Design-Imposed***

We may take the declaration that Stonehenge is an instance of *design-imposed* to be indisputably rational. What do we do when we make this declaration? We are saying that we do not believe that the properties of these rocks or of their interaction with nonpurposive aspects of their environment (wind, rain, seismic events, etc.) would lead to the formation that we see. It does not matter that the structure is in disrepair, nor that we do not know who made the structure or even why they made it.

In other words, we find a gap between the properties of the components and their environment, and the structure we find. This gap is not a product of our ignorance, but of the natures of the components: we do not believe that any research into the components will undo the inference of *design-imposed.* We may label this kind of gap as a *lacuna naturae causâ* (Latin: "a gap on account of nature")—an explanatory gap due to the natures of the components.

We must carefully distinguish this kind of gap from the other kind. For example, supposing I cannot explain why a volcano erupted when it did. I would not be warranted (at least not without further research) in declaring this as due to *design-imposed,* since the explanatory gap is due to my ignorance of the processes (which in principle are explicable). We may label this kind of gap a *lacuna ignorantiae causâ* (Latin: "a gap on account of ignorance")—an explanatory gap due to our ignorance of the processes.[21]

Therefore it follows that the detection of *design-imposed* amounts to the identification of *lacunae naturae causâ* (and not necessarily to the perception of the purpose of the event or object).

God-of-the-Gaps

To claim to have detected a miracle, or an instance of design in the natural world, renders one liable to the charge of committing the "God-of-the-gaps" fallacy.[22] That is to say, suppose we come upon some object or event for which we do not have a naturalistic explanation, and then say, "See, God must have done that," and then proceed to base either our own belief or our apologetic for belief on such an instance. This involves us in a risk. Let us suppose the sciences provide a natural-process based explanation. Then where does that leave God's involvement in the matter? Are what once were grounds for believing in God now made an argument for disbelief?[23]

A serious theological problem also is involved (at least within traditional theism) if we think that it is possible to say of some events or objects, "God made this," and of the natural ones, "God did *not* make this."[24] The doctrine of providence cited above affirms that the products of second causes are every bit as much direct divine action as the miraculous events.

It is widely held that Darwin's theory undermined the classical (Paleyesque) argument from design.[25] According to the standard reading, Paley had put forward many instances in the biological world that were impossible to account for except by divine imposition of design (*design-imposed*). Then, however, Darwin's theory of natural selection provided a natural-process based explanation of the features and interactions of organisms.[26] The most that design could claim, by this understanding, was that God had designed the properties and the laws governing the process (along the lines of *design-properties* above).[27]

From within the perspective of traditional Christian theology, there are many possible critiques of Paley's argument. I will give only three.[28] First, he overreaches. He apparently thought that ascertaining design involved discerning the purpose for a large part of the creation, and potentially for the whole of it. The book of Ecclesiastes explicitly denies that such is possible.[29] Second, he apparently assumed a static view of the creation, i.e., that what one observes today is just what came forth from the special design of the Creator. This makes no allowance for development under natural (and possibly supernatural) factors; nor does it allow for the reality of human evil. And finally, he apparently assumed that a fairly full range of divine attributes, including benevolence, could be derived from the created order. Paul simply referred to "his eternal power

and deity" (Romans 1:20). However, this hardly implies that all design arguments must be thrown out.[30]

Rationality and Detecting *Design-Imposed*

The claim that *all* appeals to special divine action lead to the God-of-the-gaps fallacy, amounts to a claim that *all gaps are gaps due to ignorance*—namely, that behind every gap lies a completely natural explanation. On the face of it, this is not an empirical claim. Instead it sets limits on what kinds of explanations are allowed for what we meet empirically. For example, consider the following statement from the National Science Teachers Association (NSTA):

> Science is a method of explaining the natural world. It assumes the universe operates according to regularities and that through systematic investigation we can understand these regularities. ... *Because science is limited to explaining the natural world by means of natural processes, it cannot use supernatural causation in its explanations.* Similarly, science is precluded from making statements about supernatural forces, because these are outside its provenance (my italics).[31]

Similarly, the National Association of Biology Teachers (NABT) claims the following:

> The diversity of life on earth is the outcome of evolution: an unpredictable and natural process of temporal descent with genetic modification that is affected by natural selection, chance, historical contingencies and changing environments.[32]

In saying this they are in effect denying the existence of any *lacunae naturae causâ*. They then go on to claim:

> Providing a rational, coherent and scientific account of the taxonomic history and diversity of organisms requires inclusion of the mechanisms and principles of evolution.

In effect they are saying that to be scientific and rational, you must agree that "all explanatory gaps are *lacunae ignorantiae causâ* only."

To evaluate whether we ought to follow this definition of rationality, we must first recognize the two domains of scientific explanation, the *nomothetic* and the *historical*.[33] In nomothetic explanations, we consider what normally happens, and explain its causation. We are looking for "laws," hence the name. This domain is represented in most common definitions of science. In historical explanations, we are asking what specific chain of cause-and-effect produced the item we are studying. Obviously, the two are related, but they are also distinguishable, e.g., how animals interact in an ecosystem (nomothetic) versus why a particular species went extinct (historical). Of course, our historical explanations make use of our nomothetic ones.

Now the biblical theist will not appeal to special divine action in a nomothetic context, because in situations like the ordinary function of God's creation, we recognize that God's activity is that of maintaining the order of what he made. Appeal to any special divine action is unsuited to a context like that.[34] To invoke supernatural causation here would involve the God-of-the-gaps fallacy. Further, many historical events, such as the 1980 Mount St. Helens eruption, may be explicable by appeal to natural factors. To attribute these to supernatural action would be improper (at least, without plenty of further research). On the other hand, there may be unique events that *do* involve special divine activity (e.g., creation, exodus, virgin birth, resurrection of Jesus). In such cases, it would be incorrect and misleading to insist that only natural factors are valid for describing what happened in those events.

The biblical theist will not appeal to special divine action in a nomothetic context, because in situations like the ordinary function of God's creation, we recognize that God's activity is that of maintaining the order of what he made.

It is wise to avoid constructing, *a priori*, unrealistic requirements for what constitutes rationality. It makes more sense to identify actions and judgments that we know to be rational, and to discern from them what characteristics they have.[35] We know the judgment that Stonehenge is an instance of *design-imposed* is rational; and any philosophy that would call the rationality of this judgment into question is itself undermined by the clash. We have experience of rocks, wind, and water, and the kinds of arrangements they produce. We recognize in Stonehenge, however, something that is beyond those natural capacities; we see that a pattern has been imposed on the components. The key to the identification of *lacunae naturae causâ* is to identify the principle that separates the design from the natural properties.

Another example of identifying a principle that separates design from natural properties is William Clark's signature on the stone formation called Pompey's Pillar in Montana. We do not have any problem being confident that either Clark wrote it or someone forged it. It simply cannot be a product of the stone, because a linguistic message is not a product of the properties of its medium.

This approach to detecting *design-imposed* is, to be sure, an intuitive one, and perhaps some people will find this to be a shortcoming. There is, however, research under way to make it more than that.[36] We may also feel cautious about using it, since we do not know everything there is to know about the relevant natural properties. On the other

Supposing we agree to the NSTA requirement that "science ... cannot use supernatural causation *in its explanations," does it follow that we must agree that there are no natural gaps? The only way this could be rational is if we knew beforehand that there are no such gaps ...*

hand, we know enough about some things that we can have confidence when speaking of them. C. S. Lewis pointed out:

> No doubt a modern gynaecologist knows several things about birth and begetting which St. Joseph did not know. But those things do not concern the main point—that a virgin birth is contrary to the course of nature. And St. Joseph obviously knew *that*.[37]

Can empirical study identify instances of *design-imposed* in the natural world? The popular writer G. K. Chesterton observed:

> No philosopher denies that a mystery still attaches to the two great transitions: the origin of the universe itself and the origin of the principle of life itself. Most philosophers have the enlightenment to add that a third mystery attaches to the origin of man himself. In other words, a third bridge was built across a third abyss of the unthinkable when there came into the world what we call reason and what we call will.[38]

These bridges across the abyss of the unthinkable equate to what I am calling gaps due to natural properties, not due to ignorance, and they, in principle, are empirically detectable.[39]

Supposing we agree to the NSTA requirement that "science ... cannot use *supernatural causation* in its explanations," does it follow that we must agree that there are no natural gaps? The only way this could be rational is if we knew beforehand that there are no such gaps; but that is beyond the bounds of the natural sciences.[40] No scientist who refuses to be a theist should be required to say that these gaps have a supernatural cause; but it is only honest to acknowledge the gaps' existence.[41]

Miracles, Intelligent Design, and Natural Theology

If the detection of gaps due to nature makes the inference of *design-imposed* rational, we then may ask about the role of miracles and intelligent design in natural theology. But what is "natural theology"? Some take it as the discipline of producing proofs for the existence of God; others take it as elucidating the knowledge of God that comes to us as humans apart from special revelation; and some take it in opposition to special revelation.[42]

It is better to step back and ask what one hopes to gain from natural theology. Aquinas, in discussing whether God exists, gave what he saw as the two really telling arguments that God does not exist. The first is the problem of evil; and the second is what we may call the problem of the redundant deity. He said:

> What can be fully accounted for through fewer principles is not produced through more. But it seems that all things that appear in the world can be accounted for fully through other principles, when it is supposed that God does not exist, because those that are natural are reduced to a principle that is nature, but those that come from intention are reduced to a principle that is human reason or will. Therefore there is no need to suppose that God exists.[43]

One function, then, of natural theology, is to remove these objections to religious believing.

There are several varieties of argument from design. For example, some focus on *design-properties*: those that adduce the cosmological anthropic principle as evidence that the universe is especially hospitable to life; or those that express wonder that our minds and the universe are so well fitted for each other. These are important, but relatively weak. Someone may reply: "Well, if it were otherwise we would not be here discussing it."[44]

Darwinism is often said to remove all evidence for *design-imposed* from the biological world.[45] It is certainly the case that the a-teleological description of evolution from the NABT does so; and this is because it is no longer simply a theory about natural origin of any number of species, but a biological theory of everything. At its heart is a precommitment to the absence of gaps, rather than the empirical discovery of that absence. The theory cannot, however, eliminate appeals to *design-properties*.

Those who think that their religious faith requires *design-imposed* will conclude both that a-teleological evolution is an ideological threat, and that only allowing *design-properties* leaves the believer with too thin a soup; hence they will want to see if there are coun-

ter-arguments to the a-teleological theory of evolution.[46] This is what Michael Behe has provided in *Darwin's Black Box*: his concept of irreducible complexity is claimed to be an instance of a *lacuna naturae causâ*. He argues:

> Darwinism is the most plausible unintelligent mechanism, yet it has tremendous difficulties and the evidence garnered so far points to its inability to do what its advocates claim for it. If unintelligent mechanisms can't do the job, then that shifts the focus to intelligent agency. That's as far as the argument against Darwinism takes us, but most people already have other reasons for believing in a personal God who just might act in history,[47] and they will find the argument for intelligent design fits with what they already hold.
>
> With the evidence arranged this way, evidence against Darwinism does count as evidence for an active God ... Life is either the result of unintelligent causes or it is not, and the evidence against the unintelligent production of life is clearly evidence for intelligent design.[48]

There are many strengths to this way of framing the argument. First, it does not ask of the empirical evidence more than it can provide (an improvement on Paley). Second, it recognizes that most people have religious faith for other reasons than the argument from design—but once they have that faith, it is reasonable of them to want a scientific theory that is both rational and compatible with that faith (or else the faith should be modified or even abandoned).[49] And finally, it exposes the nub of the issue: the a-teleological theory says life (including us) results from unintelligent causes, but it has not presented the evidence it would take to back up a claim with such far-reaching metaphysical consequences.

I do not consider here whether the empirical case made by Behe is adequate. However, it deserves consideration, and cannot be ruled automatically invalid for committing the God-of-the-gaps fallacy. This is because it is based on the claim of having discovered *lacunae naturae causâ*.

We will likely never know who made Stonehenge, or why, until we uncover and interpret a text from its makers. This illustrates nicely the limits of design when it comes to religion: it takes a text from the Maker, special revelation, to elucidate the Creator's identity, character, and will.[50] But, like Stonehenge, it raises the question: now that we know it was designed, what was it designed *for*? And now that humans see themselves as the products of design, what were *we* designed for?

Notes

*This paper was first read at the Gifford Bequest International Conference on Natural Theology, Aberdeen, Scotland, 26–29 May 2000. My respondent was Professor Roger Trigg; and I have since read his book, *Rationality and Science: Can Science Explain Everything?* (Oxford: Blackwell, 1993), with profit. I am grateful to Professor Trigg and to the audience for helpful comments.

[1]The English word "miracle" derives from Latin *miraculum*, which in turn comes from the verb *miror* "to wonder." That is, it contains the notion of the subjective response of amazement on the part of the onlookers; but this notion is not uniformly present in the biblical passages which are held to describe miracles.

[2]E.g., David Hume, *Enquiries Concerning the Human Understanding and Concerning the Principles of Morals*, ed. L. A. Selby-Bigge (Oxford University Press, 1902), 114 (section x.1), defined a "miracle" as "a *violation* of the laws of nature," while others have preferred to speak of a *suspension* of those laws. Still others think of an event that is personally significant but not necessarily metaphysically distinct from ordinary events, e.g., R. J. Berry, who wrote: "Probably all miracles are susceptible to an explanation other than the supernatural." This statement appears in *Science and Christian Belief* 9, no. 1 (1997): 77 (a response to P. Addinall's reply to Berry's previous article on "The Virgin Birth of Christ," *Science and Christian Belief* 8, no. 2 [1996]: 101–10). The occasionalist G. C. Berkouwer, *The Providence of God* (Grand Rapids, MI: Eerdmans, 1952), 196 (drawing on Abraham Kuyper), asserted that a miracle "means nothing more than that God at a given moment wills a certain thing to occur differently than it had up to that moment been willed by Him to occur."

[3]A full exegetical and theological discussion of the options in traditional Christianity appears in C. John Collins, *The God of Miracles: An Exegetical Examination of God's Action in the World* (Wheaton, IL: Crossway, 2000). This work concludes that the scholastic metaphysic has the advantages both of being exegetically sound and of being robust in the face of modernism and postmodernism.

[4]Heinrich Schmid, *Doctrinal Theology of the Evangelical Lutheran Church*, trans. Charles Hay and Henry Jacobs (Minneapolis, MN: Augsburg, 1961), 170–94. For the same position from other branches of Western Christianity, cf. Heinrich Heppe, *Reformed Dogmatics*, trans. G. T. Thomson (Grand Rapids, MI: Baker, 1978), 251–80; and Alfred Freddoso (Roman Catholic), "God's General Concurrence with Secondary Causes: Why Conservation Is Not Enough," *Philosophical Perspectives* 5 (1991): 553–85. Some theologians dispute whether *concurrence* should be included, but Freddoso's essay is, I believe, proof that it must. Such a notable Presbyterian theologian as William G. T. Shedd, *Dogmatic Theology* (Nashville: Nelson, 1980), i:527–30, speaks only of preservation and government, but from his exposition it is clear that his definition of preservation *includes* concurrence.

[5]The term "continued creation" can cause some confusion, since different writers may mean different things by it. The Reformed compendium of Heppe uses similar language about "continued creation," but adds a clarification: "*conservatio* is to be conceived as a *continuata creatio*, resting upon the same command of God as creation. ... At the same time preservation must not be conceived as a continued creation, as though by preservation the essential identity of the once created world were abolished" (Heppe, 257–8).

[6]The expression "graciously takes part" is somewhat vague; it refers to God's confirming the interactions of their causal properties. Heppe, 258, cites Swiss theologian J. H. Heidegger (ca. 1700) for a definition: "Concurrence or co-operation is the operation of God by which he co-operates directly with the second causes as depending upon him alike in their essence as in their operation, so as to urge or move them to action and to operate along with them in a manner suitable to a first cause and adjusted to the nature of the second causes."

[7]"The form of divine *gubernatio* in which God is active without second causes or uses them in a manner deviating from their orderly appointment and activity is God's performance of miracle" (Heppe, 263).

[8]Cf. Stephen T. Davis, "God's actions," in *In Defense of Miracles*, ed. R. D. Geivett and G. R. Habermas (Downers Grove, IL: InterVarsity, 1997), 163–77, at 166. I say "at least in principle" and

"some of those differences" because it is conceivable that a given special divine action is not distinguishable to us from a "natural event." Some which are clearly distinguishable, under the supernaturalist scheme, are the initial creation *ex nihilo* event; the virgin conception of Jesus; the turning of water into wine; the resurrection of Jesus; and the conversion of sinners, even at the hands of incompetent messengers.

[9]Cf. Paul Helm, *The Providence of God* (Downers Grove, IL: InterVarsity, 1994), who helpfully says "the exact sense in which objects which are distinct from God are yet upheld by him is difficult to get clear" (p. 82); and "it should be stressed that this upholding, being metaphysical or ontological in character, is physically undetectable" (p. 89). Other writers have referred to the hiddenness of the "causal joint" between God and the creation (Austin Farrer's term). Note also Helm's p. 146, where he virtually defines "providence" as "that great matrix of causes and effects through which God governs the world."

[10]These and many other texts are discussed at length in Collins, *The God of Miracles*, chaps. 5–7. This conclusion is stronger than that of Paul Gwynne, *Special Divine Action* (Rome: Gregorian University Press, 1996), 65, who supposes that the biblical material is not decisive.

[11]Cf. Matt. 1:18, 20. Of course, God is represented as active in the formation of *every* embryo (cf. Ps. 139:13); the question is the *mode* of his involvement.

[12]Although arrived at independently, my approach resembles the views of Stephen S. Bilynskyj, *God, Nature, and the Concept of Miracle* (PhD dissertation, University of Notre Dame, 1982), 104–5, who speaks of "natural powers."

[13]For a reference point, compare this with Blaise Pascal's definition of "miracle," as "an effect which exceeds the natural power of the means which are employed for it; and what is not a miracle is an effect which does not exceed the natural power of the means which are employed for it," in *Pensées* (Paris: Garnier Frères, 1964), no. 804 (no. 891 in Krailsheimer's translation). This is also similar to Gwynne's definition of "special divine action" in *Special Divine Action*: "God brings it about that some particular outcome is different from what it would have been had only natural, created factors been operative," (p. 24).

[14]Cf. Helm, *Providence*, 106–7. The objection that miracles are unworthy of a fully-fitted creation seems frequently to rely on a metaphor for the world as a machine or artifact: it would be a reproach on the Craftsman if it needed "tinkering." But suppose we change the metaphor, and picture the world as a musical instrument, and its history as the tune. It is no shame to the Craftsman if his instrument does not have the tune within itself!

[15]*Posterior Analytics* 95a (II.xi, pp. 216–9 in the Loeb edition, lines 3ff.), where it is distinguished from *ananche* "necessity" and *tyche* "chance." Hence "design" is traditionally "teleology."

[16]William Paley, *Natural Theology* (New York: American Tract Society, n.d. [originally 1802]), 1; cf. his description of the designing mind as "that which can perceive an end or purpose, as well as the power of providing means and directing them to their end" (p. 265). Paley also uses the term "contrivance" throughout as a synonym.

[17]Cf. Thomas Aquinas, *Summa Theologiae* I.a, 2, 3, which contains the five ways of showing that God exists. The fifth way is the teleological argument: "We see that things which lack intelligence, such as natural bodies, *act for an end* [*operantur propter finem*] ... Now, whatever lacks intelligence cannot move towards an end unless it be directed by some being endowed with knowledge and intelligence."

[18]Thomas McPherson, *The Argument from Design* (London: Macmillan, 1972), 8, distinguishes what he calls "design-A," or order, from "design-B," which specifically refers to purpose. My categories do not align with his.

[19]Since the program does not rule out the function of natural processes, it is clear that intelligent design offers a larger set of tools than the purely naturalistic approach.

[20]To identify *design-imposed* in the natural world does not of itself serve as an identification of a "supernatural" agent; we must bring in our background beliefs about what kinds of agents may have produced such an effect. But this is the same situation with Stonehenge: the agents may be aliens, deities, or humans; and it is our background beliefs that render any of these worth pursuing as the explanation.

[21]It was interesting to me that, after I had arrived at this analysis, I discovered a similar dichotomy in John Polkinghorne's *Quarks, Chaos, and Christianity* (New York: Crossroad, 1994), 71–2. Polkinghorne writes of gaps that are "patches of contemporary ignorance" and "*intrinsic* gaps in the bottom-up description alone in order to leave room for top-down action." This is interesting, both because of his prominence among writers on science and religion, and because Polkinghorne is not an adherent of the scholastic metaphysic given above, nor of intelligent design (*design-imposed*) in the biological world.

[22]Examples of the charge are easy to multiply: for example, Michael Roberts' review of Behe's *Darwin's Black Box* in *Science and Christian Belief* 9:2 (1997): 191–2, and his reply to a response to that review, *Science and Christian Belief* 10:2 (1998): 189–95; Richard Bube, "Seven Patterns for Relating Science and Theology," in Michael Bauman, ed., *Man and Creation: Perspectives on Science and Theology* (Hillsdale: Hillsdale College Press, 1993), 75–103, at 83–6; Robert Pennock, *Tower of Babel: The Evidence against the New Creationism* (Cambridge: MIT Press, 1999), 163–72.

[23]For example, visitors to Mount St. Helens in Washington State are treated to a history of American Indian beliefs about the mountain's eruptions: these were held to be due to special acts of the gods. If a geologist can show that the regular working of natural processes fully explains the eruptions, then the eruptions are no longer supernatural (but, on the Christian view, not necessarily irrelevant to divine providence). I have heard religious speakers on the BBC defend ignorance on the causes, say, of lightning strikes or the 1987 hurricane in the south of England, because that leaves room for God's mysterious action in his world.

[24]For example, the subtitle of R. Douglas Geivett and Gary R. Habermas, *In Defense of Miracles* (Downers Grove, IL: InterVarsity, 1997), is "A comprehensive case for *God's action in history*." Although some of the authors in the collection try to provide a more careful nuancing to this, it nevertheless shows the problem in popular parlance. A Scripture text such as Ps. 119:126, "It is time for the Lord *to act*," must be taken as analogical – that is, it speaks *as if* God were doing nothing about the wicked, rather than asserting that he actually is doing nothing.

[25]Charles Darwin, *The Origin of Species*, Harvard Classics 11; (New York: Collier, 1909).

[26]Strictly speaking, the situation is actually more complex than that. Many of Paley's examples seem to be to the effect, "I cannot imagine a natural scenario that could have produced such phenomena," while Darwin replied, "But I can." Darwin described variation plus natural selection as a mechanism that *could have* produced these structures; he never supported the modality shift from *imaginable* to *possible*, much less to *plausible* or *probable*. Instead he argued, "I cannot see why it could not," shifting the burden of proof; and he offered no empirical tests for the proposed possibility.

[27]David Livingstone, "The Idea of Design: The Vicissitudes of a Key Concept in the Princeton Response to Darwin," *Scottish Journal of Theology* 37 (1984): 329–57, presents such a reading of the nineteenth century. Livingstone believes that the *design-properties* line of argument was a positive move in response to science, and that the later Princetonians' return to the older argument for *design-imposed* was a regression. Interestingly, Paley was aware of the *design-properties* line of argument (he called it a "principle of order in nature"), and considered it inadequate for what we see (Paley, 54–5).

[28]These are complementary to those in Michael Behe, *Darwin's Black Box* (New York: Free Press, 1996), 211–6.

[29]See J. Stafford Wright, "The interpretation of Ecclesiastes," *Evangelical Quarterly* 18 (1946): 18–34.

[30]It is likely that Paley, writing a quarter of a century after David Hume's *Dialogues Concerning Natural Religion* (New York: Hafner, 1948; originally 1779), intended to overwhelm Hume's case with examples; and some think he was at least partially successful. Cf. D. L. LeMahieu, *The Mind of William Paley* (Lincoln: University of Nebraska Press, 1976), 29–54, 67–8; David Burbridge, "William Paley Confronts Erasmus Darwin: Natural Theology and Evolutionism in the Eighteenth Century," *Science and Christian Belief* 10 (1998): 49–71. For the purposes of this paper, I accept Elliott Sober's assessment of Hume's objections to the design argument, in *Philosophy of Biology* (Boulder, CO: Westview, 1993), 34–5, namely that they do not defeat Paley's form of it. (Sober thinks that Darwin's case does defeat Paley.)

[31]National Science Teachers Association, NSTA Position Statement on the Teaching of Evolution, 1997 (http://www.nsta.org/159&id=10).

[32]National Association of Biology Teachers, NABT Statement on Teaching Evolution, adopted March 15, 1995 and modified in October 1997 (http://www.nabt.org/Evolution.html). The earlier version of this statement appeared in *The American Biology Teacher* 58, no. 1 (1996): 61–2, and described evolution as "an unsupervised, impersonal, unpredictable and natural process." The newer statement is not different in its rejection of design, only less blatant: for example, it goes on to say that "natural selection ... has no specific direction or goal." (The most recent update, August 2000, does not change in this respect.)

[33]Cf. Ian Barbour, *Religion in an Age of Science* (New York: Harper SanFrancisco, 1990), 66–71.

[34]Indeed, as Helm put it, "It should be stressed that this upholding, being metaphysical or ontological in character, is physically undetectable" (*Providence*, 89).

[35]I profess the influence of Mikael Stenmark, *Rationality in Science, Religion, and Everyday Life* (University of Notre Dame Press, 1995), who stresses that our criteria of rationality ought to describe something it is possible for real people to achieve.

[36]William Dembski, *The Design Inference: Eliminating Chance through Small Probabilities* (originally a University of Illinois at Chicago PhD thesis, 1996; now published by Cambridge University Press, 1998). Jonathan Edwards' *Treatise Concerning Religious Affections*, in *The works of Jonathan Edwards* (Edinburgh: Banner of Truth, 1974), i:234–343, is an attempt to provide criteria for identifying supernatural moral transformation.

[37]C. S. Lewis, *Miracles: A Preliminary Study* (New York: Macmillan/Simon and Schuster, 1960), chap. 7, paragraph 5.

[38]G. K. Chesterton, *The Everlasting Man* (Garden City, NJ: Doubleday, 1955 [1925]), 27.

[39]The more than seventy years of scientific research since Chesterton wrote this have not done anything but provide confirmation of this. The Big Bang theory of the origin of the cosmos looks like a scientific theory that recognizes the first of Chesterton's gaps. For the second, Charles Thaxton has argued that the information-bearing function of DNA cannot result from a law-based regularity (cf. Nancy Pearcey and Charles Thaxton, *The Soul of Science* [Wheaton: Crossway, 1994], 243–5). This is a stronger conclusion than that of Paul Davies, *The Fifth Miracle* (New York: Simon and Schuster, 1999), that we *have not yet* discovered the law; it is instead a denial by principle that we *can*. Finally, as many have observed, human rationality is hard to square with a purely law-based explanation of it: "If I am physically determined to think as I do, if these physical conditions are sufficient for me to have a certain belief, then the relation between that belief and any evidence there may be for it is purely coincidental" (Paul Helm, *Providence*, 221). Interestingly enough, even Darwin (*Origin*, 251) acknowledged that he must bracket out the second and third of these. Once these three are acknowledged, it becomes a valid research project to see if there are others.

[40]Surely, at least from the point of view of the scientist, this is a contingent matter of fact; and as such it cannot be known except by empirical investigation. For a Christian theist, this is a particularly bad approach: as Helm put it: "It is not appropriate to argue, *a priori*, what God will and will not do with and in the physical creation, but—as with any contingent matter of fact—it is necessary to investigate what God has done" (*Providence*, 76).

[41]For example, with such words as: "This object or event *looks like* it has an agent as its cause. I do not know of a non-purposive process that could have produced this effect. I do not wish to attribute the effect to a supernatural agent."

[42]Cf. James Barr, *Biblical Faith and Natural Theology* (Oxford: Clarendon Press, 1993), 1–20, for a survey of "Natural theology in this [i.e., the twentieth] century."

[43]Aquinas, *Summa Theologiae*, I.a, 2, 3 (my translation).

[44]Cf. John North, *Norton History of Astronomy and Cosmology* (New York: Norton, 1995), 619. This is not to say that there is no rejoinder to this; cf. William Lane Craig, "Cosmos and Creator," *Origins & Design* 17, no. 2 (1996): 18–28, for a vigorous discussion. Further, such cosmological concerns diminish the force of Hume's objection (*Dialogues Concerning Natural Religion*, 22) that our experience is too local to be applicable to the universe.

[45]Cf. the famous job description of the biologist from Richard Dawkins in *The Blind Watchmaker* (New York: Norton, 1987), 1: "Biology is the study of complicated things that give the appearance of having been designed for a purpose" (with a view toward removing that appearance, cf. his subtitle, *Why the evidence of evolution reveals a universe without design*).

[46]This is not the same as saying they will reject *all* forms of evolutionary theory; a great deal depends on the metaphysics underlying the theory.

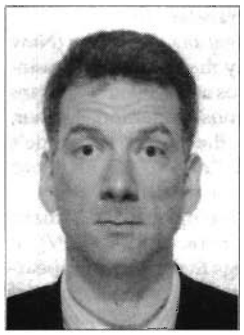
[47]I assume Behe means this analogically!

[48]Michael Behe, review of Robert Pennock, *Tower of Babel: The Evidence against the New Creationism* (Cambridge: MIT Press, 1999), in *The Weekly Standard* (7 June 1999): 35.

[49]Indeed, the believer must often confront proposed reasons for abandoning faith; and it is spiritually healthy to recollect the evidence of design at times when the overall design of the cosmos is invisible. Paley, *Natural Theology*, 344–7, was well aware of this, and commented: "It is one thing to assent to a proposition of this sort; another, and a very different thing, to have properly imbibed its influence. I take the case to be this: perhaps almost every man living has a particular train of thought, into which his mind glides and falls, when at leisure from the impressions and ideas that occasionally excite it: perhaps, also, the train of thought here spoken of, more than any other thing, determines the character. It is of the utmost consequence, therefore, that this property of our constitution be well regulated ... In a moral view I shall not, I believe, be contradicted when I say, that if one train of thinking be more desirable than another, it is that which regards the phenomena of nature with a constant reference to a supreme intelligent Author. To have made this the ruling, the habitual sentiment of our minds, is to have laid the foundation of every thing which is religious. The world thenceforth becomes a temple, and life itself one continued act of adoration. The change is no less than this: that whereas formerly God was seldom in our thoughts, we can now scarcely look upon anything without perceiving its relation to him." McPherson, *The Argument from Design* (pp. 12–3), notes that Kant also saw this as a value.

[50]Theologically, one of the functions of miracles has been to authenticate the messengers sent by God conveying such revelation.

The Panda's Thumb: Design and Optimality from Plato to Endo



Darwin and modern Darwinists such as Gould and Dawkins argue that the sub-optimality of biological structures is evidence against their having been consciously designed. Creationists and other design theorists often respond by arguing that biological structures are actually optimal. These arguments have a certain weight, as doubt has been cast upon the sub-optimality of the most popular Darwinist example, the panda's pseudo-thumb. However, conscious, and even divine, design is logically independent of optimality.

In fourth century BC Greece, the relationship between design and optimality was the opposite of the usual one today, as Plato believed in designed sub-optimality, and Aristotle in non-designed optimality. The tendency to confuse these issues can be traced back to Aristotle and Galen. Darwinist (and anti-Darwinist) arguments have a long history, which is generally disregarded, exemplifying the ignorant ahistoricality of much modern science.

One modern incarnation of [the] argument, that the sub-optimality of biological structures shows that they were not consciously designed, is a crucial component of Darwinism.

The argument that the sub-optimality of the natural world provides evidence against it having been consciously designed has a long pedigree,[1] and is closely allied to the wider anti-theist argument based on the problem of evil. One modern incarnation of this argument, that the sub-optimality of biological structures shows that they were not consciously designed, is a crucial component of Darwinism. This argument was central to the thought of Charles Darwin,[2] and is perhaps even more so to that of many modern evolutionary biologists, particularly Stephen Gould.[3]

Anti-Darwinists often respond to the Darwinist argument from sub-optimality by disputing the sub-optimality of biological structures. For example, they may argue that many vestigial structures are functional,[4] that structures supposedly rendered sub-optimal by their ancestry, such as the vertebrate eye, are actually optimal,[5] and/or that there is no such thing as nonfunctional DNA.[6] These arguments may or may not be valid, but they are beyond the scope of this article, the aim of which is to uncouple design and optimality, which are frequently linked in the debate between Darwinists and design theorists. William Dembski has shown that nondesign cannot be reliably deduced from non-optimality,[7] but I go further than he does, arguing that design and optimality are logically independent, quite apart from his suggestion of the possibility of non-apparent optimality in circumstances in which optimalization is constrained. In addition, I examine the historical relationship between design and optimality, which has led to a great deal of confusion.

Logical Independence of Optimality and Design

The Possibility of Nondesigned Optimality

One may reject design yet accept optimality. A striking example is provided by the giant panda's pseudo-thumb. The panda's hand has six digits, but its pseudo-thumb, the only opposable digit in a nonprimate, is considered to have evolved from the radial sesamoid bone in the wrist.[8] This organ was Gould's "favorite example" of imperfection due to history.[9] He writes:

> An engineer's best solution is debarred by history. The panda's true thumb is committed to another role, too specialized for a different function to become

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> an opposable, manipulating digit. So the panda must use parts on hand and settle for an enlarged wrist bone and a somewhat clumsy, but quite workable, solution. The sesamoid thumb wins no prize in an engineers' derby. It is ... a contraption, not a lovely contrivance.[10]

Richard Dawkins, praising Gould's essay, comments that "evolution can be more strongly supported by evidence of telling imperfections than by telling perfection."[11]

Hideki Endo, et al., however, now have shown this pseudo-thumb to be at least less sub-optimal than thought:

> We suggest that the three functional units, and the double-pincer-like apparatus of which they are made, can be completely controlled only by the same muscular system that is found in other bear species. ... the hand of the giant panda has a much more refined grasping mechanism than has been suggested in previous morphological models.[12]

This presents no difficulty for Darwinism. To take a hypothetical extreme case, if every biological structure were proven to be optimal, it would be possible to explain this in Darwinian terms, as one would be able to argue that structural optimization by convergent evolutionary pathways has been followed through to completion. As Darwinism is equally compatible with optimality and sub-optimality, it is not valid to offer sub-optimality as evidence for Darwinism.

The Possibility of Designed Sub-optimality

One can accept design yet reject optimality. The approach one takes depends on the type of designer in which one believes: nondivine designer(s) or God.

If one believes in an incompletely good, wise or powerful designer, sub-optimality presents little difficulty. This applies to John Stuart Mill's non-omnipotent "God,"[13] the gods of polytheistic religions, and the extraterrestrials of Erich von Däniken[14] and Francis Crick.[15] Such a belief was also a feature of the Manichaean and classical Zoroastrian systems, with the former involving creation by an evil deity in rebellion against a good one, and the latter a conflict between good and evil deities.

Jews, Christians, and Muslims believe in the absolute goodness, wisdom, and power of God, and this doctrine, theism, also sometimes has appeared in non-Abrahamic intellectual milieux, such as Dvaita Vedanta. There are four ways in which theists may tackle the problem of biological sub-optimality, none of which are especially *ad hoc*:

First, theistic thinkers have formulated various theodicies with respect to evil. As Paul Nelson has pointed out,[16] some of these are equally applicable to sub-optimal biological design. For example, Augustine of Hippo[17] and Leibniz[18] argued that evil exists for a good purpose, and only appears evil to humans because we lack God's omniscience.

Second, notwithstanding the popularity of theodicy, I would argue that the main teaching to be drawn from the Bible is that questioning of God's motives is illegitimate.[19] This attitude is influential in most forms of Judaism and Christianity, and is dominant in Calvinism[20] and Islam. Clearly, if it is illegitimate to question why God permits evil, it may be equally illegitimate to question why his designs are sub-optimal.

As Darwinism is equally compatible with optimality and sub-optimality, it is not valid to offer sub-optimality as evidence for Darwinism.

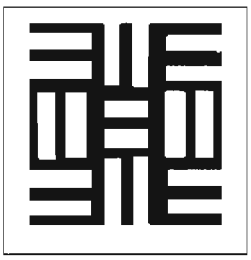
Third, it is possible that biological structures were designed to be optimal, but have since degenerated. For example, most creationists accept that some "vestigial" structures, such as the sightless eyes of cave fish[21] and the wings of ostriches, are or may be the results of intraspecific or intra-baraminic degeneration. The Christian doctrine of the Fall lends itself to this type of explanation, although the explanation could exist without this doctrine.

Fourth, one could postulate an almost unlimited range of reasons why God might have created sub-optimal structures. Three such reasons sometimes are, or have been, accepted. They are:

1. One interpretation of the Fall is that a wide range of features of the biological world are the results of human sin. The same people often believe in this as believe in the degenerate nature of sub-optimality, but it is actually a different belief, as it means that not only have structures deteriorated, but that new structures have been formed, and/or the structure and/or behavior of organisms has been drastically changed, post-creation, by either God or the Devil. One outcome of this change is sometimes seen as being the existence of carnivores,[22] and noxious or troublesome animals[23] and plants,[24] and another as being the leglessness of snakes.[25] Biblical interpretations of this type are currently accepted by many fundamentalist evangelicals and by groups such as the Jehovah's Witnesses, and they were historically taught by such Catholic theologians as Peter the Lombard, Bonaventure, and Alexander of Hales.[26] If one accepts this doctrine, sub-optimal design is not merely compatible with, but deducible from, Christianity.

2. Sub-optimal structures may have been designed in preparation for future use in a more advanced organism. This is accepted by some believers in guided evolution.

3. Sub-optimal structures may have been designed for future use in degenerate organisms, as taught by Plato. He wrote:



> For our creators well knew that women and other animals would some day be framed out of men, and they further knew that many animals would require the use of nails for many purposes; wherefore they fashioned in men at their first creation the rudiments of nails.[27]

The arguable optimality of the panda's thumb offers no more evidence for conscious design than its sub-optimality did for Darwinism.

Historical Relationship Between the Issues of Optimality and Design

Aristotle repeatedly asserted the functional optimality of biological structures, stating that nature (*physis*) makes nothing superfluous,[28] never fails,[29] omits nothing necessary,[30] and always produces the best possible workmanship.[31] This was a reaction against Plato's doctrine of sub-optimality.[32] However, Plato believed in the conscious design of biological structures,[33] whereas Aristotle did not. Therefore, in fourth century BC Greece, the orientation of the optimality versus non-optimality and design versus non-design debates was the opposite of today, with Plato arguing for designed sub-optimality, and Aristotle arguing for non-designed optimality.

Aristotle's belief in biological optimality was developed further by Galen:

> Come now, let us investigate this very important part of man's body [the hand], examining it to determine not simply whether it is useful or whether it is suitable for an intelligent animal, but whether it is in every respect so constituted that it would not have been better had it been made differently.[34]

Galen repeated this argument numerous times, with the eye being perhaps his favorite example.[35] He was particularly dismissive of Plato, and saw himself as providing explanations where Aristotle's were unsatisfactory.[36] Furthermore, unlike Aristotle, he allowed no exceptions to the rule of optimality.

Aristotle and Galen were the canonical authorities in zoology and medicine, respectively, in Europe from about 1250 until about 1700. Therefore, the assumption of biological optimality was included uncritically as part of the argument that the complexity of biological structures provides evidence for theism (the argument from biological design), when this was formulated by late-seventeenth-century English thinkers such as John Wilkins[37] and John Ray.[38] This was the first time since Roman times that any form of the argument from biological design had been formulated in the West, and it was probably the first time ever for the formulation of the fully theistic version. The assumption of biological optimality then remained an important component of the argument from biological design, and was defended in its most famous version, that formulated by William Paley.[39] Therefore, when Darwin and his followers rejected Paley's argument from biological design, they also rejected the logically unrelated doctrine of biological optimality. Anti-Darwinists have now followed suit in defending this irrelevant doctrine. Both sides in the creation versus evolution dispute appear to be formulating invalid arguments.

In this context, it is illuminating to look at the reaction to Endo's work in the three years since its publication. By Internet search, I found four articles in which creationists gleefully seized upon Endo's findings,[40] but none that offered a Darwinian perspective, suggesting that many Darwinists are genuinely embarrassed by these findings. However, the two sides are equally mistaken, and the arguable optimality of the panda's thumb offers no more evidence for conscious design than its sub-optimality did for Darwinism.

Three Possible Objections to the Above Argument about the Historical Relationship

1. *Aristotle did not invariably ascribe optimality to biological structures.*

Aristotle considered flatfish, molluscs, bats and seals to be sub-optimal.[41] This aspect of his thought is best seen as an inconsistency in, rather than a crucial component of, his thought, and was perhaps a hangover from his Platonist past. Significantly, none of his examples of sub-optimality were in humans.

Almost incomprehensibly, Aristotle explained apparent sub-optimality in terms of deviation from, rather than poor design by, nature. For example, he stated that flatfish have "twisted" heads because "they have

their natural shape distorted."[42] Incidentally, this is Dawkins' favorite example, too.[43] Aristotle also described molluscs as "mutilated," and moving "in a manner contrary to nature."[44]

2. *Plato was not a theist.*

Plato believed in a personal creator (*demiourgos*) of the universe.[45] Yet in at least some phases of his thought, this creator was a non-ultimate being,[46] and, furthermore, he also considered biological design to have involved subordinate gods.[47] That he was not a true theist is irrelevant to his belief in biological design.

3. *Aristotle held quasi-theistic and teleological beliefs.*

Aristotle seems to have held theistic or quasi-theistic beliefs.[48] However, he did not believe that God affects the sublunary realm. Therefore, his theism or quasi-theism did not imply biological design.[49]

One could accept that Aristotle did not believe in conscious design by God (or a *demiourgos*-like quasi-God), yet still argue that he considered biological structures to have purposes, and therefore must have believed that they were consciously designed, perhaps by a minor deity. Although he discussed biological structures' purposes almost continuously in most of his zoological writings,[50] and occasionally in his other works,[51] he, however, does not seem to have been referring to *conscious* purpose.[52] Indeed, at points, he seems to have contrasted nature's purpose with that of a conscious agent. He wrote:

> Now surely as in intelligent action, so in nature ... It is absurd to suppose that purpose is not present because we do not observe the agent deliberating. ... If the ship-building art were in the wood, it would produce the same results *by nature*.[53]
>
> For just as human creations are the products of art, so living objects are manifestly the products of an analogous cause or principle, not external but internal, derived like the hot and cold from the environing universe.[54]

In his cosmological and philosophical writings, the first cause or final end is probably God or a quasi-God. Yet in his biology, it seems simply to be heredity. He wrote:

> For any living thing ... the most natural act is the production of another like itself ... That is the goal towards which all things strive, that for the sake of which they do whatsoever their nature renders possible.[55]
>
> Whenever there is plainly some final end, to which a motion tends should nothing stand in the way, we always say such final end is the aim or purpose of the motion; and from this it is evident that there must be a something or other really existing, corresponding to what we call by the name of Nature. For a given germ does not give rise to any chance living being, nor spring from any chance one; but each germ springs from a definite parent and gives rise to a definite progeny.[56]

Aristotle's thought is rather confused, and the works of Gotthelf,[57] Balme,[58] and Cooper[59] must be referred to for detailed analysis. However, one is probably not going too far wrong in suggesting that by "Nature" Aristotle meant the principle of heredity. It must be remembered that many contemporary thinkers, such as Empedocles, played down the importance of heredity in favor of the intra-uterine environment,[60] and Aristotle was emphasizing his disagreement with these thinkers rather than with believers in conscious biological design.

Sub-optimality, in itself, provides little evidence for Darwinism or against the conscious design of biological structures. Equally, optimality provides little evidence for conscious design.

Finally, one could acknowledge that Aristotle confused the issues of heredity and conscious design, yet still insist that he believed in the conscious design of biological structures. Dawkins, for example, would probably assume that, as Aristotle did not know about evolution, he had no choice but to believe in conscious design.[61] However, this is mere parochial modernism, because two other explanations for biological origins were available to Aristotle. They were:

1. He accepted the spontaneous generation of plants, invertebrates, and fishes,[62] and did not rule out this possibility with respect to humans and large quadrupeds.[63]

2. He believed in the infinite age of the world.[64]

Aristotle was, therefore, perfectly free to reject both conscious design and the proto-Darwinist ideas, derived from Empedocles,[65] with which he, at times, did toy.[66]

Conclusions and Observations

Sub-optimality, in itself, provides little evidence for Darwinism or against the conscious design of biological structures. Equally, optimality provides little evidence for conscious design.

It is often argued that the complexity of biological structures is evidence for divine design. This argument is weak, because, even if a biological structure could be indisputably shown to have been consciously designed, it would be possible to argue that its designer was an extra-terrestrial, for example. Even the argument that biological complexity is evidence for design by an unspecified conscious (not necessarily divine) designer[67] is not very strong.[68] However, regardless of its weakness, the argu-

ment from complexity to either divine or merely conscious design is logically independent of the argument from optimality, as sub-optimal structures may be just as complex as optimal ones.

In addition to the above central conclusions, two observations that I find telling may be made. They are:

1. Scientists should pay more attention to the long shadows cast by history. Darwinists routinely explain the imperfections in biological structures in terms of their evolutionary histories, and argue that "evolution can be ... strongly supported by evidence of telling imperfections."[69] This is deeply ironic, as the imperfections in this argument are themselves best explained in terms of its history. Postmodernists would pounce on this as an example of the self-referential nature of science.

2. The six Japanese scientists who studied pandas at Ueno Zoo, and thus contributed facts rather than speculation to the debate, are from a culture that has been little influenced by theism, and hardly at all by Aristotle or the argument from biological design. One wonders whether, as evolutionists, they would have been more constrained in their work had they been from a culture in a state of angry reaction against Christianity.

The argument from complexity to either divine or merely conscious design is logically independent of the argument from optimality, as sub-optimal structures may be just as complex as optimal ones.

Notes

"*GBWW*" refers to: R. M. Hutchins, ed., *Great Books of the Western World* (Chicago: William Benton, 1952).

"*PIAB*" refers to: A. Gotthelf and J. G. Lennox, eds., *Philosophical Issues in Aristotle's Biology* (Cambridge: Cambridge University Press, 1987).

[1]T. Lucretius Carus, 54 BC, *De Rerum Natura*, trans. W. H. D. Rouse (London: William Heinemann, 1966), II:180–1, V:196–234.

[2]Charles R. Darwin, 1859, *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (Brussels: Culture et Civilisation, 1969), 437–58; and Charles R. Darwin, 1877, *The Various Contrivances by which Orchids are Fertilized by Insects*, in *The Works of Charles Darwin* 17, ed. P. H. Barrett and R. B. Freeman (London: Pickering and Chatto, 1988), 245–6/173.

[3]Stephen J. Gould,"Evolution and the Triumph of Homology, Or Why History Matters," *American Scientist* 74 (1986): 60–9; ——, *The Panda's Thumb: More Reflections in Natural History* (London: Penguin, (1990): 19–39; and ——, *Ever Since Darwin* (London: Penguin, 1991), 91.

[4]J. Bergman and G. Howe,'*Vestigial Organs' Are Fully Functional* (St. Joseph, MO: Creation Research Society, 1990).

[5]George Ayoub,"On the Design of the Vertebrate Retina," *Origins and Design* 17, no. 1(1996): 6–7.

[6]Richard Deem,"When 'Junk' DNA isn't Junk," in *Evidence for God from Science*, www.jps.net/bygrace/evolution/junkdna.html (Pasadena, CA: R. Deem, 2000).

[7]William Dembski, *Intelligent Design* (Downer's Grove, IL: InterVarsity Press, 1999).

[8]Stephen J. Gould, *The Panda's Thumb*, 19–25.

[9]——, "Evolution and the Triumph of Homology, Or Why History Matters."

[10]——, *The Panda's Thumb*, 19–25.

[11]Richard Dawkins, *The Blind Watchmaker*, 2d ed. (London: Penguin, 1991), 91.

[12]Hideki Endo, D. Yamagiwa, Y. Hayashi, H. Koie, Y. Yamaya and J. Kimura,"Role of the Giant Panda's 'Pseudo-thumb,'" *Nature* 397 (1999): 309–10.

[13]John S. Mill, 1870, *Theism*, in F.E.L. Priestley, ed., *Collected Works of John Stuart Mill* 10, (Toronto: University of Toronto Press, 1969), pt. 2.

[14]Erich von Däniken, *Chariots of the Gods?* (London: Corgi, 1971); and ——, *Return to the Stars*, (London: Corgi, 1972)

[15]Francis Crick, *Life Itself: Its Origins and Nature* (New York: Simon and Schuster, 1981).

[16]Paul A. Nelson,"The Role of Theology in Current Evolutionary Reasoning," *Biology and Philosophy* 11 (1996): 493–517.

[17]Augustine, early 5th C, *Enchiridion*, in M. Dods, ed., trans. J. F. Shaw, *The Works of Aurelius Augustinus, Bishop of Hippo* 9, (Edinburgh: T. and T. Clark, 1892), chap. 11.

[18]G. W. Leibniz, 1710, *Theodicy*, in A. Farrer, ed., trans. E. M. Huggard (London: Routledge and Kegan Paul, 1952).

[19]Job 38:1–42:6; Isaiah 45:9; Romans 9:14–21.

[20]John Calvin, 1559, *Institutes of the Christian Religion*, final ed., trans. H. Beveridge (Edinburgh: Calvin Translation Society, 1845), book III, chap. 22, sect. 1.

[21]Carl Wieland, "New Eyes for Blind Cave Fish?" www.answersingenesis.org/docs2/4361news8-9-2000.asp (Australia: Answers in Genesis Ministries International, 2000).

[22]Genesis 1:29-30, 2:16, 9:2–3; Isaiah 11:6–9, 65:25; Hosea 2:18.

[23]Isaiah 11:8–9.

[24]Genesis 3:18.

[25]Genesis 3:14.

[26]Collège Dominicain d'Ottawa, Footnote in *GBWW* 19, p. 511.

[27]Plato, 4th C. BC, *Timaeus*, trans. B. Jowett in *GBWW* 7, chap. 76.

[28]Aristotle, 4th C. BC, *On the Gait of Animals*, trans. A. S. L. Farquharson in *GBWW* 9, chaps. 2, 8, 11, 12; ——, *On the Generation of Animals*, trans. A. Platt in *GBWW* 9, II:5–6, V:8;——, *On the Parts of Animals*, trans. W. Ogle in *GBWW* 9, II:13, III:1, IV:11–3; and ——, *On the Soul*, trans. J. A. Smith in *GBWW* 8, III:9, 12.

[29]——, *On the Generation of Animals*, in *GBWW* 9, V:8.

[30]——, *On the Soul*, in *GBWW* 8, III:9.

[31]——, *On the Gait of Animals*, in *GBWW* 9, chaps. 2, 8, 12; ——, *On the Generation of Animals*, in *GBWW* 9, III:10; ——, *On the Parts of Animals*, in *GBWW* 9, II:14; and ——, *On Youth and Old Age, on Life and Death, on Breathing*, trans. G. R. T. Ross in *GBWW* 8, chap. 4.

[32]——, *On the Parts of Animals*, in *GBWW* 9, IV:10.

[33]Plato, *Sophist*, trans. B. Jowett in *GBWW* 7, chaps. 265–6; and ——, *Timaeus*, in *GBWW* 7, chaps. 41–7, 69–92.
[34]Galen, C. 175, *On the Usefulness of the Parts of the Body*, trans. and ed. M. T. May, (Ithaca, NY: Cornell University Press, 1968), I:6.
[35]Ibid., II:55–113.
[36]Ibid., I:12.
[37]John Wilkins, 1675, *Of the Principles and Duties of Natural Religion*, ed. J. Tillotson (London: J. Walthoe and Co., 1734), I:VI.
[38]John Ray, 1691, *The Wisdom of God Manifested in the Works of Creation* (New York: Garland, 1979), 156–85.
[39]William Paley, 1802, *Natural Theology, or Evidences of the Existence and Attributes of the Deity Collected from the Appearances of Nature*, in F. Ferré, ed., *Natural Theology: Selections* (Indianapolis, IN: Bobbs-Merrill, 1963), chap. 5.
[40]"A Second Opinion on the Giant Panda's Thumb," www.reasons.org/resources/connections/1999v1n1/ (Pasadena, CA: Reasons to Believe, 1999); Richard Deem, "Examples of Bad Design Gone Bad", www.geocities.com/CapeCanaveral/Lab/6562/evolution/designgonebad.html (God and Science, 2000); Casey Luskin, "Good Theology and Bad Design Or Bad Theology and Good Design?" www-acs.ucsd.edu/~idea/badtheolgooddesn.htm (San Diego, CA: Intelligent Design and Evolution Awareness Club, 2001); and John Woodmorappe, "The Panda Thumbs its Nose At the Dysteleological Arguments of the Atheist Stephen Jay Gould," www.answersingenesis.org/home/area/magazines/tj/v13n1_panda.asp (Australia: Answers in Genesis Ministries International, 2001).
[41]Aristotle, *On the Gait of Animals*, in *GBWW* 9, chaps. 17, 19.
[42]Ibid., chap. 17.
[43]Richard Dawkins, *The Blind Watchmaker*, 91–3; and Ecclesiastes 1:9.
[44]Aristotle, *On the Gait of Animals*, in *GBWW* 9, chap. 19.
[45]Plato, *Statesman*, trans. B. Jowett, in *GBWW* 7, chaps. 269–70; and ——, *Timaeus*, in *GBWW* 7.
[46]——, *Statesman*, trans. B. Jowett, in *GBWW* 7, chap. 273; and ——, *Timaeus*, in *GBWW* 7, 30.
[47]Ibid., 42–6, 69.
[48]Aristotle, *Metaphysics*, trans. W. D. Ross, in *GBWW* 8, I:2, XII:7.
[49]D. M. Balme, "Teleology and Necessity," in *PIAB*, 277.
[50]Aristotle, *History of Animals*, trans. D. W. Thompson, in *GBWW* 9; ——, *On the Gait of Animals*, in *GBWW* 9; ——, *On the Generation of Animals*, in *GBWW* 9; and ——, *On the Parts of Animals*, in *GBWW* 9.
[51]——, *On Sleep and Sleeplessness*, trans. J. I. Beare, in *GBWW* 8, chaps. 2, 9, 17; ——, *On the Soul*, in *GBWW* 8, II:4, III:12; ——, *Physics*, trans. R. P. Hardie and R. K. Gaye, in *GBWW* 8, II:8; and ——, *Sense and the Sensible*, trans. J. I. Beare, in *GBWW* 8, chap. 5.
[52]A. Gotthelf, "Aristotle's Conception of Final Causality," in *PIAB*, section 13.
[53]Aristotle, *Physics*, trans. R. P. Hardie and R. K. Gaye, in *GBWW* 8, II:8.
[54]——, *On the Parts of Animals*, in *GBWW* 9, I:1.
[55]——, *On the Soul*, in *GBWW* 8, chap. 4.
[56]——, *On the Parts of Animals*, in *GBWW* 9, I:1.
[57]A. Gotthelf, "Aristotle's Conception of Final Causality," in *PIAB*.
[58]D. M. Balme, "Teleology and Necessity," in *PIAB*.
[59]J. M. Cooper, "Hypothetical Necessity and Natural Teleology," in *PIAB*.
[60]Aristotle, *On the Parts of Animals*, in *GBWW* 9, I:1.
[61]Richard Dawkins, *The Blind Watchmaker*, 3–6.
[62]Aristotle, *History of Animals*, in *GBWW* 9, V:1, 15–6, 19, 31–2, VI:15; and ——, *On the Generation of Animals*, in *GBWW* 9, II:5–6, V:8, I:1, 16, II:1, III:9–11.
[63]Ibid., III:11.
[64]Aristotle, *Meteorology*, trans. E. W. Webster, in *GBWW* 8, I:14; ——, *On the Heavens*, trans. J. L. Stocks, in *GBWW* 8, I:3, 9–12; and ——, *Physics*, in *GBWW* 8, VIII:1–2.
[65]Empedocles, 5th C. BC, arr. H. Diels, in J. Burnet, trans., *Early Greek Philosophy* (London: Adam and Charles Black, 1948), fragments 57–62.
[66]Aristotle, *Physics*, trans. R. P. Hardie and R. K. Gaye, in *GBWW* 8, II:8.
[67]Michael J. Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: Free Press, 1996).
[68]Richard H. Thornhill and David W. Ussery, "A Classification of Possible Routes of Darwinian Evolution," *Journal of Theoretical Biology* 203 (2000): 111–6.
[69]Richard Dawkins, *The Blind Watchmaker*, 91.

Books Received and Available for Review

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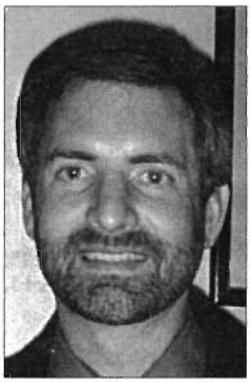
Finding Gould's God



Gould was a professor of zoology and geology at Harvard University, a prolific and influential writer on the subject of evolution, and a devoted disciple and admirer of Charles Darwin.

The scientific community suffered a great loss on May 20, 2002, with the death of Stephen Jay Gould. For anyone interested in evolution and natural history, or in the relationship between science and religion for that matter, the name Stephen Jay Gould is a household word. For twenty-seven years, his monthly columns and numerous books have entertained and informed a vast and appreciative audience. He will be sorely missed. Gould was a professor of zoology and geology at Harvard University, a prolific and influential writer on the subject of evolution, and a devoted disciple and admirer of Charles Darwin, having referred to him on more than one occasion as his hero. He was also a self-proclaimed agnostic.

Brown University biologist Kenneth Miller published a book entitled *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution*. Given Gould's admiration and respect for Charles Darwin, one might ask that if Miller indeed has found Darwin's God (as the title of his book suggests), has he not found Gould's God as well? Perhaps. Let us begin by comparing the religious views of Darwin and Gould, and then, if similarities can be found, consider the integrated view of evolution and theology proffered by Miller and others.

Charles Darwin

Charles Darwin has come to be one of the most controversial scientists in history, which is quite interesting in light of his compassionate and unassuming personality. Far from the poster boy for atheism that many groups have marketed him as, Darwin's life reads as the moving story of an honest and vulnerable human being in a state of perpetual soul searching. It depicts a man slipping from theism, to deism, to agnosticism, a fall driven as much by his scientific ideology as by his inability to reconcile human suffering with a benevolent God.

Darwin entered his adult life as a theist. In 1831, he graduated from Cambridge Divinity School with modest aspirations of life as a country parson. He boarded the H.M.S. Beagle a literal believer in the Genesis account of creation. During this voyage, many of his yet unchallenged scientific and religious beliefs came into question.

While much has been made of Darwin's naturalistic exploits aboard the Beagle, one should not overlook the significance of his more humanistic encounters, particularly the missionary work attempted in Tierra del Fuego. On board the ship were three Fuegians kidnapped by the English during a previous expedition to South America. The young hostages had been brought back to Europe where they were raised in the safe confines of Anglican society. The goal was to return them to their homeland along with a Christian missionary who was to teach the native people the ways of a civilized life. Having befriended one of the "transformed" Fuegians on board, Darwin was shocked by his encounter with the Fuegian people in their native environment. Horrified, too, was the missionary, who in an abrupt shift of priorities, refused to let the Beagle sail off without him. Later the whole experience would affirm Darwin's speculation that humans, too, are the products of an evolutionary process.

Upon returning to England, Darwin began to mull over the stacks of notebooks he had compiled, and his theory of evolution by natural selection slowly took form. His slip from theism to deism stemmed from his own interpretation of the theory and from

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the general scientific climate of the time. Newtonian physics was assumed by many to reflect the craftsmanship of the great "clockmaker" who had built a wonderfully complex universe, wound it up and let it go, never to intervene on its behalf again. One sees a glimpse of Darwin's deistic perspective in the closing paragraph of *The Origin of Species*. Darwin wrote:

> There is grandeur in the this view of life, with its several powers having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved.[1]

Ultimately, however, deism and Christianity would prove unsatisfactory to Darwin, who found its answers to the difficult questions of human suffering too simplistic, if not cruel. In a letter to Asa Gray, Darwin commented on a growing pessimism spawned by his theory:

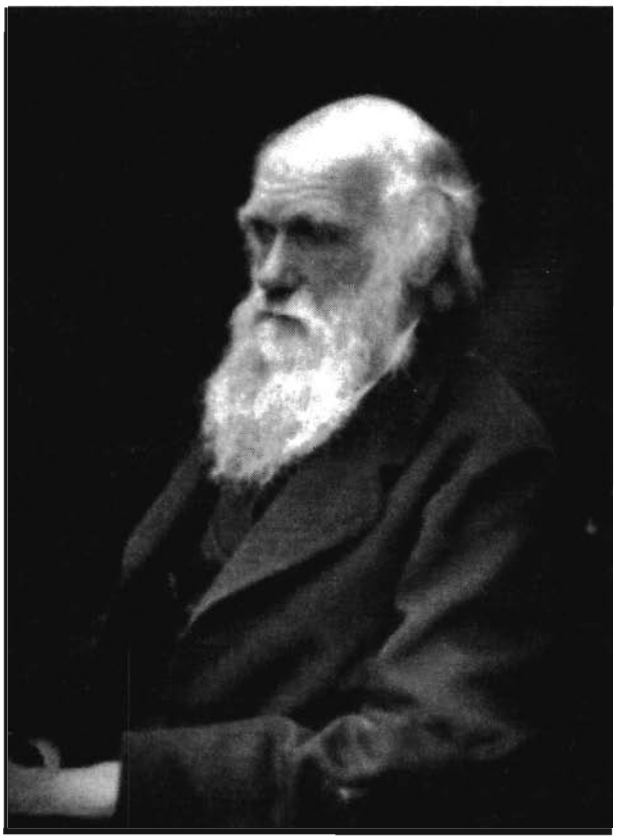
> ... with respect to the theological view of the question. This is always painful to me. I am bewildered. I had no intention to write atheistically. But I own that I cannot see as plainly as others do, and as I should wish to do, evidence of design and beneficence on all sides of us. There seems to me too much misery in the world.[2]

Darwin himself was no stranger to suffering, enduring chronic stomach disorders, migraines, and boils most of his adult life. He felt persistent guilt at the thought of having passed his "wretched" stomach on to his children and was particularly devastated by the premature death of his 10-year-old daughter Annie, an event from which the shreds of Darwin's faith never recovered.

Emma Darwin, a devoutly religious woman, worried about her husband's salvation from the first day of their marriage. She constantly urged him to read the closing section of John 13, where Christ informs the doubting Thomas that he is "the way, the truth, and the life." In one of her many letters to Charles, she implored him to give up his habit of "believing nothing until it is proved." An anguished Darwin responded: "When I am dead, know how many times I have kissed and cried over this."

Late in life, when asked about his religious views, Darwin alleged that the question of God's existence was beyond the comprehension and resolve of the human intellect. Following the precedent and terminology of his friend Thomas Huxley, Darwin confessed:

> In my most extreme fluctuations I have never been an Atheist in the sense of denying the existence of God. I think that generally (& more & more as I grow older), but not always, that an agnostic would be the most correct description of my state of mind.[3]



Charles Darwin

But reading between the lines, one gets the impression that Darwin never truly relinquished a belief in God. He supported tent ministries in his home town up until his death and contributed financially to an Anglican outpost in Tierra Del Fuego; the natives that had once shocked him with their savagery were eventually clothed and converted.[4] Darwin understood the value of religion in society. It was his fear, rather, that a shared belief in a supernatural creator was simply a neurological projection, a "beneficial variation" born of natural selection in the same manner as any other trait that confers an advantage for survival. His faith fell victim to his own theory.

Stephen Jay Gould

It is readily apparent that Stephen Jay Gould shared much in common with his admitted hero and mentor, Charles Darwin. In his book *Rocks of Ages*, Gould openly professes: "I am not a believer. I am an agnostic in the wise sense of T. H. Huxley, who coined the word in identifying such open-minded skepticism as the only rational position because truly, one cannot know."[5] Yet anyone who has read Gould's work knows that religion is a recurring topic woven into many of his essays as analogy, metaphor, and anecdote. In an age in which so many prominent scientists adamantly refuse to mention science and religion in the same breath, Gould was just as likely to use a verse of

Communications

Finding Gould's God

Scripture to help clarify a scientific idea. Indeed, he cites religion as being of extreme interest to him, ranking it only behind evolution, paleontology, and baseball.[6]

Gould is to be admired for his genuine commitment to having pursued truth wherever it led him. His *The Mismeasure of Man* is a fascinating and informative study of scientific racism.[7] He explores how the prevailing cultural attitudes of an empowered group have historically served to bias the scientific study of humans and human intelligence. Despite later accusations of racism, Darwin himself was an avid abolitionist. He said: "If the misery of our poor be caused not by the laws of nature, but by our institutions, great is our sin."[8]

Gould recognized the value of religion in society, and through his agnostic creed, he left a door open for God. But like Darwin before him, he seemed convinced that religion is simply a manifestation of natural selection in a materialistic universe.

Born of Jewish ancestry, Gould certainly must have questioned the amount of suffering in the world, and like Darwin, Gould was not immune himself. Diagnosed with cancer as his career was blossoming, Gould bravely endured chemotherapy treatments, while continuing to teach and meet monthly deadlines for his column in *Natural History*. Gould rarely mentioned his disease, but his essay "The Median Isn't the Message" continues to inspire countless individuals entrenched in their own battles with cancer.[9]

Gould, like Darwin, apparently spent time pondering the plight of the doubting Thomas. In *Rocks of Ages*, he devotes an entire chapter to the disciple in an attempt to convey the fundamental difference between faith and science. He has obvious trouble with Jesus' chastisement of Thomas: "Blessed are they that have *not* seen and yet have believed." Gould retorts: "I cannot think of a statement more foreign to the norms of science."[10]

Still, Gould recognized the value of religion in society, and through his agnostic creed, he left a door open for God. But like Darwin before him, he seemed convinced that religion is simply a manifestation of natural selection in a materialistic universe. It would seem then that materialism lies at the core of the conflict between evolution and theology, which brings us to Miller's book, *Finding Darwin's God*.

Evolution and Theology

Much of the popular debate over evolutionary theory has been waged by opponents at opposite ends of the spectrum, namely by atheistic materialists and by creation scientists. Kenneth Miller falls well within these two extremes. His book presents an ample refutation of creation science and contemporary intelligent design theory, yet, curiously, his book is also an argument for the existence of God. Many of the ideas in Miller's book are not new. Other scientists and theologians who have successfully integrated scientific and religious faith in a similar manner join him.

One key to reconciling evolution with theistic belief lies in the understanding of the word "chance." Continuing Darwin's letter to Asa Gray quoted previously, it reads:

> On the other hand, I cannot anyhow be contended to view this wonderful universe, and especially the nature of man, and to conclude that everything is the result of brute force. I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance. Not that this notion at all satisfies me. I feel most deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton.[11]

Gould notes: "Darwin does not mean chance in the vernacular senses of 'random,' 'without meaning,' or 'incapable of explanation.' By stating the proviso 'what we may call chance,' he implies a view of life for which he had no word, but which historians now call contingency."[12] Yet it is, in fact, this notion of "chance" as manifested in quantum uncertainty and chronological time that allows evolutionary theory to flourish within the context of both Western religion and modern science.

Miller points out: "One hundred and fifty years ago it might have been impossible not to couple Darwin with a grim and pointless determinism. I believe this is why Darwin in his later years tried and failed to find God, at least a God consistent with his theories."[13] Darwinism *would* mean the end of God in a Newtonian world of simple cause and effect

phenomena. But relativity and quantum theory have transcended the Newtonian picture of deterministic particles moving along in space with something much more supple and comprehensive.

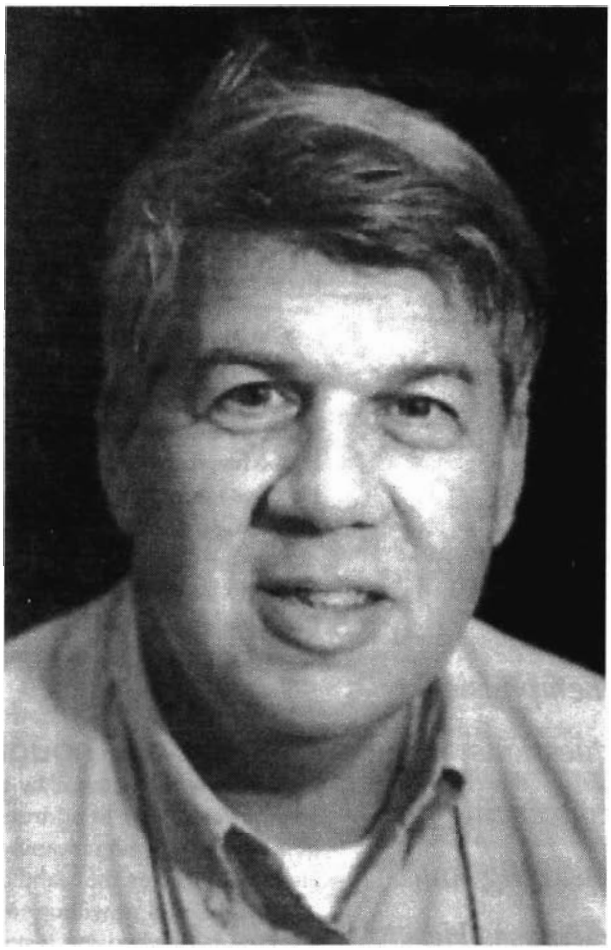
Consider electrons for a moment. They orbit the nuclei of atoms in what are simplistically portrayed as concentric circles. In actuality, the paths must be thought of as probabilistic clouds since both the exact location and momentum of an electron cannot be known at any particular instant. The physicist knows this enigma as Heisenberg's Uncertainty Principle. Ultimately, however, it *is* the positions and momentums of these quantum particles that dictate higher order events from simple chemical reactions to complex weather patterns, to super novas, and everything in between. Such sensitivity to initial conditions is part of what is better known as Chaos theory.

One begins to see that the quantum world is both unpredictable and unmechanical. Yet, when considering even a tiny piece of matter, in which the behaviors of lots of quantum particles must be added together, these variations and uncertainties tend to cancel each other out, producing a highly reliable pattern of overall behavior. This is of utmost importance, because it is this reliable pattern of behavior that allows science to be so fruitful—it is the foundation of materialism. Force, in fact, *is* the product of an object's mass and acceleration. The pressure of a gas *is* inversely proportional to its volume at constant temperature. As early as 1945, Erwin Schrödinger surmised that living things, insofar as being complex aggregates of countless quantum particles, must be of sufficiently large size relative to atoms in order to insulate themselves from atomic-level events. Only then can their physiologies be based on predictable natural laws.[14]

The uncertainty principle tells us that there is specific information about the physical nature of matter that simply cannot be known. This essentially places every piece of matter in the universe under God's *potential* control, or under the control of randomness and chance, depending upon one's world view. It is not a return to the "God of the Gaps" theology, for it is not a principle of scientific ignorance, but of indeterminacy. What ultimately directs the intrinsic unpredictability of chaotic systems is information, not energetic causation.

Addressing Deeper Concerns

Certainly, as Miller notes, quantum mechanics does not *prove* the existence of God. "If it did, we should expect missionaries to win souls by explaining two-slit diffraction experiments and by showing the derivation of Planck's constant."[15] Nor was Gould likely to have hopped quickly on the quantum mechanics bandwagon. Belief in God requires insight into the more difficult questions of human experience. Anyone familiar with the writings of evolu-



Stephen Jay Gould

tionist Richard Dawkins knows that evil and suffering are a significant part of his atheistic argument. Unfortunately, this is where Miller's book falls short. But others have plowed this ground before. Some helpful and spiritually compelling insight has come from Anglican priest and particle physicist John Polkinghorne.[16]

According to Polkinghorne, there are essentially two types of evil in the world: moral evil and physical evil. Moral evil, such as that manifested in the form of concentration camps, theft, and murder, exists because our Creator has bestowed upon us a free will. "We are moral beings, with all the possibilities for immorality that this implies, not perfectly programmed automata."[17] God is not always pleased with our actions, but realizes the consequences of his taking back control over them.

Physical evil, such as a devastating hurricane or a serious illness, is more difficult to rationalize. Surely God has some control over this. Did we not just establish that every quantum particle in the universe is under his *potential* control? Why does he not constantly perform miracles to protect us from the pitfalls of the physical world? The answer is because God is faithful, faithful to the orderly creation he has made. God does not will evil or suffering,

but rather allows it in a world that has been granted the freedom to be *other* than God.[18] Important to Christian theology is a clear distinction between the Creator and the created order. For God to love the world, he must give up some control of it.[19] He does not *have to*, but he does because of love. The logic of love requires the freedom of the beloved.

Christianity, in particular, speaks to the issue of suffering at the deepest level. Unlike other world religions, Christianity tells us that God understands our suffering because he too has suffered and suffers with us now. He does more than simply look down upon us with pity. He stands beside us in our darkness.[20] Only when God is acknowledged to be vulnerable through his love for his creation, does it become possible to speak of the mystery of a suffering God.

Concluding Thoughts

Gould knew that science, by its own design, was not equipped to address metaphysical questions concerning meaning and purpose. He knew this was the realm of religion. But it seems he was unwilling to take a leap of spiritual faith, choosing instead the path of secular humanism. To be honest, I thought that someday Gould would embrace Christianity. His faith had already seemed closer to that of a mustard sapling than a mustard seed. Perhaps he did. I speak only for his writings, not for his heart.

Belief in God is, and will always remain a leap of faith, as it should be. But it is a leap that can be taken with science firmly in hand. Faith does not mean believing the impossible. Rather, it is a motivated belief in that which cannot be known with complete assurance. Indeed, a leap of faith is required of the scientist—a commitment to the metaphysical belief that the world is intelligible and open to our rational exploration. This particular leap, however, is much easier to take. It can be objectively tested and repeatedly affirmed. More important, it does not demand the same level of response. Responding to a belief that atoms are made up of subatomic particles is not a difficult task. Responding to the belief that the universe was created with meaning and purpose by a loving God is something we struggle with on a daily basis.

Certainly Christ struggled. We can only imagine what he must have been experiencing when he put his own fate into the hands of his Father in the garden. If Jesus was fully human as well as fully divine, then a leap of faith was required of him as well. We are the beneficiaries. Let us remember his leap and contemplate our own as we strive to mold our lives after him. ❁

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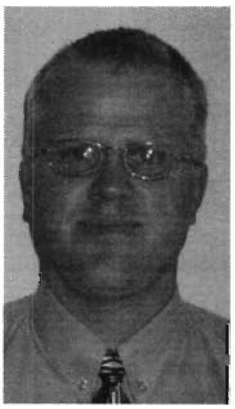
Notes

[1]Charles Darwin, *On the Origin of Species* (London: John Murray, 1859), 459.
[2]F. Darwin, ed., *The Life and Letters of Charles Darwin* (London: Murray, 1888).
[3]A. Desmond and J. Moore, *Darwin: The Life of a Tormented Evolutionist* (New York: Warner, 1992), 636.
[4]Ibid., 574.
[5]S. J. Gould, *Rocks of Ages: Science and Religion in the Fullness of Life* (New York: Ballantine, 1999), 8–9.
[6]Ibid., 9.
[7]S. J. Gould, *The Mismeasure of Man* (New York: W.W. Norton, 1996).
[8]C. Darwin, *Voyage of the Beagle* (New York: Collier, 1839), 502.
[9]S. J. Gould, "The Median Isn't the Message," *Discover* (June 1985).
[10]Gould, *Rocks of Ages*, 16.
[11]F. Darwin, ed., *The Life and Letters of Charles Darwin.*
[12]Gould, *Rocks of Ages*, 198–9.
[13]K. Miller, *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution* (New York: Cliff Street Books, 1999), 289.
[14]E. Schrödinger, *What is Life?* (Cambridge: University Press, 1967), 10.
[15]Miller, *Finding Darwin's God*, 219.
[16]See his books, *Belief in God in an Age of Science* (New Haven, CT: Yale University Press, 1998); *Reason and Reality* (Harrisburg, PA: Trinity Press International, 1991); *One World: The Interaction of Science and Theology* (Princeton, NJ: Princeton University Press, 1986).
[17]J. Polkinghorne, *Quarks, Chaos, and Christianity: Questions to Science and Religion* (New York: Crossroad, 1994), 44.
[18]Ibid., 47.
[19]Ibid., 45.
[20]Ibid., 48.

Transcultural Issues in Science

In this paper, I discuss internationalizing science by sharing from personal experience and introducing the uniqueness of doing science in the developing world. I give examples of how historical, political, and cultural values influence the way science is done in China. I explain some aspects of global research, including the challenge of doing theoretical research in conditions of limited funding. I show why it is important that research be closely tied to application with reference to our work in China. Finally, I introduce ways my faith influences my approach to science.



Shanxi Evergreen Service is an American Non-Governmental Organization (NGO) registered and located in China. Its purpose is to collaborate with organizations and departments in Shanxi Province to establish programs that will meet the needs of the common people. Evergreen has a distinct Christian history in China dating back to the 1920s, and continues to carry on this spirit today.

After working as a high school teacher and laboratory biochemist, I went to China in 1991 with my wife Rene to study Chinese. In 1994, I assumed the role of Medical Programs Officer for Evergreen, which I continued to do until 2000. In that capacity, I worked with a team of Christian MDs from North America to determine the health needs of the local people, to understand the goals of the local health system, and to determine ways we could collaborate to meaningfully meet the needs of the local people. Although I was not trained in health administration, a background in the biological sciences helped me to grasp the goals of our medical doctors, and I had learned from studies in community development how to work with local people to solve problems and meet needs.

Science in China

The way science is done in a country is influenced by historical, political, and cultural factors unique to that country. As much as we might like to think globalization is making for a uniform global culture, cultural differences continue to run very deep.

China has a long history of a strong central government that significantly controls people's lives. Historically, obedience to authorities has been the main value. Even an educator as celebrated as Confucius was known to say: "The common people should be made to follow orders, not to understand them" (Analects 8.9). China does lay claim to some scientific greatness, but it is largely limited to a few inventions, namely, gunpowder, the compass, paper-making, printing, acupuncture, the seismograph, and the production of silk fabric.

The political situation of the last fifty-three years has been in keeping with China's historical method of governance. From the founding of China in 1949, communist ideology came to pervade all of life for Chinese people, including their science. In the 1960s and 70s, medical research was required to be done from a communist viewpoint. Communism was portrayed as a scientific and intellectual system. Eventually the very word *science*, with all the authority it had assumed in the modern world, was taken over and used as a political tool.

The word *science* was even used to legitimize policy. Genetic cleansing (sterilization of criminals, the handicapped, the mentally ill) was carried out in the 1990s in China by arguing that it was a scientific way to improve the quality of the population (even though it was based on faulty scientific

The way science is done in a country is influenced by historical, political, and cultural factors unique to that country.

Mark Strand *(M.S. Cell and Developmental Biology, University of Minnesota) is married to Rene, and they have three children: Bjorn (7), Marit (5), and Anders (3). For nine years in the 1990s, they worked in China with Shanxi Evergreen Service, an American non-government organization. In June 2000, Mark returned to the U.S. and began work toward a Ph.D. in Health and Behavior Science at the University of Colorado, Denver. In March 2003, Mark will return to China to carry out dissertation research, focusing on nutrient deficiencies in infants and children, and will also resume work with Evergreen. He has been a member of the ASA since 1990. His email address is: MARKSTRAND3@aol.com*

Early Career Scientists' Corner

Transcultural Issues in Science

reasoning). Factories boasted of using "scientific management." Many health products were labeled "scientific." Cafeterias were to be managed "scientifically" and beauty salons boasted of being "scientific." These problems have been so pervasive that people have grown suspicious of anything labeled "science," and even science itself. They fear it is not science, but propaganda, whether political or in the marketing of products.

Chinese education has reinforced the standard science-religion warfare rhetoric in order to prop up materialism, which was being offered to them from the works of Marx and Dewey.

Science understood as a process of systematic discovery of the way the world functions has been overwhelmed by these competing uses of the word. Wanting to understand better what Chinese people mean by *science* I began asking people, "What is the opposite of *science*?" The consistent answer I received from my Chinese friends was *superstition*. This made sense of the common response of Chinese people to the question, "What do you believe?" and the answer, "science." Religion is seen as superstition and science is considered to be according to reason. Therefore, religion and science are in opposition.[1]

Chinese education has reinforced the standard science-religion warfare rhetoric in order to prop up materialism, which was being offered to them from the works of Marx and Dewey. In a January 1995 article in a Chinese medical journal, the opening line read: "In the middle ages, the oppressive and sexist theological ideas of the Christians held science cruelly hostage." The article then described how Harvey helped to destroy religious ideas by his medical discoveries. This kind of propaganda makes it difficult for people to publicly identify themselves as Christians. It also makes science appear as a universal acid out to dominate all ways of thinking, not as a discipline or activity carried out by scientists. It is seen not as a process, but a power.

In addition to historical and political factors, cultural factors also influence the way science is understood and carried out. Two aspects of Chinese culture make doing good science in China unique—face or respect (*mian zi*) and connections (*guanxi*). This causes respect for people and relationships to have priority over respect for data or respect for the truth. The good side of this attribute is that within one's own network, relationships are intimate and supportive. For many Westerners, relationships can be quite formal or distant. But because of a concern that somebody might "lose face," scientific research can also be hindered by these cultural values. Research may not proceed freely, but must be checked against how the results of the research will make other people, institutions, or even national policy look. It can only be published if it affords the right people adequate "face," and as long as it does not question the motives or actions of the ruling authorities (in all fairness, these aspects are true, to some extent, of science done anywhere). Another side of this same issue is that if one has the right connections (to the publisher or to the authorities), this affords a distinct advantage in getting published. In few cases is true peer review followed. People are aware of these confounding variables to good science, so many people are suspicious of the validity of published literature.

How can science proceed in such an environment?[2] Chinese people are bright and highly motivated. They want to improve in this area. Policies need to be established and enforced against fraud. This is taking place in China as it seeks to improve its legal system. More global collaboration can also spread good science practices.

These obstacles to science are one reason so many gifted Chinese scholars wish to earn their degrees in the West and remain here to work afterwards. China has a long history of valuing education and learning, and has many very bright individuals. But the current system prioritizes social and political stability above all else. This system keeps people in science from excelling on their own merits and often reduces everyone to a common denominator of mediocrity. In the West, we take for granted the culture of transparency and honesty necessary to sustain science.[3]

If you work overseas, be aware of how history, politics, and culture influence the way science is viewed and carried out. One must resist the temptation to criticize unfamiliar attributes of the host culture. Rather, one must seek to understand how these attributes affect the way science is perceived, both in good and bad ways.

Global Research

Networks of collaboration between Western and Chinese scientists are extensive. Along with globalization on other fronts, interest in global research is growing among Westerners. This climate creates the potential for increased awareness and increased sharing of information and resources toward the common purpose of science, including the solution of shared problems. However, doing research in a developing country, I have become aware of the imbalance that exists in power, knowledge, and resources between the West and most of the developing world. Consequently, as Westerners doing research in developing contexts we need to self-consciously develop and nurture true collaboration with our national colleagues. This is part of Christian humility.

It is essential to take the time necessary to build a research project and research team that is truly representative of what the local collaborators know and value.[4] It is easy to proceed with our agenda and to think it is enough just to keep our collaborators informed—perhaps giving them a copy of the publication or report when it is completed. But this is not enough. Out of respect for them as colleagues and as our hosts, and out of gratitude for the opportunity to do research among their people, I believe we need to allow them to contribute, shape, and ultimately own the research itself. We must be patient enough to bring our national collaborators along at their pace. In this way, we not only get a final research product that is valid and truly reflective of the local situation, we also benefit from the unique contributions of the local scientists.

Our Approach to Research

The work of Evergreen began as a program aimed primarily at clinical care and clinical training. As we saw the need, our team moved into conducting research to guide our work.[5] Though this research is low budget and unsophisticated, it is important to our work. It is conducted to explain an observation or to test the effectiveness of an intervention. For example, in 1999, after three years of work carrying out a rickets prevention program, we surveyed 229 children, analyzing 62 variables. This work was enlightening for all involved, and helped us modify our prevention strategy. Research such as this has been cooperative, and has proven crucial in guiding our work and building mutual understanding with our local colleagues.

We strive to conduct research that has high social validity. Social validity refers to the societal value and practical significance of a research or intervention program.[5] Of course, all research should be grounded in good science, but it is possible that research with high scientific validity and grounded in good science is threatened by low social validity. For example, the research may not reflect the most urgent health problems in the community; or the proposed interventions may be too expensive to be sustainable locally without external funding. A common problem is that an effect can be found under highly controlled circumstances, but without those specific circumstances, the program stands no chance of survival. We hope to do research with high social validity, in locally appropriate ways, with the participation of the local people, and thus increase the capacity of local people to do similar research in the future.

Out of respect for them as colleagues and as our hosts, and out of gratitude for the opportunity to do research among their people, I believe we need to allow them to contribute, shape, and ultimately own the research itself.

As an organization, we occupy a unique position in the research world. Being "on the ground" in a developing country, we have an understanding and an access that few Western researchers have. I hope that in the future I will be able to serve as a link between researchers, research institutes and the frontlines in international health. It would be good if more Christian colleges in North America (or elsewhere) became involved in ministry situations like these. The colleges bring expertise and name recognition to the field, and get a unique opportunity of participating in international research that is a part of building the kingdom of God! The Chalmers Center for Economic Development at Covenant College is an example of a college-based program that links researchers with opportunities in the developing world. They conduct research useful to guide programs in micro-lending and poverty elimination.

Personal Ambitions

I admire some of the earliest scientists. In addition to their personal professions (farming, ministry, medicine, etc.), they satisfied their curiosity by doing science experiments and research in their free time. Sundays were devoted to Christian nurture and fellowship, and the study of theology. They conscientiously wrote down thoughts and observations on topics such as science, natural history, ecology, humanity and Christian faith. They enjoyed rich and stimulating lives. I would like to aspire to their level of professional and spiritual fruitfulness.

Early Career Scientists' Corner

Transcultural Issues in Science

I hope that ASA members will continue to expand their influence through research and teaching collaborations around the world. Such efforts undoubtedly will strengthen us as individuals and as an organization, and hopefully will allow us to be a blessing to the world.

Upon completion of my dissertation, I will resume my previous role in China. Working with a team of seven other Westerners who are committed to work in China long-term, I want to expand the scope of our programs and increase the number of beneficiaries for each program. I also desire to better train national colleagues to build and manage these programs. I hope to conduct simple, high quality research that helps us to determine what needs to be done and how best to do it. This research will be applied in nature and, I hope, lead to the improvement of existing programs or the establishment of new ones. Furthermore, as a Christian service organization, we desire to be a blessing to the Chinese church as we do it.

I hope many of my readers will have the opportunity to be involved in teaching or research in another country. An opportunity like this can be refreshing and enlightening. We have so much to learn from the many wonderful cultures and people around the world. If you do have this opportunity, remember to consider what science means in the historical, political, and cultural context of the country to which you go.

Conclusion

Politics, history, and culture inform the way science is perceived and carried out. It is important that we take these contextual variables into account when considering how science is to be done in a given country. Surely we can benefit by learning from people of another cultural setting. Likewise, there are contributions Westerners can make in the developing world. I hope that ASA members will continue to expand their influence through research and teaching collaborations around the world. Such efforts undoubtedly will strengthen us as individuals and as an organization, and hopefully will allow us to be a blessing to the world.

In this paper, I have tried to extend discussion within the ASA around the topic of "Internationalizing Science" by sharing from my personal experience. I thank God for giving me work in China that is a fascinating blend of service, ministry, and applied science. For those interested, many similar opportunities await you as well. ❁

Notes

[1]Interestingly, some Chinese people consider Christianity to be a religion of reason, rooted in history, and engaging of the human mind. This is in contrast to Buddhism and Daoism that are mystical and ahistorical. The "religion is superstition" rhetoric may come from years of political indoctrination along these lines, for historically Chinese people have been very religious, if in an eclectic and syncretistic way.

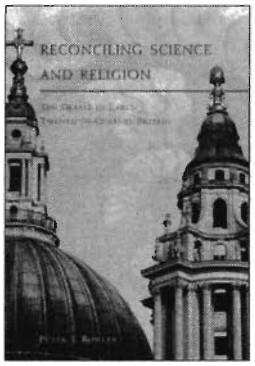
[2]Japan shares these cultural values in large measure, but science in Japan has been very successful and is very advanced. A good legal system helps to control the negative consequences of these values, and enhance the positive results of these values, e.g., respect for others, and loyalty to people and to employers.

[3]Is it possible that modern relativism in the West threatens to undercut the precious foundation upon which our success in science has been built?

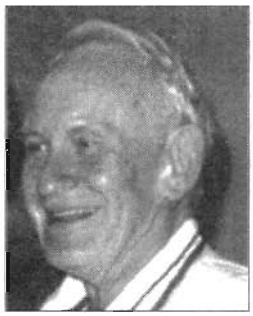
[4]A. Costello and A. Zumla, "Moving to Research Partnerships in Developing Countries," *British Medical Journal* 321 (2000): 827–9; and C. Sitthi-amorn and R. Somrongthong, "Strengthening Health Research Capacity in Developing Countries: A Critical Element for Achieving Health Equity," *British Medical Journal* 321 (2000): 813–7.

[5]E. S. Geller, "Where's the Validity in Social Validity?" *Journal of Applied Behavioral Analysis* 224 (1991): 189–204; R. A. Winett, J. F. Moore, et al., "Extending the Concept of Social Validity: Behavior Analysis for Disease Prevention and Health Promotion," *Journal of Applied Behavioral Analysis* 24 (1991): 215–30; and D. Stokols, "Translating Social Ecological Theory into Guidelines for Community Health Promotion," *American Journal of Health Promotion* 10, no. 4 (1996): 282–98.

[6]This involved research in areas such as children's nutrition, hypertension, education methods, participatory learning, seeds and soils, and poverty elimination. Feel free to contact the author if you are interested in any of these areas.



Deconstructing the Story of Early-Twentieth-Century British Views on Science and Religion



Peter J. Bowler, *Reconciling Science and Religion: The Debate in Early-Twentieth-Century Britain* (Chicago and London: University of Chicago Press, 2001). 479 pages, biographical index, bibliography, index. Hardcover; $40.00. ISBN: 0226068587.

The conventional account of the status of British science and religion in the early part of the last century assumes that the conflicts of the Victorian period were largely resolved by 1900. It holds that an erosion of interest in religion and a tacit agreement that peace had been assured had turned the interests of scientists and theologians to other matters—unlike the USA where the confrontation between fundamentalists and evolution evoked highly sensational outbursts during this period.

Belfast University historian of science Peter Bowler has turned from his studies of Victorian and early-twentieth-century biology to examine the science-religion literature of this period. Rather than peaceful somnolence, he has uncovered evidence of a "lively discussion" and constructs a more detailed (and more inclusive) picture than previously has been drawn.

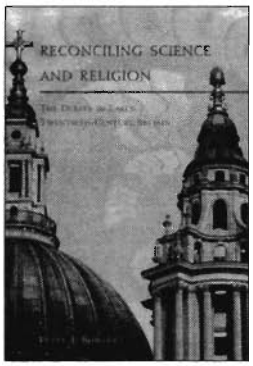
A body of intellectually conservative scientists, liberal religious thinkers, and popular writers sought to convince the reading public that science had turned its back on materialism while religion had become more open to the kinds of changes that were consistent with the new understanding of nature. This attempted reconciliation was promoted most actively in the 1920s, but it fell apart in the course of the 1930s. Many conservative Christians, both Catholic and evangelical, reacted with suspicion to the claim that their faith could be adapted to the idea that human beings were the product of a natural process, even when that process was portrayed as the unfolding of a divine plan. It was the resurgence of this more conservative attitude that did most to undermine this reconciliation in the late 1930s (p. 3).

For Bowler:

> The tensions of the Victorian era have thus been sustained throughout the twentieth century, each episode of challenge being followed by one of attempted reconciliation. These episodes seem to reflect the fluctuating balance of power between secularizing and traditional forces within our society, and if this is so, we can surely learn something of value from the debate—if only the futility of expecting the underlying issues ever to be resolved (pp. 4–5).
>
> The argument developed in this book depends on the point [that] the reconciliation proposed between nonmaterialistic science and liberal Christianity was based on a continued belief in progress and in the purposefulness of the material universe. It was taken seriously only because a large proportion of the educated public—to say nothing of the scientists and the Modernist clergy—still hoped for progress. Curiously, the literary elite paralleled the more traditional Christian thinkers, both evangelical and Catholic, in rejecting this faith, although for very different reasons (p. 23).

Rather than peaceful somnolence, [Bowler] has uncovered evidence of a "lively discussion" and constructs a more detailed (and more inclusive) picture than previously has been drawn.

John W. Haas, Jr. *served as Professor of Chemistry at Gordon College from 1961–1995. Following ten years as editor of* PSCF, *he became editor of the ASA web site. A physical chemist with research interests in electrochemistry and carbohydrate reaction mechanisms he was inspired to work on historical aspects of science and Christianity at a 1987 seminar led by Ronald Numbers and David Lindberg. His publications in this area include studies of the response to science of British Methodists from the eighteenth to the early twentieth century. He is elder, organist, web page editor, and Sunday school teacher at First Presbyterian Church, Ipswich, MA.*



Essay Review

Deconstructing the Story of Early-Twentieth-Century British Views on Science and Religion

The twentieth century has seen the professionalization of scientists and clergy and the emergence of journalism and popular writing as professions. The result has been a sharp reduction in the polymaths of the past able to expound on both science and religion with equal understanding. Bowler takes a broad view of religion—including views from liberals and conservatives in the Church of England and free churches of many stripes.

Bowler takes a broad view of religion—including views from liberals and conservatives in the Church of England and free churches of many stripes.

The Victorian era was crucial for the debates that extended into the twentieth-century confrontations among advocates of materialism, idealism, various shades of biblical religion, spiritualism, and occult religions such as Theosophy. The one constant was an ever-changing scientific landscape that was used for different purposes by participants in the discussion.

Bowler frames his book in three sections dealing successively with the scientists, theologians and clergy, and leaders of public discussion. This allows the figures in each division to attack the same issues from a particular perspective, although there was wide variation in viewpoint within each perspective. His account is littered with names great and small; particular individuals rose to the top because of professional prominence or voluminous literary output. A "Selected Biography" provides sixty short sketches of the more notable participants of the 285 names listed in the index.

The Sciences and Religion

The latter part of the nineteenth century saw a reaction against the scientific naturalism espoused by T. H. Huxley and John Tyndall by scientists who sought ways to accommodate natural knowledge with their religious beliefs. Sorting out the landscape is made difficult by the reticence of some to reveal their views in public (J. J. Thompson, Lord Rayleigh) and by the religious diversity represented—ranging from evangelicals and conventional Anglicans to those with vague individualized beliefs who seldom darkened a church door. What Bowler dubs the "new Modernism" diminished the place of Christ to a moral teacher and ransacked the Bible for scientifically acceptable beliefs. W. H. Bragg saw the scientific quest for understanding and the religious search for faith as similar. Religion was no longer simply a collection of dogmas. Now it could "borrow from science a method ... that would transform it to a flexible and progressive view of the purpose of human life" (p. 52).

Scientists with roots in the nineteenth century included Robert Bloom, J. S. Haldane, Oliver Lodge, Conway Lloyd Morgan, E. W. McBride, William McDougal, and J. Arthur Thompson. Figures prominent in the 30s and beyond included Julian Huxley, Richard Gregory, J. D. Bernal, Charles Raven, R. A. Fisher, Arthur S. Eddington and James Jeans. Biochemist Anglican Joseph Needham called himself "an honourary Taoist"; he was committed to both free thought and Marxism. In this later period, some younger scientists scoffed at the dated science of some of the older group (Thompson and Haldane) as those "whose watches stopped forty years ago" (p. 28). Others were suspect because of their participation in the spiritualism craze of the day (Oliver Lodge, William Crookes).

Eddington saw the new physics of quantum mechanics and relativity as supporting the possibility of God. Evangelical Victoria Institute leader J. Ambrose Flemming made an extended attack on evolution. Presbyterian paleontologist Robert Bloom believed that "evolution unfolded in accordance with a divine plan" (p. 37).

Some surveys seemed to argue that most scientists were sympathetic to religion. In one case, the question: "Is belief in evolution compatible with belief in a Creator?" drew 142 positive responses out of 147 votes cast.

Many scientists believed in a creator God able in some ways to interact with the universe but were not willing to accept the need for *regeneration*—moral theists but not Christians. Many Gifford lecturers held this position using a national platform from which to promote the values of science for *modern* religion. The venerable Darwinist Alfred Russell Wallace, J. Arthur Thomson, C. Lloyd Morgan, and E. W. McBride were among those who opposed materialism and sought to link some sort of spiritual progress with evolution. For some, the new physics of the 1920s brought new hope for the argument from design. Yet "the wave of enthusiasm for Jeans's and Eddington's books were the last major boost that the proposed reconciliation between science and

religion would receive. Few other contemporary physicists took up the theme, and there were no younger biologists following in the footsteps of Haldane, Thompson, and Morgan" (p. 50).

During this period, the rigid certainty of science became tempered by a more flexible scientific model that recognized the role of the *observer* in making judgments about data. A more "provisional" science was not that far from the notion of a more "flexible" religion. William Bragg's 1941 Riddell Memorial lecture married the two.

> Bragg ... presented Christianity as an experimental religion that was also willing to learn from experience, with dogma now being treated in the same way as scientific hypothesis. The demands for the absolute acceptance of definite items of faith were no longer acceptable (p. 52).

This line had nothing to offer the (mostly silent) evangelicals or the new generation of indifferent scientists whom, finding religion irrelevant, kept their focus on the lab, avoiding the broader implications of their work.

Psychic research, spiritualism, and interest in the occult were popular at the dawn of the twentieth century—and along with religion, each represented a metaphysical domain open to attack by materialists. Staunch materialists in the Tyndall/Huxley mold like E. Ray Lankester, Karl Pearson, and J. D. Bernal railed against any traditional idea of God and the pseudo-science of natural theology and metaphysics. Others, like Julian Huxley, sought to redirect the purpose of religion. "God was, in effect, humanity's conception of the universe as a whole and our sense of involvement in that whole" (p. 71).

Many late-nineteenth-century physicists (J. Clerk Maxwell, Lord Rayleigh, and J. J. Thomson) were deeply religious. Some were influenced by the then fashionable theory of the "ether." Oliver Lodge's linking of an ethereal universe with the human spirit offered a convincing counter to materialism in the early twentieth century.

> There was a complex relationship among science, religion, and ideas about the paranormal within the [ether physics] group. Rayleigh and Thompson seldom spoke on religious matter in public, but their religion almost certainly upheld their faith in the reality of the ether, and there seems little reason to deny that this vision of nature helped to shape their very real scientific discoveries. It is paradoxical that Thompson should discover what became known as the electron, thereby doing much to precipitate the revolution that would destroy the paradigm within which he worked (p. 89).

The rise of relativity theory destroyed the notion that the "ether [was] credible as a basis for a belief in a parallel 'spiritual' world existing on a material plane higher than that of everyday matter" (p. 101). The new quantum world, dependent on the observer, left the idea of a unified cosmos in disarray. James Jeans, however, found unity in the mathematical relationships of quantum mechanics. Scientists became philosophers to the disgust of their peers and the professionals. Vicars flocked to the new ideas—not recognizing that "the new idealism did not merely introduce spirit into the material world—it replaced the material world with a purely mental universe" (p. 113).

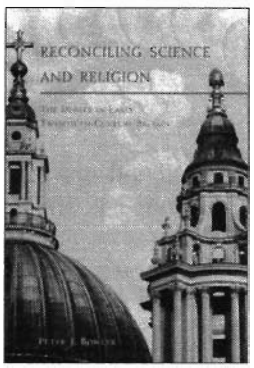
Evolution

Public understanding of the wider implication of evolution had fluctuated since Darwin's cohorts sought to base life in a purposeless materialism of chemistry and physics. As the nineteenth century closed, the mood had shifted to a new natural theology where evolution was nothing more than the "unfolding of a divine plan" (p. 123). Oliver Lodge, Henri Bergson, Julian Huxley, Robert Broom, and R. A. Fisher were among those who saw humanity as the ultimate purpose—even as E. Ray Lankester and other old-line Darwinians fought this new line. Most early evolutionists were *not* Darwinists in the sense that they did not accept natural selection as the operative mechanism. Many years later, a new generation of scientists won the day for the Darwinian synthesis aided by the new genetics.

Bowler identifies a "small but vociferous antievolution movement [that] ... emerged in the 1920s, paralleling the far more active crusade in America" (p. 124). British scientists, for the most part, shook their heads at the Scopes trial and the influence of a literal view of Scripture. Others wondered if the ordinary British citizens were any more convinced of evolution than their American counterparts.

Sir Ambrose Fleming, an Anglican evangelical, spoke out against many aspects of evolution in his role as president of the Victoria Society. A major 1935 anti-evolutionist rally at Essex Hall in London led to the founding of the Evolution Protest Movement. Other scientist supporters included ornithologist Douglas Dewar and paleontologist A. Morley Davis (*Evolution and Its Modern Critics*, 1937). Catholic anti-evolutionists included anatomist Sir Bertram Windle (*The Evolutionary Problem as It Is Today*, 1927). Windle found no actual proof of evolution and denied the possibility of the natural origin of the human soul yet felt that a believer could view "organic transformations as God's method of creation" (p. 129).

The pre-Darwin Lamarckian theory of the inheritance of acquired characters was long associated with the claim that evolution was a *purposeful* process directed by the *mental powers* of animals. This kept design in the picture. The new science of genetics, however, stood the argument from design upon its head by insisting that change *is* directed by *environmental stress*. Some scientists fought a rear-guard action by incorporating vague holistic and organismic concepts prompted by the exercise of mind that could not be completely excluded from a hereditary



Essay Review

Deconstructing the Story of Early-Twentieth-Century British Views on Science and Religion

[Bowler] provides a convincing case for the strong engagement of scientists in the public debates on science and religion in the first half of the twentieth century. Evangelicals were little represented.

impulse. A mixed bag of scientists employed scientific experiments and logic to argue against the notion that the "regulating and directing powers of life could arise from the chance encounters of atoms" (p. 144). Later the genetic theory of natural selection would gain the day.

In the chapter "Matter, Life, and Mind," Bowler deftly draws together the mix of conflicting ideas that get to the heart of the British evolution debate. The historical path and mechanisms of evolution embodied in a materialist world view were pitted against views which saw "life and mind as active agents, capable of taking decisions and actions that had a real effect on the world ... actions [transcending] the laws of chemistry and physics and were thus in some sense free" (p. 160). Religious thinkers offered various strategies to ground God's actions in this innovative behavior. Vitalism was revived.

> The various [specialized] areas of science came at these problems with different expectations and prejudices, but their claims were likely to be taken up by outsiders wanting to see a message coming from science as a whole. Such outsiders were equally likely to seize upon the writings of a particular group of scientists whose work appealed to them and hail their views as indications of a new direction of thought, even though the majority of scientists in the same or related fields were indifferent or even hostile to those views (p. 161).

The stakes were high for Christians and rationalists—either the world was created and is sustained by a God who "offers a transcendental source of values and belief" or it randomly emerged "as an essentially amoral and purposeless system" (p. 162). Bowler provides a wealth of detail on the ways that representatives of the polarities and those in-between went about handling the "the origin of life," "vitalism and organicism," and "mind and body." He provides a convincing case for the strong engagement of scientists in the public debates on science and religion in the first half of the twentieth century. Evangelicals were little represented.

The Churches and Science

Outsider Bowler bravely tackles the place of Christianity in British life.

> The involvement of the churches in the debate over the implications of science has to be understood in light of the threat of declining membership and the disagreements within the religious community over how best to present their case to an increasingly indifferent public. The Modernists, who were anxious to forge a new theology purged of ancient dogmas, thought that the only way forward was to make Christianity compatible with science and other aspects of modern thought—even if this meant abandoning what most traditionalists saw as the essential foundations of their religion ... traditionalists, whether Catholic or evangelical, felt that there was no point in preserving a church that was no longer truly Christian. If faith in science and progress had obscured the awareness of sin and the need for redemption, then it was the Church's duty to keep the ancient flag flying and rally what few converts it could to the cause ... The failure of modern science and thought to solve humanity's problems would become apparent. And the need for redemption might again become obvious to all. Both of these approaches were expounded with enthusiasm, but neither was ultimately successful" (pp. 192–3).

Orthodox Christians had long struggled with the implications of the biblical higher criticism for the creation accounts, "Mosaic geology," and miracles. The evangelical faithful decried the compromise that pulled them from a literal account of the "inerrant" Word of God or to abandon the traditional view of the Fall and need for redemption. Their clergy seemed more inclined to accept allegorical treatments of Scripture than the constituents.

> Evangelicals in both the Anglican and the Free Churches faced this dilemma when confronting the new science and the new biblical scholarship, and as in America, it was from the evangelicals that the antievolution movement was drawn ... on the defensive during the early decades of the century, evangelicalism in both the Anglican and the Free Churches revived in the 1930s as

> the optimism that sustained more liberal interpretations of Christianity faded (p. 208).

Disunity among and within all churches—Modernist and conservative, Catholic and Protestant, Anglicans and Nonconformists—was a distraction for those seeking to cope with science. Bowler offers much detail on the many attempts by clerics to fashion a synthesis. He provides overviews of denominational movements and details of prominent spokesman within these communions. Dean W. R. Inge, Rev. J. M. Thompson, Hastings Rashdall, Bishop E. W. Barnes, Rev. F. R. Tennant, Rev. R. J. Campbell, J. Y. Simpson, Rev. E. Griffith-Jones, Rev. J. Warschauer, Rev. John Oman, J. H. Morrison, Rev. B. H. Streeter, Archbishop Charles D'Arcy of the Church of Ireland, and Rev. Charles Raven (an anti-Darwinian with a preference for the Lamarckian view of evolution) represent attempts of Modernists to reconcile religion and science.

Bowler concludes:

> Driven by an increasingly [1930s] harsh economic and political situation, the churches turned away from liberalism and Modernism, stressing once again humanities innate sinfulness and need for redemption ... Modernism was eliminated from the Anglican Communion, and along with it, the only party that was seriously interested in making the changes to the faith that would have made it more credible to the majority of contemporary scientists (p. 286).

The 1930s saw the rise of Karl Barth's neo-orthodoxy—a system that rejected natural theology and downplayed science in general. One development of interest to ASA readers was the emergence of a group of Christian intellectuals—C. S. Lewis, T. S. Elliot, J. R. R. Tolkei—whose popular writings attracted many. Lewis adopted Barth's antiscientism and downplayed the notion of reconciliation with Christianity.

A further complication for reconciliation came from developments in psychology. Initially seen as a friend, by the 1930s, it would be seen as a threat to the survival of Christianity. An earlier psychology had maintained the importance of free will and moral awareness. The new theories of behaviorism and Freudian analytical psychology were based on inductive methods and were essentially determinist—in conflict with the Christian view of human nature. Curiously, "the new psychology [was] denounced more in the press than in the pulpit ... the effect of psychology on the value of religious experience was less in Britain than in America because, outside Nonconformist circles, the churches stressed the ethical message of religion rather than its emotional impact" (p. 310).

Bowler notes that opposition to evolution was less strident among British evangelicals than with their American counterparts. James Orr, Charles H. Vine, P. T. Forsyth, and Albert Goodrich characterized those who may have been sympathetic to a form powered by God but spoke out against a reconciliation that excluded major themes of Scripture. Others took up the torch against evolution on the grounds of an insufficient mechanism or as the source of such evils as "feminism, socialism, pacifism, and unnecessary surgical operations to remove organs deemed no longer useful to humans" (p. 294). Bernard Acworth (1929) "promoted a catastrophist geology that undermined the monotonous chant of evolutionary fanatics who demand periods varying from one hundred thousand to one thousand million years for the working out of their mutually destructive theories" (p. 294).

The *Journal of the Transactions of the Victoria Institute,* the *Evangelical Quarterly,* the *Baptist Times,* and the Evolution Protest Movement all contributed to what Bowler calls "a minor resurgence of popular doubts about evolution" (p. 295). Bowler argues that few evangelicals insisted on a thorough, literal reading of Scripture; most were more concerned with the loss of freedom of the will, a concern for salvation, and the "need for a return to the old Christian principles" (p. 296).

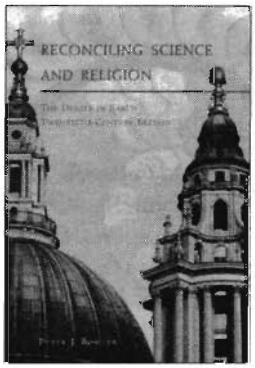
Anglo-Catholics Charles Gore and William Temple resisted anything more than a superficial dose of evolution. As with the evangelicals, the major objection was to *modernist* theology. Loss of the miraculous creation of humanity, Christ's divine nature, his miracles, the Eucharist, and a pervasive naturalism were insurmountable barriers.

Roman Catholics, though small in numbers, had a disportionate influence in British intellectual life. C. G. Chesterton, Hillarie Bullock, W. E. Orchard, Martin D'Arcy, C. W. O'Hara, and Henri de Dorlodot offered influential responses to the new physics and evolution. In 1909, the Pontifical Biblical Commission removed the necessity of reading the Genesis creation account literally. Bowler notes:

> Like the Anglo-Catholics ... the Roman Church could go some way with the new natural theology's effort to found a nonmaterialistic view of nature, provided always that certain clear boundaries were marked around the territory in which the idea of creation by law can be applied could be applied. In the heat of debate, though, it is difficult to be sure whether popularizers such as Belloc believed in evolution at all, and there is no doubt that many Catholics remained opposed to the theory in even its most non-Darwinian forms (p. 322).

For Bowler:

> It was Belloc and Chesterton, far more than the Evolution Protest Movement, who sustained the popular myth that Darwinism was dead even with science ... their views paralleled those of Gore and the Anglo-Catholics, but they were articulated in a far more popular format (p. 327).



Essay Review

Deconstructing the Story of Early-Twentieth-Century British Views on Science and Religion

Bowler argues that few evangelicals insisted on a thorough, literal reading of Scripture; most were more concerned with the loss of freedom of the will, a concern for salvation, and the "need for a return to the old Christian principles" (p. 296).

The 1930s "marked a final departure from the optimistic liberalism of the late nineteenth century, which had been prolonged by the attempted synthesis of religion and anti-mechanistic science" (p. 317). The depression and the brutality in Russia, Germany, and Italy signaled the moral failures of industrial capitalism and Marxism. A return to religious faith by many intellectuals was accompanied by indifference to, if not an active suspicion of, a synthesis of Christianity and science. The theologies of Reinhold Neibuhr and Karl Barth fueled the new orthodoxy leading to controversy with advocates of Modernism such as Charles Raven, who saw the Student Christian Movement turn back toward orthodoxy.

The new orthodoxy produced converts who had the skills to reach a wide audience in Britain (and America)—C. S. Lewis and Dorothy L. Sayers among them. Lewis' writings often maintained a dim view of science with a particular dislike of evolution. At the same time, an aging Raven became isolated from both students and scientists at Cambridge because of his advocacy of the old liberalism and lack of understanding of modern biology.

The Wider Debate

Participants in the science-religion discussion as far back as Huxley realized the need (and profit) in sending their message to a wider audience than upper-class intellectuals. Newspapers, books, magazines, and radio brought the debates to the masses. Bowler reminds us that social class provided wide differences in cultural values and interests. Idealism might still be found in the churches and the popular literature even if "banished from Bloomsbury and Oxbridge" (p. 335).

Bowler laments the

> difficulty of defining the culture of a [1930s] generation divided by class and other loyalties, let alone changes from one generation to another ... The same decade saw a reinvigoration of concern for social democracy and the rise of the Marxist alternative to Fascism. Meliorism still fought in its own corner, and for the Marxists it took on the messianic overtones once characteristic of religion. The rise of Christian orthodoxy was also real enough—but was only one facet of a complex response to ever more stressful national and international problems (pp. 335–6).

"Salvationist ideology" (the conviction that we can only be saved by appealing to a force outside this world) became a staple as one response to the national problem brought on by depression and an impending war. Jeans and Eddington sold well. Yet, attacks on religion and controversial sermons on evolution would be fodder for the mass media. Bertrand Russell's "Why I Am Not a Christian" was aimed at a general audience. Logical positivist A. J. Ayer joined the popular assault on religion.

A giant in this period, H. G. Wells (a student of T. H. Huxley in 1884–1885) was hostile to organized religion. He advocated a materialistic biology and science as a vital component in the transformation of society—one controlled by an educated elite. Popular through his early science fiction, his later writings included *The Shape of Things to Come* (filmed in 1933), which offered various images of science and technology, notably a space gun able to send people to the moon. His monumental *Outline of History* popularized an out-of-date version of Darwinism, which became a norm for the readers of its many editions.

Hilarie Belloc, G. K. Chesterton, and C. S. Lewis were able popular exponents for the Christian faith. Other writers were content to offer a generalized theism or a truncated theology—even creative evolutionism as an alternative religion (G. B. Shaw). Oxford chaplain Ronald Knox was an effective debunker of those who embraced spiritualism and the new materialism. Bowler's analysis of Lewis rightly places his critique of the modernizing spirit. He writes:

> The idea of progress is a force for evil, hence the encouragement we have given to all these schemes of thought such as Creative Evolution, Scientific Humanism, or Communism, which fix men's affections on the Future, on the very core of temporality ... The danger was not science itself, but the priests of science who were trying to turn an honorable but limited institution into the basis for a new civilization" (p. 399).

Evangelicals six decades later face the struggles of their grandparents in fashioning a world view that that gave due weight to nature and Scripture. R. E. D. Clark's *The Universe and God* (1939) argued that human life could only derive from a designing power, in light of what he saw as the inadequacy of models of spontaneous generation and the failures of natural selection.

The discussion of science and Christianity received new force in the post-war world. Advocates for a secular foundation for morality and knowledge were vigorously countered by Christian thinkers who proclaimed orthodoxy and a return to natural theology. E. A. Milne's *Modern Cosmology and the Christian Idea of God* (1950) expanded Eddington's vision that the latest science could support a religious perspective. David Lack's *Evolutionary Theory and Christian Belief: The Unresolved Conflict* (1957) reflected the problems in maintaining design in a Darwinian world. Michael Polanyi's picture of the involvement of the observer in the creation of knowledge and the significance of unproven traditional (religious) beliefs in the foundations of all knowledge systems *(Personal Knowledge,* 1958) influenced many evangelicals.

Bowler argues the polymath Charles A. Coulson provided the most successful attempt to provide a reconciliation of science and Christianity (p. 415). His approach was methodological—one that saw each discipline providing different (but complementary) ways of gaining knowledge. An influential work with evangelicals, it sparked a discussion that marked the last half of the century.

Bowler cannot resist the temptation to draw lessons from an earlier day for today's discussion. Not unexpectedly, he finds the fields of cosmology and physics most compatible with the idea of a creator. Biology and psychology offer greater difficulty especially as one looks more closely at the details. Orthodox Christians challenged those theologies that combine a minimal theism with an evolutionary driving force. Then, as today, the discussion was influenced by cultural attitudes toward science and religion as well as the spirit of the times. Finally, Bowler is concerned with the lack of awareness on all sides of the current state of knowledge in the scientific fields that they discuss. One is tempted to say the same about theology, history, and other disciplines.

Observations

Oliver R. Barclay's *Whatever Happened to the Jesus Lane Lot* (1977) covers the story of the Cambridge Inter-Collegiate Christian Union (CICCU) during a parallel period. In describing the struggles (and triumphs) of evangelical students seeking to maintain a consistent witness in a time of aposticity and "multi-lateral theology," Barclay notes "that the baiting of CICCU men with problems about evolution, Jonah and the Flood became an entertaining pastime for many Cambridge friends" (p. 87). He provides an inside perspective of the struggles of a faithful remnant that would begin to build strength in the 1930s. Significantly, there was little interest in areas beyond evangelism, Bible study, and fellowship. Chemist R. E. D. Clark and others led a struggling apologetics discussion group in the 1930s that drew little attention from the CICCU leadership (p. 105).

There is much for the evangelical to ponder in Bowler's portrayal. It illustrates the poverty of nonbiblical religion—something that observers of the current scene might conclude from the burst of multi-cultural science-religion activity. It also illustrates the poverty of an evangelicalism that restricts its world to evangelism, worship, and living a holy life—by limiting the mind. We must respond to the challenge to build world views that reflect the state of Christianity and scientific understanding today.

Bowler has done a masterful job in opening up the multifaceted arena of British science and religion in the first half of the twentieth century. His balanced interweaving of *little pictures* within the framework of the *big picture* provides a standard on which others may build. An American counterpart would be welcome.

The addition of a biographical appendix, bibliography, and general index are valuable aids in following a story with many characters. Perhaps the greatest difficulty for this reader is that some characters reappear so regularly that one is hard put to get the chronology straight. The problem with dividing the pie into three parts is that some of the actors have a place in each—leading to some repetition. Should Whitehead and Teilhard de Chardin, or any number of other figures receive more or less attention? One missing link for this reader was the evangelical church leadership of the day—J. Campbell Morgan, Martin Lloyd Jones, F. F. Bruce, among others. Surely they had something to say about the themes of this book.

I heartily endorse *Reconciling Science and Religion* for the clarity of its telling and the evenhanded analysis drawn by Bowler. He closes with a pertinent comment:

> In biology especially, the writings of those who argued for a renewed dialogue between science and religion created a misleading impression that left most ordinary readers with an unrealistic expectation of what was to emerge from current research. The growing power of the popular press and mass-market publishing created an opportunity for particular interest groups to manipulate what was presented to the public. Whatever its significance for the debate over science and religion, this is a point that needs to be born in mind by anyone concerned with the way in which science is popularized and discussed today (p. 420). ❁

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Book Reviews

ENVIRONMENT

FOR THE BEAUTY OF THE EARTH: A Christian Vision for Creation Care by Steven Bouma-Prediger. Grand Rapids, MI: Baker Academic, 2001. 234 pages. Paperback; $21.99. ISBN: 0801022983.

This book is a worthy addition to the growing body of writings on ecology and Christian faith by evangelical advocates of creation care. Bouma-Prediger (Hope College) presents a well-organized, readable and passionate argument for evangelical action.

In chapter 1, the author brings alive in vibrant prose the experience of a jungle (Belize), a mountain highland (the Sierras), and a lake region (the Quetico-Superior Wilderness). With this sense of the world's beauty evoked, he moves on in chapter 2 to help the reader hear "the groaning of creation": rapid human population growth and its attendants—widespread hunger; declining biodiversity; habitat, land, and water degradation; fossil fuel consumption with acid rain and global warming—all illustrated briefly but with disturbing data.

Chapter 3 explores the oft-made accusation that Christianity is responsible for this crisis. While Bouma-Prediger questions "the cogency of the complaint," he agrees with Wesley Grandberg-Michaelson that the Western Church is a complicit actor: (1) captive to Western culture, (2) it has accepted the anthropocentrism of modernity (3) and the Western divinization of technology, (4) has forgotten the doctrine of creation, and (5) has been "theologically arrogant ... and condescending of non-Western Christian traditions" (pp. 80–3). Scientific and economic materialism have greatly contributed to this crisis.

Yet, with the Church lies hope for changing Christian and cultural attitudes, and Bouma-Prediger approvingly cites eco-theologian Thomas Berry's admonition that Christians take another look at the Bible. The author does so in chapter 4 with a series of truly fine exegeses of critical passages, identifying themes that undergird a theology of creation care: that the creation is God's and is good (Gen. 1), that God made a covenant with *all* of creation (Gen. 9), that our human understanding of creation is limited, for we do not have God's eye-view (Job 38–41), that Christ holds *all* of creation together (Col. 1:15–20), and that God's good future includes a recreation of heaven and earth (Rev. 21–22). In the chapter following, he offers a theology and an ethic of care for the creation rooted in central foci of evangelical faith: a theocentric vision; the doctrine of the Trinity, the power and presence of the Holy Spirit, humans as Image-Bearers, sin and salvation, the role of Christ, and especially the need for the Church to be a *community* committed to stewardship. He examines various elements often evoked for an ethic of earth care, including conservationism, land and wilderness ethics, and deep ecology; and in analyzing the strengths and weaknesses of each, he identifies aspects that could be incorporated into a distinctively Christian ethic.

In chapter 6, Bouma-Prediger addresses the question, "What kind of people ought we be?" by revisiting the classic virtues developed by Aristotle and Christianized by Thomas Aquinas, and shows how they may be transformed into ecological virtues. A concrete embodiment of such virtues is essential, he maintains, for accomplishing the good work of caring for creation. The urgent circumstances of the present ecological crisis call for the Christian community to draw upon its biblical, theological and moral strengths and its faith in the Creator to make a *corporate* commitment to creation care (chap. 7). We must recognize that "we're all in this together," that God commands us to this work, and, finally, that gratitude for God's providential gifts is reason enough to make us become the earth-keepers we are called to be. Finally (chap. 8), Christians can call upon and act within the theological virtue of hope. He concludes:

> Perhaps at the end of the day we should heed that most passionate medieval evangelical, St. Francis of Assisi, who admonished all who follow Christ to preach the gospel always, and if necessary, to use words. We modern evangelicals tend to be too wordy, too preachy, not incarnational enough. Perhaps we should, like Francis, speak only when necessary and spend more time preaching with our actions. That, after all, is the most genuine evangelism. The world is watching, and what we do and fail to do with respect to the earth speaks volumes.

Bouma-Prediger has read widely and ecumenically: Paul Santmire, Calvin De Witt, Joseph Sittler, Thomas Berry, Annie Dillard, Rosemary Radford Ruether, and Max Oelschlaeger are some of the many whose voices are heard here. This accessible exposition would make a fine text for any academic course or for a church study group wishing to explore issues of Christianity and ecology. Highly recommended.

Reviewed by Robert J. Schneider, Committee on Science, Technology and Faith of the Episcopal Church, 187 Sierra Vista Dr., Boone, NC 28607.

ECOLOGY AND THE END OF POSTMODERNITY by George Myerson. Duxford, England: Icon Books, 2001. 80 pages. Paperback; $7.95. ISBN: 1840462795.

The title of this little book suggests a puzzle: How can postmodernity already be at an end? But the answer—according to the author who has written other works on contemporary culture such as *Habermas and the Mobile Phone*—is also in the title. The importance of ecology undercuts one of the key claims of postmodernism.

The term "postmodernism" has been in use for over twenty years and means many things to many people. One of its key ideas is what Lyotard called "The End of the Grand Narrative." Modernism had been characterized by ideas growing out of the Enlightenment, especially the unlimited validity of science and the values of a democratic society. It was supposed to provide a global world view which, in principle, was valid for everyone. The end of modernism then means that this "grand narrative" is in fact not universally valid. Science is a way in which some

people look at the world but there are other ways that are equally legitimate for other people.

Myerson focuses on the events of what he calls the "millennial autumn" of 2000 in Britain. Protests against a rise in the price of petrol intended to combat pollution and global warming, massive flooding associated with climate change, and the crisis of "mad cow disease" (BSE) came together in that season. Myerson intersperses his discussion with news reports from those days to show that in fact ecology was providing a new grand narrative "in which science and democracy advance together, legitimising one another. Or they meet common obstructions and antagonists" (p. 44).

"Postmodernity," the author says, "is slipping into the strange history of those futures that did not materialise" (p. 74). The example of one autumn presented in one book will certainly not silence all proponents of postmodernism but they have been given a significant challenge.

Postmodernity's rejection of "the grand narrative" has been extended to *all* meta-narratives, including those of religious traditions. In particular, claims that Christ is the universal savior have been criticized as a form of modernist colonialism. Myerson's book does not address this issue directly, but those who are interested in the impact which postmodern thought has had on theology in recent years will profit from reading this short critique of the movement.

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FAITH & SCIENCE

UNSHAKABLE FOUNDATIONS: Contemporary Answers to Crucial Questions about the Christian Faith by Norman Geisler and Peter Bocchino. Minneapolis, MN: Bethany House, 2001. 413 pages. Paperback; $16.99. ISBN: 0764224085.

Packed with countless gems of fact and logic relevant to science and Christian faith, this book offers "credible reasons as to why Christianity is intellectually sound." It emphasizes first principles of logic and reveals the fallacies of relativistic pluralism that teaches all views are true even if they oppose each other, even alleging every religion is equally valid when Christianity affirms evil is real and Hinduism claims it is illusion. Three world views with different assumptions about God, reality, humanity, and evil that bias observations and produce incompatible conclusions are a major focus—atheism, theism (represented by orthodox Christianity), and pantheism (represented by the New Age), which affirms that God is the universe. The authors repeatedly show how theism fits all facts and first principles. Whenever Christianity is challenged, they recommend shifting the burden of proof by asking rational questions about world views and first principles. Subjective emotional diatribes "spouting off answers or obnoxiously stumping for the Christian faith will not help ..." (p. 61).

Five chapters on physical and biological sciences focus upon the cosmos, the origin of life, macroevolution, and intelligent design. When applied to cosmology, cosmogony, the origin of life, and evolution, the law of noncontradiction and second law of thermodynamics reveal the false views of reality in atheism and pantheism and expose the philosophical fallacies of prominent scientists who commingle science and metaphysics. Among fascinating topics succinctly addressed are the radiation echo, black holes, the big bang, quantum cosmology, imaginary and real time, DNA molecular information, intelligent design, information theory, punctuated equilibria, fossils, microevolution, and the biblical age of the earth and humanity.

The authors show that belief in universal moral laws is credible and views of creation, law, and government logically connected. Natural law inherent in humans is central to discussions of nihilism, utilitarianism, evolution[ism], postmodern legal theory, moral relativism, positive law theory, human rights, similarities of Nazism to current education, defense strategies in criminal justice, and relationships of legal theory to personal morality. Because government-created laws are self-centered, promoting their creators' interests, only natural law emanating from the *Imago Dei* and emulating God's moral attributes can protect human rights.

The fact that evil troubles atheists "logically leads to a standard of good or justice beyond the world, ... [while pantheists] offer neither substantial explanation for the problem of evil nor intelligent justification for calling evil an illusion" (p. 231). Things are not evil; evil is a corruption of what ought to be, not a created substance. God could eradicate evil only by eliminating freedom and thus precluding love, the greatest good.

Kushner's explanation of why bad things happen to good people presumes an evaluative standard beyond God to evaluate his actions, but we cannot know all of God's purposes for suffering. Pain has purpose. Many disasters (floods, tornadoes, earthquakes) are necessary in the natural world. Others result from people's freedom, while birth defects and cancer verify the universal law that everything in the universe deteriorates.

Historical questions include whether miracles are possible. They are outside laboratory tests, possible only if there is a God who can act. *Operation science*, which concerns observable causes and effects in the present physical world, is limited to discovering secondary natural causes for regular patterns of events. It cannot deal with nonrepetitive phenomena like the singularities no longer happening that are the subject of *origin science*. "How can science prove that something does not exist outside of nature when ... science cannot go beyond nature?" (p. 64).

Evidence from tests for the reliability and authenticity of historical documents and rules for the credibility of authors fully satisfy the historicity of the Bible and claims for the deity of Jesus (chapters 12–13). Ethics and moral law are addressed in Chapter 14 and the Appendix on "First Principle Responses to Ethical Questions" (abortion, euthanasia, cloning, assisted suicide, and other biomedical issues). Two chapters (15 and 16) cover the ultimate meaning of life, heaven and hell. Eternal separation from God is fair because people choose it and God never forces love on unwilling people.

One might quibble about details, like the assumption that theistic evolution precludes God's continuous intervention (which they label "progressive creation") after his first cause, calling folkways *mores*, and treating human drives as instincts, yet this is an excellent survey of Christian apologetics. It is well-written, easily understood, and packed with macro- and micro-aids for defending the Christian faith, including a bibliography, index, and Scripture index.

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SCIENCE AND RELIGION IN THE ENGLISH-SPEAKING WORLD, 1600–1727: A Bibliographic Guide to the Secondary Literature by Richard S. Brooks and David K. Himrod. Lantham, MD: The Scarecrow Press, Inc., 2001. 620 pages, index. Hardcover; $85.00. ISBN: 0810840111.

The historical and philosophical study of the (sometimes-acrimonious) discourse between science and religion is a topic of perennial interest to scholars in many disciplines, and to Christian scholars particularly. This recent bibliography will provide the serious student with a thorough, if somewhat idiosyncratic, resource for researching this topic and for bringing together diverse strands of the rich intellectual history of the period 1600 to 1727, the year of Newton's death.

This book, the result of ten years of research the authors tell us, was once planned to be even more comprehensive and to cover a greater period (an almost unimaginably ambitious project, the diversity of topics actually covered being as broad as it is). The authors surprised even themselves with the sheer volume of secondary literature that exists on the topic (no primary literature is included in the bibliography), which is evidenced by the 2,000 sources that are referenced here. Three bibliographies constitute the bulk of this book following an introductory essay and a description of the criteria that were used to select works for inclusion and for indexing. An annotated bibliography of books and articles contains 1,735 entries and is followed by shorter lists of other bibliographies and doctoral dissertations on the subject. Indexes are by topic, historical persons likely to be of interest, and authors and editors of secondary works.

Twelve topical categories are defined to give some structure to the material. However, the overlap that occurs between them (which the authors readily acknowledge and even spell out for the reader's convenience) and the discontinuities the separate them, result in a collection that is something less than a complete systematic catalog of the material and is a bit awkward to negotiate. The topics are: historiography; magical, alchemical, and *Prisca* traditions; Protestantism and the rise of modern science; Christianity, social ideas, ideology, and science; social institutions in science and Christianity; religion, technology, architecture and the environment; theology, philosophy and science; natural theology and natural philosophy; heretical Christianity, deism, and atheism; science, the Bible, and literature; religion and medicine; and, Newtonian studies. Rather than defining each topic explicitly, these are characterized by certain recurring themes. For instance, studies of religio-medical theories of soul and body is one of the discourses that is included under the topic of religion and medicine. This list gives an idea of the enormous diversity of the subject matter and the idiosyncratic style of the project. The diversity means that this book will be a very useful reference for a variety of studies. The idiosyncrasy means that locating sources that pertain to a specific research question may be difficult.

Overall, the detail of the annotations and the scope of the literature that has been included results in a very impressive collection. It is unfortunate that the topics covered are as peculiarly chosen as they are. Inevitably, there will be some relevant studies that have been overlooked because they fall through gaps that emerge at the intersection of discontinuous categories or that lie at the periphery of the subject. Nevertheless, this reference is an important contribution to the already prolific research on the topic of science and religion studies, and provides an indispensable roadmap to the secondary literature on a period of much intellectual change and growth.

Reviewed by John Drake, University of Notre Dame, Notre Dame, IN 46556.

RELIGION AND SCIENCE: God, Evolution, and the Soul by Nancey Murphy. Kitchener, ON: Pandora Press, 2002. 125 pages. $14.00. ISBN: 1894710207.

Murphy, professor of philosophy at Fuller Theological Seminary and an ordained Church of the Brethren minister, has written other books of interest to readers of this periodical. She gave three lectures at Goshen College as the speaker for the 2001 Goshen Conference on Religion and Science. The first was entitled "Science, Anabaptism and Theological Anthropology," the second, "God's Nonviolent Direct Action," and the third, "Evolution: One Anabaptist's Perspective." The lectures, and most of the discussion after them, are recorded in this book. There are notes, and the index is adequate.

In the first lecture, Murphy argues, as she has before, for what she calls a *physicalist* view of the soul, namely, that there is no immaterial soul or spirit, but that consciousness is a product of our physical brain. She claims that the idea of a separate soul was introduced early in the Christian era to explain some scientific phenomena, not because scripture demands it. Murphy gives a capsule history of Christian views on the soul. She argues that a dualist view of soul and body has led to some problems for Christians. Two such problems are that gospel ethics involves the body, not just the soul, and that "it is impossible to do justice to God's relation to the natural world without an appreciation of humans' role in nature" (p. 23). If you have never encountered Murphy, or the idea of physicalism, this lecture is a good place to meet them both.

In the second lecture, Murphy discusses an interesting question, namely "How does God act in the natural world?" Her conclusion is that he is constantly acting, limiting himself because of the powers he has invested in his creatures. This view of how God acts, she says, solves the problem of explaining evil.

In the third lecture, Murphy again deals with how God acts in the natural world. Her conclusion, in relation to evolution, is basically the second sentence in the previous paragraph, and she says that one's view of evolution usu-

ally depends on one's view of how God acts. In this lecture, and others, it is clear that she has read more than just theology books. She refers knowledgeably to, for example, the work of Holmes Rolston and Frans de Waal.

The discussions identify the speakers by number, so that the reader can tell when a speaker enters the discussion more than once. The discussions take up almost as many pages as Murphy's lectures. There is one gap, due to changing the recording tape, but apparently all other discussions are complete. Approximately half of the comments are Murphy's. The discussions were wide-ranging. Two of the most interesting topics were what it means to be a fundamentalist and Murphy's reaction to Phillip Johnson ("First, he does not understand biology. Second, he plays fast and loose" [p. 98].).

Murphy is an important Christian thinker and we can be grateful that she gave these Goshen College lectures and that they have now been published at a reasonable price. The book is accessible to lay readers. Members of the ASA are especially encouraged to read it.

Reviewed by Martin LaBar, Southern Wesleyan University, Central, SC 29630.

GENERAL SCIENCE

NOTHINGNESS: The Science of Empty Space by Henning Genz. Translated by Karin Heusch. Cambridge, MA: Perseus Publishing, 1999. 340 pages, 102 illustrations, notes, references, index. Paperback; $20.00. ISBN: 0738206105.

Genz is professor of theoretical physics at the University of Karlsruhe, Germany. He is the author of another popular science book, *Symmetries: Bauphan der Natur (Symmetry: Blueprint of Nature).*

In *Nothingness,* Genz attempts to convince the readers that there really is something in nothingness, and that empty space is just another physical system worthy to be studied and described. He first cites many early philosophical concepts and metaphysical speculations on nothingness, empty space, void, vacuum, and ether. He then explains these ideas in terms of modern physics, quantum mechanics, and the theory of relativity.

Reading just a few paragraphs of the text, one can easily tell that this book is a translation of a German text. Although the translation is excellent, there are terms and phrases that are definitely of Germanic characteristics. Numerous interesting illustrations appear throughout the book. A few of the illustrations are as funny as comic strips and are reminiscent of George Gamow's popular science books.

Typical of a German fashion in scientific writing, the author comprehensively covers the subject of nothingness with topics related to empty space. These topics include the cosmological principle, quantum physics, the general theory of relativity, elementary particles, fields, chaos, and order. As a simple-minded chemist, I found many of the terms and their illustrations in the book, such as quantum vacuum and ur-matter, quite fascinating.

The book is divided into eight chapters, each of which consists of several short sections. The title for Chapter 6, Spontaneous Creation, is rather misleading. This chapter deals only with elementary particles and fields, but not with the origin of the universe or life, as we members of the American Scientific Affiliation may suspect. Each section has a heading, which may be helpful in focusing the readers' attention on the central ideas therein; however, it is really unnecessary. Some section headings seem irrelevant to the discussion in the text. For example, the section with the heading, "The Quantum Numbers of the Universe," is a discussion of the origin of the universe. I do not see the quantum numbers of the universe in that section.

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HEALTH & MEDICINE

OUT OF ITS MIND: Psychiatry in Crisis by J. Allan Hobson and Jonathan A. Leonard. Cambridge, MA: Perseus Publishing, 2001. 292 pages. Hardcover; $26.00. ISBN: 0738202517.

This book has received high praise from professionals within the field of mental health. Its "call to arms" seeks to establish a mental health system which would supply the best treatments science can provide in a compassionate way. Its thirteen chapters are accompanied by endnotes, a bibliography, and index.

While most Americans are familiar with the crisis in healthcare, both in terms of cost and availability, fewer are aware of the vast need and disjointed approach in the field of mental illness. Millions of patients with mental illness are untreated, many are unsuccessfully treated, and often professionals responsible for treatment are unfocused.

Humanistic psychologists opt for "the talking cure," psychiatrists frequently follow the pharmacology route, and neuroscientists think understanding brain functioning should have more consideration. Hobson and Leonard, while favoring neuroscience, believe the solution to the dilemma is a combination of the three. To achieve improved care, reforms must occur in the courts, HMOs, hospitals, clinics, higher education, and medical schools.

The four parts of the book summarize its contents: psychiatry's lost mind; finding the mind's brain; psychiatry and the brain; and prescription for a new psychiatry. These segments cover how society got to its present status on mental health and what it needs to do to improve it. In other words, understanding the history of the problem may better enable professionals to chart a new and improved course. It is hoped that this book will "kick-start a long overdue debate." Revolutions are hard to incite, but science and journeys begin with single steps and often move at slow paces. This book may be an impetus.

Where does religion fit into this scheme? The authors comment pejoratively on religion (p. 15) while acknowledging the necessity of understanding its influence (p. 76). Religion's adherence to dualism has made it attractive to quantum physicists; the authors think "it looks odd seeing religious philosophy and quantum physics hitched to the

same wagon" (p. 77). Their only other comment on religion refers to the evidence that obsessive-compulsive disorder shares something in common with repetitive magical and religious rituals in various cultures (p. 151).

While the part religion plays in mental health is generally a beneficial one, anecdotes reveal that it sometimes can have a deleterious effect. Those who adopt a Christian persuasion may become mentally healthier, but they may not rid themselves of mental conflict and disorder as illustrated by the existence of Christian psychotherapists and therapies.

There is little debate on the problem mental illness presents, not only to America, but to the whole world. Any attempt to help those who suffer is welcomed. Hobson and Leonard have offered up a synergistic approach which has the potential to move therapy forward. For interested professionals, laypersons, and patients, this volume is recommended. Knowledge is power. Hobson and Leonard offer a erudite, lucid, and authoritative perspective on the chronic problem of mental illness.

Hobson is a psychiatry professor at Harvard Medical School and director of the Laboratory of Neurophysiology at the Massachusetts Mental Health Center. Jonathan Leonard is a freelance medical writer and contributing editor at *Harvard Magazine.*

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

HISTORY OF SCIENCE

ON PASCAL by Douglas Groothuis. London, UK: Wadsworth Philosophical Series, 2003. 97 pages, bibliography, notes. Paperback; $15.95. ISBN: 0534583911.

This is one in a series of over seventy short books in the Wadsworth Philosophers Series. The purpose of each volume is to provide an up-to-date view of the lives and ideas of one of history's major philosophers. The series editor is Daniel Kolak, chairman of the department of philosophy at the William Paterson University in New Jersey. The author is associated with the Denver Seminary, Denver, Colorado.

The author does a credible job of providing the casual reader with an overview of Blaise Pascal's brief life (1623–1662), scientific achievements and philosophical thinking. The intended audience is apparently advanced high school and college undergraduate students.

Groothuis describes Pascal's epiphany experience on November 23, 1654, his services to the poor and oppressed of the day, and his famous "wager." He is careful to note, as many writers do not, that part of Pascal's writings, undoubtedly his most famous, was never finished, and consequently when we read the *Pensées*, we are looking at an interpretation of raw, unedited notes "... written on four sides of a single folded sheet. Some paragraphs are inserted into the main text, other sentences are written vertically up the margins, and parts are written upside down on the page" (p. 75).

Pascal, argues Groothuis, thought the topic "Jesus Christ and the Meaning of Life" was of preeminent importance. His final chapter, seven brief pages, addresses this subject as he perceived Pascal saw it. Seven pages is far too little space to develop the subject in full, but what is written is a useful summary. The book concludes with what has always been my favorite Pascal saying: "The heart has its reasons of which reason knows nothing; we know this in countless ways."

This book provides a short overview of an important scientist, philosopher, and theologian. It is useful as an introduction to Blaise Pascal, a most remarkable human being. The serious scholar will want much more, and for that the bibliography will be useful.

Reviewed by John W. Burgeson, 2295 E. Iliff Ave. #101, Denver, CO 80210.

LOVE AT GOON PARK: Harry Harlow and the Science of Affection by Deborah Blum. Cambridge, MA: Perseus Publishing, 2002. 336 pages. Hardcover; $26.00. ISBN: 0738202789.

Blum, 1992 Pulitzer Prize winner for writing about primate experiments, is a professor of journalism at the University of Wisconsin. She has chosen to write about the work of one of her university's former psychologists, Harry Harlow, who performed some of the most important and famous experiments in history. (Harry changed his last name from Israel to Harlow—his father's middle name—because of prejudice against Jews, although Harry was not Jewish.) Indeed, a check of five introductory psychology texts reveals that Harlow's studies are included in every one of them. Out of the dozens of such texts published today, probably none omits Harlow's research. And yet, among the general public, Harlow is hardly known compared with Skinner, Ellis, Rogers, Terman, and Maslow (who was Harlow's student at Wisconsin), all of whom lived in the twentieth century.

So why is Harlow significant in psychology? Blum points out that "most people don't realize that in the 20th century, psychologists argued that affection was unnecessary, and it could be destructive for a parent to treat a child in a loving manner." Robert Sapolsky, a Stanford University psychologist in the early twentieth century, believed that "touching, holding and nurturing infants was sentimental maternal foolishness."

Perhaps the most famous psychologist in the early twentieth century was John B. Watson who led a crusade against parents showing infants affection. "When you are tempted to pet your child remember that mother love is a dangerous instrument ... (there are) serious rocks ahead for the over-kissed child." Harlow's experiments changed all that. His experiments with rhesus monkeys (He worked with rats so much in graduate school that he vowed never to work with them again. He said he had worked with rats more than any two living psychologists combined.) led him to the conclusion that "we learn human connection at home. It is the foundation upon which we build our lives—or it should be—and if the monkey or the human doesn't learn love in infancy, he or she 'may never learn to love at all.'" As Blum points out, Harlow argued that "mothering mattered, that babies needed an involved parent, that first

relationships were enormously important." This view did not endear Harlow to the feminists who thought he was urging them to stay home and mother. The animal rights activists also thought his monkey experiments were unethical; by today's standards, they were.

Harlow coined the term "contact comfort" to refer to the need monkeys (and humans) have for security which comes from skin-to-skin contact between the infant and the mother or surrogate. He demonstrated that monkeys ran to cloth-covered surrogate mothers for security, not the wire surrogate mothers who fed them. By the time the monkeys were one-month old, they were all fleeing to the cloth-covered surrogates, clinging to them with their hands, burrowing their faces into their warm, fluffy body, closing their eyes, sleeping on them, and making them their home bases.

Blum points out the irony of Harlow's work: he lived "at the lab, dawn to dark, fueled by coffee, cigarettes, alcohol and obsession ... He was an unlikely crusader for love ... a father more involved with science than with his children, a husband who expected that his wives would understand that his real home was the psychology lab."

Blum wrote this book because she thinks many people are unaware of the revolution in the science of affection and relationships caused by Harlow's experiments. She wrote: "It's incredible to me how newborn our idea of love is ... memory loss affected our knowledge of Harlow. Because he was so controversial, also, many people were happy to forget him. So my mission, in a sense, was to bring him back." She has done so in an interesting way.

Blum has written a superlative book of science history. Even if you have never heard of Harry Harlow, you will come to understand and appreciate the importance of his work when you read this book. This book will have special appeal for research scientists, science historians, college teachers, and public speakers. Harlow said teaching an introductory college class is "the best possible speech and timidity therapy you can have." By the way, the title of the book comes from the former University of Wisconsin psychology building, now demolished, given the nickname Goon Park, because of it street address.

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

NATURAL SCIENCE

THREE ROADS TO QUANTUM GRAVITY by Lee Smolin. New York: Basic Books, 2001. 231 pages. Hardcover; $24.00. ISBN: 0465078354.

The major unsolved problem which the theoretical physics of the twentieth century has bequeathed to the twenty-first is the development of a correct theory of quantum gravity. Einstein's general relativity, based on the concept of curved space-time, is our best description of gravitation at the macroscopic level. Quantum mechanics provided the key to the microworld. But it has not yet been possible to bring about what John Wheeler called the consummation of the "fiery marriage" of these two great theories. Here

Lee Smolin of the Center for Gravitational Physics and Geometry at Penn State describes the approaches to this goal being pursued by theorists today.

The first four chapters set out basic principles. Smolin sketches the relational view of space and time characteristic of relativity theory, points out that not only the universe but the cosmic information available to us changes with time, and says that quantum theory has to do with a single world seen by many observers. Finally he argues that "The Universe is Made of Processes, not Things." Some readers might want to make connections with versions of process thought which have been used by theologians.

Smolin then devotes the next four chapters to black holes. While our understanding of these strange entities emerged from classical general relativity, close theoretical examination has revealed properties connecting them with quantum theory. The realization that a non-zero temperature must be associated with a black hole led to Hawking's discovery of black hole radiation. The area of a black hole's horizon is proportional to its entropy, and thus to the information that is hidden within the horizon.

The fact that a volume of space can contain only a finite amount of information suggests that space is discrete rather than continuous. The quantization of space-time itself is one of the most fundamental results of the search for a theory of quantum gravity, and Smolin points out how surprising it is that it should come from considerations about the thermodynamics of black holes. I wish, however, that he had pointed out that a limit on the size of space-time intervals can be derived from the uncertainty principle and the effects of gravitation on measuring instruments. This allows one to calculate the limiting Planck length, 10^{-33} cm from the basic ideas of relativity and quantum mechanics.

Smolin then goes on to describe two major approaches to quantum gravity—loop theory and string theory. While the latter has gotten a great deal of publicity, Smolin gives reasons for believing that the loop description is more fundamental. In it space can be built up from discrete units of volume with dimensions on the order of the Planck length. This can be done without assuming any pre-existing background space, thus satisfying the relativistic criterion that space and time are entirely relational. Space seems to be continuous even on the smallest scales that high energy physics has yet been able to probe. It is possible, however, that observation of interference effects on photons that have traveled billions of light years across the universe will reveal the granular character of the world's geometry.

Smolin closes with some fairly optimistic predictions about the development of quantum gravity theories, including the statement that the basic framework of the theory will be worked out by 2015 at the latest. At the same time, his description of the different approaches to this theory, combined with personal anecdotes, will give a feel for the confusion that attends the development of any fundamental theory.

Some confusion, however, could have been avoided. In his prologue, Smolin indicates that the "three roads" of his title are string theory, which starts from quantum mechanics, loop theory, which starts from relativity, and theories which do not assume either quantum theory or relativity as fundamental. But when we get to page 169, we are told that the third road is that via black hole physics. This is not surprising given the amount of space devoted to that topic but readers may feel a bit of a jolt. Moreover, some notice might have been taken of the road followed by pioneers such as Rosenfeld and Bergmann who tried to apply conventional quantization techniques to general relativity.

Smolin's presentation has its flaws but that is perhaps inevitable with a popular report on work in progress in a highly technical field. The book will give attentive readers a sense of the way things are proceeding in one of the most important areas of theoretical physics.

Reviewed by George L. Murphy, St. Paul's Episcopal Church, 1361 W. Market St., Akron, OH 44313.

SHATTERING THE MYTH OF RACE: Genetic Realities and Biblical Truths by David Unander. Valley Forge, PA: Judson Press, 2000. 127 pages, references. Paperback; $14.00. ISBN: 0817013172.

Interested in a book of manageable size that brings a Christian perspective to the age-old issue of race? You might appreciate the insights that ASA Member Unander brings to this topic, as I did recently, in reading this book. The theme developed is that from a Christian view there is only one race, the human race.

Although physical and cultural ethnic differences occur in human populations all over the world, the biological similarity of DNA in humans is more similar than the DNA in any other species. Three main sources of information—history, genetics, and Scripture—are used to encourage the reader to revisit and reformulate their widely held concept of race.

Part of the history is personal as the author grew up on the south side of Chicago in a predominantly African-American neighborhood. His experience with other ethnic cultures extends to the Deep South in Mississippi and to Puerto Rico, where he conducted agricultural research for the University of Puerto Rico. It was in this latter context in a conversation with a local pastor in Puerto Rico that this book had its origin. Along with the author's roots in Christian truth and historical research, he has added his insight in genetics from graduate work in biology. Thus, he is well qualified to lead the reader down new paths to a more complete understanding of one of the critical issues in the modern world.

Content is organized into nine chapters beginning with the concept of race and its relationship to economics. Minority groups frequently end up at the lower end of the economic scale. The chapter on slavery and abolition in the United States is exceptional. The role of power and domination by wealthy plantation owners over slaves, often justified in religious terms, is clearly exposed in all its brutality. Slave owners were granted three votes for every five slaves according to a provision of the Constitution resulting in the 1857 Dred Scott decision by the U.S. Supreme Court that a black man was only three-fifths human. The Bible clearly states that we are to respect and dignify all persons created in God's image.

Biology, genetics, and DNA are carefully explained. The number of human genes given as 80,000 has now been reduced to about 36,000 as the result of research for the Human Genome Project directed by Francis Collins, ASA member. Data from sequence DNA studies seem to support greater diversity the closer one gets to Africa, but samples from many ethnic groups in different parts of the world are compatible with the concept of one human race.

Near the end of the book are two chapters about racial superiority. One of these focuses on evolutionary genetics and the other considers the views of the scientific community. The extrapolation of Darwin's principles into Social Darwinism is illustrated by Haeckel's views supporting the idea of a superior Aryan race in Germany. The rise of eugenics through Galton's influence is also reviewed as bolstering the notion that eminence and superiority are more prevalent in the white race. Unander also cites S. J. Gould's book, *The Mismeasure of Man*, by documenting racist quotes from such earlier scientists as Cuvier, Lyell, and Agassiz.

The final chapter brings the author's personal Christian faith to bear on the theme of the book. Both Old and New Testament passages are given which directly or implicitly emphasize that it is the inner spiritual person that is important, not the physical appearance. In Revelation, the final book of the Bible, every nation and people group is present in the great multitude that no person can number. There are no "races" excluded, there is only the one human race. Encouragement toward reconciliation and peacemaking complete the final pages with mention of Martin L. King's famous speech and the role of John Perkins in The Voice of Calvary Ministries in Mississippi.

An index would be helpful before the next printing is done. The reference to Pat Shipman's book *The Evolution of Racism* (New York: Simon and Schuster, 1994) on page 65 was omitted.

Reviewed by Raymond H. Brand, Research Associate, The Morton Arboretum, Lisle, IL 60532.

ORIGINS & COSMOLOGY

THE FIVE AGES OF THE UNIVERSE: Inside the Physics of Eternity by Fred Adams and Greg Laughlin. New York: Touchtone Books, 2000. 251 pages, illustrations, notes, bibliography, index. Paperback; $14.00. ISBN: 0684865769.

Fred Adams is a professor of physics at the University of Michigan. Greg Laughlin was a National Science Foundation Fellow at the National Astronomical Observatory in Japan. While cosmological work in the recent years has focused on the past history of the universe, Adams and Laughlin, starting in 1995, began a detail study into the universe of the future.

In *The Five Ages of the Universe*, they present their vision of the history of the universe. Their theory involves five stages and they introduce standards for coping with the incredibly large numbers required for such a discourse. The five stages cover from the beginnings in the big bang to the lonely demise of the universe in the Dark Ages. Time is measured by the "cosmological decade," providing a comprehensible summary of the extraordinary events of our universe from its inception to its bitter end.

The authors' biography of the universe cites a potential melting of the earth's surface as one of a series of events just waiting to occur as the cosmos and its contents grow older. The publisher believes that with this book, the mythologies of eternity and apocalypse can now be matched against scientific fact.

Reviewed by Dominic J. Caraccilo, Lieutenant Colonel, US Army, Vicenza, Italy, CMR 427, Box 1628, APO AE 09630.

THE DEFECTIVE IMAGE: How Darwinism Fails to Provide an Adequate Account of the World by Ben M. Carter. Lanham, MD: University Press of America, 2001. 183 pages. Hardcover, $33.00. ISBN: 0761819614.

Carter, an ASA Member with a Ph.D. in Christianity in the Non-Western World from the University of Edinburgh, has the academic credentials to address this subject. He writes: "This book was occasioned by my own loss of faith in the theory of evolution, a loss that made me increasingly aware of the dogmatism of those who insist that Darwin's model is as fixed in the intellectual firmament as the heliocentric solar system."

I was greatly impressed by one feature of the book, namely, the large amount of space devoted to endnotes. I counted 176 pages of text plus endnotes. The endnotes accounted for 54 pages, or 30% of the book! I appreciated reading the endnotes as much as I did the text.

The book is written in two parts. In Part I, the theory of evolution is discussed, emphasizing the epistemological problems inherent within it. In part II, the phenomenon of abstract communication is discussed, not only as it relates to human language, but as it relates to animal existence in general. In this section, the attempt is made to show how Darwinism fails from its own limitations to account for the phenomenon of communication.

Carter begins his epistemological analysis by pointing out that western thought developed more in line with Plato's views. Plato addressed a fundamental philosophical problem: "How do we know a thing is what it is?" His answer: the world derives its meaning from the realm of transcendent ideals or "forms." His theory of knowledge was based on intuition. The "logos principle" was the rational principle integrating all knowledge. In the early seventeenth century, western culture was shaken by the Galileo controversy with the Church. This led Francis Bacon (a contemporary of Galileo) to declare: "We must free science from the corrupting influence of religion." The development of naturalism came in the "Age of Reason" (18th–19th centuries). In Darwin's day, the universe was presumed to be a continuum, closed to outside influences. Darwin used this prevailing world view to propound his theory of evolution. Carter states his thesis: "If Darwinism is true, it should not have been able to produce a mind capable of understanding that Darwinism is true."

The sample given above is reminiscent of Phillip Johnson's critique in his book *Darwin on Trial*. Carter falls a bit short of the elegant logic and argumentative skill

displayed by Johnson. Even so, Carter does a creditable job of his critique of Darwin's epistemological approach. He recalls Johnson's statement that "survival of the fittest" is a tautology, and can be restated "the survivors survive." Carter reminds us that Darwin looked at life forms extant in his day and then extrapolated back in time millions of years to describe the kind of life forms that he supposed existed early in time and proceeded to produce life in forms found in his day by chance variation in species.

Carter introduces Part II of the book thus: "In this section I want to challenge evolution theory by asking a question about communication. I will argue that given evolution's materialistic assumptions, communication (as most animals experience it) should be impossible. The two parties communicating must have something in common." Random mutations can hardly produce "irreducible complexity" (Michael Behe's example) by slow stages. Consciousness is something of an anomaly. We should not have expected evolution to have produced it. Communication is a function of consciousness and is fundamentally intuitive. Consciousness is a property of the soul, and evolutionary theory has no way to account for the existence of a "soul."

I recommend this book to ASA members and anyone interested in a critique of Darwinian evolution. Carter has done an excellent job of casting grave doubt on the evolutionists' claim that their theory is a "firmly established science." In my view, he has made a good case that "Darwinism Fails to Provide an Adequate Account of the World."

Reviewed by O. C. Karkalits, McNeese State University, Lake Charles, LA 70609.

THE GOD HYPOTHESIS: Discovering Design in Our "Just Right" Goldilocks Universe by Michael A. Corey. Lanham, MD: Rowman & Littlefield Publishers, 2001. 360 pages. Hardcover; $27.00. ISBN: 0742520544.

Intelligent design (ID) is a popular line of reasoning and exploration among members of the ASA. This book sets out to contribute to the ID discussion by "proving the existence of God through a detailed analysis of the physical universe and inferring the various attributes of God using *only* the empirical data of modern science as an interpretive guide" (p. ix). Unfortunately the faults of the book are so significant that the book is ineffectual at convincing this reader that ID can be a legitimate, important way to approach part of the faith and science issue.

The introduction to *The God Hypothesis* describes many "Principles" of science. These mostly come from the author's own analysis of the workings of science. Examples include his "Principle of Deceptive Appearances," that things rarely are the way they seem to the naked eye; "Principle of Sufficient Reason," that all finite objects must have a sufficient reason for their existence; and the more familiar "Principle of Theoretical Economy," which he correlates with the famous Ockham's Razor and "Principle of Universality." These Principles are presumably going to lead the reader to the proof for God's existence and nature. The bulk of *The God Hypothesis* is organized as a series of chapters that describe various aspects of the cosmos as they fit perfectly together to enable human life to exist on earth. Corey uses mostly secondary sources and cites primary sources only haphazardly in this book. This habit led me to question why I wouldn't read the cited books by Hugh Ross, Paul Davies, and the others instead of *The God Hypothesis* itself.

This book contains significant factual problems in the science that I am most familiar with, biochemistry and cell biology. For example, in chapter 8, Corey compares the evaporation of methane, ammonia, and water in his discussion of the "just rightness" of earth, and makes the statement that water has the "just right" molecular mass (18, versus 16 for methane and 17 for ammonia) to prevent its rapid evaporation under conditions where the other two molecules do evaporate. In this statement, he fails to acknowledge that the main reason that water evaporates differently is not its molecular mass but the network of hydrogen bonds that form in water but not the other liquids. This incompleteness is particularly vexing because in chapter 9 Corey describes the remarkable properties of water, including its hydrogen bonds. There are several odd or misinformed biological statements within the book as well. Online critics' statements include an endorsement of the book by Hugh Ross, so I assume that the astronomy is better than the chemistry and biology.

Perhaps most disconcerting is his near-idolatrous focus on humans as the center of the entire cosmos, his anthropic principle. While this proposition is a valid starting point for a philosophical or theological discussion, Corey turns to science to back it up with shaky evidence that includes the size of a human as the geometric mean between the size of a planet and the size of an atom. Putting aside the difficulty in choosing *which* atom or planet, and what measurement to use for this calculation (mass, volume, something else, does it matter?), the statement fails to note that there are many other organisms of similar size to humans and so would also fit the geometric mean. This form of reasoning is used in many places, always failing to note that all organisms are remarkably complex, and thus *scientifically* just as valid to mark as the "goal" of the cosmos. Theologically, it seems far more orthodox to see the universe's goal as glorifying God (Psalm 19:1-4), just as the Westminster Shorter Catechism defines the goal of creaturely humans—to glorify God and enjoy him forever (Q&A 1).

In conclusion, *The God Hypothesis* does not make any original contributions to the concept of ID. It is more worth the reader's time to consider the original books by Behe, Dembski, their critics, and others instead of this marginal compilation of ID ideas.

Reviewed by Robin Pals-Rylaarsdam, Assistant Professor of Biology, Trinity Christian College, Palos Heights, IL 60463.

INTELLIGENT DESIGN CREATIONISM AND ITS CRITICS: Philosophical, Theological, and Scientific Perspectives by Robert T. Pennock, ed. Cambridge, MA: MIT Press, 2001. 805 pages. Paperback; $45.00. ISBN: 0262661241.

This anthology of articles was put together to serve as a companion volume to Pennock's book (*Tower of Babel: The Evidence Against the New Creationism*) and to bring together

original sources on this issue. As a reference book, it is a useful resource for insight into the current debate on cosmology. Because the book is very long with many authors, it is impossible to review it all. Instead, the focus will be on three presuppositions that stand out as formative throughout the book, emphasizing that each side in this debate uses a significantly different paradigm which accounts for the differing conclusions.

In general, the tone of the editor's comments is negative and condescending to the Intelligent Design creationists, specifically with respect to what Pennock thinks is their failings in the area of real scientific research (this begs the questions because by "science" he means "naturalism"). The first crucial presupposition, noticeable throughout the book, is that cosmology is a scientific (empirical) issue. However, it is impossible for theories about the past to be truly empirical (there can be no experience of the past, only of the present). Rather, the interpretive framework of "naturalism," or "uniformity," must be assumed (neither of these can be proven empirically). In a similar fashion, those who believe this is a religious debate begin with the presupposition that this is a matter for special revelation, which assumes that God the creator exists (also begging the question). In contrast to these approaches the question of origins seems to fall within the domain of philosophy, which can ask the question: "which paradigm should be used to interpret the data?" The Intelligent Design creationists address some of the presuppositions behind naturalism (Parts 2, 5, 8). Specifically brought out are questions about materialism and uniformity.

In this the reader is confronted with the second notable presupposition, namely, conclusions reached by empirical investigation are interpreted through the framework of uniformity. Contemporary thinkers often take the assumption of uniformity and apply it to the interpretation of various kinds of data, coming up with what they then call "facts" (i.e., the bone is 10,000 years old, or it took 80,000 years to form this canyon). But why assume uniformity (say, in Carbon 14 dating)? Why not begin with the assumption that the earth as seen today was formed by large catastrophic causes over a short period of time? Even naturalists resort to this when pressed, as in theories about the extinction of dinosaurs. But if non-uniformity is used in some cases, how can it be ruled out in others? Uniformity is an essential part of the evolutionist's epistemology, yet cannot be empirically supported.

The final presupposition noticeable in this book is that a third, compromise, position is possible (discussed in Part 6). Theistic contributors present Theistic Evolution as an option, and it even seems that others, like Alvin Plantinga, do not rule it out. Yet this is not acceptable for the Theist or the naturalist in that it contradicts the essential features of both world views. In Theism, God as perfect in power and goodness made a world without any evil. Yet for Theistic Evolution natural evil must have been in the creation from the beginning. For the naturalist, the desire is to give a cosmology that relies only on material causation. If God guides every mutation, then material causation and naturalism are lost. In the end, Theistic Evolution as a compromise, distorts the essence of both positions.

In conclusion, while this book offers no new insight into the creation/evolution debate, it does provide a helpful resource of articles on many issues from notable persons on each side. In spite of certain biases that can detract from the whole, the book offers a reminder that philosophical questions cannot be solved by polemics. Until more basic issues in cosmology are brought out and addressed philosophically, the debate will continue without resolution. It is this reviewer's hope that interpretive frameworks, often used without awareness, will be brought to light and the appropriate paradigm shift will be made by those operating with a logically inconsistent ontology.

Reviewed by Owen Anderson, Philosophy/History Professor at Paradise Valley Community College, and Researcher in the Religious Studies Department, Arizona State University, Tempe, AZ 85287.

PHILOSOPHY & THEOLOGY

THE BATTLE FOR GOD by Norman L. Geisler and H. Wayne House. Grand Rapids, MI: Kregel Publishing, 2001. 336 pages. Hardcover; $15.99. ISBN: 0825427355.

This book is about an issue being discussed by many Christians. Neotheism, also known as "openness to God" theology, attempts to redefine the biblical understanding of God. The principal advocates of these concepts do this by challenging fundamental tenets of Orthodoxy such as God's power, understanding and wisdom. Its world view is not immediately obvious or comprehensible, reminiscent of the Gnostic heresy which made damaging inroads into the early church.

Geisler, an apologist, and House, also an apologist and a lawyer, have the credentials and tools for analyzing this issue. They provide a Table of Contents, comprehensive list of sources, and a helpful index. The reader-friendly type face and sparse footnotes make for easier reading. The book's sturdy binding and attractive cover enhance the book's value. There is more to this book, however, than these features.

The authors refute the ideas of neotheism as well as provide an alternate view. The tenet put forward by this new philosophy is that although God created humans, he now is unable to exercise total control over their freedom and independence from him. This is because God is also temporal, is liable to change and who, perhaps, is also on a learning curve. God does not have infallible foreknowledge of an individual's future acts which was a characteristic lacking in pagan deities, also. This is neotheism which is closely related to process theology or panentheism taught by Alfred North Whitehead and others in the earlier part of the twentieth century. However, some of the writers of neotheism acknowledge that their thesis has little historical support.

The writers of this book infer that because evangelicalism has not defined its theology there is no clearly marked boundary to show where liberal ideas contradict their orthodoxy. In fact, some conservatives accommodate or even accept parts of this liberal theology. The authors explain the current understanding of God revealed in the Scriptures and set out by the Church, examining in depth God's attributes and comparing them with the challenge posed by these new ideas. They emphasize his omni-

science, the absolute universality of divine knowledge, his eternal being, immutability, immortality and incorruptibility, always confronting and answering the challenges of neotheism. Examples are given where the clear statements of the scriptures are twisted, thus exposing the nebulous ideas of some neotheists. This approach is summed up in the comment that error does not so much need refutation as it does a clear exposition.

In confronting the challenges to biblical teaching raised by neotheism, it sometimes is more effective to ask of them the right questions rather than try to answer each issue. Geisler and House have achieved this as well as presenting useful counter-arguments, sometimes from the original biblical languages. They make frequent reference to the views of some influential theologians of past eras.

This is a helpful book that provides a sane assessment of neotheism, discusses many issues in-depth and remains faithful to the clear teachings of the Bible. The authors have researched the issues, and they show that many of these have no biblical or theological basis. The authors show that the battle for God is a valid one for Christians. I believe this book would be of interest to anyone reading this review.

Reviewed by Ken Mickleson, 21 Windmill Road, Mt Eden, Auckland 3, New Zealand.

RELIGION & CHRISTIAN FAITH

REALIZED RELIGION: Research on the Relationship Between Religion and Health by Theodore J. Chamberlain and Christopher A. Hall. Radnor, PA: Templeton Foundation Press, 2000. 239 pages. Hardcover $29.95. ISBN: 1890151459.

Chamberlain is associate professor of counseling psychology and vice president for student development at Eastern University in St. Davids, Pennsylvania. He was the founding director and chair of the graduate program in counseling psychology at Eastern University. Hall is associate professor of biblical and theological studies at Eastern University. He has written a number of books and has also served as senior editor for *Christianity Today*. The authors state in the introduction that they have "approached this study with a Christian faith commitment that embraces the notion that religion is beneficial for living a meaningful life" (p. 23). Yet they feel that the information presented in this book is compelling in its own right and that their faith bias does not "unduly influence" their findings.

The authors chose to focus on the phrase "realized religion" in order to more effectively overcome the problem of studying the mystery of faith from the perspective of objective scientific methodology. The word "realized" is defined in the introduction as "to bring into concrete existence." Religion is therefore realized when the essential elements of religion (faith and trust) are made operational by being brought into "concrete existence." The byproducts of realized religion which are analyzed in this study include better physical and mental health, a higher degree of well-being, more marital satisfaction, less addiction, less suicide, fewer mental disorders, and a better likelihood of healing.

The book includes ten chapters that are organized into three sections. In part one, the relationship of realized religion to prayer and healing is explored. The relationship of realized religion to well-being is the subject of part two and six out of the ten chapters are included in this section. In part three, the authors discuss the relationship of realized religion to future research. They argue in the last chapter of the book that more research on religion and health is needed from the specificity of a Christian perspective.

The main purpose of the book is to provide the reader with numerous summaries of past research focused on the relationship between personal religious faith and personal health and well-being. In addition to these summaries, each chapter ends with a list of references as well as a separate, extensive bibliography. According to the information provided on the front cover flap, the authors have documented over 300 scientific studies that have been published by reputable scientific journals. The lists of source material included in the references and bibliography sections contain many articles which support the authors' main thesis. But the book also includes a number of articles in which neutral or even negative conclusions are drawn from the research. It therefore provides a wealth of information for anyone who is interested in exploring this topic further.

This book is one that should be read by all Christians who are employed in any type of medical profession. It could easily be used as a textbook in a health course that is taught from a Christian perspective. This book is easy to read, well organized, thoroughly researched, and well worth the price, especially since it is available at a lower price in the paperback edition. It will be an invaluable resource in the emerging field of spirituality and health for years to come.

Reviewed by J. David Holland, Associate Professor of Life Science, Nyack College, 1 South Blvd., Nyack, NY 10960.

WHEN RELIGION BECOMES EVIL by Charles Kimball. New York: HarperCollins Publishers, 2002. 240 pages, bibliography, notes. Hardcover; $21.95. ISBN: 0060506539.

Charles Kimball, chair of the department of religion at Wake Forest University, an ordained Baptist minister, and author of three books on Middle East religion, examines the nature of religiously based evil as it takes place in each of the major religious traditions and offers corrective measures. Arguing that no tradition is exempt, Kimball defines and explains five basic religious corruptions, both as they have existed in history and as they are seen today.

Kimball does not see religion itself as the problem, but religion gone bad. The five corruptions discussed are: (1) absolute truth claims which are seen to be imposed on others; (2) blind obedience to authority figures; (3) the establishment of the "ideal" time; (4) the belief that ends justify means; and (5) the practice of declaring holy war. Each of these corruptions is addressed in a separate chapter.

Kimball argues that one's religious views can be reconciled with respect for those of other faith traditions. The process of conversation with those of other traditions can result in significant personal growth. He resists the syncretic blending of religious ideas, however, and grounds his views of tolerance theologically. This excellent book is highly recommended.

Reviewed by John W. Burgeson, 2295 E. Iliff Ave. #101, Denver, CO 80210.

SKEPTICAL ODYSSEYS by Paul Kurtz, ed. Amherst, NY: Prometheus Books, 2001. 415 pages. Paperback; $15.95. ISBN: 1573928844.

Kurtz, professor emeritus of philosophy at the State University of New York at Buffalo, is a major disciple of David Hume and a high priest of secular humanism. He is a past president of the American Humanist Association, founder of the Council for Secular Humanism, the National Center for Science Education and the Committee for the Paranormal (CSICOP). This book has thirty-six articles by CSICOP members which by scientific and skeptical enquiry try to debunk the evidence for the supernatural. Kurtz states:

> We need to state forthrightly the scientific case against intelligent design, the survival of the self after death or the dearth of evidence for personal salvation ... it is incumbent on us to defend the natural interpretations of reality, a materialist's not for a spiritual-paranormal account ... in a universe without purpose or design (p. 80).

The essays include efforts to debunk UFOs by Philip Klass, psychic phenomenon by Susan Blackmore, creationism by Eugenie Scott, Intelligent Design by Victor Stenger, and the Bible Code by David E. Thomas. Also, Kurtz presents his side of why CSICOP original magazine editor Marcello Truzzi and the original statistician resigned charging the CSICOP with bias and one-sidedness.

For one who has read the scientific evidence for phenomenon which defy natural explanations, *The Skeptical Odyssey* is unconvincing. For example, while three parapsychology debunkers expose psychic Uri Keller and UFO abduction claims no mention is made of the evidence for psychokinesis (ability of the mind to influence physical objects) by Princeton University Engineering Department Chairman Dr. Robert Jahn.

In claiming to explain the unexplainable image of Jesus on the Shroud of Turin, CSICOR exposes its own manipulation of facts. On page 315, Lores Gamez says: "Walter McCrone, one of the world's leading forensic microanalysis, was expelled from the group (of scientists examining the shroud) after he revealed that what looks like blood was really paint pigment." On page 225, Joe Nickell of CSICOP says he proved that he can make similar images to the one on the shroud by his "rubbing technique that utilizes a base-relief sculpture."

In *Verdict on the Shroud* (Servant Books, 1981), Shroud committee spokesman Kenneth Stevens denies that Walter McCrone was ever a member of the committee. On pages 108–9, he responds to Joe Nichells, concluding that the Nichells' technique "requires the building up of particles in the image area and microscopic inspection finds no evidence of this." While maybe not a committee member, McCrone has tried to debunk the Shroud image in CSICOP's magazine claiming it is a painting as evidenced by the presence of iron oxide. Stevens responds: "Microchemical studies determined that there is not nearly enough iron oxide on the cloth to account for even an enhancement of the image."

Report on the Shroud (Houghton Mufflin, 1983) is by Shroud team member, Dr. John H. Heller, a Yale professor of medical physics. He responds to McCrone in chapters nine through thirteen with strong counter evidence. Three times he challenges McCrone to debate the evidence of the source of the shroud's image and three times the skeptic failed to show.

Eugenie Scott says: "Nonmaterial causes are disallowed ... science must explain using natural causes and scientists must be willing to change their explanations when they are refuted" (p. 247). Common sense says that if one starts with the David Hume mindset that there is nothing but the natural, one cannot objectively investigate the evidence for the supernatural. Therefore, we must be skeptical of these skeptics.

Reviewed by Leland P. Gamson, LCSW, LMFT, CDAPA, Marion, IN 46952.

SOCIAL SCIENCE

RELIGIOUS PLURALISM IN THE ACADEMY: Opening the Dialogue by Robert J. Nash. New York: Peter Lang Publishing, 2001. 224 pages, index, bibliography. Paperback; $29.95. ISBN: 082045592X.

For many years, the topics of religion, particularly those which touch on religious pluralism, have been avoided by much of American higher education, and so religious faith has become marginalized, ignored or, at best, sugar-coated as students move through their educational years. The author wants this to change. Nash brings to the task the expertise of a gifted educator, the understanding of a philosopher, and the belief in the importance of religious stories. He thinks religious conversations (and confrontations) can take place within the university in a meaningful, civil, and constructive way.

Nash, an educator for thirty-three years, has been addressing this issue since 1998 in a course titled "Religion, Spirituality and Education." It has been filled to overflowing in each of the five semesters it has been offered. Nash sets three goals for his course: (1) To convince his fellow educators that the need to address religious and spiritual meaning is of high importance to young college students; (2) To critically examine the nature of religious differences as they exist on college campuses today; and (3) To present a model for "moral conversation." It is not possible for me to evaluate his first goal, but he has succeeded excellently in his second and third.

Nash contends that "... religious pluralism, if left unattended, is a phenomenon that in the future will threaten to divide students, faculty, and administrators in a way that makes all the other campus divisions look tame by com-

parison" (p. 30). The perplexing dilemma for educators, of course, is how to deal with fundamentalists, both religious and secular, in a pluralistic university environment. Drawing on Stephen Carter's three books *(The Culture of Disbelief, Civility,* and *God's Name in Vain*) he discusses his own successes and failures in addressing this problem.

Toward the end of the book, Nash discusses what he calls "the Six Principles of Moral Conversation." Based on the poem "The Man with the Hoe" by Edwin Markham (1899), which concludes: "We drew a circle that took him in," these are: (1) Belief declarations are not the same as conversations about beliefs; (2) All views deserve initial respect; (3) Find the truth in what you oppose, always focusing on achieving agreements on word meanings; (4) "All or nothing" thinking is destructive; (5) Reality exists. But all we know are stories about it; and (6) Moral conversation in itself "leans to the left, therefore allow for this." This book is highly recommended.

Reviewed by John W. Burgeson, 2295 East Iliff Ave. #101, Denver, CO 80210.

Letters

On Universal Language

I would like to raise a few questions about Carol Hill's biblical evidence for a local versus universal flood (*Perspectives on Science and Christian Faith* [September 2002]: 170–83). The thesis and conclusion of this article is that "all of the evidence, both biblical and scientific, leads to the conclusion that the Noachian deluge was a local, rather than a universal, flood." What caught my attention in this statement is the universal "all." It is certain that Hill has not examined all of the scientific evidence, but I will leave that for others to discuss. My intent here is only to point out some internal inconsistencies in Hill's biblical arguments.

The first biblical argument for a local flood is based mainly on interpretation of the universal language in the biblical account of the flood. Several biblical texts are cited to illustrate the use of universal language in contexts where a local application is probable. For example, universal language used to describe the famine in Gen 41:46, apparently does not mean the whole earth, so Hill concludes that the universal language in Gen 6–9 can likewise be interpreted as local. This conclusion may be correct, but it cannot be established from such comparisons. Why not compare the universal statements in Gen 6–8 to other examples where universal language is indeed universal. For example, the article refers to Col 1:6 where "world" (*cosmos*) seems to require a local interpretation, but perhaps the universal language in Gen 6–9 is more like the *cosmos* of John 3:16 and "all creation" in Col 1:15. What makes the examples Hill cites useful to her purpose is that the limited intent of the universal language is implied (though not always sure) from the immediate context in which it appears. One could make the opposite and equally weak argument by citing only the examples where the universal language taken in context has a universal or global intent. So, Hill's comparisons establish nothing except that universal language in Scripture must be understood in context. Taken in its appropriate context, the universal language in Gen 6–9 and other biblical references to the flood (consider, for example, *cosmos* in Heb. 11:7) appears global.

The second of three of Hill's biblical arguments for a local flood is centered on a refutation of the canopy theory. Hill provides evidence and arguments which support the view that the mist of Gen 2:6 was an underground stream or spring rather than a canopy. Hill seems to agree with global flood proponents, at least on this one point, that the canopy theory, if correct, is evidence for a global flood. That may be, but it is not direct evidence for a global flood and the absence of the canopy is not evidence for a local flood. As Gen 7:11–12 implies, God apparently had lots of water (Gen 7:11); whether or not he got some of it from a canopy says nothing about the extent of the flood.

The third biblical argument cited in support of the local flood theory is, like the second, a refutation of a commonly held belief that is not directly relevant to the question. Hill's arguments to the effect that the ark did not land on Mount Ararat are substantive, but even if it could be proven that the final resting place of the ark was a much smaller hill, that would add little to an argument for or against a local flood. The only thing we can be sure of from the biblical account is that God directed the ark to a location which was safe for the people and animals to disembark.

So, taking stock (no pun intended) of "all the biblical evidence" cited in the article, we have three lines of argument, one which is fallacious and two which provide no substantive support for a local flood or against a global flood. But, there is more. Following Hill's principle that the biblical text can be "taken at face value," other questions arise from the plain reading of Gen 6–9.

If the flood was local, why spend 120 years building an ark; why not just chase the cows over the hill? Or why bother at all since most of the species already existed over the hill? Certainly most of the birds would be able to fly to higher ground; how humiliating for the eagles to be carried out of the valley in a house boat! What about the people that lived over the hill; are we to assume that everyone alive on the earth at the time of the flood lived in Mesopotamia; or, that none of the able bodied people in Mesopotamia were able to climb to higher ground? Were the survivors somehow not human as bearers of God's image, or was God a little confused when he made the statements in Gen 6:6–7? Then there is the problem of the rainbow; if the Noachian flood is local, then God's covenant with Noah and "all" flesh (Gen 9:12–17) must also refer to local floods and every subsequent destructive deluge stands in contradiction to God's Word (unless you assume that the covenant applies only to Mesopotamia which leads to the silly conclusion that Noah's descendants cannot benefit from the covenant unless they stay in Mesopotamia).

Hill also makes much of what the Bible does not say. For example, the article makes several statements similar to the following: "The Bible itself never claims that all of the sedimentary rock on earth formed at the time of the Noachian flood ..." This is true, but what the Bible does

not say about specific events is irrelevant to the question. The Bible also has nothing to say about unidentified flying objects (well okay, maybe Ezekiel's wheels have not yet been fully characterized). More important than the formation of sedimentary rock is Hill's assertion that the biblical account makes no reference to miracles associated with the flood. While acknowledging that God ordered the flood, Hill is anxious to minimize the miracles in the biblical account because she wants to use the lack of miracles as evidence for a local flood. For example, she emphasizes that *"Noah did all that the Lord commanded him"* (Gen 6:22) to make the point that Noah did not require a miracle from God to, among other things, collect all of the animals. In other words, Hill concludes that the flood must be local because the Bible does not specifically say that it took a miracle to collect the animals and a universal flood would have required Noah to collect more animals than is humanly possible. The difficulty, as Hill confirms, is that even a flood confined to the region of Mesopotamia would require collection and care of several hundred if not thousands of species. That would require, at the least, a divine course in zoology. Yes, Noah did what God commanded, but if we are to believe Gen 6–9 at all, we must accept that he did not do it without extraordinary means.

In my view, Hill's handling of both the science and the biblical evidence is influenced by uniformatarian assumptions about the physical evidence. The result is a "square peg-round hole" attempt to make Genesis conform to modern science. In any case, the principal thesis of Hill's paper is false. None of her biblical arguments provide direct support for the local flood theory.

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Response to Art Hill

I will attempt to address Art Hill's criticisms of my "The Noachian Flood: Universal or Local?" article in the September 2002 issue of *Perspectives on Science and Christian Faith* (pp. 170–83) in the order that they were given.

1. *Universal language.* The main reason for interpreting the language of Gen. 6-9 to be local rather than universal comes from the fact that the people of the Bible had a very limited world view. The ancient Mesopotamians had no idea of the Earth as a planet. Their "world" was the Mesopotamian alluvial plain and nearby surrounding areas. The term "the world," corresponding to the Greek word *kosmos* does not appear in the Bible until Matt. 4:8—it never appears in the Old Testament (the concept was not around yet), and when it does appear in the New Testament, it can be used either in a wide or narrow sense (*Strong's Concordance*). The word *kosmos* is never used in the Bible in a worldwide sense, because even in New Testament times, the Earth was not known to be a global planet. In other words, it does not matter that Art Hill quotes John 3:16, Col. 1:6, and Heb. 11:7 because the universality of the word, *as we have come to understand it today*, was not applicable in the first century AD, any more than it was in the third millennium BC. It was only gradually, over time, that the sense of the word was expanded to include the entire planet Earth and all of its people groups.

2. *Context.* Referring back to Genesis and the "universal language" used therein, it thus seems logical from the above discussion to assume that this type of "biblical language" should be understood *in the context of that time and place and world view*—that is, in the context of the third millennium B.C., in Mesopotamia, and the limited (and local) world view of the Mesopotamians.

3. *Canopy theory.* In no way did I mean to imply that the canopy theory is correct or that it might be evidence for a global flood. The canopy theory is a purely human theological construction that tries to account for a universal flood—the original assumption. The idea of a canopy "mist" (Gen. 2:6) comes from a mistranslation of the Hebrew text, as pointed out by Hebrew scholar Cassuto and others.

4. *A much smaller hill.* The point of the Jabel Judi discussion was not the size of this hill (actually the main construct is a mountain), but its *location*. Jabel Judi lies within the Mesopotamian hydrologic basin, a necessary condition if the flood was really local rather than universal. Only in a restricted, very flat, hydrologic basin (such as the Mesopotamian basin), could the ark have traveled upstream, against the current, to reach the Ararat (Urartu) area. (Hopefully, the topic of the hydrology of Noah's Flood will be covered in a three-part series in *PSCF* sometime in the future.)

5. *One hundred twenty years building the ark.* The ancient Mesopotamians had two numbering systems—one sacred (numerological) and one secular (numerical). Numbers like 600 (60 x 10) (Noah's age) and 120 (60 x 2) were part of their sexagesimal (60-based) numerological system and are not to be taken literally, but symbolically, like the ages of the patriarchs. (I have a *PSCF* manuscript in review now entitled "Making Sense of the Numbers of Genesis" that discusses this topic.)

6. *People-animals outside of Mesopotamia.* This is a very good question, but unfortunately its answer is beyond the scope of this short reply. It encompasses a very controversial subject that involves Adam as the first human, the meaning of original sin, etc. It is my opinion that "all the people" who perished in the Flood resided in the Mesopotamian basin at ~2900 BC and were "sinfully" descended from Adam and thus under God's judgment. (I would advise reading John McIntyre's "The Historical Adam" in the same September 2002 issue for some of the theological aspects of this topic.)

7. *Rainbow.* The best answer that I know of to this question was given by Hugh Ross in *The Genesis Question* (Navpress [1998], 72–3): "The Bible makes no claim that the rainbow God showed Noah in Genesis 9 and the rain that caused it had never before been seen on Earth ... The rainbow was established by God as a sign or symbol of a covenant ... God chose something familiar, something previously existing ... the rainbow fits a pattern of something old and familiar being adopted as a sign of something new." It was a local flood, but the *meaning* of the rainbow became universal through God's covenant and intent.

8. *Sedimentary rock ... what the Bible does not say.* If what the Bible does not say is "irrelevant to the question," then you must be of the opinion that most of the tenants of Young Earth Creationism are irrelevant. The Bible says nothing about a vapor canopy, about continents rapidly drifting apart, about sedimentary rock being formed at the time of Noah's Flood, etc. This was exactly the point of my article in the March 2000 issue of *PSCF* on the "Garden of Eden: A Modern Landscape": you cannot base a theology on what the Bible does not say, only on what it does say. The Bible does not claim that all of the sedimentary rock was formed in Noah's flood (in fact, it implies the opposite), so neither should we.

9. *Miracles.* The same logic applies to miracles: we should not assume miracles that the Bible does not claim. God told Noah to round up the animals—the Bible says nothing about a miracle being involved in this particular activity. This does not mean that I do not believe in miracles or that miracles were not involved in the case of Noah's Flood. However, if the Bible is to be taken at "face value," then the miracles that it actually claims should be considered to be miracles, but those it does not claim should not be manufactured. In the case of Noah's Flood, the Bible claims these miracles:

a. It was God (*I, even I*; Gen. 6:17) who purposely brought the flood of water upon the Earth; i.e., God exercised absolute control over the forces of nature by causing the Flood. This was a miracle because God *intervened* into his physical laws for his own purposes.

b. It was the Lord God who shut up Noah and his family into the ark (Gen. 7:17).

c. It was God who restrained the floodwaters (Gen. 8:1-3) and brought the ark safely to the mountains of Ararat (Gen. 8:4).

d. It was God who established a covenant with Noah (Gen. 6:18) and who made the rainbow a sign of that covenant (Gen. 9:13).

10. *Uniformitarian assumptions.* This sounds like Young Earth Creationist rhetoric. What does it have to do with the discussion? If, by this, you mean that I take an "Old-Earth Creationist" position, then you are correct. But it does not mean that I believe all things have remained uniform since the beginning of time. The Bible clearly indicates that God has intervened in his created world.

I thank Art Hill for his comments because such open discussion is crucial to maintaining a healthy Christian community. I invite other readers of *PSCF* (of whatever Christian persuasion) to submit their opinions on this topic.

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Discher Analysis Raises Concerns

The Discher-Van Till interaction raises two concerns in my mind. The first is moral. Christians generally regard themselves in some sense as God's representatives in the world, and all would agree that God would not want any of us to believe that which is not true. Consider the following analogy. Fundamentalistic "date-setting" for the return of Christ has been almost completely abandoned by evangelicals. The reason, I suspect, is they understand that, regardless of the validity of the doctrine itself, the total failure of date-setting to this point has been counterproductive and destructive of the Christian message. "Gap-finding" is today's upscale version of date-setting, and it is likewise obvious to all that, like date-setting, *all* previous gap-finding has resulted in the promotion as true of that which was not. Contemporary evangelicals have (for the most part) learned a lesson about date-setting. Perhaps it is time for the same to be said of gap-finding. All Christians, but particularly those in science, would do well to seriously consider the history of gap-finding and its impact on the message they are called upon to hold up before the world.

The second concern is methodological. Discher calls Van Till's RFEP a "theory" that could be "confirmed empirically," but which nevertheless "might not be correct." I believe this analysis is seriously flawed. Discher has confused the choice of theories *within* a scientific world view (which is what Polyani's meteorite example was about) with the choice of assumptions required to make *any* scientific understanding of the world possible. His claim that "empirical investigations" are somehow self-interpreting and require no background assumptions is very naive. Consider the oft-noticed refusal of current ID theorizers to take a position on the young-old earth controversy. Usually interpreted as politically motivated to avoid splitting the ID movement, this refusal in fact neatly avoids the necessity of revealing a commitment to naturalism, the only possible foundation on which a scientific choice can be made on the age issue (this is made admirably clear in Henry Morris' writings). For centuries, it has been understood that empirical evidence tells us nothing without naturalistic assumptions. Philip Gosse, for example, considered the agreement with all empirical evidence to be a major argument in favor of his "apparent age" theory of a recent creation. This agreement was fully acknowledged by even Gosse's most severe critics, and *every* proposed gap involves some version of such apparent age thinking (that is, involves a discontinuity between some physical state and the preceding state that cannot be bridged naturalistically). Much earlier, the single most important factor precipitating Galileo's trial was his caviler treatment of Urban VIII's favorite argument: God could have created a world in which all the evidence indicates that the Earth moves but in which it, in fact, does not.

In my judgement, Discher's analysis confuses rather than clarifies how gap thinking might relate to scientific attempts to understand the world from a Christian perspective.

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On Discher's Reply to Van Till

Mark Discher's reply, "Is Howard Van Till's Response to 'Van Till and Intelligent Design' a 'Right Stuff' Response?" (*PSCF* 54 [December 2002]: 240*f*), was very disappointing to me. His first point has three subpoints. He says that he referred to Van Till's published works. True, but his article footnotes more overheads from an oral presentation he did not hear than published sources.[1] Second, he says that Van Till did not do what he thought he should. This may be a relevant criticism to those who obfuscate to hide the truth, or to a judge instructing a witness to answer a question. It is patronizing here. Third, he simply declares: "I understand him just fine." This is equivalent to "I'm still right, and I've just told you how right I am."

The second point, that Van Till engages in a fallacy by generalizing from the past successes of science and the failures of nonscientific explanations, is not justified by the failures of philosophers (or scientists engaging in philosophy). Further, the unsuccessful and discouraged swain he mentions may well be judged objectively as continuing to fail so long as his approach and attitude remain the same. In any event, the immediate subjective response to disappointment cannot be elevated to a logical principle.

The third point, that Van Till is abetting the atheists, is irrelevant. Let me turn it around: Discher should not support a view to which followers of Moon, who claims to be the new Messiah of the Second Coming, adhere.[2] An honest appraisal recognizes that no one is responsible for those who may agree with them.

The fourth point, that one can detect design without knowing how it works, neglects the vital point that Van Till makes, that there is a difference between blue print and manufacture.[3] He is clear that the universe was designed, so well designed that it worked properly from the moment of creation. What he wants is an explanation, if God did not do a complete job at creation, why the Almighty lacked competence to perfect the beginning and how the missing parts were later inserted.[4] Indeed, one may press the matter further. One has a choice here between two empirical claims:

1. Since science has discovered so many mechanisms in the past, it will probably fill in most of the current gaps in our knowledge, which Van Till believes.
2. Science will *never* fill the gaps we recognize today, which springs from ID.

Does anyone who understands logic even a little want to demonstrate a "never"?

Fifth, the claim that all scientists engage in folk science is bogus. Folk science is not testing with a hope that a hypothesis is right, as Discher states, but an attempt to use science to justify a philosophical or theological assumption.[5] Discher has blatantly altered the meaning to make it seem foolish. This is dishonest and unconscionable.

Rather than analyzing Discher's original paper,[6] I have focused on his reply in order to more briefly present a critique of his approach. I find his response to Van Till grossly inadequate. The original paper, which received some criticism when it was presented orally, makes fewer errors. So, were I still teaching "Logic in Practice," I would not use it as an example of sophistry. The two pages of the "Reply" could obviously be so used.

Notes

[1]Howard J. Van Till, "Is the Creation a 'Right Stuff' Universe?" *PSCF* 54 (December 2002): 232. Nine footnotes in Mark Discher, "Van Till and Intelligent Design," ibid., pp. 220–31, cite the overheads. Six refer to published material, one to an Internet site.

[2]Jonathon Wells, Senior Fellow, Discovery Institute, was ordained in the Unification Church of Rev. Sun Myung Moon. The teachings of the Unification Church are presented in www.rapidnet.cpm/~jbeard/bdm/exposes/moon/general.htm or, from the organization itself, in http://members/tripod.com/~jho2/.

[3]Van Till, "Is the Creation a 'Right Stuff' Universe?" pp. 237*f*.

[4]Theological grounds allow the claim that vertebrate and human life were miraculously introduced (Gen. 1:21, 27), but do not support multiple interventions. We do not have the information for a definitive scientific assessment of these matters.

[5]Van Till, "Is the Creation a 'Right Stuff' Universe?" p. 235. Note the repeated specification of "worldview beliefs" and religious beliefs.

[6]Discher, "Van Till and Intelligent Design," ibid., pp. 220–31.

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Intelligent Design and Right Stuff: Where is the Truth?

I do not have the credentials to allow me to enter into the discussion involving "Intelligent Design" and "Right stuff" featured in the December issue of *PSCF*, but I would like to express my thoughts. First of all, I find Discher's remarks very convincing, but nevertheless I find Van Till's position more nearly in accord with what the truth must be—more in accord with the position of John Polkinghorne who said that "Only God could make a world that makes itself."[1] This seems to me a more wonderful God than one who must tinker with creation now and then to bring about his designs. But I believe the truth is grander still.

Any discussion of creation must include "why creation," and it must address "evil." Gregory Boyd has done a marvelous job is speaking to these two aspects of creation.[2] He shows that because the Creator is Love, evil is essentially inevitable. He does not address how the fact of evil can be reconciled to God. The first chapter of Colossians states that all things are reconciled to God through Jesus. Because of the truth of Colossians 1, God will see as he did after finishing creation that "it has been good. Very good." A more narrow view of Jesus would have God say something like, "It could have been much better, if only my creatures would have listen to me."

What reconciled means is given to us in Scripture by example. During the time of rebuilding the temple, a place for one of the stones could not be found. It was thought to be useless—a mistake—and just "in the way" of furthering the project. However, it was eventually found that it was exactly what was needed for the all-important "corner stone" (Ps. 118:21–24). Jesus used that incident as an example of his reconciling work (Mark 12:10–11). Peter also referred to the stone rejected by the builders in his

proclamation of Jesus (Acts 4:11), and in his instruction to believers (1 Peter 2:7).

The meaning of reconciliation is to make what is contrary to the purpose of the one in charge, constructive. So, when all things are reconciled to God they are all made constructive in terms of his purpose in creation. The "forming" of Israel is given as an example of reconciling in action (Isa. 43:1–2, for example). The years that Israel was in slavery formed them into a coherent people, and the evil of Egypt was used as the tool of formation—all was reconciled. The same principle is used in forming of God's people today (Gal. 4:19; James 1:2–4).

Now, it might be possible that the reconciling that encompasses all of creation is the missing design element needed to make biological evolution function creatively.[3] If it is not the needed design element itself, then it might supply what is necessary for design to be realized.

Notes

[1]John Polkinghorne, Lecture at Chestnut Hill on November 28, 2000, as reported in *The Newsletter of the ASA/CSCA* 43, no. 2 (MAR/APR 2001): 8.

[2]Gregory A.Boyd, *Satan and the Problem of Evil* (Downers Grove, IL: InterVarsity Press, 2001).

[3]John Bracht, "Natural Selection as an Algorithm: Why Darwinian Processes Lack the Information Necessary to Evolve Complex Life," *PSCF* 54, no. 4 (December 2002): 264–9.

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Shocking News on Genetically Modified Corn

This is just a short note to colleagues to whom I have expressed concern on the worldwide misinformation on genetically-modified (GM) foods. It was disturbing in early September to see news reports that Zimbabwe had turned down U.S. corn because it contained some GM kernels.

Even more shocking is the report in *Science* ([8 November 2002]: 1153–4), that Zambia has turned this food down because of its "scientists' advice." The report says that these science "experts" in Zambia conclude "that the U.S. corn should be refused on the 'precautionary principle' because studies of the health risks of GM foods 'are inconclusive.'" Our U.S. experts say that Zambia has disregarded "the scientific evidence" and some label the Zambian science as "pseudoscience." The news report states that 35,000 Zambians will die of starvation by March 2003 if outside food is not let in.

This is an amazing tragedy. The Zambians express fear about a "might be" hazard and disregard the real hazard of starvation. Some of us know well the breadth and pernicious depth of the so-called "precautionary principle" so ardently adopted and used (misused) by doctrinaire environmentalists. It is a shame and sin for scientists and the Church to be ignorant and unconcerned about what is going on in these African countries.

The unsound sophistries of the Greens in Europe and the WHO have been taught to neophyte "scientists" in Africa—and look at the results. It is as if somebody is saying, "Let them starve! At least that is natural, and generations of the future will be protected from an unnatural evil that just might possibly be there. This GM food thing is suspect because it comes from industry and the evil U.S."

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How Do I Become More Active in the ASA?

Each member will be asked to choose a primary and secondary affiliation or commission from the list below. Affiliations are autonomous but usually meet in conjunction with the ASA Annual Meeting. Commissions are led by a four- to six-member board with a chairperson. Each commission is asked to relate its discipline toward science. They also usually meet in conjunction with the ASA Annual Meeting.

Affiliations

- Affiliation of Christian Biologists (ACB)
- Affiliation of Christian Geologists (ACG)
- African Institute for Scientific Research and Development (AISRED)
- Christian Engineers and Scientists in Technology (CEST)

Commissions

- Bioethics
- Communications
- Creation
- Global Resources and Environment
- History and Philosophy of Science
- Physical Sciences
- Science Education
- Social Sciences

Local Sections of the ASA are organized to hold meetings and provide an interchange of ideas at the regional level. Additional information can be obtained from the national office. Listed below are some of the more active local sections.

Local Sections

- Chicago–Wheaton
- DC–Baltimore
- Eastern PA
- Rocky Mountain
- San Francisco Bay
- Southwest (AZ)

What Is the American Scientific Affiliation?

The American Scientific Affiliation (ASA) is a fellowship of men and women in science and related disciplines, who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. Founded in 1941, the ASA has grown significantly since then. The ASA's stated purposes are: "to investigate any area relating Christian faith and science" and "to make known the results of such investigations for comment and criticism by the Christian community and by the scientific community."

Science has brought about enormous changes in our world. Christians have often reacted as though science threatened the very foundations of Christian faith. ASA's unique mission is to integrate and communicate properly researched science and biblical theology in service to the Church and the scientific community. ASA members have confidence that such integration is not only possible but necessary to an adequate understanding of God and his creation. Our total allegiance is to our Creator. We acknowledge our debt to him for the whole natural order and for the development of science as a way of knowing that order in detail. We also acknowledge our debt to him for the Scriptures, which give us "the wisdom that leads to salvation through faith in Jesus Christ." We believe that honest and open study of God's dual revelation, in nature and in the Bible, must eventually lead to understanding of its inherent harmony.

The ASA is also committed to the equally important task of providing advice and direction to the Church and society in how best to use the results of science and technology while preserving the integrity of God's creation. An evangelical organization, the ASA provides a forum where scientists, social scientists, philosophers, and theologians can interact together and help shape Christian views of science. The vision of the ASA is to have science and theology positively interacting and affecting one another.

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American Scientific Affiliation

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 on Science and Christian Faith* 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.

Canadian Scientific & Christian Affiliation

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 publications (*Perspectives on Science and Christian Faith* and the *ASA/CSCA Newsletter*). The 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. Contact CSCA by writing to: Canadian Scientific and Christian Affiliation, PO Box 40086, 75 King St. S., Waterloo, ON N2J 4V1 or visit their web site at: www.csca.ca.

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

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