PERSPECTIVES on Science and Christian Faith

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In this issue . . .

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

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Perspectives on Science and Christian Faith

MANUSCRIPT GUIDELINES

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

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The Literature on Science and Religion

A recent correspondent has questioned the quality of the review process for *PSCF*. I agree that each of us; writers, reviewers, and editor could do better. The current explosion of writing on science and religion themes has created a problem of inadequate knowledge of the literature—a literature which is not always amenable to the usual search approaches used by scientist authors. In examining articles in various science and religion magazines, it seems that writers often exclude quality papers in other journals. We can understand writers who quote only those who have the "received truth" but we should be no less forgiving to those who ignore or dismiss the *literature* out of hand.

As editor, I often remind prospective authors that they have not taken into account relevant articles in our journal let alone what has been said in *Science and Christian Belief* or *Zygon*. These journals are abstracted in *Religious and Theological Abstracts* and web sites for the journals increasingly provide article lists if it is not possible to consult the journals themselves. The ASA web site (asa.calvin.edu) offers a detailed keyword index for all but the most recent issues of *PSCF* and a list of subscribing libraries. An abstracting service that covers the entire range of the field—periodicals and books—would be of great value.

Material on science and Christianity in English (and important work being carried out in other languages) is found in many places. It takes a significant start-up period to embrace the literature before one can, with confidence, bring a fresh approach to more recent themes, let alone ideas which have been debated for 150 years.

The burden on reviewers is enhanced due to the multidisciplinary nature of many manuscripts. On occasion a scientist, theologian, and a philosopher are required to fully assess a manuscript. Thankfully, the letters to the editor section provides a useful venue for catching the *errors* that all of us have missed. ❄

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In This Issue

The "Portraits of Human Nature" symposium at the CIS/ASA 1998 meeting reflects an increasing Christian interest in the many-sided field of neurobiology. Pablo Polischuk's Essay Review of *Whatever Happened to the Soul? Scientific and Theological Portraits of Human Nature* (Fortress Press, 1998) considers the work of the participants in the symposium.

Along the same lines, Ben M. Carter's paper offers a critique of philosopher Daniel Dennett's attempt to construct a philosophical model of consciousness based on naturalistic science. Glenn Morton then provides a novel approach to the age of Adam by linking traits such as language, pain in childbirth, sweat, etc., with anthropological evidence consistent with *fallen* human being's existence on earth—a date far earlier than that in recent attempts to limit *spiritual* humankind to 100,000 years.

Our four *Communications* offer "something old and something new." Harley D. Potter first offers an alternative to recent proposals seeking to provide a place for experimentally-based intelligent design. Here he "demotes" portions of science (mostly in biological origins) from main-stream science that insists on a methodological naturalism that is intellectually dishonest because it bars questions important in a broader context. Kenell J. Touryan then examines the question, "Are Truth Claims in Science Socially Constructed?" both for science and, by extension, to the truth claims of Christianity. David Siemens continues the Intelligent Design (ID) discussion in suggesting two distinct groups of experimental predictions derivable from alternative versions of ID. Finally, Gavin Basil McGrath provides an analysis of Scotsman James Orr's (1844–1913) views on Theistic Evolution.

A diverse set of book reviews and three Letters to the Editor conclude this issue.

Young Scientists' Corner

A Guide to Graduate School for Christians in Science: Growing and Staying Sane

by William M. Struthers,* graduate student at The University of Illinois at Chicago

Is this really worth it? That is the question that I have asked myself countless times since I began my career as a professional graduate student (at least it feels like a career). Many scientists who pursue careers in industry or academia will obtain their advanced degrees while enrolled as a full-time graduate student. Graduate school is an experience that is qualitatively different from undergraduate work. As a psychology student finishing my undergraduate work, getting into grad school was the prize that so many of my classmates and I had pursued. After my acceptance into a doctoral program, I thought that my worries were over. I have never been more wrong.

In college I rarely considered how my studies fit with my faith. My religious beliefs were neatly packed away in the corner of my life labeled "Church Stuff—Open Only on Sundays." My faith did not interfere with my college life, so why should graduate school be any different? My first semester in graduate school was the beginning of the end for my neatly packaged world. The long hours studying, the time spent learning statistical software packages, preparing discussion sections for my teaching assistantship and developing my research techniques and conducting experiments were difficult enough without the loneliness and competitive, often spiritually hostile, environment. Preparing a thesis can become an obsession. "Publish or Perish" is the warning at lab meetings and beefing up your vita is a top priority. This atmosphere can suffocate anyone who is interested in pursuing a life in research or academia and Christians are not immune to these pressures.

As Christians in science, we face a unique challenge—most schools offering advanced degrees are not interested in integrating our discipline with our faith. Unlike theological schools, a psychology or chemistry graduate at a research university is not encouraged to grow spiritually. Christian campus organizations are usually geared toward undergraduates, and graduate/undergraduate relationships present another opportunity for grads to walk on eggshells, especially when they may be responsible for evaluation of course work and grade assignments. Within the university, faculty and graduate colleagues can be hostile toward what they view as "oppressive religious values." In some ways, we can feel as if we are in *Inherit the Wind* with tweed coats and lecterns. In addition, the trend toward specialization that many universities have as a part of their structure makes pulling together our research with our faith quite difficult.

So what can a Christian who is a graduate student working with non-Christians do? From my own experience, graduate school has been a challenging time of soul-searching and spiritual growth. It has refined my character, my faith, and my commitment to Christ. How can we stay sane and grow closer to Jesus during this time? Here are a few suggestions.

ASA Student Member

1. Manage your time wisely. This is, without a doubt, the key to continuing your Christian walk and maintaining your sanity. Few people realize the amount of work that goes into graduate studies and the amount of time that disappears. Reading journal articles, studying for exams, setting up your lab for experiments, running statistical analysis, and preparing lecture notes all seem to take twice the amount of time that they should, so plan accordingly. For procrastinators (like me) the lack of departmental and/or advisor deadlines can act as a silent Black Hole. Be disciplined with your academic goals; set dates, and be accountable to someone who is close and can monitor you. Semesters pass much more quickly, and before you know it, that abstract submission date or oral exam, which seems so distant, will be upon you. Above all, continue to make time with God a priority and guard this time jealously. Too often I have found myself putting time aside to read that article in *Scientific American* or *Brain Research*—placing God on the back burner. Only at the end of the day before I drift off to sleep, do I remember him. Your time is the treasure that you give to what you value; don't forget your time with God.

Be disciplined with your academic goals; set dates, and be accountable to someone who is close and can monitor you.

2. Stay in the Word and have consistent quiet times. Just putting time aside with God is not enough. All Christians, whatever their occupation, get spiritual nourishment from taking in the Word on a daily basis. This is what anchors our relationship with Christ. Consistently studying the Scriptures, meditating on them, and offering our prayers to God draws us closer to him and helps us put our studies and our anxiety into perspective. Looking back on these past few years, I have noticed that the times that I have struggled the most with my advisor, my experiments, or my nervousness about my future were when I was not in the Word. God will grant us the peace that we need (Ps. 55:22, Phil. 4:7).

3. Be honest. The pressures of classes, getting manuscripts accepted, and collecting data for conference presentations can sneak up on you and tempt you to omit references, embellish results, or stretch your data. Science is not done in a vacuum and, unfortunately, academia can be a very competitive profession. Competing for fellowships, awards, and funding can bring out the worst in anyone. Plagiarism and falsifying data damage your integrity and testimony. Being dishonest in your research is one way to set yourself up for a professional fall. You also need to consider the ramifications of publishing false information that other investigators are trusting to be valid for their own research. One example is the well-publicized account that occurred in Francis Collins' lab (*Science* 274 [Nov. 8, 1996]: 908–10). Dishonesty goes against the tenets of Scripture (Eph. 4:25) as well as science (*Philosophy of Science* by Del Ratzsch, Downers Grove, IL: InterVarsity Press, 1986).

Consistently studying the Scriptures, meditating on them, and offering our prayers to God draws us closer to him and helps us put our studies and our anxiety into perspective.

4. Get involved with a local church. Fellowship is absolutely necessary to maintain accountability in your spiritual walk. The church gives you an opportunity for corporate worship and provides you with a chance to learn and grow with those who are like-minded. The church also provides an opportunity to develop your spiritual gifts and serve your community. If you are married, your spouse can give you emotional support. If you are single, where does your emotional support come from? Your brothers and sisters in Christ are a valuable resource to both married and single students. An encouraging word from your pastor can lift a load off your shoulders. The body of Christ is most effective when we are actively involved and part of the work of the church (1 Corin. 12:12–26).

5. Find a mentor. Your advisor may be your professional mentor, but you will also need a mentor who will help you grow in your spiritual walk as well.

Although your focus at this time needs to be on your research, God also desires for you to develop Christian character and become more like his Son. You will face many temptations as you struggle to complete your degree requirements. A mentor can prepare you for unforeseen problems or "touchy" issues that you might not see coming. Additionally, they can offer advice about personal matters that academic advisors may be hesitant to. Finding a mentor who is mature in Christ will help you navigate the ethical, spiritual, and emotional waters that you undoubtedly will face.

Finding a mentor who is mature in Christ will help you navigate the ethical, spiritual, and emotional waters that you undoubtedly will face.

6. Think in terms of integration. Too often we approach our studies as if they were separate from the rest of the world. In this age of academic specialization, we are encouraged to be experts in a particular field and carve out our niche. Try to make a conscious effort to incorporate your research into your Christian perspective and avoid the isolationist mentality. In his book, *The Idea of a Christian College* (Downers Grove, IL: InterVarsity Press, 1997), Arthur Holmes wrote that all truth is God's truth. If this is true, the truths that your research reveals must not contradict the truths revealed in Scripture. How do Christian scholars in your area of expertise integrate their faith with their research? In psychology, David Myers and Malcolm Jeeves have written several books dealing with the major questions, such as the mind/brain problem and the nature/nurture debate. Physicists might be interested in picking up a book by Hugh Ross or Roger Penrose. Becoming involved in professional societies, such as the American Scientific Affiliation, and reading journals devoted to integration can help you to incorporate your faith with your research. If Jesus were to ask you how your research draws you closer to him, what would you say? When you can clearly see how your research brings you toward a greater understanding of God, then you are integrating your faith with your work.

7. Be a missionary. Look around you. There are lost souls that need Christ in your department. They are your fellow graduate students, staff, and faculty members. While I am not saying that you have to stand on a soapbox at the next colloquium and deliver a hellfire and brimstone salvation message, you can still be a light in the darkness (Matt. 5:14–16). The life that you live can be a tremendous witness to those who work around you on a daily basis, and they may be more willing to listen than you might think (*Science* 277 [Aug. 15, 1997]: 890–3). Your character can speak volumes about the love of Christ. Because you will probably be in the lab a majority of the time with your labmates, you have a mission field of future scholars who will teach the next generation of students. This is your chance to affect lives for Christ in a way that you may never have the opportunity to again. Reach out to those around you. Pray for them and minister to them. Speak to them about spiritual matters in your office with respect and love. The Great Commission does not exclude scientists.

Find out what your weaknesses are and strengthen them. We all have weaknesses. The key is to make sure that they are not our downfalls.

8. Know your strengths and weaknesses. Be aware of what you do well and what you need to work on. As a general rule, try to work toward leading a balanced life but take comfort in the fact that God has endowed each of us with special gifts that he intends for us to use. Identify what your strengths are and continue to develop your career around them. Use your God-given abilities so that they bring glory and honor to him. At the same time, you may notice some areas where you have difficulty (as I mentioned earlier, mine is procrastination). Be intentional about developing these areas so that they detract as little as possible from your work. Try to set a minimum standard to stay above so that your research progresses, your testimony remains intact, and you are becoming more like Christ in everything you do. Find out what your weaknesses are and strengthen them. We all have weaknesses. The key is to make sure that they are not our downfalls.

9. Read something outside your field. One way to refresh your spirit is to read a book to expand your intellectual boundaries. Many times I have stopped and realized that I have not read a book that was not related to psychology or biology in the past three or four months. If you are a bioengineering student, pick up J. R. R. Tolkien's *The Lord of the Rings*. If you are an anthropology student, read Immanuel Kant's *Critique of Pure Reason* or Bill Hybel's *Honest to God*. Stretch yourself. God has given us so many wonderful ways to understand him. It would be a shame to look at him only through our microscopes. See him through the eyes of C. S. Lewis, Thomas Aquinas, J. I. Packer, or René Descartes. It will change your perspective on just how awesome our God is and give you a greater appreciation for disciplines outside your own.

These are just a few of the ways that I have found to help keep me sane and growing while I have been in graduate school. My wife has been a source of encouragement and has picked me up more times than I can count. It would also be disingenuous to give you the impression that I have cruised through without any bumps or bruises along the way. Everyone will have a few horror stories. God teaches us about himself throughout our lives. Your time in graduate school can be a battle against time, ideas, finances, deadlines, anxiety, and loneliness. However, it can also be a time of spiritual growth, evangelism, and personal victory. We can choose to struggle through it all on our own strength or be victorious through the love, strength, and grace of Christ. Is it really worth it? It has been for me. ❋

Your time in graduate school can be a battle against time, ideas, finances, deadlines, anxiety, and loneliness. However, it can also be a time of spiritual growth, evangelism, and personal victory.

News & Views

Doing Science and Loving the Needy

by Catherine H. Crouch
postdoctoral fellow at Harvard University, Cambridge, MA
*Deborah B. Haarsma**
Haverford College, Haverford, PA
*and Loren Haarsma**
University of Pennsylvania, Philadelphia, PA

"The Lord sets the prisoners free;
the Lord opens the eyes of the blind.
The Lord lifts up those who are bowed down;
the Lord loves the righteous.
The Lord watches over the strangers;
he upholds the orphan and the widow,
but the way of the wicked he brings to ruin"
(Ps. 146:8–9).

Scripture is full of verses which remind us that the Lord is particularly concerned about the poor and the helpless. As scientists and science teachers, how can we share that concern in the course of our professional work? We spend most of our working hours among the (relatively) privileged and wealthy. Few of us have jobs that directly redress injustices or give support and dignity to the poor.

One way to is to look around our professional world and ask, "Who in this world is poor? Who here suffers from injustice?" It may seem difficult to think of our scientific colleagues this way. It may also seem difficult to think of the nonscientists at our workplaces, such as secretarial and custodial staff, as being part of our professional world. But exploring these questions can also give us new love and compassion for these people.

In asking these questions, we have found a surprising number of answers. Not all of these ideas are appropriate for every person; rather, we hope they will stimulate you to find the specific ways you are called to be part of bringing justice into your professional world. We are eager to hear stories of how you have seen God work within your profession to set the prisoners free and to lift up those who are bowed down.

*ASA Member

In today's society, technical knowledge and a college education are increasingly a significant source of economic opportunity and social power.

- Do science education outreach to the general public, elementary schools, and high schools. Do this especially at poorer schools and communities with less resources.
- Offer to tutor students who are struggling with science or math. Find such students at your institution, at a local school or children's ministry, or through your church.
- If you are a college or university faculty member, particularly if you are in a position of leadership, be aware of your institution's admissions and finanacial aid policies. Advocate admission of—and outreach to—capable students who are from disadvantaged backgrounds.
- If you work at a prominent institution, offer resources and connections to faculty at community colleges and other less prestigious institutions which tend to serve students from poor backgrounds.

At universities, graduate students and other student employees lack power and need an advocate.

- When hiring students to be research assistants, rather than automatically choosing those with the highest grades and most extensive experience, also look for students who can become just as capable but have lower grades or less experience because of more limited backgrounds.
- Make yourself available to counsel students who are facing difficult career decisions, both your own students and other students in your department. Give particular help and encouragement to those who doubt themselves and their ability.
- Do not assume it is best for all students or postdocs to take "the fast track" to a prestigious research career. Affirm priorities that they have in addition to pursuing science.

At major research universities, some faculty give little time or effort to teaching, or focus their attention primarily on the talented students.

- Teach in a way that challenges and benefits all students, not just the most talented ones. Do not ignore the poor and under-prepared students in your classes. Give them time, and connect them with tutoring and other resources.

- Familiarize yourself with the research done in the last few decades about how students learn science, so you can teach as effectively as possible.

In the research world of academia and industry, power and opportunity are awarded to the best-known and most accomplished groups. The "rich tend to get richer and the poor, poorer" in literal funding dollars, as well as figuratively.

- When looking for research collaborators, do not automatically choose labs with strong reputations, and so try to "hitch your wagon to their star." Look for less well-known collaborators who can do the work just as well.

- When refereeing papers, giving talks, writing review articles, and so forth, give credit to groups who do good work but are less well known than the "stars" of the field—especially groups from poorer countries. Be aware of and help publicize good work done at less prestigious schools.

Support staff at our institutions often lack autonomy and may also be poorly compensated for their work.

- Learn the names of support staff whom you see regularly, including cleaning staff. Express appreciation for their work and treat them with dignity. Find out how your institution treats them and advocate fair employment practices. Pray for them.

- When giving work to support staff, think about whether your requests, and especially the time frame for completing them, are reasonable.

The powerful in society often use science and technology at the expense of the powerless.

- Consider the impact your research has on other people, including the social and ethical implications of technologies developed by your discipline (not just your own work). Speak out for developing applications which benefit all of society, not just the rich.

- Think about the needs of the poor and whether work in your own discipline can serve those needs directly. You may be able to chose a research project which directly benefits the poor.

- Ask whether your research activities damage the environment directly or indirectly (such as through production of toxic chemicals), and how you can minimize their impact. Speak out on the need for environmental stewardship within your own research community. Some may be called to study extensively and speak publicly on these issues.

- Be active in your professional societies and encourage them, as institutions, to champion the cause of the oppressed. Many scientific societies already speak out for scientists who are unjustly imprisoned by repressive governments; we can challenge them to advocate justice on a wider scale.

And, of course, all of us have lives outside our profession.

- In use of personal money, and in conversations, be aware of the needs of the poor—especially in countries which often do not "make the news." By our actions, we can raise our colleagues' awareness of injustice and prejudice. ❄

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Consciousness Explained?

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Beginning with the proposition that the theory of evolution has transformed the mind-body philosophical dilemma into a scientific question, Ben Carter critiques philosopher Daniel Dennett's attempted scientific resolution of the problem. Carter finds five specific reasons for rejecting Prof. Dennett's solution, and argues that Prof. Dennett's solution is too model-bound and too reactive to last. However, Carter agrees that Prof. Dennett raises some important questions, and challenges evangelicals to begin to deal seriously with those questions in terms of the scientific research that has given rise to them.

Julian Jaynes begins his discussion of the origin of consciousness by pointing out that the theory of evolution has transformed the mind-body philosophical problem into a scientific one. Today we are far less concerned with metaphysical speculations on the relationship of mind and body, and far more concerned with scientific investigations of the origin of the mind.[1] Science's engagement with metaphysics on this level is unsurprising. As Grant Wacker observed, scientists from Carl Sagan to Theodosius Dobzhansky have admitted that evolutionary cosmology is the metaphysics of modernity.[2] Its denial of teleology makes appeals to divine agency redundant. Immanent, relativistic, and completely secular, evolution has provided atheism with a powerful reply to natural theology.[3]

One philosopher who has embraced the evolutionary approach to metaphysical problems is Daniel Dennett, the Distinguished Arts and Sciences Professor and Director of the Center for Cognitive Studies at Tufts University in Massachusetts. The author of many books and articles, Dennett is an enthusiastic Darwinist who has spent the better part of his professional career attempting to unravel the mystery of consciousness.[4] In 1991, he published *Consciousness Explained* in which he summarized his conclusions. In this paper, I will briefly recount Dennett's argument as it appears in that book and list five objections to his thesis. The first three objections are philosophical, the fourth is scientific, and the last is theological.

A Summary of *Consciousness Explained*

A book with so impressive a title is bound to either provoke or disappoint. Dennett does both in somewhat equal measure. An unapologetic materialist, Dennett asserts early:

> the various phenomena that compose what we call consciousness ... are all physical effects of the brain's activities, ... these activities evolved, and ... give rise to illusions about their own powers and properties.[5]

One illusion produced by these brain activities is the perception that they are centered, that there is what Dennett calls a conceptual or Cartesian Theater (understood in either dualistic or materialistic terms), a single point in the brain where everything comes together to create our sense that we exist as unified beings. He writes:

> There is no single point in the brain where all information funnels in ...[6]

> The idea of a special center in the brain is the most tenacious bad idea bedeviling our attempts to think about consciousness.[7]

Dennett also insists: "We must stop thinking of the brain as if it had such a single functional summit or central point."[8] Many neuroscientists agree.

Writing in *Scientific American* (September 1992), Francis Crick and Christof Koch note:

> [E]xperimentalists have not found one particular region in the brain where all the information needed for visual awareness appears to come together. Dennett has dubbed such a hypothetical place "The Cartesian Theater." He argues on theoretical grounds that it does not exist.
>
> Awareness seems to be distributed not just on a local scale, ... but more widely over the neocortex.[9]

As William H. Calvin puts it:

> There is no one place in the brain where an executive sits, receiving reports and issuing orders ... The real me is a little bit of everywhere in there. It's a committee of nerve cells.[10]

Because a single information point in the brain would create a "single, definitive 'stream of consciousness,'" Dennett interprets its absence to mean there is no such stream.[11] He argues that what we experience as a unified "stream of consciousness" is discontinuous or "gappy,"[12] and is evaluated not by a central witness but by "coalitions of specialists."[13] These "specialists" are subprocesses in the brain that, though "'stupid' and mechanical" in themselves, yield due to their "clever organization ... a device that *takes the place of* a knowledgeable observer."[14]

These subprocesses distributed throughout the brain constantly produce multiple drafts of external events. The drafts, which allow the brain to fix content and then discriminate among that content, are continually edited and eventually produce "something *rather like* a narrative stream or sequence."[15] Dennett describes the process this way:

> [S]timuli evoke trains of events in the cortex that gradually yield discriminations of greater and greater specificity. ... parts of the brain are caused to go into states that discriminate different features... These localized discriminative states transmit effects to other places, contributing to further discriminations, and so forth ...[16]
>
> Some of these distributed contentful states soon die out, leaving no further traces. Others do leave traces ... Some of these effects ... are at least symptomatic of consciousness. But there is no place in the brain through which all these causal trains must pass in order to deposit their content "in consciousness."[17]

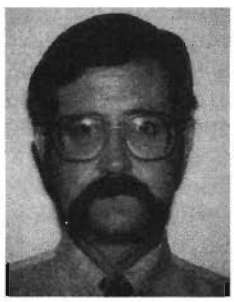
Consciousness, according to Dennett, is a product built-up incrementally over time from processes that are themselves unconscious, "a *mode of action* of the brain rather than a *subsystem* of the brain."[18] Consciousness is a complexity evolving from simplicity within a brain that, Dennett tells us, "is a massive parallel processing machine."[19]

Dennett has provided a way of imagining how consciousness might have been generated through an unconscious random purpose. If Darwinian materialism is true, consciousness must be a function of matter and must have been produced by a random unconscious process. This process, which evolved bodies with their distinct but inner-dependent organ systems, could in the same way have produced a brain that expressed a similar kind of unifying harmony from various, though separated, functions. Dennett is, of course, aware that his model is tentative, may incorporate error, and is in need of significant revision, but he is confident that it is a model that will generate better questions than earlier models have. His is an impressive feat of imagination, and Dennett believes he is on the right track.

There are, I believe, at least five good reasons for suspecting he is on the wrong track.

1. Dennett's model is by his own admission rooted in illusion.

Originally space and time were conceived as distinct entities, and the cosmos was imagined as a three-dimensional box in which things happened. For everyday purposes, this view of events is still adequate, but we now know both theoretically and experimentally that it cannot be an accurate model of the cosmos as it actually is. The three-dimensional



Ben Carter earned a B.A. in economic history at the University of Wisconsin-Milwaukee, an M.A. in theological studies from Wheaton College, an M.Th. in Christianity in the Non-Western World from the University of Aberdeen, Scotland, and a Ph.D. in Christianity in the Non-Western World from the University of Edinburgh in Scotland. He has published three books and a variety articles and reviews. He is married to Salma Carunia from south India, and is currently employed through the Dallas/Ft. Worth Hospital Council.

box in which things happen, though it seems so objectively true, is a profound illusion.

Dennett would have us believe that our experience of this illusory box is compounded by two related illusions: the illusion of a single self and the illusion that this single self experiences a stream of continuous observed events. Dennett's model—which he readily admits is incomplete and possibly even wrong in some of its particulars—is inserted into the intersection of these three, very powerful illusions. Why should anyone find such a model compelling under such circumstances? Why should the incomplete theories of an illusory self that generates its own illusions within an illusory box be accorded any credence? What we have here is a philosophical dilemma created by a humanistic conceptualism.

Though often quoting fourteenth-century nominalist William of Occam,[20] scientists who investigate the workings of the brain actually tend to embrace a form of conceptualism. Their intellectual heritage derives more nearly from Abelard, who lived during the eleventh and twelfth centuries, than from the nominalists, the first of whom, Roscelin[21] (c. 1050–1125), was Abelard's teacher. Skeptical of formalism and tempted to a nominalistic denial of universals, Abelard found that he was unable to affirm nominalism's denial of objective universals and its stress on physical particulars, since such an emphasis led one to interpret the Trinity in a tri-theistic way. He eventually came to the position that God thinks in universal concepts and that those concepts are expressed in creation.

In 1092, the Council of Soissons condemned nominalism, but it survived the condemnation and continued to exercise a profound influence on Western thought. Indeed, the conflict between nominalism and conceptualism first experienced by Abelard is a leitmotif in Western philosophy. During the eighteenth century Enlightenment, it surfaced in the dispute between David Hume and Immanuel Kant. In 1781, Kant, a scientist, reacted to Hume's extreme nominalism and the assault on secondary causality afforded by that nominalism. His publication, *Critique of Pure Reason*, responded to Hume's *An Enquiry Concerning Human Understanding* (1748). In it, Kant argued that the mind organizes experience by means of universal categories, a position that is pure conceptualism, though conceptualism with a humanistic rather than divine focus.

Kant did not imagine that God created a divine reality according to divine concepts. Instead he believed that humans created a human reality according to human concepts, and that such concepts (or categories) were perfectly adequate for solving the practical problems addressed in science. However, Kant also argued that such categories were ill-equipped to address the larger metaphysical questions. Instead, when wrestling with such questions, philosophers had to rely on "pure reason," and "pure reason," because it was tied to an inevitably inadequate information base, would always generate contradictions. Kant called such contradictions logical antinomies. Contemporary scientific investigators of the brain have tended to substitute neural systems for Kantian categories. They believe that what we experience as reality is a creation of these systems.[22]

Dennett, adopting the latest neurobiological models, denies the reality of the unified self and even the reality of that stream of consciousness by which the self gets its data.

Dennett, a philosopher, has certainly read Kant, but one wonders, "Has he understood him?" If there were ever a scenario in which logical antinomies could rule unchecked, it is here! Kant at least believed in the reality of the unified self. This belief gave him confidence that the world constructed by that self was accurate in an immediate sense. He defined truth as the agreement of the cognition with its object. Kant also accepted Newton's formulation of cosmic reality as an infinite, three-dimensional box. Space, Kant thought, was an aggregate expressed through time. Thus he imagined a cosmos in which a unified self contemplated events as they unfolded in an infinitely large box. Kant sought to rescue science from Hume's radical skepticism by using such categories to bridle reason. But Einstein has snatched the box from us, and now Dennett, adopting the latest neurobiological models, denies the reality of the unified self and even the reality of that stream of consciousness by which the self gets its data. It seems that all three (the box, the self, and its perceptions) are illusions, and illusions cannot bridle reason. Instead they give reason free reign.

One might argue that traditional science need not concern itself too much with whether its theoretical models are ultimately accurate. What matters to traditional scientists is whether the paradigms they develop secure predictability. But when materialists

use science to model origins, ultimacy is key. It follows then that the kind of illusions we are describing compromise those models because they suggest that the data upon which scientists construct their explanatory models are penultimate and unreliable.[23] Such models are built on partial descriptions of a part of reality, and the data they employ is always subject to modification. This observation brings us to our second objection.

2. Dennett's model ignores too much.

Were the problem of illusion put aside, Dennett would still be confronted with the limitations imposed on him by the paradigm he adopts. The West, as it has struggled to understand the world, has moved through four epistemological paradigms: the mythic paradigm, the substance/form paradigm of Hellenism, the mechanistic Newtonian paradigm, and the current organic/process paradigm. Each paradigm imaged the cosmos in very different ways, asked pointedly different questions about the cosmos, and developed strikingly divergent answers. These questions and answers were system-bound and derived their urgency and conviction from the paradigm that inspired them. However, systems of understanding always eliminate some possibilities, not because those possibilities are not true but simply because they have no place in the system. Dennett is very aware of this problem. He says:

> Of course there has to be some "leaving out"—otherwise we wouldn't have begun to explain. Leaving something out is not a feature of failed explanations, but of successful explanations.[24]

The problem here is precisely what Dennett has left out. He has sharply truncated the realm of causality for starters. He writes: "Causes must precede effects."[25] Is this true? Not quite in the way Dennett suggests. He is concerned primarily with secondary causality, yet three other kinds of causality have been discriminated: formal cause, final cause, and material cause. One can understand why Dennett has ignored formal and final causality. Modern science has ignored both possibilities as scientifically untestable,[26] and Dennett is attempting to construct a philosophical model of consciousness based on science. Why, however, has he ignored material causality almost completely? Surely secondary causality produces effects on *something*. Is it not possible that the properties of that something might influence the kind of effects secondary causality produces?[27] Matter is neither passive nor uniform, but reading *Consciousness Explained* one can easily imagine that it is both. In fact, the only thing matter does in his book is act as a vehicle for eliminating spirit.[28]

Dennett makes a basic conceptual mistake common to materialists. He assumes that the "really real" is comprised of "stuff" and that everything else is "metaphysical claptrap."[29] Perhaps he is concerned that positing some fundamental "mind" capabilities to some forms of matter is too reminiscent of "metaphysical claptrap." But surely it is fair to ask, "Is there any significance to consciousness being found consistently in relation to certain animal proteins?"[30] Dennett would say, "No." For him consciousness is an illusion created as information is processed. It is generated by what we might call a program and has nothing to do with the medium that contains the program. Any medium—silicon chips, for example—might serve just as well. Other philosophers, like John R. Searle, who have become interested in the problem, would disagree.

[Dennett] has sharply truncated the realm of causality ...

Besides, there are obviously some realities that are metaphysical or nonmaterial. For example, the laws of mathematics and logic are real and can be used to formulate ideas about some underlying order in the cosmos, an underlying order that impacts the behavior of matter. Evolution itself assumes the reality of such nonmaterial laws. In Hellenistic culture, logic and mathematics were subsumed under the rubric "rational principle" and identified with the *logos*, the reality that Neo-Platonists and Christians posited as uniting the realms of formal and material cause. During the second and third centuries of the current era, the *logos* became identified with the Christ and reinterpreted as personality.[31] The Christian doctrine of Providence was born and given a full articulation by Augustine in his *City of God*. The resultant theory of history has dominated the West ever since. Even the Marxists, who imagined themselves as thoroughgoing materialists, borrowed heavily from it. So do other evolutionists, and so does Dennett. But by adopting materialism, he imagines that he is able by definition to eliminate the possibility that God is guiding the process. Here we see clearly the deceptive power of models.

In addition to truncating the realm of causality, Dennett, by focusing so completely on a scientific model and stressing secondary cause to the exclusion of all else, has predetermined the results he will get. Quoting Philip Johnson-Laird he writes: "Any scientific theory of the mind has to treat it as an automaton."[32] It does? If so, the issue is settled from

the outset. By deciding to investigate the mind scientifically, we have already classified it is an automaton. Everything else is simply justification.

What gives Dennett's ideas power is not the data he uses, but the model by which he interprets the data. That model like all others is provisional and limiting. The universe *as it is* may be peppered with unique events, with events expressing formal and final causality, with spirits that affect events, with hosts of demons masking what is really going on in test tubes, and so forth, but Dennett can say nothing about such a universe. To be scientific, he must assume that the universe expresses laws that are relatively uniform and, therefore, mathematically quantifiable in terms of material and secondary causality. And these assumptions predetermine his conclusions. Note here that such conclusions are not intended to be predictive. They are intended to be descriptive. They are supposed to provide a model of consciousness as it is, but the model eliminates specific possibilities at the outset. As far as Dennett is concerned, the mind—to be explicable scientifically—must be a robot.[33]

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Apparently Dennett is not fully aware of this problem, for he expresses a confidence in raw information that is almost touchingly naïve. He seems to believe quite sincerely that information itself is the final arbiter, that disagreements are expressions of ignorance, and that if enough were known, most fundamental disagreements would evaporate. For example, he genuinely seems to believe that evolution is a settled question and that those who will not acknowledge this are either inexcusably ignorant or fundamentally dishonest.[34] Since he believes that "reality" is a construct of brain processes and culture, it seems peculiar that he does not seem to recognize that the problem is not one of information but of how that information is processed.[35] Indeed, he is careful to draw to the reader's attention how similar his ideas of the self are to those proposed by deconstructionists.[36] One hears a great deal of talk about postmodernism but one wonders if those doing the talking have really grasped its significance.

3. Dennett's conclusions are profoundly counterintuitive and beg the question anyway.

When we discuss consciousness, we must discuss that which remains mysterious by evading our metaphors.[37] It is not like anything, yet it creates the empathy upon which the metaphor is grounded. It seems both to be me and to be possessed by me. Consciousness, though invisible, makes the world visible. It recedes beyond the horizons of comprehensibility while tracing those horizons and rendering them comprehensible. And with its absence the corpse seems incomplete. We might expect, given such mystery, that grappling with the riddle of consciousness would lead us to conclusions that are counterintuitive, and this is the case with Dennett's theory. Nevertheless his own metaphors for consciousness are often distressingly revealing. In a letter to me, he described the human soul (which he identifies in some way with consciousness) as comprised of thousands of tiny robots. He imagines the soul as a swarming insectile thing. In *Consciousness Explained*, he writes:

> So wonderful is the organization of a termite colony that it seemed to some observers that each termite colony had to have a soul (Marais, 1937). We now understand that its organization is simply the result of a million semi-independent little agents, each itself an automaton, doing its thing. So wonderful is the organization of a human self that to many observers it has seemed that each human being had a soul, too ...[38]

After comparing a human soul to a termite colony, he then says that the most important difference between ants and human beings is that ants cannot talk.[39] It is frankly unnecessary to caricature such a position. It becomes a parody of itself. Here is a theory that is not only counterintuitive but seems to deny the obvious facts. Like the old canard that if whales had thumbs, they would rule the world, Dennett seems to suggest that if ants had language they would be our equals. Bees, of course, have language. One might even call them the lords of dance. However, one would not call a hive conscious. Something more than robots with language seems to be required.

In fact, and this is the point, Dennett spends more time talking about the self than he does about consciousness per se. Had he entitled his book, *The Self Explained*, he would have had to change nothing in its pages (although he might have enjoyed fewer sales). This is striking. Certainly consciousness, the awareness of experience, and selfhood, the subject of experience, are two distinct things. We know this because a self may be unconscious and still be a self, and because the existence of a self precedes the ap-

Dennett never explains consciousness; he explains it away.

pearance of consciousness. After all, there must be a self to be conscious. Dennett never explains consciousness; he explains it away. He presents one possible way the brain organizes information but fails to account for awareness. Indeed, as Searle has pointed out, Dennett ends by affirming the subjective but denying its feelings, denying that conscious states really exist.[40] He integrates neurobiology with a problematically-named science, artificial intelligence, to come up with the idea of a brain as a computer.[41] Naturally if the brain were a computer, it might organize information as a computer does, but the organization of information does not of itself create consciousness, otherwise filing cabinets and libraries would be sentient beings.

4. Dennett fails to present a credible evolutionary account of human intelligence.

In many ways, this objection may sound strange. Surely, as we observed earlier, evolution is the central idea behind Dennett's speculations. Yet there are two things to notice. First, if high intelligence has survival value, it is strange that it has appeared only once. The survival value of flight, speed, and sight (to use three examples) is obvious. Many creatures possess variations on these capacities. Though they are quite different and express the ability in somewhat different ways, beetles, birds, and bats fly. Flying fish and flying squirrels glide. Yet all receive equivalent survival benefits from their flying ability. Speed is another survival strategy one discovers in a host of different creatures. Also, the eye has assumed myriad forms, as we see in creatures as disparate as the octopus, the spider, and the weasel. High intelligence, however, is found only in humans. Is such a lonely ability what we would expect from a capacity that conveyed unparalleled survival benefits?[42] Second, it would seem that more than language is required to produce intelligence (something Dennett implies by the sequence of his own outline of proposed events, as we shall see) and that language can exist apart from noticeably high levels of intelligence, as we saw in the case of bees.

Now having made these two observations, let us discuss Dennett's evolutionary scenario as it applies to the emergence of human intelligence. I will quote at some length to better illustrate my objections. Dennett writes:

> Chimpanzees are our closest kin—genetically closer, in fact, than chimpanzees are to gorillas or orangutans—and current thinking is that we shared a common ancestor with chimpanzees about six million years ago. Since that major break, our brains have diverged dramatically, but primarily in size, rather than structure. While chimpanzees have brains of roughly the same size as our common ancestors ..., our hominid ancestors' brains grew four times as large.[43]
>
> For several million years after the split with protochimpanzees, our hominid ancestors got along with ape-sized brains, in spite of becoming bipedal at least three and a half million years ago. Then, when the ice ages began, about two and a half million years ago, the Great Encephalization commenced, and was essentially completed 150,000 years ago—*before* the development of languages, of cooking, of agriculture. ... the innate specializations for language ... are a *very* recent and rushed add-on ...[44]

Let us consider this scenario, stressing its temporal sequence. *Six million years ago* our line and that of the chimpanzee diverged. *Two-and-a-half million years later* our ancestors stood erect. This change in posture had no appreciable effect on the size of their brains or on their brains' basic structure although we might imagine that it would have facilitated an increased use of their hands and an increased potential for tool manipulation. *Another million years elapsed. Then in something over two million years ago* our ancestors' brains swelled to their current size. This increase in size was not accompanied by language development, cooking (implying no mastery of fire), agriculture, or any of those things we associate with higher intelligence. It seems to have been an increase in potential, nothing more. Of course, Dennett requires this vast potential in order to set the stage for the kinds of neurological processes he believes must have happened. But we have a right to ask, what was its survival value at the time this extraordinary advance took place? What forces were selected for this unprecedented increase in potential?

... our ancestors' brains swelled to their current size [but] this increase in size was not accompanied by language development, cooking (implying no mastery of fire), agriculture, or any of those things we associate with higher intelligence.

Dr. Sherwin Nuland has pointed out, "[M]uch of our brain's structure and function is unique to our species ..."[45] And he adds:

> Though three pounds [the weight of the brain] represent a mere 2 percent of the body weight of a 150-pound person, the quartful of brain is so metabolically active that it uses 20 percent of the oxygen we take in through our lungs ... Fully 15 percent of the blood propelled into the aorta with each concentration of the left ventricle is transported directly to the brain.[46]

He goes on to say that the brain's cortex is comprised of "10 billion neurons and 60 trillion synapses."[47]

In other words, this structure, which is four times larger than the brain of a chimpanzee, which puts tremendous metabolic demands on the body, and which is vastly intricate and unique to our species, evolved in a little more than two million years from an ape's brain—an ape's brain that had served quite adequately for three-and-a-half million years and still serves our nearest relatives quite well today. *Once this evolution was completed about 150,000 years ago nothing else happened for over a thousand generations* until our ancestors discovered how to control fire, then evolved some kind of language,[48] and finally about ten or fifteen thousand years ago began to domesticate animals and plants. How random natural selection could have accomplished so wonderful a feat when the evolution of huge, hungry, and unique brains offered no obvious survival value and, once fully formed, would apparently not begin to actualize their potential for many times longer than we have had written history, Dennett leaves to our imagination. One supposes that with the abracadabra of a broad brush and "vast amounts of time" (that favorite mantra of evolutionists), the difficulties in the theory will be painted over.

5. Religious objections

The vast majority of people across time and cultures have been dualists, that is, they have believed that something identified with, but distinct from, a corporeal being animates that being and survives for an indefinite period after corporeal death. Sometimes this something is equated with the principle of life. Sometimes it is identified with personality, intentionality, and the like. Sometimes it is distinguished from, and sometimes used as a synonym for, spirit. We call this something a soul. We might think of a soul as the living essence of a thing, distinct from that thing, but with an intimate correspondence to its many parts. The soul, like the spirit, need not be human. Anything might be imagined to have a soul or to be a soul. But as we are using the term, soul should be understood to mean the human personality that survives the body and is itself immortal.

Despite his rejection of the idea of a unified self, Dennett seems to leave the door opened not only for a sort of soul but also for a sort of immorality.

Dennett is not a dualist. He is a monist who believes that matter is all there is, but that, in and of itself, does not mean that he denies the existence of a soul. Despite his rejection of the idea of a unified self, Dennett seems to leave the door opened not only for a sort of soul but also for a sort of immorality. Dennett asserts:

> [I]f you think of yourself as a center of narrative gravity ... your existence depends on the persistence of that narrative ... which could *theoretically* survive indefinitely many switches of *medium*, be teleported as readily (in principle) as the evening news, and stored indefinitely as sheer information. ... [Y]ou could in principle survive the death of your body as intact as a program can survive the destruction of the computer on which in was created and first run.[49]

How this transfer or survival of a center of narrative gravity (which is how Dennett and the deconstructionists imagine the self) is possible without some template to carry the information, Dennett does not say, but the passage is an odd one and seems to suggest that his idea allows room for some form of traditional religion.

If that is his intent, he is mistaken. The only religious traditions (besides atheism) that I can think of that *might* be comfortable with what Dennett has described are the Judaism of the Sadducees and certain types of Buddhism: Theravada Buddhism and Zen in Mahayana. All of the others from so-called animists to yogis believe in souls that are considerably different from Dennett's posited centers of narrative gravity. If Dennett is correct, a huge amount of the "religious wisdom" of all cultures and all ages will be revealed as "metaphysical claptrap." It is not Dennett's implicit atheism that is the problem here. The presence or absence, the existence or nonexistence, of God is not directly affected by anything said in *Consciousness Explained*. It is instead the nature of human beings as imagined by Dennett that is the problem. If he is right, the anthropologies of

many religions will be proved wrong, and that would be excellent grounds for rejecting what those faiths have said about everything else from ethics to God.

This is the dilemma: religions base their faith claims on propositions drawn from myths that ideally cannot be falsified or verified. To a limited extent those myths can survive some adjustment. Christianity, for example, has changed consequent to profound challenges to its story of origins yet remains robust. One can, it seems, accept both Christ and the teachings of Darwin, especially if, as Dennett has argued elsewhere, one does not think too closely about it.[50] But at some point something has to give. Faiths cannot be compromised indefinitely before their assertions about everything cease to be credible. And this is the provocative side of Dennett's book. His proposal is disappointing and will in the end be abandoned. It is too model-bound to last, too much a reaction to the mechanistic Newtonian worldview of Descartes (as is revealed in the telling phrase "ghost in the machine" to which Dennett occasionally refers).[51] But he does raise important questions that all religious people need to consider. Neurobiology is only beginning to unravel the mystery of brain functions and there will doubtless be many surprises. Religious believers need to engage with this discipline on the level that materialist philosophers like Dennett are engaging with it. Otherwise we will be presented with a fait accompli in the not too distant future, and then it might be difficult to salvage much from the ruins. ❄

Notes

[1]Julian Jaynes, "Introduction: The Problem of Consciousness," in *The Origin of Consciousness in the Breakdown of the Bicameral Mind* (Boston: Houghton Mifflin Co., 1976), 3.

[2]Grant Wacker, "Searching for Norman Rockwell," in Richard John Neuhaus and Michael Cromartie, eds., *Piety and Politics* (Lanham, MD: University Press of America, 1987), 340.

[3]We should point out that the issue here is not whether science as such can provide us with a useful if tentative description of reality. Instead the issue involves materialism's use of science to address metaphysical questions. Traditionally metaphysics has been conceived in nonphysical terms. Such a conception of the world as comprised of physical and metaphysical realities is called dualism. Materialism was developed as a means of rejecting dualism. And science, because it formulates conclusions predicated on material-based descriptions of phenomena, was adopted by materialists as a convenient ally in their struggle to overcome dualistic assumptions.

[4]In *Darwin's Dangerous Idea* (New York: Simon & Schuster, 1995), Daniel Dennett says he believes Darwin had "the single best idea anyone has ever had" (Part I, chap. 1, 21).

[5]Daniel C. Dennett, "Prelude: How Are Hallucinations Possible?" chap. 1 in *Consciousness Explained* (Boston: Little, Brown & Company, 1991), 16.

[6]Ibid., "Multiple Drafts Versus the Cartesian Theater," in pt. II, "An Empirical Theory of the Mind," 103.

[7]Ibid., 108.

[8]Ibid., 111.

[9]Francis Crick and Christof Koch, "The Problem of Consciousness," *Scientific American* (September 1992): 158.

[10]William H. Calvin, *The River that Flows Uphill* (New York: Macmillan Publishing Company, 1986), Day 6, p. 160.

[11]Dennett, "The Architecture of the Human Mind," chap. 9 in pt. II of *Consciousness Explained*, 253.

[12]Ibid., "Dismantling the Witness Protection Program," chap. 11 in "The Philosophical Problems of Consciousness," pt. III, 356.

[13]Ibid., 358.

[14]Ibid., "A Method for Phenomenology," chap. 4 in "Problems and Methods," pt. I, 91.

[15]Ibid., chap. 5 in pt. II, 113, 135.

[16]Ibid., 134.

[17]Ibid., 135.

[18]Ibid., "Time and Experience," chap. 6 in pt. II, 166.

[19]Ibid., "How Words Do Things With Us," chap. 8, 217. Computers by contrast are serial processors. They do one thing at a time.

[20]Occam's Razor, of course, is the quote plucked from the context of Occam's philosophy. It appeals to scientific investigators who, as William H. Calvin points out, are professionally predisposed to search for ever simpler explanations. See William H. Calvin's *The River that Flows Uphill*, Day 1, p. 24.

[21]Gordon Leff, "The Renewal of Letters and Speculative Thought in the Eleventh and Twelfth Centuries," chap. 5 in *Medieval Thought* (Baltimore: Penguin Books, 1958), 105. Some scholars trace nominalism to Porphyry who lived in the third century AD.

[22]Harry J. Jerison in his *Evolution of the Brain and Intelligence* (New York: Academic Press, 1973) talks consistently of the brain creating reality (see chap. 1 in pt. I, 22 and chap. 17 in pt. IV, 410 and 429 for explicit statements). His influence on William H. Calvin's speculations in *The River that Flows Uphill* is clear (see Day 6, pp. 160–71). And Daniel Dennett is explicit about his debt to William Calvin.

[23]Kant demonstrated that flawed premises led to reasonable but false conclusions. He supposed empiricism would secure the premises upon which reason built, and that reason and empiricism together could solve humanity's practical problems. This was his model of science. Traditional metaphysical questions, he believed, had no place in scientific discourse precisely because there was no sure way to secure the premises upon which traditional metaphysics was built. But during the nineteenth and twentieth centuries metaphysicians attempted to reformulate their premises in empirical terms. Their move opened the way for materialists to begin to address the kinds of ultimate questions Kant tried to place out of scientific bounds, but the reformulation fails to secure metaphysical conclusions not only because the problem of empirical imprecision remains but also because it assumes a worldview that may not be ultimately true.

[24]Dennett, "Consciousness Imagined," in pt. III of *Consciousness Explained*, 454.

[25]Ibid., chap. 6 in pt. II, 152.

[26]For an outstanding discussion of the reasons for science's abandonment of formal and final cause, see M. B. Foster's essays, "The Christian Doctrine of Creation and the Rise of Modern Natural Science," in *Mind* XLII (1934) and "Christian Theology and Modern Science of Nature (I)," in *Mind* XLIV (1935).

[27]For example, an amoeba could not win a chess match against Garry Kasparov but apparently IBM's "Deep Blue" can. However, an amoeba is aware at some level. "Deep Blue" is not. If mind is an expression of matter, is it an expression of only some kinds of matter?

[28]One might ask, what is meant by spirit? Check any dictionary and one will discover that the word is used in a variety of ways. However, in this context, spirit means that incorporeal aspect of a thing, its essential part. Spirit is another way of talking about philosophical dualism. This is the way Dennett employs the concept and the way it is being used in this paper.

[29]Dennett, "The Reality of Selves," chap. 13 in pt. III of *Consciousness Explained*, 413.

[30]If this proved significant, then consciousness would always be beyond the reach of computers. They would simply be made of the wrong stuff. And it would follow that the way information is organized in computers, though providing the model Dennett finds so intriguing, would be irrelevant.

[31]Charles Norris Cochrane, *Christianity and Classical Culture* (Oxford: Oxford University Press, 1957).

[32]Dennett, chap. 9 in pt. II of *Consciousness Explained*, 256.

[33]The word "robot" was coined from the Czech word *robotnik* meaning "serf" by playwright Karel Capek in 1920 in his play *R.U.R.* A robot in this context was a mechanical man who could do human-like tasks automatically. Robotic behavior conveys the idea of behavior that is machinelike, without volition, behavior that is passively obedient, nonconscious, zombie-like. Throughout *Consciousness Explained*, Dennett refers to zombies, theoretical entities that are indistinguishable from people but lack any sense of self, any consciousness. Finally ("Qualia Disqualified," chap. 12 in pt. III, 405–6), he asserts that such an idea is:

> dangerously silly, for it echoes the sort of utterly unmotivated prejudices that have denied full personhood to people based on the color of their skin. It is time to recognize the idea of the possibility of zombies for what it is: not a serious philosophical idea but a preposterous and ignoble relic of ancient prejudices.

But of course the idea of zombies can also be applied to robots which is how Dennett employed it throughout his discussion. However, he insists that human beings, though they have evolved from robots, have long since passed that stage. Notice how the groundwork is being laid for insisting that those who deny personhood to HAL or R2D2 or CPO3 (should such machines ever be constructed) are just bigots, a thesis defended by Isaac Asimov in some of his fiction.

[34]Dennett, chap. 2 in pt. I, 46; chap. 10 in pt. II, 263; chap. 17 in pt. III, 519 of *Darwin's Dangerous Idea*, and in personal correspondence with me.

[35]He even goes so far as to say that "native Chinese minds differ dramatically from native French minds" ("The Evolution of Consciousness," chap. 7 in pt. II, 207). Here, and not in any idea of zombies, lies virulent racism. "They" really are different from "us" and need to be treated so. Such philosophies were common coin in nineteenth and early twentieth century Europe where they spawned chauvinism, new varieties of racism, and two World Wars. One would have liked to imagine that after so much blood, we had heard the last of them.

[36]Dennett, chap. 12 in pt. III of *Consciousness Explained*, 410–1.

[37]Julian Jaynes, "Consciousness" chap. 2 in"The Mind of Man" Book I of *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, 53.

[38]Dennett, chap. 13 in pt. III of *Consciousness Explained*, 416.

[39]Ibid., 417.

[40]John R. Searle, "Consciousness Denied: Daniel Dennett's Account," chap. 5 of *The Mystery of Consciousness* (New York: NYREV, Inc., 1997), 99, 106.

[41]Again we run into the problem of misleading metaphors. There are certainly psychologists sympathetic to Dennett's basic model who dislike the term "artificial intelligence." Steven Pinker, for example, in *How the Mind Works* (New York: W. W. Norton & Company, 1997), prefers the expression "natural computation" ("Thinking Machines," chap. 2 in section "Natural Computation," 83).

[42]In fact the brain from the perspective of an evolutionist is a very conservative organ, as Harry J. Jerison points out in *Evolution of the Brain and Intelligence*. He proposes a three-tiered model for brain evolution in vertebrates. On the first tier one finds fish, amphibians, and reptiles. Brains on this level evolved to express the sense of vision. Birds are on the second tier as a big-brained variation on the sense of vision as are mammals whose larger brains developed around the senses of smell and hearing. The genus *Homo* stands on the final tier alone with dolphins. What impresses Prof. Jerison is how modestly brains increased in size and how long it took such increases to appear.

[43]Dennett, chap. 7 in pt. II of *Consciousness Explained*, 189.

[44]Ibid., 190.

[45]Sherwin B. Nuland, "Mining the Mind: the Brain and Human Nature," chap. 12 in *The Wisdom of the Body*, 327.

[46]Ibid., 328.

[47]Ibid., 329.

[48]In *Philosophy in a New Key* (New York: Mentor Books, 1951) Susanne Langer points out that language is universal among human groups and that even among those that have what she calls "the simplest of the practical arts," there are no archaic languages. All are fully and complexly present (chap. 5, 99). She suggests that language developed rapidly as members of our sociable species began to use sounds to name objects in a scenario reminiscent of the second chapter of Genesis (pp. 118–20). What is striking about her idea, like Daniel Dennett's, is that *all the equipment had to be in place before that development could occur.*

[49]Dennett, chap. 13 in pt. III of *Consciousness Explained*, 430. John Searle, referring to an earlier work *The Mind's I* (New York: BasicBooks, 1981) that Dennett co-authored with Douglas Hofstadter, has pointed out that in a real sense Dennett, because he considered the mind to be an abstract entity that is independent of any particular physical embodiment, can even be considered a dualist ("Conclusion" in Section 1 of *The Mystery of Consciousness*, p. 192).

[50]Dennett, "Bully for Brontosaurus," chap. 10 in "Darwinian Thinking in Biology," pt. II of *Darwin's Dangerous Idea*, 310.

[51]The phrase was originally coined by the philosopher Gilbert Ryle who used it to ridicule Descartes.

Dating Adam

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The time of Adam's creation has long been a contentious issue in Christianity. The Scripture indicates that fallen human beings possess certain traits. These traits are language, pain in childbirth, sweat, clothing, religion, and murder by the use of tools. They can be connected with various forms of human behavior that are capable of leaving physical evidence in the fossil record. Using this evidence as proxies, the anthropological record is examined for evidence of behavior consistent with fallen human beings' existence on earth. It is concluded that the anthropological record would support the existence of fallen humans having been on earth for 400,000 years and very likely for as long as two million years. The evidence is inconsistent with an apologetic that limits human spirituality to the past 100,000 years.

Early in Genesis, the Bible lays out some very profound differences in the behavior of humans vs. the behavior of animals after the Fall. These features are language, clothing, the pain of childbirth, sweat, the need for a relationship with God, and murder. These unique behaviors are seen in the following verses:

"... and whatever the man called each living creature, that was its name" Gen. 2:19 (NIV).

"Then the eyes of both of them were opened, and they realized they were naked; so they sewed fig leaves together and made coverings for themselves" Gen. 3:7 (NIV).

"To the woman he said, 'I will greatly increase your pains in childbearing; with pain you will give birth to children. Your desire will be for your husband, and he will rule over you.' To Adam he said, 'Because you listened to your wife and ate from the tree about which I commanded you, 'You must not eat of it,' Cursed is the ground because of you; through painful toil you will eat of it all the days of your life. It will produce thorns and thistles for you, and you will eat the plants of the field. By the sweat of your brow you will eat your food until you return to the ground, since from it you were taken; for dust you are and to dust you will return.' Adam named his wife Eve, because she would become the mother of all the living. The LORD God made garments of skin for Adam and his wife and clothed them" Gen. 3:16–21 (NIV).

"But in the course of time Cain brought some of the fruits of the soil as an offering to the LORD" Gen. 4:3 (NIV).

"... Cain attacked his brother Abel and killed him" Gen. 4:8 (NIV).

These traits can be used regardless of whether one believes that the Genesis 3 and 4 account is relating actual history or merely conveying a list of traits possessed by fallen humans. In this paper, we will examine the fossil record for these traits and determine what the data imply for various theological positions on the origin of humans. This paper does not claim to be a comprehensive review of the many excellent previous attempts at harmonizing fossil humans with Scripture. Those interested in how the views advocated here fit into the geographic and cultural description of Eden given in Genesis should consult the author's previous article that answers many of those questions.[2] This article's aim is to lay out, as clearly as possible, the implications of the anthropological data to the various widely-held apologetical positions.

Fossil hominids have been divided into two genera, *Australopithecus* and *Homo*. Since there is very little cultural information about the lifestyle of the Australopithecines, they will not be discussed further.[2] The genus *Homo* contains several species, the exact number depending upon the taxonomist. In general, the genus *Homo* can be divided into *Homo habilis*, *Homo erectus*, and *Homo sapiens*. *Homo sapiens* is further subdivided into archaic *Homo sapiens*, *Homo sapiens neanderthalensis*, and *Homo sapiens sapiens*. Under this officially sanctioned taxonomy, archaic *Homo sapiens*, Neanderthals, and modern humans are members of a single species. This is the

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taxonomy we will use. For the purposes of this paper, the distinctive morphological features between the three species and subspecies of *sapiens* are not relevant because we will be examining cultural remains.

Homo habilis is found only in Africa and lived between 2.5 and 1.5 million years ago. The cranial capacity of the various specimens ranges from 500 to 800 cc. *Homo erectus* is found throughout the Old World (Java, Asia, Africa and Europe). *Erectus* attained heights of up to six feet and his cranial capacity ranged from 775 cc to 1225 cc. *Erectus* fossils are found in strata dating between 1.8 million years and 30,000 years old.[3] Archaic *Homo sapiens*, found throughout the Old World, and Neanderthals, found only in Europe and the immediately adjacent regions, were all within the modern human range of variation in both cranial capacity and height. Archaic *Homo sapiens* are found in strata dating from around 400,000 years ago to as young as 33,000 years ago. Neanderthals date between 230,000 years and 30,000 years ago.[4]

The Various Positions

Many Christians hold that all fossil humans are descendants of Adam. Whitcomb and Morris[5] and Lubenow[6] represent this position. Generally, this inclusion only applies to members of the genus *Homo*. *Australopithecus* is usually relegated to the status of an ape with Morris[7] and Gish[8] advocating this. This view would expect to find no evidence of language, religion, clothing, murder, and pain of childbirth in deposits associated with *Australopithecus* but would expect to find them in deposits associated with *Homo habilis*, *Homo erectus*, and the various forms of *Homo sapiens*. While this view is generally held by young-earth creationists, this author has presented an old earth view that would also require that the various members of the genus *Homo* be descendants of Adam. This old earth version leaves open the possibility that some australopithecines might be Adam's descendants, too.[9]

The second view, widely held by Christians accepting an old universe, restricts the attribution of spirituality to anatomically modern humans who first appeared around 130,000 years ago. David Wilcox advocates such a view.[10] Phillip Johnson appears to hold to a similar limitation.[11] Hugh Ross is even more restrictive, limiting spirituality to anatomically modern humans who lived *no longer ago* than 60,000 years.[12] This limit is based upon his view of the genealogies. Dick Fischer and E. K. V. Pearce would place Adam only 10,000 years ago.[13] While Pearce seems to separate Adam's descendants from hominids who lived earlier,[14] Fischer believes in genetic continuity.

The final view is that humankind's spirituality arose gradually. This can be either an evolutionary or a nonevolutionary process. This view is often held by those who interpret the early Genesis account as fully allegorical. Fischer allows for the gradual arising of many "human" traits, among them a religious sense.[15] He views spirituality as being only applicable to modern humans who lived after 8,000 B.C. and who are descendants of Adam. The inclusion of Gentiles at the time of Christ modified this restriction.

These are the three views we will examine and seek supportive evidence from the fossil record. The data we seek will come from both cultural and anatomical data. Surprisingly, there are much data that bear on this problem.

Language

A human being is the only creature on earth that possesses language. Can one conceive of worship without the symbolic language with which to convey religious concepts? Since ritual requires symbolism, my cat, lacking the ability to use symbols, would appear incapable of worship. Without language, there can be no worship, no prayer, and no communion with God. Without language there could have been no command to Adam and Eve to

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avoid eating the fruit of the tree; without that command, there would have been no Fall. While one can train a cat not to eat the anchovies on a pizza, this can be taught only via negative consequences learned from already having eaten them several times before. This does not seem to be the way God taught Adam and Eve not to eat the fruit. Language is crucial to everything that makes us human. Evidence for the existence of language is powerful evidence of the existence of humanity. As noted above, the Bible seems to indicate that God taught Adam to speak and implies that this is the reason for the uniqueness of language. The naming of the animals is somewhat reminiscent of the sudden thirst for knowing the names of objects that Helen Keller experienced when she finally understood what her teacher was trying to convey.

The Bible seems to indicate that God taught Adam to speak and implies that this is the reason for the uniqueness of language.

Human language differs from all forms of animal communication in four ways. First, human language can produce an almost infinite variety of thoughts as opposed to animal communication systems that, in the wild, rarely exceed forty different displays or calls.[16] When attempts are made to teach a language to a chimpanzee, the vocabulary limitation quickly becomes apparent. Even after six years of training, Kanzi the chimp had mastered only 150 words.[17] By contrast, a six-year-old child will have mastered about 13,000 words and a high school graduate, 60,000.[18]

Secondly, animal communication lacks grammar and complexity. This is even true of language-trained apes. They use no articles, auxiliaries, and prepositions in their language-like communication.[19] Pinker notes that the average length of a chimpanzee "sentence" remains constant even after years of training.[20] A human child rapidly moves from one- or two-word sentences to complex, multi-word statements.

Thirdly, Deacon points out that the uniqueness of human language lies in its symbolic reference; all nonhuman communication is nonsymbolic.[21] Human language is a symbol-based communication system. The word stands for a concept, not really an object. The concept of a farmer in the American language is quite different from the concept of *nong ming* in Chinese. While both produce food from the soil, in America the farmer is an independent businessperson while in China the farmer represents a potent political idea as the representative of the proletariat. Some have tried to say that some animals have mastered symbolism in their calls. They cite the three unique alarm calls made by vervet monkeys to alert their comrades of dangers from leopards, snakes, or eagles. Each call is applied only to the specific danger and elicits a unique response. But this is not a symbolic system. Deacon notes the invariant response evoked by each of these calls and shows that the behavior is instinctual.[22] In all examples of nonhuman communication, only two apes, after years of intensive training, have shown any sign of symbol use.[23]

Finally, human brains are structured differently from animal brains in ways related to language production. Humans use a different part of the brain for communication than animals do.[24] Animal communication is controlled in the brain stem and limbic system, while human language is controlled by the left cerebral cortex. Humankind does produce vocalizations from the brain stem and limbic system but these are usually in response to stubbing our toe or smashing a hammer into our thumbs. Such vocalizations from our more "animal" region are usually not socially acceptable. Another difference between the structure of human and animal brains is an enlarged Broca's area. Only human brains possess this enlarged area on the left temporal lobe. Broca's area has long been associated with speech since damage to this region produces a curious inability to communicate called Broca's aphasia. Another difference between human and animal brains is connected with speech. The different hemispheres of the human brain control different functions. The left hemisphere is more involved in language control than the right hemisphere. This lateralization of function produces slightly different shapes between the left and right hemisphere of the brain and, most importantly, Clive Gamble notes that brain lateralization is a requirement for language.[25] While some other animals do possess brain lateralization, none are quite as strongly lateralized as human brains.

Recently a report claimed that chimpanzee brains have an enlarged planum temporale, which is a small part of Wernicke's area.[26] Damage to Wernicke's area creates language difficulties. But such proof has not been forthcoming for the planum temporale *alone*. Even so, it often has been claimed to be involved in language. This report has raised some speculation that chimpanzees have a language. Unfortunately for this hypothesis, the authors admit that this area may have nothing to do with language;

Deacon noted that thirty out of one hundred humans do not have an enlarged planum temporale yet they use language like everyone else.[27]

The above information yields three objective criteria that can be applied to the fossil record to shed light on the language abilities of the ancient hominids. First, we can examine the interiors of the skulls looking for evidence of brain lateralization. Secondly, we can examine fossil skulls looking for an enlarged Broca's area. Their existence in an ancient hominid skull would suggest speech. Thirdly, the relationship between brain lateralization and handedness yields other ways to look for language abilities. There is a clear statistical correlation between having a larger occipital lobe on the left hemisphere and having a larger frontal lobe on the right hemisphere with right-handedness. Most animals have a 50/50 ratio of right- vs. left-pawed individuals while humans have a 90/10 ratio.[28] Because of the way a person manufactures a stone tool, one can determine if it was made by a right- or a left-handed individual. Stone tools can be studies to determine handedness and thus they become a proxy for brain lateralization and speech.

The fossil record can only tell us the earliest evidence for language. It cannot tell us when that language actually appeared.

The fossil record can only tell us the earliest evidence for language. It cannot tell us when that language actually appeared. The earliest evidence of speech comes from the skull KNM-ER 1470. This specimen is that of a *Homo habilis* and dates to nearly two million years ago.[29] The skull clearly has an enlarged Broca's area, unlike the Australopithecines' skull that preceded it. Since an enlarged Broca's area is found only in humans and is associated with speech, most authorities feel that *Homo habilis* was the first creature on earth for which speech abilities can be documented.

Secondly, morphological evidence of strong brain lateralization is also found in all hominids who lived during the past two million years. These include *Homo habilis*, *Homo erectus*, Neanderthal, archaic *Homo sapiens* and anatomically modern humans.[30] This finding is consistent with the archaeological data from stone tools that were clearly made by predominantly right-handed individuals over that same period. Schick and Toth explain:

> Let's look at what a right-handed tool maker typically does during hard-hammer percussion. As outlined above, a right-handed individual normally holds the hammer stone in the dominant right hand (which gives more precision and power to the flaking blows and lessens the chance of hitting one's fingers) and the core to be flaked in the more passive left hand. The left hand essentially acts like a vise to securely grasp the core during repeated blows from the hammer stone, orienting the core properly for each successive impact.
>
> Now, what effect does this setup have upon the flaking process? If a sequence of flakes is removed from one face of a core, there is a tendency for the left hand holding the core to rotate it in a clockwise direction as the flakes are removed. One hits off a flake, rotates the cobble a little, and strikes off another to the right of the first, rotates it slightly again and flakes again, and so forth. If the core is made on a cobble or thick cortical flake, we can see this clockwise rotational bias by examining the flakes that have been produced. Successive flakes tend to have part of a flake scar on the left (where the previous flake had been struck off) and part of the cobble's cortex on the right. Thus, large samples of these flakes can tell us something about handedness: whether the cobble was being rotated in this way, as would a right-handed person, or whether it was being turned by a left-handed person, in the opposite hand and producing the opposite pattern. Experiments show that right-handed tool makers produce significantly more oriented flakes. In our experiments, (we being right-handed), a ratio of 57–43 of right-oriented flakes was produced.
>
> This is an experimental result that can be applied directly to early Stone Age artifacts. So far, every site we've examined from the early Stone Age, including those at Koobi Fora dated from about 1.9 to 1.5 million years ago, shows exactly the same pattern. Thus it appears that by the time of early tool making in the archaeological record, these ancestral hominid populations may have already become preferentially right-handed. For whatever reason or reasons, right-handedness seems to be an ancient trait in humans.[31]

This would also imply that language is an ancient trait in humans. Was *Homo habilis* the first being who could speak? One of the foremost authorities on the structure and evolution of the brain published a theory that advocates that Broca's area is the result of the development of language, not the cause of it.[32] If this were the case, then some *Australopithecus* would have to have been able to speak. While *Australopithecus* speech cannot be proven, we could not reject him from the human family if he could speak.

One final objection to speech among all hominids over the past two million years concerns the sup-

posed inability of Neanderthal to speak. This was based upon the hypothetical reconstruction of the Neanderthal larynx in a position that would inhibit the formation of certain vowels. This view was disproved by the discovery of a hyoid bone which demonstrated that the Neanderthal larynx was identical to modern humans and thus Neanderthal could speak.[33] Deacon notes that Neanderthals were probably our linguistic and intellectual equals.[34]

Sweating, Clothing, and Pain in Childbirth

These three issues are all interrelated and cannot be addressed separately. The line of reasoning is as follows: large brains tend to overheat requiring a cooling system like sweating. Efficient heat removal by sweating requires hairlessness which, in turn, produces the need for clothing. The large head required to house this large brain causes pain in childbirth. Here are the details.

The brain is a huge consumer of energy. Human adults use about 20% of their metabolic energy running the brain.[35] Without an efficient cooling system, the brain would quickly overheat and die. Even modest increases can be fatal; raising the brain temperature to 106° Fahrenheit causes brain damage. This fact means that the brain must be cooled and the temperature stabilized. One must be clear to distinguish temperature from heat production—heat production only raises the temperature of an object if the heat is not removed. Temperature, a measure of heat content not production, can remain stable if the heat is removed as rapidly as it is produced.

Physically, there are several ways to accomplish the temperature stabilization of the brain: heat conduction, fluid convection or a fluid coolant system. Heat conduction through the skull is too slow to maintain the brain's temperature. Convection works only in fluids; the brain is not fluid. The only real solution is a coolant system like an automobile uses. Dean Falk advanced a theory in which the hominid brain could not grow any bigger than the cooling system attached to it. The theory originated from a comment by her mechanic, who had said that her car's engine could not be bigger than what the radiator could cool.[36] The brain, like an engine, can only be as big as the cooling system it has. In the brain, the blood acts as the coolant.

The brain has several emissary veins that go from the interior of the skull to the skin of the face. These veins are part of the "radiator" system. When a person is cold, blood flows from the cranium outward in these veins. But when a person exercises and becomes overheated, the blood flow reverses and blood flows into the cranium. The reason for this reversal is that the skin of the face (the brow included) acts as a radiator, cooling the blood, which then enters the brain to cool that organ. These veins are preserved in the skulls of hominids as emissary foramina (a foramina is a hole in the skull).[37] Thus a record of the size and number of emissary foramina in ancient skulls is available for anthropologists to examine. Falk notes that over the past two million years as the brain size has increased, the number of emissary foramina increased in proportion.[38] But emissary veins are only part of the cooling mechanism in humankind.

Large brains tend to overheat requiring a cooling system like sweating. Efficient heat removal by sweating requires hairlessness which, in turn, produces the need for clothing. The large head required to house this large brain causes pain in childbirth.

An efficient sweating system cools not only the face but also the rest of the body and blood. The human sweating system is uniquely capable of performing that function. Bernard Campbell describes the function of sweat glands:

> The sweat glands fall into two groups: the apocrine and eccrine glands. The apocrine glands secrete the odorous component of sweat and are primarily scent glands that respond to stress or sexual stimulation. Before the development of artificial scents and deodorants, they no doubt played an important role in human society. In modern man these glands occur only in certain areas of the body, in particular in the armpits, the navel, the anal and genital areas, the nipples, and the ears. Surprisingly enough, glands in the armpits of man are more numerous per unit area than in any other animal. There is no doubt that the function of scent in sexual encounter is of the greatest importance even in the higher primates and man.
>
> The eccrine glands, which are the source of sweat itself, have two functions in primates. Their original function was probably to moisten friction surfaces, such as the volar pads of hand and foot to improve the grip, prevent flaking of the horny layer of the skin, and assist tactile sensitivity. Glands serving that function are also found on the hairless surface of the prehensile tail of New World monkeys and

on the knuckles of gorilla and chimpanzee hands, which they use in quadrupedal walking. Glands in these positions are under the control of the brain and adrenal bodies, and in modern man an experience of stress may produce sweaty palms.

The second and more recently evolved function of the eccrine glands is the lowering of body temperature through the evaporation of sweat on the surface of the body. The hairy skin of monkeys and apes carries eccrine glands, but they are neither so active nor so numerous as in man. Modern man is equipped with between two and five million active sweat glands, and they play a vital part in cooling the body. The heat loss that results from the evaporation of water from a surface is enormously greater than that which could be expected to occur as a result of simple radiation. The fact that sweat contains salt necessitates a constant supply of the mineral if man is to survive in a tropical climate.

It has been observed that like almost all mammals, primates sweat very little. Even hunting carnivores, such as dogs, lose heat by other means, such as panting. Sweating has evolved as a most important means of heat loss in man, a fact that is surely correlated with the loss of his body hair. The apparent importance in human evolution of achieving an effective means of heat loss indicates without doubt that early man was subject to intense muscular activity, with the production of much metabolic heat; he could not afford even the smallest variation in body temperature. With such a highly evolved brain, the maintenance of a really constant internal environment was a need of prime importance in human evolution.[39]

With this need to dissipate heat in order to maintain a constant brain temperature, hair becomes a problem. Hair traps the sweat and hinders evaporation. Zihlman and Cohn relate:

How might early hominids have dissipated the heat load generated internally, as well as externally from the sun? One way is through the skin. The skin of modern humans contrasts with that of other, nonhuman primates in four features: 1) humans have a great density (over two million) of functioning eccrine sweat glands over the entire body surface; 2) loss of the apocrine sweat glands has been associated with hair loss, and has occurred except in the ano-genital and axillary regions; 3) hair follicles are diffuse and hair shafts are noticeably reduced in size; 4) skin pigment ranges from dark to light.

How might these features be interpreted in a functional and evolutionary way? There is the remarkable thermo-regulatory function of eccrine sweat glands. Sweating can deliver two litres of water to the skin surface in two hours and carry off almost 600 calories of heat. Hair tends to trap moisture, so that sweat evaporation is more effective with reduced hair. Interestingly, the number of hair follicles in humans is similar to that in chimpanzees and gorillas, but the much reduced size of hair shafts in humans gives a hairless appearance.[40]

Why do we have hair on our head? Radiatively, hair on the top of the head absorbs the solar heat and re-radiates most of it. An absorbing layer can reduce by half the amount of energy reaching the top of the skull. Zihlman and Cohn note that head hair protects the scalp from ultraviolet radiation and acts to stabilize the temperature of the brain.[41] Although various human populations possess different amounts of body hair, all have hair on the head but the rest of the body is hairless enough to allow efficient sweating.

Ancient humans would have needed this mechanism very early. For modern humans even moderate exertion on the savanna increases the heat production by 100% over the resting levels. Since *Homo erectus* was as large as we are, similar exertions on the plains would yield similar heating.[42] Even the smallest *Homo erectus* has a brain that is over twice as large as that of the chimpanzee, which can get by without much sweating. *Homo erectus* would need to sweat and he therefore needed to be relatively hairless.

A relatively hairless *Homo erectus* living in Georgia (former USSR) would have been ill-equipped to handle the winter temperatures below zero Fahrenheit which occur from time to time in that area.[43] Because of these considerations, anthropologists like Brian Fagan were forced to conclude that when *Homo erectus* inhabited Europe, he had to have been capable of building shelters, fire, and clothing.[44]

Thus archaeology has provided evidence for the curse of sweating and hairlessness as far back as 1.9 million years ago when *Homo erectus* first appears. Because of this, it indirectly provides evidence of clothing that long ago. By 300–400 thousand years ago, humankind was living in northern Germany and possibly Siberia where they definitely would need clothes.[45]

There is some more direct physical evidence for clothing among humans living between 300 thousand and 1.9 million years ago.[46] It comes again from a study of stone tools. When a stone tool is used, microscopic scratches are left on the stone. These scratches are unique for each use and can be used to identify the material that was cut. A characteristic pattern of wear indicative of scraping animal hides is found on tools of this age. But the most interesting

direct evidence for working with animal skins comes from some bone tools found at Swartkrans and Sterkfontein, South Africa and Olduvai Gorge, Tanzania all of which indicate working in animal skins. Richard Klein writes:

> At all three sites, the bone implements certainly or probably date from between 2 mya and 1.5 mya. Microscopic examination supports the artifactual nature of 41 Olduvai pieces. Of these, 4 were not tools in the narrow sense but apparently served as anvils or platforms on which soft substances such as skin were repeatedly punctured by sharp ended stone artifacts. The remaining 37 are large, flaked pieces of bone, including (a) 26 with polish of the kind that forms on experimental pieces used to cut or smooth soft materials such as hide and (b) 11 with wear that probably formed from contact with a more abrasive substance such as soil.[47]

The evidence for the processing of animal hides goes far back into the archaeological record.

God's curse for the man and woman could have been implemented through an increase in brain size.

Some have suggested that the tools at Swartkrans and Olduvai were manufactured by *Australopithecus* rather than by *Homo*. While one cannot rule out *Australopithecus* as the tool-maker, there is no proof of this today. There are no stone tools long before the appearance of *Homo*. At Swartkrans, advocates of *Australopithecus* tool-making cite the fact that 95% of the fossil material from that site is Australopithecine. But at least six fossils of *Homo* are found there[48] and the fossil SK-847 dating from the earlier Swuartkrans beds is in our terminology, *Homo erectus*.[49] *Homo habilis* is found at Olduvai in beds dating at least 1.8 million years ago.[50]

Now to tie up the final item, pain in childbirth. Among mammals there are two patterns of brain growth. The first pattern is called altriciality. In this pattern, the animal is born helpless and extremely immature. The brains of altricial animals are usually half the size of the adult's, and double in size by adulthood. Because of this, it takes lots of parental effort to raise the young. Animals following this pattern usually have litters and perform this care for multiple offspring at once. Cats, with their blind and helpless kittens, are altricial. The other pattern is precocial. In this pattern, the offspring are usually born single and from birth can get around quite well. Their brains are nearly adult size at birth. They are alert and all their organs are functioning. An example of this pattern is the horse, the wildebeest, etc., where the young runs with the herds within minutes.

According to Walker and Shipman altricial species almost never have bigger brains than precocial species.[51] The reason is that for all mammals except one, the brain grows rapidly during gestation but then grows less rapidly after birth. There is a kink in the graph of brain size vs. time that occurs at birth. Altricial species are in an immature state at birth and the subsequent slowdown in the rate of brain growth means that they forever remain behind the more maturely-born precocial species.

What humans seem to have accomplished is the trick of keeping the brain growing at the embryonic rate for one year after birth. Effectively, if humans are a fundamentally precocial species, our gestation is (or should be) twenty-one months. However, no mother could possibly pass a one-year-old baby's head through the birth canal. Thus, human babies are born "early" to avoid the death of the mother. Walker and Shipman write:

> Humans are simply born too early in their development, at the time when their heads will still fit through their mothers' birth canals. As babies' brains grow, during this extrauterine year of fetal life, so do their bodies. About the time of the infant's first birthday, the period of fetal brain growth terminates, coinciding with the beginnings of speech and the mastery of erect posture and bipedal walking.[52]

This pattern of growth has huge implications. Every other primate doubles their brain weight from birth to adulthood. But due to the early birth of humans, we triple our brain's size. Our last twelve months of fetal brain growth occur outside the sensually deprived womb. This allows vast quantities of sensory input to affect the rate and nature of the neural connections. There are also huge emotional implications to this pattern of growth. Unlike chimp babies who can cling to their mother's fur, human infants cannot hang onto their mother despite having the hand reflex. The mother has no fur because she sweats and she sweats because of a big brain, which is why she gives birth to her child early. This early birth then requires the mother to care for the infant, which increases the bond between mother and child, which partially makes us human.

So, what is the birth pattern in *Homo erectus*? It is human. Shipman and Walker point out that the adult

Homo erectus cranial capacity was 950 cc.[53] If they followed the apelike pattern of doubling their brain size after birth, they would need to be born with a brain size of around 400 cc. Following the discovery of a nearly complete *Homo erectus* skeleton, the size of the *erectus* birth canal is known. A head with a 400-cc brain is 10 cm too big to fit through the birth canal. Estimates place the maximum fetal brain size able to fit through the *erectus* birth canal at just 231 cc.[54] *Homo erectus* had a human pattern of birth and must have endured similar pain in childbirth, and then cared for their young in a human pattern.

To close this section, it would appear that God's curse for the man and woman could have been implemented through an increase in brain size. This increase caused the need for an efficient sweating system and thus the loss of hair which, in turn, caused a need for clothing when humankind eventually inhabited northern climates.

Religion

One absolute characteristic of a fallen human being is his constant engagement in religious and ritual activities. In spite of the many claims that there is no evidence of religion prior to 40,000 years ago, religion has apparently played a part in the life of humans for several hundred thousand years. Because everyone agrees that anatomically modern humans engage in religion, we will not discuss their activities except as an analogy for what earlier hominids did.

One indirect evidence of ritual among Neanderthals concerns the existence of a flute dating from 43,000 years ago. Bruno Netti points out that in primitive societies music is always associated with ritual and is often viewed as a special form of communication with the spirits.[55] If this connection is real, then the discovery of a bear bone flute at Divje Babe, Slovenia by Ivan Turk and colleagues, sheds some light on the religious activities of Neanderthal.[56] Although some Christians have downplayed this discovery as nothing more than a fire starter, this explanation has not been advanced by anyone in the anthropological community.[57] The object is identical to bear bone flutes made by modern humans and universally accepted as flutes.

Many circumpolar peoples today engage in a form of religion known as shamanism. Converts believe that spirits enter the shaman, who then acts as a medium between the spirit world and his people. Most often the spirits take the form of animals and the shaman wears a costume made from the animal's skin as part of the ritual. Evidence of a shaman's cape was found with a 50,000-year-old Neanderthal burial at Hortus, France.[58] A Neanderthal was found with the paw and tail bones of a leopard arranged in a fashion suggesting that these bones had been part of a cape worn by the Neanderthal. Only the bones of the paws and tail were left of the leopard which would seem to rule out a fortuitous arrangement of bones. This find is reminiscent of costumes worn by primitive shamanistic tribes today.

Religion is not restricted to anatomically modern humans and Neanderthals. Three* Homo erectus *sites have yielded evidence for religious activities.

In 1996 at Bruiniquel, France, a possible Neanderthal sanctuary was discovered. Several hundred meters inside a cave, in total darkness, Neanderthals, prior to 47,000 years ago, built a 13 by 16 foot-rectangular structure. Neanderthals must have had a powerful incentive to travel deep into a dangerous cave, which required lamps or other artificial lighting; religion is an obvious possibility. Inside the structure burnt bear bones were found.[59] None were found outside the structure, implying that Neanderthals used the Bruiniquel site to sacrifice a bear. This activity is not unique to Neanderthals. Similar evidence, when associated with anatomically modern humans, is readily accepted as evidence of religion. Such evidence includes sites such as the 32,000-year-old Chauvet Cave in France, where a bear skull was ritually arranged.[60] Indeed, many modern peoples still make a yearly sacrifice of a bear to their gods in rituals remarkably similar to those depicted at the 18,000-year-old Le Trois Frere[61] and at the 12,500-year-old site of Mas d'Azil.[62] This bear cult religion appears to have originated with Neanderthals.

From the Neanderthal site of Nahr Ibrahim, Lebanon come reports of a deer that had been ritually arranged and sprinkled with red ochre.[63] Red ochre was used by anatomically modern humans and Neanderthal as a symbolic substitute for blood. All throughout the world, graves of Neanderthal and modern humans were liberally sprinkled with red ochre. Interestingly, while the Nahr Ibrahim cave itself contained red ochre, the ochre associated with the grave was chemically different and is believed to have been brought into the cave from elsewhere, implying long-range planning for the ritual.

But religion is not restricted to anatomically modern humans and Neanderthals. Three *Homo erectus*

sites have yielded evidence for religious activities. Chronologically, the youngest is the finding of a Venus figurine from Berekhat Ram, Golan Heights.[64] This crude piece of art dates between 250-280,000 years ago. It is a carved figure of a naked woman that is quite reminiscent of the Venus figurines used as fertility symbols by anatomically modern humans between 30,000 years and the present. The most recent study of the object by one of the world's leading authorities on Upper Paleolithic art confirmed that the figurine was made by a human.[65] When such figurines are found with the remains of anatomically modern humans, no one questions their association with religion and spirituality.

The second *Homo erectus* site with evidence for ritual is near Toralba, Spain. Of this 400,000-year-old site, Johanson and Shreeve write:

> Almost the complete left side of one elephant skeleton was found arranged as if for display, each bone turned over and replaced in the position it would have held in life. At the nearby site of Ambrona, Howell found several leg bones lying end to end in two perpendicular lines.
>
> The oddly symmetrical half-carcass was harder to explain—perhaps it was the remnant of some ritual, though no other signs that *Homo erectus* indulged in ceremony had ever been found.[66]

Johanson and Shreeve are wrong. This is not the only example of ritual. Perhaps the most amazing evidence for religion comes from the 400,000-year-old site of Bilzingsleben, Germany. Bilzingsleben has yielded some of the most amazing cultural artefacts from life that long ago, including a report of a drawing of a four-footed animal.[67] This site was preserved so exquisitely by travertine deposition that wood chips from the cutting and shaping of saplings are found. The site preserved the remains of three huts that were next to a 27-foot wide paved "social area." The excavators of Bilzingsleben write:

> The home base of early man from Bilzingsleben was situated on a shore terrace close to the outflow of a karst spring into a small lake. Previous excavations revealed a division of the camp site into different activity areas and outlines of three simple shelters with hearths and workshops set up in front of them. Five to 8 m from the dwelling structures, an artificially paved area with a diameter of 9 m was found. According to the archaeological evidence, special cultural activities may have been carried out there.[68]

The nature of these cultural activities was not published in English until 1997. Rick Gore reports:

> But Mania's most intriguing find lies under a protective shed. As he opens the door sunlight illuminates a cluster of smooth stones and pieces of bone that he believes were arranged by humans to pave a 27-foot-wide circle.
>
> "They intentionally paved this area for cultural activities," says Mania. "We found here a large anvil of quartzite set between the horns of a huge bison, near it were fractured human skulls."[69]

It would appear that this was an altar upon which human sacrifice may have occurred. This was a religion every bit as much as was the Aztec religion that also performed human sacrifice. As we have seen, there are no grounds for restricting religion only to anatomically modern humans.

Murder

The final item in the list is murder. We do not know the means by which Cain slew Abel but humans use tools to kill their comrades; animals use their teeth and claws. Thus I would restrict the term "murder" to those cases where a tool was used. Around 45,000 years ago, somebody tried to kill one of the Shanidar Neanderthals. The ninth rib on Shanidar 3 shows a partially healed slit made by a stone spear head that had been thrust into him. He survived the attack but before he could heal, he was killed in a rock fall.[70] The 300,000-year-old Broken Hill man, an archaic *Homo sapiens*, is believed to have died from a blow to the head by an antler pronged pick axe.[71] At Zhoukoudian, China, the *Homo erectus* people found, who date between 400 and 500,000 years ago, were believed to have been murdered, then eaten.[72]

Conclusion

The data presented here clearly shows that the various species of hominid engaged in activities indicative of a fallen human being. The data are consistent with the view that all members of the genus *Homo* are descendants of Adam. The data are also consistent with the third view that human characteristics arose gradually. However, the data clearly disprove the second view that restricts spirituality to anatomically modern humans.

In 1995, this author published a novel view of Noah's flood.[73] One criticism of that view is the antiquity of the flood. The data presented here are consistent with that model of the flood and amplify the need for an apologetic that extends the time fallen humankind has been on earth. This data also expand the definition of humans and again empha-

size the point that spirituality is not determined by uniformity or differences in appearance. This is true no matter whether the differences arise merely because of skin color or, as with fossil humans, bone structure.

To claim that spiritual humankind was not on the earth prior to 40,000, 60,000, or 100,000 years ago or to claim that spirituality is restricted to anatomically modern* Homo sapiens *ignores the abundant anthropological data.

Biblically, humanity is determined by the ability to speak, the wearing of clothing, sweating, pain in childbirth, religion, and murder. It would appear that all traits that the Bible lists as indicative of a fallen human being were in existence *at least as early as 400,000 years ago*. However, some of these traits, language, pain in childbirth, and sweating, appear to have been on the earth for up to two million years. It would appear that Adam must be dated prior to this time. This data have important implications concerning how the scriptural data are to be interpreted and/or harmonized. To claim that spiritual humankind was not on the earth prior to 40,000, 60,000, or 100,000 years ago or to claim that spirituality is restricted to anatomically modern *Homo sapiens* ignores the abundant anthropological data. It is time for Christianity to come to grips with this important fact. ❄

Notes

[1]Glenn R. Morton, *Foundation, Fall and Flood* (Dallas: DMD Publishing Co., 1995); see also Glenn R. Morton, "The Mediterranean Flood," *Perspectives on Science and Christian Faith* 49:4 (1997): 238–51.

[2]There are some suspected associations of *Australopithecus* with stone tools. However, these associations only occur after the appearance of genus *Homo* around 2.3 million years ago. For this reason, the data are too sparse to draw any firm conclusions. For a discussion, see Donald Johanson and Blake Edgar, *From Lucy to Language* (New York: Simon & Schuster, 1997), 184.

[3]Alan Walker and Pat Shipman, *The Wisdom of the Bones* (New York: Alfred Knopf, 1996), 145; C. C. Swisher III, et al., "Latest *Homo erectus* of Java: Potential Contemporaneity with *Homo sapiens* in Southeast Asia," *Science* 274 (1996): 1870–4.

[4]Chris Stringer and Clive Gamble, *In Search of the Neanderthals* (New York: Thames and Hudson, 1993), 66.

[5]John C. Whitcomb and Henry M. Morris, *The Genesis Flood* (Grand Rapids: Baker Bookhouse, 1961), 457.

[6]Marvin L. Lubenow, *Bones of Contention* (Grand Rapids: Baker Books, 1992), 162.

[7]Henry M. Morris, *The Biblical Basis for Modern Science* (Grand Rapids: Baker Bookhouse, 1984), 398.

[8]Duane T. Gish, *Evolution: The Challenge of the Fossil Record* (El Cajon: Creation-Life Publishers, 1985), 179.

[9]Morton, "The Mediterranean Flood."

[10]David L. Wilcox, "Adam, Where Are You? Changing Paradigms in Paleoanthropology," *Perspectives on Science and Christian Faith* 48:2 (1996): 88–96, p. 94.

[11]Phillip Johnson, *Darwin on Trial*, 2d ed. (Downers Grove: InterVarsity Press, 1993), 85.

[12]Hugh Ross, "Art and Fabric Shed New Light on Human History," *Facts & Faith* 9:3 (1995): 2.

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[14]Ibid., p. 45.

[15]Dick Fischer, *The Origins Solution* (Lima: Fairway Press, 1996), 189, 194.

[16]E. O. Wilson, "Animal Communication," *Scientific American* 227:3 (Sept. 1972): 52–60.

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[18]Steven Pinker, *The Language Instinct* (New York: Harper/Perennial, 1994), 339–40.

[19]Derek Bickerton, *Language & Species* (Chicago: University of Chicago Press, 1990), 107–8.

[20]Pinker, *The Language Instinct*, 339.

[21]Terrence W. Deacon, *The Symbolic Species* (New York: W.W. Norton, 1997), 43.

[22]Ibid., 331.

[23]E. S. Savage-Rumbaugh, "Language Training of Apes," in S. Jones, et al., eds., *The Cambridge Encyclopedia of Human Evolution* (Cambridge: Cambridge University Press, 1992), 139.

[24]Pinker, *The Language Instinct*, 334.

[25]Clive Gamble, *Timewalkers* (Cambridge: Harvard University Press, 1994), 172.

[26]Patrick J. Gannon, et al., "Asymmetry of Chimpanzee Planum Temporale: Humanlike Pattern of Wernicke's Brain Language Area Homolog," *Science* 279 (1998): 220–2.

[27]Ibid., 221; and Terrence Deacon cited by Sandra Blakeslee, "Brain of Chimpanzee Sheds Light on Mystery of Language," *New York Times* (January 13, 1998).

[28]Kathy D. Schick and Nicholas Toth, *Making Silent Stones Speak* (New York: Simon and Schuster, 1993), 140; and Gamble, *Timewalkers*, 172.

[29]Dean Falk, "Comments," *Current Anthropology* 30:2 (April 1989): 141–2.

[30]Dean Falk, *Braindance* (New York: Henry Hold and Company, 1992), 122.

[31]Schick and Toth, *Making Silent Stones Speak*, 142.

[32]Deacon, *The Symbolic Species*, 340.

[33]B. Arensburg, et al., "A Reappraisal of the Anatomical Basis for Speech in Middle Palaeolithic Hominids," *American Journal of Physical Anthropology* 83: 137–46, p. 145

[34]Deacon, *The Symbolic Species*, 372–3.

[35]Donald Johanson and James Shreeve, *Lucy's Child* (New York: William Morrow, 1989), 263.

[36]Falk, *Braindance*, 156.

[37]Ibid., 153.

[38]Ibid., 159.
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[46]Schick Toth, *Making Silent Stones Speak*, 162.
[47]Richard G. Klein, *The Human Career* (Chicago: The University of Chicago Press, 1989), 164.
[48]Ian Tattersall, *The Fossil Trail* (New York: Oxford University Press, 1995), 201–2.
[49]Donald Johanson and Blake Edgar, *From Lucy to Language*, p. 184. Most authorities believe that the tools were made by *Homo*, not by *Australopithecus*.
[50]Ibid., 172.
[51]Walker and Shipman, *The Wisdom of the Bones*, 220–2.
[52]Ibid., 222.
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[54]Walker and Shipman, *The Wisdom of the Bones*, 226–7.
[55]Bruno Netti, "Music," *Microsoft Encarta* (1994).
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[67]Paul G. Bahn and Jean Vertut, *Images in the Ice* (Leichester: Windward, 1988), 208, note 63; and Paul G. Bahn, "Comments," *Rock Art Research* 5:2 (1988): 91–107, p. 96.
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[72]Ian Tattersall, *The Fossil Trail* (New York: Oxford University Press, 1995), 61–2.
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Communications

How to End Science's Border War: A Conceptual Framework

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Whether the rational case for intelligent design, based on interpretation of scientific data, should be brought within science's borders or left outside because of a necessity for methodological naturalism has been a topic of vigorous debate in this journal and elsewhere. Border disputes are sometimes settled by establishing buffer zones. Something of that sort is involved in two recent suggestions for dichotomizing science. Alvin Plantinga has argued for a division into Duhemian science and "Augustinian science," enlarging science's outer boundary to take account of "what we know as Christians."[1] Keith Abney has advocated recognizing teleological and nonteleological science.[2]

This communication deals with a third, perhaps more radical, dichotomization. Developed independently some time ago, it is not a reaction to the other two, but it could serve as either a complement or an alternative. It is presented here as part of an overall, basic conceptual framework for critiquing conventional science and arguing for intelligent design. While this framework has a place for those arguments, it does not seek to "promote" intelligent design to scientific status. Rather, it "demotes" portions of science from apparent equality of merit with other science—if they indeed must be closed to intelligent design by methodological naturalism. Its primary purpose is to focus critical attention on special subsets of science that, in a larger intellectual context, give rise to a question scientists have a duty to face: Can my working assumption of naturalism be at least partially false?

Freighted with philosophical implications, this question is one of the most important questions the human intellect can address—even if one's viewpoint is not religious. Therefore, it is argued that effectively censoring its adequate consideration in classroom and public discussion on the pretext of protecting methodological naturalism is intellectually dishonest and anti-intellectual.

In this framework, special areas (mostly, but not necessarily entirely, in biological origins) would become a zone within science called "parascience." These areas raise rational issues, outside science, about the local validity of the basic naturalistic assumption of science and thus about that assumption's universal applicability. So, the exposition of some theories requires an accompanying caveat: identify the issue's existence and adequately acknowledge the case in a larger intellectual context against methodological naturalism's universal applicability, even where parascience practitioners disagree with that case or wish to argue against it.

Three presuppositions influence this approach:

1. Mainstream, conventional scientists will never accept intelligent design or nonnatural causes into science. Neither will they accept, as part of their own task, questioning the complete sufficiency of the principle of methodological naturalism. This is taken as a sociological reality.

2. Unless the suggested strategy is adopted, most scientists and many educated people will prob-

ably continue to use the case against considering intelligent design *within* science as an excuse for not considering it at all. Also, the general culture may increasingly misperceive naturalism as a finding of science rather than as its working assumption.

3. There is merit in methodological naturalism continuing to provide an independent check on the arguments of those who infer discontinuities or uncrossable barriers to a naturalistic explanation of particular phenomena. That case for the defense may remove particular criticisms of parascience or move its borders. If, however, those who argue for the insufficiency of methodological naturalism are really right, then further naturalistic research must, on balance, strengthen those criticisms—just as it has increasingly made possible their current form.

Science's "Grand Paradox"

Science has developed from the top down, so to speak. Historically, it started with nature's ongoing operations, readily subject to experimentation and repeated observation. Methodological naturalism largely or entirely "works" with this largest part of science's subject matter. It also partly works when one proceeds from the top toward the bottom, i.e., origins. Scientists at various times have pushed back the boundary between ordinary or nonproblematic science and parascience. (By "nonproblematic" one means without problems as to the naturalistic assumption's applicability.) Therefore, parascience exponents have immense confidence in the validity of the assumption that everything that happens or has happened in the creation of the universe is, in principle, explainable in terms of natural causes or ongoing regularities. (See a Christian scientist's articulation of that confidence.[3])

But, as indicated, a case has gradually developed in special areas that suggests that this assumption might not be true. Therefore a paradox develops—science's "grand paradox." On the one hand, if methodological naturalism is abandoned, science's search for a better, perhaps adequate, naturalistic explanation of particular phenomena may have difficulty proceeding. If investigation does proceed, then particular challenges might disappear, as they often have (largely in operations science). On the other hand, in some situations, particularly those related to origins, difficulties appear to present not just "gaps" but specific, logical barriers to naturalistic explanation. If an adjunct, extra-scientific, rational consideration of these is refused or strongly discouraged, then these special areas of science easily turn into unconscious, but systematic, intellectual dishonesty.

Premise Criticism

An adjunct rational examination of the larger intellectual issue about the scope of methodological naturalism's viability would be to test science's premise for falseness. This premise, i.e., all things that have happened in the origin and development of the physical universe have occurred in accordance with ongoing natural laws or regularities, is potentially falsifiable in one of two senses: (1) by finding logical and physical difficulties or barriers to naturalistic or fully naturalistic explanations of some past phenomena, demonstrating that naturalistic explanation is impossible; or (2) by establishing cases of vanishingly small probability of any possible naturalistic explanation. In the second context, there is a loose analogy to the rejection of the null hypothesis in statistical inference: one might reject—even if provisionally—the hypothesis of no difference between reality and the universal rule of natural laws, though one could not formally quantify the probability. (In courtroom terms, one is dealing with "the balance of evidence."[4]) This necessary analysis, outside science, might be called "premise criticism," "premise analysis," or "protasiology" (from the Greek for premise: *protasis*).

Phillip Johnson has commented on the need to "audit" naturalistic science.[5] Ongoing premise criticism would audit parascience. In turn, parascience would audit premise criticism by trying to show that the seeming barriers were merely "gaps" that it has succeeded in filling. Though applied partly outside conventional science, this reciprocal process retains the provisional or tentative character of much of science, where that seems warranted.

The concept of premise criticism parallels, and is partly debtor to, Ruse's view that it can be legitimate to use science to show that no scientific explanation is possible, that some phenomena lie beyond science's ability to describe or explain.[6] This is perhaps not quite the same thing as premise criticism, but close to it.

The educated public has some familiarity with the idea of the "limitations of science." There is hope that educational authorities could be persuaded to accept premise criticism and the concept of parascience, providing nothing is inserted into science and no attempt is made to discourage ongoing endeavors to extend naturalistic explanation.

Premise criticism should not be assimilated into science, though scientists could take part. It does not seek and cannot create a new paradigm within which science can begin new investigations. Johnson has made cogent points on the difficulties of scientists auditing science.[7] In well-run factories, quality control does not report to production managers.

Why the "Para" in Parascience?

Why the "para" in parascience? Science was originally a subdivision of philosophy, i.e., of the intellectual pursuit of truth. But *if* there is a substantive basis for doubt in the larger intellectual context about the valid scope of naturalism, this methodological necessity in such special cases can amount to shunning a necessary search for truth. Therefore, while ordinary or nonproblematic science still qualifies as a legitimate child of philosophy, parascience becomes its bastard offspring—unless qualified by an ongoing, extra-scientific evaluation of the validity of science's naturalistic working assumption.

Ordinary science commands great academic and public respect, based on its demonstrated usefulness and relative reliability in the domain of ordinary science. This esteem is unwarrantedly transferred to parascience and exploited without restraint by the naive and the ideologically motivated.

Ultrascience and "Theistic Science"

Positive arguments for "intelligent design" or creation cannot be assimilated into premise criticism, since premise criticism is concerned in a narrow way only with the falsity or tenability of naturalism as such. A protasiological finding against naturalism would, of course, lead many to a third level of consideration. It too may require a name. "Ultrascience" is suggested—"*ultra*" is Latin for "beyond." This discipline could consider whether there is a case for intelligent design (as, of course, there is). Outside science, like premise criticism, but making judgments using information from science, ultrascience would attempt rational, intellectual judgments.

One can conceive of ultrascience as either this last step, after premise criticism, or as the combination of parascience, premise criticism, and ultrascience. Ultrascience differs from the "theistic science" of some who, after concluding upon an *ascription* to supernatural causation, apparently would have scientists drop methodological naturalism locally. A criticism of "theistic science," of course, has been that it results only in ascription to a cause or class of causes that cannot be described analytically, whereas such description is the business of science.

In the concepts presented here, science is essentially the attempted *description* of natural processes, tenably or otherwise when evaluated by premise criticism. It assumes *ascription* to natural causes as a class and bars itself from questioning that. Premise criticism does that questioning and may reject the ascription. Then ultrascience evaluates possible ascription to intelligent design and may adopt or reject that ascription, but presumably cannot undertake any, or much, description.

In some environments, one might succeed only in attaching premise criticism to the teaching of parascience; in other environments, one might also append ultrascience and the rational case for intelligent design; and in Christian institutions, one might go further to Augustinian science.

Just "Theistic Natural Philosophy"?

The combination of premise criticism and conventional science suggested here is more generous to methodological naturalism than the "theistic science" some propose. It specifically envisages continuing research based on the naturalistic assumption even where the evidence on balance is contrary; all that is asked is honesty in labeling, an acknowledgment of a nontrivial case against the naturalistic assumption, whether the researchers agree with that case or not. In such special situations, continuing naturalistic research becomes a frank attempt to vindicate the naturalistic assumption or validate the extension of its scope in which the researcher already has personal confidence. Therefore it operates essentially in parallel with ultrascience in cases where premise criticism permits the latter.

In this context, it seems unreasonable to describe the union of parascience, premise criticism, and ultrascience as simply "theistic natural philosophy," as Van Till has suggested for "theistic science."[8] Philosophy that can consider arguments for the existence of God is not qualified as "theistic." The threefold set of activities suggested here goes beyond natural philosophy to basic philosophical issues. By contrast, parascience by itself cannot qualify philosophically as more than apologetics for materialism or for the theistic naturalism or "creationomic" worldview of Van Till.

Given the associations words have in academic and popular usage, even the term "natural philosophy" would put ultrascience at an unfair disadvantage. If it should be that natural processes really cannot adequately account for the origin and development of life, ultrascience would be more in touch with the original spirit of science than is parascience

without premise criticism. Therefore ultrascience seems a fair description. The term acknowledges that the activity lies beyond any conventional definition of science, but implies a just claim to its close relationship to conventional science, applying an extension of science's methods beyond its naturalistic limitation.

Ultrascience, of course, should be strictly limited to rational analysis of premise criticism's implications and free to criticize or reject the case for intelligent design. "Augustinian science" is theistic in the proper sense of *starting* from theism. This is legitimate in its proper context, based on confidence in biblical revelation, which has its own strong rationality outside the conceptual framework used here. But one cannot expect it to be widely accepted outside Christian institutions.

"God of the gaps" has little relevance. If theism does not depend on limiting methodological naturalism, as "gapophobics" argue, critiques of the general theory of evolution, along lines suggested here, do not put God on trial. They try methodological naturalism, an intellectual issue aside from religious questions.

In Conclusion

Names or labels can affect thinking. Thus many materialists insist on packaging their philosophy as part of "science." For sociological reasons, this cannot be changed much (as the ASA's guidelines for teaching science partially seek to do). What is needed is to promote the recognition that science is not all of one piece. This can be done by the widespread, persistent use of "parascience," or at least "noncritical science," to describe the general theory of evolution. Persistence would provoke irritation; irritation, debate; and debate, perhaps some academic and public consciousness of the issues. Hard core materialists would probably be moved only by the defeat of a court challenge to the teaching of careful premise criticism in a tax-supported U.S. educational institution.

My personal views on origins by no means coincide with the "guided evolution" of many intelligent design advocates. If one concedes any Divine intervention, there is a basic difficulty in "knowing" that such activity has been limited to cases where natural processes are demonstrably inadequate. Naturalists use this as an argument against any concession to intelligent design.[9] But it cannot be a defense for intellectual dishonesty, even if unconscious, in censoring legitimate premise criticism in educational institutions. Of course, if naturalism lost its monopoly in origins studies, Christians, too, might be horrified by the preternatural speculations that replaced it. "What we know as Christians" includes Scripture's teaching that the human mind is influenced by an unseen world in reasonings relating to God. ❄

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Are Truth Claims in Science Socially Constructed?

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In a prize-winning book of essays entitled *Golem: What Everyone Should Know About Science*, sociologists Collins and Pinch claim that the establishment of scientific truth is a cultural process rather than the consequence of the accumulation of facts about the natural world.[1] The postmodern credo is that neither reason nor revelation gives us objective truth. Even truth claims in science are socially constructed by producing agreement among experts. The positive aspect of this approach to science is its refusal to champion the triumphalism of "scientific fundamentalism." Postmodernism, however, becomes pernicious when it leads to the conclusion that objective truth in science is a cultural artifact (to say nothing about the truth claims of Christianity).

In this communication, we first review the postmodern view of cultural constructionism both in its "weak" and "strong" forms. Then we very briefly explore the roots of the postmodern or deconstructionist view of science. Next, we attempt to show why this quarrel with science has some justification when scientists resort to triumphalism, ignoring the human limitations of their endeavors. And yet the evidence that reality exists out there independent of the observer is overwhelming. Science works, and it works miracles through technology. We show that, given the complexity and subtlety of nature, scientists are looking more and more for *multiplicity of strands of evidence*. Many strands are weak and often ambiguous, but when woven together, they make a coherent logical bond whose strength is enormous. Finally, we show that the same argument can also be made for the truth claims of Christianity, which has benefited from the positive aspects of postmodernism, and yet has been subjected to the same vitriolic attacks regarding its objective truth claims.

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The Postmodern View of Cultural Constructionism

In their book entitled *Higher Superstition: The Academic Left and its Quarrels with Science*, Gross and Levitt challenge the cultural constructionists head-on, and try to expose their "muddle headedness" when dealing with the nature of the physical sciences, with wit and polemic efficiency.[2] As duly noted by Gross and Levitt, the cultural constructivist's view is too diverse and internally contentious to merit a coherent exposition. However, they do share one similarity. They all carry a hostile tone toward science. The cultural constructivist list includes: postmodernism, traditional Marxism, radical feminism, multiculturalism (e.g., Afrocentric science), and deep-ecology environmentalism.

What makes dealing with these views difficult and frustrating is that they are not based on sound arguments. Rather, they use rhetorical and polemic approaches, taking the position of moral one-upmanship. For example, if one presents a critique of feminist science, no matter how justified, he or she can be accused of being part of an old-boys network. A position against *eco-apocalyptic* environmentalism can earn one the title of capitalist-industrialist polluter. A critique against postmodernism itself can classify one as an obscurantist.

Of course, there is nothing new here for Christian scholars defending their faith against strong cultural constructivism. What is ironic, is that now the scien-

tists, and mathematicians too, find themselves to be the whipping boys of the academic left.

Cultural constructivism has made its appearance in two generic forms: weak and strong (or soft and hard). We review each briefly.

The Weak Form

As with all human activities, science is and will always be part of human culture. Despite their honest efforts to remain objective, scientists are human beings and subject to emotional and/or irrational excesses when facing opposition to their cherished theories. The statement "science has shown" is often used as a triumphalist *shibboleth* to silence opposition, by saying effectively, "Stop arguing and believe me!" A common trap of scientific fundamentalism is the attitude of many scientists that the hypothesis of intelligent design belongs to the realm of metaphysics, or worse, religion. Yet the same scientists fail to acknowledge the faith content of their ontological naturalist position, especially as it pertains to evolutionary biology from the perspective of philosophical accidentalism.[3]

In his seminal work, *The Structure of Scientific Revolutions*, Thomas Kuhn exposed the reluctance of the scientific community to accept unorthodox approaches, when dealing with anomalies that cast doubts about the veracity of a commonly held theory.[4] According to Kuhn, most scientists never question an accepted model or paradigm. They solve problems whose solutions reinforce and extend the scope of the paradigm rather than challenge it. Kuhn called this "mopping up" or "normal science." When anomalies accumulate, they may eventually trigger a revolution that could be a destructive as well as a creative act; and scientists are often reluctant to accept a new paradigm. This attitude can turn especially nasty when scientists faced with increasingly scarce research and development funds compete for those funds. The conversion of scientists is thus both a subjective and a political process. They often adopt a paradigm simply because it is backed by others with strong reputations or by a majority of the community.[5]

A classic example of this is the manner in which Wegener was ostracized and ridiculed for his theory of tectonic plates in 1915.[6] Wegener supported his work with extensive geological research, but died in 1930, an intellectual outcast. Now, almost seventy years after his death, his idea is accepted as common wisdom. In scientific debate and in the process by which a preference of one paradigm emerges over another, *attitudes* come into play that are in some measure dictated by social, political, and ideological preconceptions, or even by sheer professional jealousy and personal whim.

Another example deals with the law of red shift that is now well established among astronomers and astrophysicists. It is instructive to note a deplorable situation, where a maverick astronomer, Alton Arp of Max Planck Institute in Garcheny, Germany, has been ostracized by a powerful scientific community that disagrees with his unorthodox ideas regarding stellar red shifts.[7] Arp has lost access to big telescopes and cannot find funds to support his work.

In his book, *Against Method,* Paul Feyerabend agreed with Kuhn on many of his points but went further by arguing that there is no logic to science, and that scientists create and adhere to scientific theories for what are ultimately subjective, or even irrational, reasons.[8] Kuhn, in a later discussion with Horgan, chose the word *arational* to describe the above phenomena.[9]

Finally, John Wheeler was one of the first prominent physicists to propose that reality might not be wholly physical, and in some sense, our cosmos might be a participatory phenomenon, requiring the act of observation, and thus consciousness itself. In 1960, he helped popularize the *anthropic principle*.[10]

On the other side of the ledger, Collins and Pinch conducted case studies on seven complex and highly controversial episodes in science. These included scientific investigations in chemical transfer of memory, the Michelson Morley experiment that confirmed the theory of relativity, the story of cold fusion, Louis Pasteur and the origins of life, nondetection of gravitational radiation, the sex life of whiptail lizards, and the case for missing solar neutrinos. They concluded that a number of these investigations end up with a *consensus* by scientists that is not always based on empirical data and tested theory. Unlike most sociologists and cultural anthropologists, who make pronouncements against scientific research showing an appalling lack of understanding, Collins and Pinch have made a genuine effort to understand the subtleties of scientific research. Some of their conclusions, that science is often a poorly understood concept and that many scientists continue holding on to their "pet" theories even after being confronted with good practice and good sense from researchers with maverick ideas, are quite to the point.

Where they err, however, is when they and other social constructivists do not take into account the fact that knowledge, as a human endeavor, though

never certain, can be overwhelmingly probable. In each case they discuss, Collins and Pinch follow a *single strand* of evidence, where, as pointed out by Mermin, there exists a multiplicity of strands of evidence that *can* make a coherent, logical bond that is very strong.[11] (More on this below.) We now turn briefly to the more pernicious trend called the *strong form* of cultural constructivism.

The Strong Form

In its strong (or hard) form, Gross and Levitt describe the epistemological position for cultural (or social) constructivism as follows:

> Science is a highly elaborated set of conventions brought forth by one particular culture (our own) in the circumstances of one particular historical period; thus it is not, as the standard view would have it, a body of knowledge and testable conjecture concerning the *real* world. It is a discourse, devised by and for one specialized *interpretive community*, under terms created by the complex met of social circumstance, political opinion, economic incentive and ideological climate that constitutes the ineluctable human environment of the scientist. Thus, orthodox science is but one discursive community among the many that now exist and that have existed historically. Consequently its truth claims are irreducibly self-referential, in that they can be upheld only by appeal to the standards that define the *scientific community* and distinguish it from other social formations.[12]

It must follow, then, that science deludes itself when it asserts a particular privileged position in respect to its ability to *know* reality. Science is *practice* rather than knowledge, and practice involves convention and arbitrariness. The practices that most particularly embody the sacred "objectivity of science—experiment and observation—are inescapably textual practices, meaningless outside the community that endows them with meaning."[13] In its extreme form, it is held that a series of words, whether in writing or in our minds, have at best a shadowy and unstable relationship to reality itself. In fact, even *reality* is a mere construct of the mind, a remnant of the Western metaphysical tradition. The logical outcome of such an approach is that verification is a discursive, linguistic event and therefore reliable knowledge cannot be distinguished from superstition!

This type of reasoning begins to look suspiciously like Eastern monistic thinking. In fact, it was Suzuki, the 60s champion of Zen Buddhism, who said: "I do not know whether I am a human being, dreaming that I am a butterfly, or a butterfly dreaming that I am a human being."[14] Such imagery expresses in extreme form what Buddha taught regarding ultimate reality, i.e., ultimate reality transcends what can be expressed in words. In fact, the universal mind is alone real, and thus it behooves us to leave behind analytic reason and realize the universal mind through a flash of sudden awakening.

It seems that dissatisfaction with the purely rational—often at the expense of a dynamic faith in spiritual realities beyond the mere observable and empirical—has led many intellectuals to opt for Eastern mysticism, almost as a philosophical revenge against positivism. The latter, expressed by the likes of Ayer in *Language, Truth and Logic*, was widely supported by many physical and biological scientists in the '20s and '30s, and was devastatingly hurtful to traditional humanists, social theorists, and theologians.[15] Positivism imposed severe tests of meaningfulness on all sorts of propositions. For example, empirical statements about emission or absorption spectra were perfectly meaningful, but statements regarding ethically or aesthetically inferior or superior assertions were considered meaningless.

Thus, according to J. D. Grove, the views of postmodernists became a reaction against positivism, and many humanists and social scientists embraced postmodernism as instruments of *revenge* against scientism or *physics envy* created by the positivists.[16] They also interpreted Kuhn's analysis of the structure of scientific revolution in an eclectic manner, choosing the subjective component of science over and against its objective aspects.

In one sense, the Christian scholar applauds the demise of positivism that produced the *demon of rationalism*, banishing anything supernatural, such as revealed truth, angels, heaven, hell, and biblical accounts of miracles, into the domain of mythology and superstition. On the other hand, the "muddleheadedness" of the academic left in rejecting objective truth in science is a warning to us that Christianity itself is under the same attack for insisting on the existence of absolute truth. Here are two revealing examples quoted by Gross and Levitt of how cultural constructivists think.

1. The Biology and Gender Study Group identifies the image associated with the rush of the sperm in search of the ovum in the uterus as "gang rape." Or, the ovum is a passive victim, a whore, fulfilled as a proper lady only when the fertilizing sperm survives as a hero while others perish, and reaches the egg as a successful suitor![17]

2. Sociological theorist Stanley Aronowitz in his book, *Science as Power*, argues that since physics has

discovered the uncertainty principle, it can no longer provide reliable information about the physical world. It has lost its claim to objectivity and is now embedded in the unstable interpretations of subject-object relationships, without ever mentioning the predictive success of quantum mechanics, which can really tell us so much about the physical universe.[18]

It is tempting to dismiss such extreme positions as bizarre, not worthy of serious consideration. Most science critics who hold the strong cultural constructivist position, however, have high positions in such notable universities as Princeton, Berkeley, Brown, MIT, just to name a few, and thus can have great influence on the new student generation. In addition, as Christians, we face opposition from both the positivist empiricist, who champions objectivity and the hard sciences, and the postmodernist, who dismisses reality and absolute truth. The tangible, physical universe is as real to the Christian, as is the invisible, intangible, spiritual world. If the Eastern monist absorbs the material world into the spiritual, the atheist absorbs the spiritual world into the material, and Christians place a *proper balance* between the two. In fact, one (the spiritual) is the very source of the other (the physical), according to Heb. 11:3 and thus, both realities represent a legitimate, knowable domain for the Christian, irrespective of whether he or she is there to observe and know it. The very fact of the Incarnation of God taking on a physical nature and *dwelling among us* demonstrates *the importance of the physical universe* in God's eternal plan for humankind. Therefore, we can be hardly indifferent to the untruth propagated by an elite group of academicians and intellectuals that denies the objective basis of both reason and special revelation.

Where Then Do We Go From Here?

First, as with the cultural constructivist, we reject the triumphalist attitude of many scientists, who claim that the only way to know reality is through the instruments and methodology of a narrowly defined science, i.e., *matter is the only thing that matters*. We also reject the postmodernist's credo that neither reason nor revelation gives us objective truth.

Next, we present supporting evidence in defense of the truth claims of science and technology on the one hand, and those of Christianity on the other. To this end, we use the *multiplicity of strands of evidence* approach that considers the weaving together of a number of strands of evidences, each necessary for the defense of the case but not sufficient if taken by itself, alone. Let us cite two examples: (a) the big bang theory and (b) the relationship between mathematics and the physical sciences.

The Big Bang Theory: An Example

A classic example of this type of evidence is the big bang theory. One of the solutions of Einstein's equations of general relativity led to the result that the universe is expanding while decelerating. The only physical phenomenon in which expansion and deceleration occur at the same time is in an explosion, and hence the big bang theory.

The first *strand* or *thread* of evidence that gave credence to the big bang theory was Hubble's announcement in 1929 of his law of red shifts, based on his observation of distant galaxies: the more distant a galaxy, the greater, in direct proportion, is its velocity of recession. This observation perfectly fits the simplest model of an expanding universe. The second *strand* was the contention of Eddington and other theoreticians that the second law of thermodynamics demanded the *winding down* of the universe, from order to greater disorder, as its entropy increased. A third *strand* of evidence was the 2.7260K background radiation measurement by Penzias and Wilson of Bell Laboratories in 1965. This background radiation exactly fits the black body radiation expected from a primordial cosmic explosion in complete thermodynamic equilibrium. Other *strands* include the ambient helium abundance observed for the universe, the trace amounts of deuterium, and the apparent limit on the size of the red shift observed as one moves toward the edges of the known universe. The latter implies the paucity of stars and galaxies at the extreme cosmological distances. Individually, each of these *strands* or *threads* is necessary but not sufficient by itself, to support the big bang hypothesis. When *woven* together, however, they make a rope of enormous strength.

Another approach in defense of the reality of the physical world and its interplay with the human mind is the *coincidence* that keeps recurring in human history between the physical sciences and mathematics.

Reality of Nature and Unreality of Mathematics: Second Example

It is true that scholars must distinguish between the world of natural phenomena on the one hand, and mathematical and computational models of the world on the other. And yet mathematical systems formulated by the human mind for sheer intellectual pleasure have later proved remarkably applicable to an accurate description of nature. According to Penrose, there exists a deep mathematical underpinning to physical reality.[19] Two classic examples will suffice to illustrate the profound mathematical sub-

structure that is already hidden in the very workings of nature.

In 400 B.C., Apollonius of Perga developed the trigonometry of conic sections, such as the ellipse, the parabola, and the hyperbola. Twenty centuries later, in 1640 A.D., Kepler applied the conic sections to his observation of the orbits of the planets with remarkable accuracy. Einstein, in 1912, in his efforts to explain the law that describes how matter forces spacetime to curve, was led to the *absolute differential calculus*, the *tensor analysis*, or, in the language of today, the *differential geometry* of Riemann (1860), Ricci (1880) and Levi-Civita (1890). These mathematical formulations fit the physical phenomena of spacetime warpage with extraordinary accuracy. It was Eugene P. Wigner who expressed his amazement at such coincidences with the following memorable words: "the miracle of the appropriateness of the language of mathematics for the formulation of the laws of nature is a wonderful gift which we neither understand nor deserve."[20]

In view of such remarkable confluences that have occurred repeatedly in describing physical phenomena, i.e., the linking (with precision) of concepts developed in a mathematician's mind for pure intellectual pleasure with observable phenomena in nature, the academic left does disservice to the objective nature of the physical sciences when it attributes them to mere *discourse* or *cultural constructs.*

The Multiplicity of Strands Applied to Christian Truth Claims

As a final observation, I believe the Christian faith can be defended on the same basis as the *multiplicity of strands* approach discussed above. Reason is an integral part of the Christian worldview. The Great Commandment expects us to love God with our mind, as well as our heart, soul, and strength. God challenges us to reason with him (Isa. 1:18); Jesus rebukes the religious leaders for *discerning the skies* but being oblivious to God's presence in their midst (Matt. 16:1–4).

Conflict between reason and faith is as ancient as humankind. Yet, science and faith were not always in conflict when the foundations of modern physics were laid in the eighteenth and nineteenth centuries. Also, the good news of Christianity is inextricably bound with history and, therefore, open to historical verification. One can identify five strands of evidence to establish the reasonableness of the Christian faith: (1) evidences from the physical universe; (2) evidences from human nature; (3) evidences from history and archeology; (4) evidences from Scriptures; and (5) evidences from personal experience. Each evidence is necessary but not sufficient to reconcile the *scientific worldview* with the Judeo-Christian tradition. Each set of evidence represents a strand of rope that has insufficient strength to support the affirmative response to the above query, but when *woven together*, the five evidences present a convincing argument of the unity of faith and reason.

The multiple evidences that support the Resurrection event are another example. Ten such strands of evidences can be identified, starting with the known fact of the empty tomb, the number of eye witnesses to the resurrection event, the ethical lives of the disciples who proclaimed the resurrection, the speed at which the message spread through word of mouth alone, etc.

Concluding Remarks

No serious thinker about science, most of all a Christian in science, doubts that personal and social factors influence problem choices and the acceptance of results by the scientific community. And what is more, Christians are painfully aware of the unspoken premises upon which the rejection of intelligent design by most scientists is based, viz., ontological naturalism. However, few serious thinkers about science would deny the fact that empirically verified results in science are indeed *written in nature* and have enabled humankind to benefit from its tangible, practical, verifiable results through its progeny, technological breakthroughs.

As Christian intellectuals, we have the double duty of defending our faith against both extremes: rationalism on the one hand and postmodernist relativism on the other. Our strategy should be to take the positive aspects of each position and develop a Christian constructivist approach, one that supports the importance of objective truth in the realm of the physical world and confirms the existence of objective truth in the spiritual realm.

Christian constructivism should acknowledge that scientific knowledge is important and valuable, but is not the only reliable means of knowing truth. In fact, to avoid scientism, and thus eviscerate one of the key arguments of the academic left, all we need to do is to remember to keep the following points in perspective:

> (1) Science continually raises philosophical questions that go beyond the competence or purview of science; (2) evidence of random chemical processes is not necessarily evidence for philosophical

accidentalism; (3) in science, an unanswered question is far more important than an unquestioned answer; (4) in science, tentative conclusions should be stated in tentative form; and (5) the confidence expressed in any scientific conclusion should be directly proportional to the quantity and quality of evidence for that conclusion.[21] ❄

Notes

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Two Prediction Sets and Their Consequences for Applying Intelligent Design Theories

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Intelligent design, stripped to essentials, covers a broad range of theistic views. It includes Van Till's "functional integrity," which insists that God, in the original creation, provided both the causal principles and physical basis for the development both of the inanimate universe and terrestrial life.[1] This view is not to be confused with deism or process theology, for it holds (1) that the rational Creator originally established the universe so that, under his continual providential care, it developed "naturally," and (2) that he is omniscient, omnipotent, and sovereign.[2] Though Van Till is Reformed, his view is comparable to Luther's teaching that all natural principles are *larvae dei*, the masks of God, behind which he is at work.[3] Although it is always God at work, we see only the masks, whether we look at the development of the inorganic, from the Big Bang on, or the total development of the organic world. This is why we declare with the psalmist, "The heavens declare the glory of God," while recognizing that "The fool hath said in his heart, There is no God."[4] We recognize God's hand behind natural events while the fool does not. Indeed, the fool's attitude is the same as that which brought forth Christ's rebuke: "Except ye see signs and wonders, ye will not believe."[5]

The Common Views of Intelligent Design

At the other extreme, intelligent design includes immediate creationism, the notion that God, in the recent past, produced the universe in something like its present state. Since this does not produce empirically testable consequences, it will not be further considered here.

Common among the views to be examined is continuous creationism. The more obvious version holds that every species, or every genus, or at least every family, was created independently at the appropriate time.[6] A more moderate version of this type is expressed by those who are developing the Intelligent Design Theory. Since some of its members object to such placement, I will present a brief justification of my claim.

Behe's "irreducible complexity" holds that life exhibits structures and functions that could not have developed gradually.[7] Despite his lack of expressed commitment, his view implies either that the mechanisms were introduced by some nonnatural force, or that organisms had to accumulate useless structures or "mutations" until the functional organ or process emerged.[8] It appears difficult to envision a natural mechanism for this latter condition, while the former fits Dembski's approach.[9] Dembski claims that, in a closed natural system, the amount of information cannot increase. Thus, more complex organisms with more advanced functional repertoires cannot arise except by the input of information from without. This claim may require a little modification,[10] but necessarily excludes production of the genetic information found in organisms by material forces.[11]

Consequently, we may divide the total range of positions espousing intelligent design into two parts. On the one side is Van Till's "functional integrity" (hereafter referred to as FI), that is, what may be studied scientifically involves no external inputs.[12] The alternative is a group of views which insist that there must be, in addition to the miraculous introduction of life, multiple inputs over time

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for the biosphere to have become what we now observe. To be sure, there is a notable difference among the claims that no more than information has to be inserted from without; that entire organs, functions, and their genetic support must be produced by nonnatural means; and that whole organisms are created and introduced at appropriate times during Earth's development. However, for what follows, these distinctions have overlapping consequences. So this set of views will be referred to as multiple input theories or MI.

The Two Sets of Predictions

Two distinct groups of predictions spring from these alternate versions of intelligent design. The first prediction provides that in the genome of normal individuals, whatever their species, we should find no quiescent genes that are similar to active genes. A related prediction requires that at least some structurally similar genes will have specific functions that do not parallel or overlap those found among related species. This is consistent with MI. The second prediction specifies that we should find sets of genes in various species in which one gene of the set preserves a function while other members of the set produce different effects. This includes the possibility that some of these similar genes may be quiescent in some lineages. Further, such sets should be more common in closely related species than in markedly different species. This is primarily compatible with FI.

These predictions do not depend on, or derive from, the questions usually discussed by proponents of intelligent design: namely, the inclusion of notions growing out of Intelligent Design Theory in the practice of science. I have discussed some of these elsewhere.[13] Here the problems spring solely from the consequences of these two versions of the theory. Also, these two sets are not contradictory, coming closer to being contraries, though they even fall short of this. Yet each prediction grows out of, and tends to confirm, only one of the two fundamentally distinct intelligent design views noted above.

First Consequence: On Efficiency

This last point needs explanation and qualification. As noted above, extreme MI holds that all the primordial creatures came into existence directly by divine fiat. If we assume that the deity knows as much about efficiency as human beings, then the creatures' functions should proceed without excess demands on their metabolism. It has been observed, for example, that at least some plants' syntheses of those chemicals that defend against infectious attack takes away from the synthesis of materials needed for growth and reproduction. Thus, the defensive chemicals are synthesized only when a plant is attacked.[14] In the interests of efficiency, one may expect that God would provide only the nuclear DNA necessary to produce the proteins vital to the organism or needed to control protein synthesis and other basic functions. Production of unnecessary DNA takes energy that otherwise could be expended for the organism's welfare. If all introns can be shown to be essential to the control function or to meet some other essential need, then we can claim confirmation of the direct creation of the creatures. On the other hand, if part of an intron is unnecessary, unless it is demonstrably not original,[15] or if some exons are redundant, then the evidence against their immediate production by an intelligent deity is strengthened. The alternative is that God inserted "garbage" sequences to mislead us.[16] But dare we suggest this of the one who swore by himself because he could swear by no greater?[17]

In contrast, moderate MI is not as affected by this test. Further, proving that some part of a creature's genome is useless is very difficult. It will not do to produce a modern version of Weiderscheim's late nineteenth century list of vestigial organs, which included all of the endocrine glands. Nevertheless, the volume of introns in the genomes of advanced plants and animals raises questions about their efficiency. For example, three bacteria have about 1,100 bases per gene in their genome; a yeast, 2,000. This we may attribute to their relative simplicity. A roundworm, *Caenorhabditis elegans*, and a simple dicot, *Arabidopsis thaliana*, have about 7,500. *Homo sapiens* comes in at about 30,000 bases per gene; but four species of grasses range from about 14,000 to over 500,000.[18] Why should wheat require thirty-seven times as many bases per gene as rice?

Second Consequence: On Descent

The second prediction in the first set (at least some structurally similar genes will have specific functions that do not parallel or overlap those found among related species), which is connected to the first prediction of the second set (we should find sets of genes in various species in which one gene of the set preserves a function while other members of the set produce different effects), also requires comment. If a distinct gene springs from duplication followed by mutation to modify its purpose, we assume that the original function must be maintained by one of the pair, while the other is free to acquire a different function. Since either or both genes may repeat this path, there may be several similar genes with distinct functions, but one must maintain the

original function if it is vital.[19] At least in the simple case, we can then compare various organisms to determine the developmental sequence. For example, let us imagine that species *A* is ancestral to sibling species *B* and *C*, with *B* the progenitor of *D*. We must expect that gene *a*, found in *A*, will be found in all four species. If *a* gave rise to *b* in *B* and to *c* in *C*, we can expect that *D* will carry *a* and *b*, but not *c*. This is not a total prohibition, for there can be convergent and parallel evolution. Gene *a* can presumably give rise to *c* in *D* as easily as to a different gene, *d*. Of course, if there is a gene *d*, it could arise from *b* rather than from *a*. This possibility must also be considered. Any such sequences lend more support to FI, but do not eliminate MI.

What appears to be an example of this sort of development is found in the visual pigments. The gene for rhodopsin, the widely distributed basic visual pigment, is found on chromosome 3 in human beings. The blue-sensitive pigment, found on chromosome 7, is more than 40% identical with it. The sex-linked red and green pigments are 98% identical with each other, but only 43% identical with the blue pigment. All monkeys, apes, and humans have rhodopsin and the blue-sensitive pigment, but only the Old World monkeys, apes, and humans have both the red- and green-sensitive ones on the X chromosome. Interestingly, in *Homo sapiens* the latter may occur twice or thrice. New World monkeys have only one long-wave pigment on their X chromosome.[20] Hence, all the males are dichromats. However, because some species have developed multiple alleles of the long-wave pigment, females can be trichromats.[21]

In contrast to the scheme noted above, if *A*, *B*, *C*, and *D* were independently created, there is the probability that, in the context of special sets of proteins or other enzymes, which in principle do not even have to overlap, gene *a* may be missing in one or more of the organisms. *Ex hypothesi*, its place can be taken by a totally different gene producing an unrelated enzyme having essentially the same effect within a totally different context as *a* has in its environment. A homolog to *a* might then have a totally different function. This has been argued in favor of MI. There may be an example in bacterial genomes.[22] However, in making this interpretation, one must be careful of redundant or interacting pathways.[23]

One must be aware of a further problem in pressing this claim, namely, that some genes have multiple functions. If one knows of one function of a gene in *A* and of a different function of its closest known homolog in *E*, it is not established that the genes have different functions in the two organisms. A closer investigation may reveal that both functions are present in both species. Note that in *C. elegans*, the roundworm that has been studied in remarkable depth, a single pathway is involved in vulva formation, cell migration, oogenesis, and male tail development.[24] Knowing only some of the functions could lead to a claim of nonoverlap when functions are actually similar. However, a genuine total set of homologs without overlapping functions in a pair of species would be a strong support of MI. On the other hand, several copies of genes with the same function apparently can coexist in an organism.[25] These matters are open to experimental analysis, but will require a great deal of work to pin down.

A challenge to some forms of MI is found in the horizontal transmission of hereditary elements. Their appearance in pathogenic organisms may be ascribed to the consequences of sin, making them more efficient producers of pain and death. Yet, if the progenitors of all creatures came perfect from the hand of God, then horizontally transmitted elements can hardly increase the fitness of an organism. It must be that these elements interfere with their God-given original fitness, for MI cannot tolerate the notion that God created sloppily. Thus, there is an opportunity for research to confirm MI. If every horizontally transmitted genetic element interferes with the competence of the organism receiving the element, the stricter versions of MI are confirmed. On the other hand, if all of these elements enhance an organism's fitness, FI is confirmed. A mix of benefits and detriments is compatible with both FI and moderate MIs.[26]

Third Consequence: Extinction vs. Overlap

There is, however, a version of FI that can be distinguished from MI, only with greater difficulty. If one assumes that the Creator determined the total set of "natural" principles and then "supernaturally" determined every twist in the sequence of the outworking of those principles, the paleontological record would probably not differ observably from that of the sequential production of the creatures by divine fiat. Nevertheless, the tests noted above might detect subtle differences in current genomes. But, since this version of FI calls for as much direct divine intervention as MI, it is not usually encountered. However, there is a possible observation that would make it less likely, for it posits that the development of new taxa should be linear. If, in contrast, the geologic record indicates numerous variants among sibling species with only a few persisting to produce later taxa, this version of FI is rendered much less likely. The same applies to strict MI.

In addition, the vast number of highly specialized creatures found only in the geologic record fit better with normal FI than with this specialized version or with MI. It seems much harder, under the presuppositions of any version of MI, to explain the development or creation of so many different creatures, only for them to be exterminated.

The normal version of FI expects continuity throughout living things. It has no problem absorbing the recent observation that the same gene produces eyes in fruit flies, squid, and mice, although their structure is very different.[27] An evolutionary tree is not automatically rejected. It assumes that God not only had ages within which to work, but has reasons for developing the universe and everything within it during these long periods. It asks why God should create sequentially over long ages when he could have done it all instantaneously.[28] At this point, the discussion is philosophical and theological rather than scientific. But the discovery of the fossils of whales and snakes with legs seems to fit FI better than most versions of MI.[29]

A further complication is the apparent ease with which presumed ancestral features may be restored. For example, perissodactyls apparently originated in the late Cretaceous, ca 60 million years ago (Mya). The artiodactyls probably split off about 50 Mya. Yet mule-footed pigs are known today.[30]

Final Consequences: On Life, Leanings, and Logic

On the other hand, the origin of life is a graver problem for FI, at least in the current state of science. The computation of difficulty with odds beyond the astronomical[31] assumes that all life must be at least as complex as what we currently observe.[32] But this has not been demonstrated, only assumed. As Fulton notes, the possibility of "scaffolding," that is, the likelihood of intermediate supporting structures or states that have not survived, has seldom been considered.[33] This is because it is extremely difficult to examine the problem of "scaffolding" within current scientific knowledge. Indeed, should someone come up with the correct sequence of ancient events, it is exceedingly unlikely that he or she could confirm its correctness, and it is certain that many adherents of MI would dismiss it as unfounded speculation.[34]

The variety of body plans has been urged against FI, on the basis that no mechanism has been suggested for the Cambrian explosion. Certainly, some of the Pre-Cambrian and Cambrian fossils seem exceedingly strange. As more becomes known, however, some of these fossils appear to fit into more familiar patterns. Further, the known forms are too few to tell us much about whatever happened between the first living forms and those preserved as fossils.[35] So this appears to be what logicians know as the fallacy *ad ignorantiam*. The argument may also be turned around. Why would an intelligent designer introduce information to produce such bizarre creatures destined for oblivion? Unless one adopts the limited deity of process theology, there seems no reasonable explanation from MI. But this option excludes theism.[36]

This last point underscores a fundamental problem in this area. Tacit commitments have more effect than we normally recognize. The problem is more with theological and philosophical commitments than with scientific investigations. As I noted previously, some arguments are based on what we do not know,[37] the *ad ignorantiam* fallacy. In contrast, I am tentatively suggesting some experimental tests which bear on FI and MI and produce a factual basis for decision. I grant that these are both difficult and inconclusive, although scientific progress should make them possible. Additionally, working scientists need to think through what such experiments can show, and plan better ones. Still, I justify my comments in that, first, they should bring more clarity to the discussion; and second, science is not capable of strict demonstration. Additionally, I trust that these thoughts will lead to discussion of additional areas of investigation and to more relevant tests.[38] ❁

Acknowledgment

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Notes

[1]See Howard J. Van Till, "Special Creationism in Designer Clothing: A Response to *The Creation Hypothesis*," *PSCF* 47 (June 1995): 123–31; "Is Special Creationism a Heresy?" *Christian Scholar's Review* 22 (June 1993): 380–95. In personal correspondence, George L. Murphy noted that discussions of design almost always neglect this view.

[2]See Siemens, "Don't Tar Van Till: A Response to Anderson and Mill," *PSCF* 49 (March 1997): 70.

[3]Another traditional term is *Deus absconditus*, God hidden in his works.

[4]Pss. 19:1 and 14:1; 53:1, respectively.

[5]John 4:48. Is it too strong to suggest that some adherents of the Intelligent Design Theory, specifically those holding to continuous creationism, are similar to those to whom Christ spoke? They seem to hold that, unless there is an overt miracle, God cannot be at work.

[6]This appears to be the view of Phillip E. Johnson, *Darwin on Trial* (Washington, DC: Regnery Gateway, 1991); *Evolution*

as Dogma: The Establishment of Naturalism (Dallas, TX: Haughton, 1990); and of J. P. Moreland, "Complementarity, Agency Theory, and the God-of-the-Gaps," *PSCF* 49 (March 1997): 2–14.

[7]Michael J. Behe, *Darwin's Black Box: The Biochemical Challenge to Evolution* (New York: Free Press, 1996).

[8]If this external force is denied, then his version of intelligent design collapses to FI.

[9]William A. Dembski, "Intelligent Design as a Theory of Information," *PSCF* 49 (September 1997): 180–90.

[10]See Siemens, "Dembski's Dogma Denied: Natural Causes Produce Information," *PSCF* 49 (December 1997): 287f. Also relevant is the comment in Denis Duboule, "The Evolution of Genomics," *Science* 278 (24 October 1997): 555.

[11]It has been claimed that the Intelligent Design Theory merely claims that design can be recognized in nature. While this may be true of some, Dembski explicitly and Behe implicitly require an intelligent source for the structure of information or design.

[12]This does not proscribe miracles, for God is sovereign. Some miracles are required by orthodoxy, for example, the virgin birth and resurrection of the Lord. But these events are on a par with "In the beginning God created" (Gen. 1:1), for they initiate a totally new entity.

[13]See Siemens, "On Moreland: Spurious Freedom, Mangled Science, Muddled Philosophy," *PSCF* 49 (September 1997): 196–9.

[14]See Barbara Baker, et al., "Signaling in Plant-Microbe Interactions," *Science* 276 (2 May 1997): 726–33; P. J. O'Donnell, et al., "Ethylene as a Signal Mediating the Wound Response in Tomato Plants," ibid. 274 (13 December 1996): 1914–7; Ann Simon Moffat, "Improving Plant Disease Resistance," ibid. 257 (24 July 1992): 482f; Barry McGurl, et al., "Structure, Expression and Antisense Inhibition of the Systemin Precursor Gene," ibid. 255 (20 March 1992): 1570–3; Carole L. Cramer, et al., "Rapid Switching of Plant Gene Expression Induced by Fungal Elicitor," ibid. 227 (8 March 1985): 1240–3.

This is different from the plant-wide synthesis of a signal to a parasitic wasp when a plant is being eaten. This signal is useful only at the time of an attack. See H. T. Alborn, et al., "An Elicitor of Plant Volatiles from Beet Armyworm Oral Secretion," *Science* (9 May 1997): 945–9.

[15]This is a possibility since the types of MI considered here allow for at least millions of years of development since their original creation for most species or whatever other taxon was primitive, or since the information or structure was introduced. Human beings are a possible exception, if the species is restricted to tens of thousands or, at most, to a few hundred thousand years. This places tighter restrictions on what may be allowed in the human genome under these versions of MI. Nevertheless, as much as 1% of the DNA people carry is worse than useless, being made up of sequences of genetic code that have the potential to produce infectious viral particles. See Robert P. Lanza, David K. C. Cooper and William L. Chick, "Dealing with Viral Stowaways," *Scientific American* (July 1997): 59.

[16]Objection has been raised against calling any part of the genome "garbage." At one time it was popular to divide the genome into coding and "junk" DNA. But more recently, at least some noncoding DNA has been found to have vital functions. Still, no one can now demonstrate either that all DNA has some utility or that some is useless junk. Much further study is needed.

[17]Heb. 6:13. See Titus 1:2.

[18]John Cohen, "Corn Genome Pops Out of the Pack," *Science* 276 (27 June 1997): 1962.

[19]The necessity of a specific organ may vary with the environment. For example, whatever genes govern the normal development of chordate and arthropod eyes may become nonfunctional in cave-dwelling species, where blindness is no hindrance. However, similar conditions of light have had an opposite effect among abyssal fish, whose visual sensitivity appears greater and who have light-producing organs. So "one-size-fits-all" theories are too simplistic. An additional complication is that some functions are redundant in certain organisms but essential in others. Knocking out a "vital" gene may be lethal in one organism and have little effect in another. Living creatures are too complex for snap judgments. See, for example, John Ralph, et al., "Abnormal Lignin in a Loblolly Pine Mutant," *Science* 277 (11 July 1997): 235–9, summary p. 157.

[20]Jeremy Nathans, et al., "Molecular Genetics of Human Color Vision: The Genes Encoding Blue, Green, and Red Pigments," *Science* 232 (11 April 1986): 193–202; Jeremy Nathans, et al., "Molecular Genetics of Inherited Variation in Human Color Vision," ibid.: 203–10.

[21]Song-Kun Shyue, et al., "Adaptive Evolution of Color Vision Genes in Higher Primates," *Science* 269 (1 September 1995): 1265–7.

[22]Frederick C. Neidhardt, review of E. C. C. Lin and A. Simon Lynch, "Regulation of Gene Expression in *Escherichia coli*," in *Science* 276 (20 June 1997): 1812.

[23]See, for example, Michael Balter, "New Clues to Brain Dopamine Control, Cocaine Addiction," *Science* 271 (16 February 1996): 909, and the reference in note 19.

[24]Robert K. Herman, review of *C. elegans II*, *Science* 276 (13 June 1997): 1656.

[25]Nigel Williams, "Yeast Genome Sequence Ferments New Research," *Science* 272 (26 April 1996): 481.

[26]See Denis Duboule, "The Evolution of Genomics," *Science* 278 (24 October 1997): 555.

[27]Maria Barinaga, "Focussing on the *eyeless* Gene," *Science* 267 (24 March 1995): 1766f; George Halder, et al., "Induction of Ectopic Eyes by Targeted Expression of the *eyeless* Gene in *Drosophila*," ibid.: 1788–92; "On the Path of the Primordial Eye," ibid. 275 (28 March 1997): 1885. Walter J. Gehring, "Letters," ibid. 272 (26 April 1996): 468f.

[28]This point goes back to St. Augustine in the fourth century.

[29]Philip D. Gingerich, et al., "Hind Limbs of Eocene *Basilosaurus:* Evidence of Feet in Whales," *Science* 249 (13 July 1990): 154–7. Annalisa Berta, "What Is a Whale?" ibid. 263 (14 January 1994): 180f. J. G. M. Thewissen, S. T. Hussain, and M. Arif, "Fossil Evidence for the Origin of Aquatic Locomotion in Whales," ibid.: 210–2. Both Gingerich, et al. (p. 154) and Berta (p. 180) note that some embryonic whales have hind limbs. Carl Zimmer, "How the Snake Lost Its Legs," *Discover* (July 1997): 32f.

[30]The investigation of the genetics may have interest to the various versions of intelligent design. Is the gene that produces a single hoof in *Sus* homologous with that of perissodactyla, or a deletion or mutation of a different sort? A related matter involves archaic genes. See "Reviving Old Mouse DNA." *Science* 264 (1 April 1994): 27.

[31]See, for example, Charles B. Thaxton, et al., *The Mystery of Life's Origin: Reassessing Current Theories* (New York: Philosophical Library, 1984), 127–66, 218f.

[32]This assumption is not restricted to adherents of MI. See the letters in *Science* 276 (20 June 1997): 1776f.

[33]Alice Fulton, review of Michael J. Behe, *Darwin's Black Box* in *PSCF* 49 (June 1997): 122.

[34]This is already explicit in the recent-creation group of adherents to MI. They dismiss all science that they cannot twist to their purpose. For example, I recently was challenged to explain the existence of comets, whose lifetime is on the order of ten thousand or so years, in a solar system five billion years old. The challenger would not accept the Oort cloud or Kuyper belt, even though members of the latter have recently been observed. As Swift observed, "There's none so blind as they that won't see."

[35]See, for example, Richard A. Kerr, "Timing Evolution's Early Bursts," *Science* 267 (6 January 1995): 33f; Gregory A. Wray, et al., "Molecular Evidence for Deep Cambrian Divergences Among Metazoan Phyla," ibid. 274 (25 October 1996): 568–73; Kenneth J. McNamara, "Dating the Origin of Animals," ibid. (20 December 1996): 1995f; Heinrich D. Holland, "Evidence for Life More Than 3850 Million Years Ago," ibid. 275 (3 January 1997): 38f.

[36]This view, currently much discussed, considers God to be time-bound and therefore restricted to some extent in what he can predict as he acts. See, for example, James O. Morse, "The Great Experimenter?" *PSCF* 49 (June 1997): 108–10; Siemens, "Don't Tar Van Till: A Response to Anderson and Mills," ibid. 49 (March 1977): 70. Despite its acceptance by some who claim to be evangelicals, I hold that this viewpoint pantheistically places the deity in the universe rather than understanding him theistically (or even deistically) as the eternal Creator of the universe *ex nihilo*. It further seems to compel modalism rather than orthodox Trinitarianism. So it will not be further discussed here.

[37]See note 2.

[38]These ruminations grow out of *obiter dicta* in a pair of juxtaposed "Perspectives" on pages 1658–60 of *Science* 276 (13 June 1997). Gerald F. Joyce, "Evolutionary Chemistry: Getting There from Here," noted that gene-duplication allows "[o]ne gene copy to maintain the original function, while the other is free to evolve a new function." Daniel L. Hartl, "*Mariner* Sails into *Leishmania*" commented on horizontal transmission of genetic elements between families, orders, and phyla.

Like Lilies of the Field

(Matt. 6:28; Luke 12:27)

Why don't the lilies rant and rave
worry, strive or misbehave
display concern if petals pert
or stem's in line come rain or shine?
How nice to be like these, we say
would never have to be alert
about oneself in any way
if you're a flower that's ok
but people-world seems otherwise
each self's a burden, balanced well
or not—if overcome by fret
enough to trigger psyche off—
now, bio-self's genetic act
from causes uncontrolled by us
and ego-self's oft traumatized
by social forces from the past
while upper self must synthesize
these several "layers" we each call "me"
(which also fades and fleets with time)
there's also endless face to save
for super-ego self sure craves
to be in charge of life's affairs
be up to snuff, fail-safe, secure
solicitous of status quo
so doesn't really want to know
the fate it hates to contemplate
if nothing more than puffed up wind!
all aglow this outside frame
spinning webs of own contrive
what's *really* live within each one
that deeper self is hid, ignored—
might better have another look
where lilies precious simply live
begotten not of floral will
forgotten not—and then just be!

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James Orr's Endorsement of Theistic Evolution

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James Orr[1] is a well-known and respected, religiously conservative Protestant who believed God accomplished the creation via theistic evolution. The purpose of this article is to use James Orr's writings to highlight the biblical elements in Genesis 1–3 that theistic evolutionists must hold to if their model of creation is to stay within the boundaries of orthodoxy on such matters as the Trinity, soteriology, the soul, or miracles.

James Orr—An Awesome Defender of the Faith

Within conservative Protestantism, the Scotsman James Orr (1844–1913) is one of the most important apologists of the nineteenth and twentieth centuries. He wrote two articles on Genesis and science in *The Fundamentals* (1910–1915, final edition, 1917). In 1893 Orr specifically rejected the suggestion of Henry Calderwood, a prominent United Presbyterian layman, that a human being's mind, but not body, required God's creative power. For Orr, God guided the evolution of both. He defined "theistic evolutionists" as those evolutionists who "held that the development of an organism could not be explained without the assumptions of intelligence and purpose," and looked with favor on the work of such theistic evolutionists as St. George Mivart and Alfred Wallace. He noted that "Mr. Wallace holds that there are provable breaks in the chain of evolution, and that man, in particular, has a distinct origin."

In *The Fundamentals*, Orr rejected Darwin's theory of evolution in favor of theistic evolution in which "evolution" was just "a new name for 'creation'," and said "man's origin can only be explained through an exercise of direct creative activity, whatever subordinate factors evolution may have contributed." He recognized that the "revelations of *geology*" supported the "gradual formation of the earth," and accordingly understood the "six days" of Gen. 1 to represent "vast cosmic periods."[2]

*ASA Friend

I Believe in Adam and Eve

Orr adhered to what Robert C. Newman and others call "Adam theistic evolution" (as opposed to "No-Adam theistic evolution"). He recognized the importance of maintaining that no true human beings have ever existed other than those who are generated from Adam, and that Adam was given a sinless human nature and conditional immortality, which he lost due to the Fall. Thus in *The Fundamentals*, Orr said that "man" came "from his Creator's hand in as morally pure a state, and as capable of sinless development, as Genesis and Paul affirm"; that "the Fall ... is not a myth, but ... an actual moral catastrophe in the beginning of our race, which brought death into the world and all our woe," for if "man had not sinned, he would never have died."

In other writings, Orr also commented on the importance of Adam and the Fall to Christian theology. For example, in *The Bible Under Trial*, he said:

> ... I take it be the plain teaching of Scripture, that man, made in God's image, was the last of the Crea-

> tor's works (Gen. 1:26, 27), and that the whole race of human beings has sprung from "Adam," the first man created (Gen. 3:20).

Orr rejected the "Darwinian theory" and natural selection in favor of an evolutionary theory with "sudden changes" and "abrupt mutations," saying that this then allows "[r]oom ... for a doctrine of sin—both individual and racial ..." In *God's Image in Man & its Defacement*, Orr maintained that God supernaturally guided the evolutionary process leading to humanity. Referring to a person's "soul" that "survives the body" and the "*racial* consequence" of sin, he said:

> A view of sin and of the moral state of the world requires for its basis a different account of the origin of man and his primeval constitution from that which ordinary evolution theories yield.

In *The Christian View of God & the World*, Orr said that the Darwinian idea that "sin is a necessary law of human development" is contrary to the biblical teaching about "the sinless nature of Christ." He rejected the Darwinian picture of humanity being in an "originally savage state," and said that the "connection of sin and death" requires that humans must have had original immortality, although he did not consider this so for the animals. He says of Gen. 3: "The truth embodied in that narrative, viz. the fall of man from an original state of purity, I take to be vital to the Christian view." This meant Orr was opposed to any Pelagian or Semi-Pelagian views of Gen. 3 that simply regard Adam and Eve as *representational types* with the same fallen sinful natures and bodily mortality as we fallen humans.[3] In his understanding of Gen. 1–3, Orr was thus a religious conservative who believed in creation miracles in the evolutionary process, and was orthodox with respect to Adam, the Fall, and original sin.

Some of Orr's Contemporaries

I shall now consider Orr in the context of three prominent Protestant contemporaries: evangelist and educator Bob Jones, Sr. (1883–1968), an anti-evolutionist follower of Scofield's Gap Theory and founder of a large fundamentalist university; theologian Benjamin Warfield (1851–1921), who considered evolution as a valid theory but was noncommittal on its correctness; and theologian Augustus Strong (1836–1921), a theistic evolutionist.

Jones was a Methodist minister who resigned from Methodism because of the rising influence of religious liberalism in that denomination. In harmony with orthodoxy, he believed in humanity's common descent from Adam, the creation of humans in a state of original righteousness, the sinful nature and mortality of humans due to a historical fall by Adam, the Apostles' Creed, Jesus our only Mediator, the Lord's Prayer, the blood atonement, justification by faith, the new birth, the authority of the Bible, patriarchy in the home and church, and the Ten Commandments.

Jones' commitment to uphold truth against a spirit of compromise is very commendable, but his theology was not without error. For example, he did not always teach forgiveness of sins in harmony with the Bible. His belief in mental "telepathy" was highly superstitious, and his favorable attitude toward the idolatrous syncretism of Freemasonry was, at best, the misguided view of a deceived man. Contrary to Rom. 5:12–14, Jones sided with Pelagians, Arminians, and the New School in subverting the biblical teaching of original guilt. He claimed that "God doesn't send you to hell for what Adam did," and so like Coelestius, Jones claimed "a little baby" who "died ... would ... go on to heaven" because "the wages of sin is death" (Rom. 6:23) and the baby "didn't commit a sin." He failed to recognize the defect in his own logic, i.e., since "the wages of sin is death," then infants, if they really were sinless, could never die.

Jones also failed to recognize the distinction between the spiritual Fatherhood of God, belonging only to Christians (John 8:41–44), and the universal Fatherhood of God as Creator, belonging to all humans. In Luke and Acts, we are told that all humans are God's "offspring," since we come down "from one" man (Acts 17:26, 28, 29, NASB). As "Adam ... was the son of God" (Luke 3:38), it follows that "Adam" must be that "one man." It also follows that all sons of Adam are thus *sons of God*. But Jones denied the universal Fatherhood of God. Thus he devalued the racial unity of Adam's race that underpins both the universal Fatherhood of God and also original guilt.

By contrast, Orr as a Presbyterian believed in the *Westminster Confession*, which recognizes the imputation of Adam's primal sin and thus original guilt (on a Federalist model), and maintains election rather than the universalist salvation of infants. Therefore, theistic evolutionist Orr was more theologically sound on matters about humans and sin relating to Gen. 1–3 than was anti-evolutionist Bob Jones, Sr.[4]

Like Orr, B. B. Warfield was a Presbyterian and contributed to *The Fundamentals*. He upheld Christ's sinless human nature and said that the "fundamen-

tal" element in "the Biblical doctrine of the origin of man is that he owes his being to a creative act of God." Warfield regarded "the method of the divine procedure" as a "subsidiary question," and while remaining noncommittal on what this "divine procedure" was, considered that evolution was a valid theory since "'evolution' cannot act as a substitute for creation, but at best can only supply a theory of the method of the divine providence." Warfield recognized the "absolute restriction of the human race within the descendants of ... [a] single pair," Adam and Eve, and considered that the "prevalence of the evolutionary hypothesis has removed all motive for denying a common origin to the human race." He said:

> The fact of racial sin is basal to the whole Pauline system (Rom. 5:12ff; 1 Cor. 15:21f) ... It is only because all men were in Adam as their first head that, all men share in Adam's sin ... and ... punishment... It is because the race is one and its need one, Jew and Gentile are alike under sin, that there is no difference between Jew and Gentile in the matter of salvation either ... Jesus Christ therefore, as the last Adam, is the Saviour ... of the world ... The unity of the human race is therefore made in Scripture not merely the basis of a demand that we shall all recognize the dignity of humanity in all its representatives ... since all bear alike the image of God ...; but the basis also of the entire scheme of ... salvation ... [I]n the hands of the great Protestant leaders of the sixteenth century, and of their successors ... of the seventeenth century, the threefold doctrine of imputation—of Adam's sin to his posterity, of the sins of His people to the Redeemer, and of the righteousness of Christ to His people—at last came to its rights, as the core of the three constitutive doctrines of Christianity—the sinfulness of the human race, the satisfaction of Jesus Christ, and justification by faith ...

Understandably, Warfield considered Orr's evolutionary model to be theologically orthodox.[5]

A. H. Strong was a Baptist with some unorthodox opinions. But this theistic evolutionist upheld such fundamentals of the faith as creation miracles—regarding with favor divine intervention models, such as those of A. R. Wallace and St. G. Mivart. He recognized humanity's common descent from Adam and Eve, the creation of humans in a state of original righteousness, humanity's fall in Adam, a human being's possession of a soul, and Christ's sinless human nature.[6] The points isolated by Strong as fundamentals that needed to be retained in any model of evolutionary creation are thus strikingly similar to those isolated by Orr.

Intersections with Roman Catholic Theology

The Protestant Reformers recognized that the creedal doctrine of the 380 Nicene Fathers and 150 Constantinoplean Fathers, the Trinitarian doctrine, and the anti-Pelagian doctrine in the four General Councils of the Church Fathers' Era (post New Testament to 451), namely, Nicea (325), Constantinople (381), Ephesus (431), and Chalcedon (451), was biblically sound. These areas of agreement with the Roman Church (and Antiochian Church[7]) relate to recognizing God as Creator (Nicene Creed[8]), original sin and human death resulting from Adam's sin at the Fall (Ephesus), Christ having a sinless human nature like Adam before the Fall (Chalcedon), and miracles (for example, the virgin birth or Christ's resurrection in the Nicene Creed)—relevant to the issue of creation miracles, for example, Adam's soul (Gen. 2:7). Unlike the Apollinarian heresy, which denied Christ's full humanity by claiming that in Christ the Logos took the place of a human soul or rational soul (Constantinople and Chalcedon), the Council of Chalcedon (like the Athanasian Creed endorsed by the Protestant Reformers and the Roman Catholic Church) says that since Christ was a "man" he had "a rational soul and body." That is, orthodoxy requires the recognition that (unlike other earth life forms) Adamites have souls.[9]

The Roman Catholic Church has been sympathetic to a certain type of theistic evolution. For example, in 1876 Pope Pius IX awarded St. George Mivart a doctorate for his work in science and religion. In *Humani Generis* (1950), Pope Pius XII (like the Protestant Benjamin Warfield, discussed above) said "evolution" is a valid theory for "the origin of the human body," although he was noncommittal about whether it, or some other theory, is the correct one. However, he required that Roman Catholics be soul creationists. He said no diversity of opinion could exist concerning monogeny and polygeny since Roman Catholics should not believe that true humans existed after Adam who were not generated from him "since it is in no way apparent how such an opinion can be reconciled with ... the [Roman] Church's [teaching] ... with regard to original sin, which proceeds from a sin actually committed by an individual Adam and ... through generation is passed on to all ..."

Orr looked with favor on the contribution made by Roman Catholic theistic evolutionists, such as Mivart. With respect to the creation and the Fall, there are clearly points of intersecting agreement between the Roman Catholic theistic evolutionists

who adhere to *Humani Generis*, and the Protestant theistic evolutionists, such as Orr, who recognize the importance of creation miracles, monogeny, Adam and the Fall, original sin, and the second Adam as "perfect man" (Athanasian Creed) having a sinless human nature.[10]

Upholding Orthodoxy

Biblical teaching about the Trinity and plan of salvation cannot be reasonably maintained apart from a historical fall by Adam. Semi-Pelagian models that do not regard Gen. 2–3 as depicting a historical fall from original righteousness and immortality by humanity's progenitor, Adam, but do recognize humanity's depravity and need for Christ's saving power, fail to satisfactorily deal with the origin of humanity's sinful nature, human mortality, the limitation of salvation to Adam's race, the second Adam's human nature, and the second Eve's human nature after glorification. They make God responsible for creating sinful humans and, thus, the author of sin and human death; whereas the Bible says Adam is responsible and Christ died for Adam's guilty race (Rom. 1:16, 17, NASB; Rom. 5–8; 1 Cor. 12:13, NASB; 15:22, 45, 49).[11] Christ's sinless human nature means that as the second Adam (1 Cor. 15:45), he overcame where the first Adam failed. But if the first Adam had a sinful nature, then Christ has proven nothing and did not die for humanity's sins. For if Adam lacked original righteousness, then the sinless Christ (Heb. 4:15; 1 Peter 2:22) was not truly human and so not the second Adam.

Understandably then, the four General Councils of the Church Fathers' Era dealt with *both* the Trinity and Pelagianism. For example, Coelestius's Pelagian claims that "Adam was created mortal, and he would have died, whether he sinned or not" or "Adam's sin injured himself alone, not the human race"; since these issues are indissolubly intertwined with Christological teaching about Christ's sinless human nature and his place in the plan of salvation. Thus, Athanasius (c. 296–373), Basil (c. 329–379), and Augustine (354–430) linked Christology and soteriology. Gregory of Nazianzus (c. 329–389) declared: "What" Christ "did not assume he did not heal" (*Epistle* 101). Furthermore, heaven is only the temporary abode for the souls of the departed faithful (2 Cor. 5:1–11; Phil. 1:20–24), since at the Second Coming, Christ returns with the souls of the saints, who together with believers alive on earth, then experience the resurrection of the body (1 Thess. 3:13; 4:13–18). This future freedom from sin and death (Rom. 8) is described in Scripture as a restoration of Eden where humans again have access to the Tree of Life (Rev. 22:2, 14). But a second Eden, where humans are sinless and immortal, requires a first Eden where humans lost this. If the second Adam is "without blemish and ... spot" (1 Peter 1:19), then the first Adam must also have possessed righteousness originally. Similarly, if the second Eve, the Church, is to be presented to her husband, the second Adam, "not having spot or ... blemish" (Eph. 5:27–32, RV & ASV; cf. Rom. 16:20 parallel to Gen. 3:15; 2 Cor. 11:2, 3), but after glorification possessing "righteousness" (Rev. 19:7, 8), then the first Eve must also have possessed such "righteousness" originally.

In formulating models of the creation, evolutionists, such as John Polkinghorne and Howard Van Till, seem to think that as long as their model recognizes God as the Creator, they have met any necessary theological requirements of the Christian faith. Certainly they have met *one* important first step. But by denying the possibility of creation miracles, such models are religiously liberal. By not affirming God's intervention in the evolutionary process to create Adam with a soul as the first human from whom all other humans are generated (Gen. 2:7,18–24; 3:20; Luke 3:38; Acts 17:26, NASB; 1 Cor. 15:45, 49) and with his wife in a state of original righteousness (Gen. 1:26; 2:25; 3:7–11; Eph. 4:23, 24, NASB; Col. 3:9, 10, NASB) with conditional immortality (Gen. 2:9, 16, 17; 3:19, 21–24; 1 Cor. 15:22), such models fail to uphold the biblical teaching of humanity and original sin (Gen. 3; 8:21; Rom. 5–8; Eph. 2:3), and are either Pelagian or Semi-Pelagian. Wilfully unrepentant persons, who support "heresies ... shall not inherit the kingdom of God" (Gal. 5:20, 21b, AV & RV); for "heresies" are "destructive" (RV) or "damnable" (AV) to those who accept them, and those who teach them are also brought to "destruction" (RV) or "damnation" (AV) (2 Peter 2:1–3, AV & RV). These broad parameters, however, still leave a good deal of room for differences among the orthodox on Gen. 1–3.

Louis Berkhof criticized "Denney, Gore, and Orr" for "accept[ing], though with reservation, the evolutionary account of the origin of man," and said that while their view "leaves room for the doctrine of the fall in some senses of the word," it was nevertheless:

> significant that they all conceive of the fall as a mythical or allegorical representation of an ethical experience or of some actual moral catastrophe at the beginning of history which resulted in suffering and death. This means that they do not accept the narrative of the fall as a real historical account of what occurred in the garden of Eden.

With respect to the Fall, Orr said (emphasis mine):

> I do not enter into the question of how we are to interpret *the third chapter of Genesis*—whether as history or allegory or myth, or most probably of all, as old tradition clothed in oriental allegorical dress,—but *the truth embodied in that narrative, viz. the fall of man from an original state of purity, I take to be vital to the Christian view.*

I reject any possibility of the *genre* in Gen. 2 and 3 being "allegory," "myth," or an "old tradition clothed in oriental dress" (and in *The Fundamentals* Orr rejected any possibility that the event of the Fall itself, as opposed to the writing style of Gen. 3, was "myth"). I consider our first parents were tempted by Satan, who literally demon-possessed a serpent and spoke through that snake (cf. Num. 22:28; Luke 8:30–33; Rev. 12:9); Adam fell by literally eating the forbidden fruit that was hanging on a literal *Tree of the Knowledge of Good and Evil* in a literal *Garden of Eden*; and Adam and Eve were thereafter barred access to a literal *Tree of Life*. But I do not consider Orr's view on the *genre* of Gen. 2 and 3 puts him outside the bounds of orthodoxy, since he maintains a real historical fall by Adam as the progenitor of the human race, even though he thinks that this historical fall was "probably" told in an "allegorical" manner. That is, on Orr's view, we do not know what Adam and Eve actually did in their rebellion against God. We only know Eve was deceived by Satan and sinned. Then she tempted Adam, who sinned and was ultimately responsible. Thus humanity fell from original righteousness and immortality. Orr's understanding of the Gen. 3 *genre* is not entirely dissimilar to Berkhof's view that "the tree of life ... must be understood sacramentally."[12]

I regard Berkhof's anti-evolution reference to Orr as misleading and unfair. He fails to state that unlike Orr, who was orthodox, it is inconceivable that "false teachers," such as Denney, Gore, or Tennant who brought in "damnable heresies" (2 Peter 2:1–3), would have been asked to contribute some article(s) on Gen. 1–3 in *The Fundamentals*. Berkhof associates Orr with "Denney" and "Gore." But Denney was clearly unorthodox, since he was indifferent to whether one considered Adam and Eve were created in a state of original righteousness; whereas Orr said, "the fall of man from an original state of purity, I take to be vital to the Christian view." Yet Berkhof does not make this distinction. Likewise, Gore was unorthodox since he said that Gen. 3 was "not a history of two individuals, Adam and Eve, but an 'allegory' of mankind as a whole or of every man." This heresy embraces the Pelagian teachings of Coelestius condemned by the Council of Ephesus, one of which was, *It is not through the death or the fall of Adam that the whole human race dies*. The views of Gore, a liberal Puseyite Anglican Bishop, are also condemned in Art. 9 of his own Anglican church's *39 Articles*:

> Original sin standeth not in the following of *Adam*, (as the *Pelagians* do vainly talk;) but it is the fault and corruption of the nature of every man, that naturally is ingenedered of the offspring of *Adam*; whereby man is very far gone from original righteousness, and is of his own nature inclined to evil.

Orr was orthodox on this point, yet once again Berkhof does not note this difference. Berkhof follows his reference to Orr and others with a dissertation on the evolutionist Tennant, without mentioning the debates that occurred between Orr and Tennant in which it was very clear that Orr was orthodox on issues of Adam and the Fall, whereas Tennant embraced elements of Pelagianism and was clearly unorthodox. Orr specifically rejected Tennant's Pelagian theory on the origin of sin referred to by Berkhof, that as humans evolved they acquired certain moral impulses, and thus gradually became ethical beings. (In more recent times, Polkinghorne agrees with Tennant's basic theory on the origin of sin.) Yet again, Berkhof does not refer to this as a point of difference with Orr.[13]

Conclusion

Miracles and their importance to Gen. 1–3, are fundamentals of the faith with regard to the Trinity and soteriology. Examples are: the creation of human beings with a soul (Gen. 2:7; Eccl. 12:7); original righteousness (Eccl. 7:29, RV & ASV); humanity's subsequent demise due to a historical Fall by the human race's progenitor, Adam, resulting in original sin and death to all humans (Gen. 2–3; Eccl. 7:20; 9:3); and associated with this the second Adam's sinless human nature (Isa. 53:9). These miracles were upheld by the four General Councils of the Church Fathers' Era and all the major confessions of the Protestant Reformation. For those interested in subscribing to a model of evolutionary creation, it is certainly possible, as seen by reference to Orr, to hold these biblical fundamentals of the faith and maintain a certain kind of theistic evolutionary model. ❄

[*Ed. note:* It is the policy of *PSCF* to edit gender specific terms, although it is against Mr. McGrath's religiously conservative Protestant value system.]

Notes

[1]Sketch from W. A. Elwell, ed., *Handbook of Evangelical Theologians* (Michigan: Baker, 1993).

[2]Unless otherwise stated, biblical references are to the Authorized (King James) Version. Glen C. Scorgie, *A Call For Continuity* (Macon, GA: Mercer University Press, 1988), 114–5; cf. W. A. Elwell, ed., *Handbook of Evangelical Theologians*; James Orr, *Christian View of God & the World*, 7th ed. (Edinburgh, Scotland: Elliot, 1904), 415–8; Orr, *The Fundamentals*, vols. 4 and 6, 1st ed.; vol. 1., 2d ed.

[3]Robert C. Newman, "Scientific & Religious Aspects of the Origins Debate," *PSCF* 47, no. 3 (1995): 164–75, at 165; James Orr, *The Bible under Trial* (London: Marshall Bros., c. 1905), 157, 160–1; Orr, *God's Image in Man & its Defacement*, 4th ed. (London: Hodder & Stoughton, 1908), 52, 222, and 298–301; Orr, *Christian View of God & the World*, 178, 181–5 cf. 228–46; Scorgie, *A Call For Continuity*, 115–20. Cf. my letter,"Response To Bube" *PSCF* 49 (1997): 209–10. (I use the term "Semi-Pelagian" for those who accept some idea of original sin but adopt some element[s] of Pelagianism in devaluing it.)

[4]M. Wright, *Fortress of Faith*, 3d ed. (Bob Jones University [BJU], 1984), 103–8; R. K. Johnson, *Builder of Bridges* (BJU, 1969, 1982), 47, 273–307, 322–3, *Word of Truth* 118 (cf. D. M. Lloyd-Jones, *What is an Evangelical?* [Banner of Truth Trust, 1992], 22–4); *Word of Truth* 109; 110; 114; 117; 131; 145; 151; 325; 337; 407; 415; re: 122, 141, 443. The *BCP* (1662) refers to "fornication, and all other deadly sin" (*Litany*); but unrepentant fornicators and adulterers are forgiven (1 Cor. 6:9–11). Yet Jones disallowed repentant fornicators to become BJU students (*Word of Truth* 423), and said a repentant adulteress should leave town ("Neither Could They Blush" BJU), but the biblical teaching is more forgiving (Jer. 31:34; Matt. 18:23–35, NASB; Luke 15:11–32; 19:7–10); *Word of Truth* 148 ("telepathy"); *Bob Jones' Sermons* 1907 (BJU, 1983), 67 (pro-Masonry, see my article, "Religious Liberty ...," *Am. J. of Juris.* 40: 280–3); *Word of Truth* 203 (prohibition); *Word of Truth* 105; 106; 145, cf. 228; 418 (no original sin/guilt), cf. *Westminster Confession* 3:3; 6:3; 10:3 and my article, "Soteriology: Adam & the Fall," *PSCF* 49, no. 4 (1997): 262–3, ftn. 27; H. Bennenson, *Documents of the Christian Church* (Oxford: 1963), 53–4; *Word of Truth* 106; 225; 228; 348 (denies God's universal Fatherhood); re: Billy Sunday: *Word of Truth* 124; Johnson, 47; Wright, *Fortress of Faith*, 202–3; W. Ellis, *Billy Sunday* (Chicago: Moody, 1959), 80, 142, 185–6; L. Berkhof, *Systematic Theology* (Grand Rapids: Eerdmans, 1939), 241; A. H. Strong, *Systematic Theology* (Judson Press, 1907), 48–9, 606–8, 783–4. Johnson, 151, 166 (anti-evolution) *Word of Truth* 222; 248; 435 (Scofield); 235, 320, 407 (Gap Theory). R. Numbers, *The Creationists* (Berkeley, CA: University of California Press, 1992), 209, 281 (Morris & BJU). Unlike the Roman Church (*Council of Trent* 5:5), the Reformers distinguished between being *declared righteousness* by faith (justification) and *righteousness* from moral growth in holiness (sanctification). In this life, we are *imputed* with Christ's *righteousness* before God *only by faith* in a *legal sense* and due to original sin, sanctification never leads to sinless perfection but is attained at glorification when original sin's effects are gone (Rom. 1:17; 5, 7, 8). By contrast, Charles G. Finney devalued original sin and claimed regeneration was "an instantaneous change from entire sinfulness to entire holiness" (Strong, *Systematic Theology* 877); Finney, *Lectures on Systematic Theology* (Grand Rapids, MI: Eerdmans, 1951), 391, 393, 407, 455–7.

[5]B. B. Warfield, *Biblical & Theological Studies* (Philadelphia: Presbyterian & Reformed Pubishers, 1968), chaps. 9 and 10; *The Person & Work of Christ* (Philadelphia: Presbyterian & Reformed Pub, 1950), 211, 212, 215; *Biblical Foundations* (London: Tyndale, 1958), 125–6. Noll claims Warfield was an evolutionist who "chided ... Orr for ... worrying about accepting 'a purely evolutionary theory' of natural development" (Elwell, *Handbook of Evangelical Theologians*, 33). But in the article he refers to (*Review* of Orr's *God's Image in Man*), Warfield is committed only to "slight" evolutionary "variation" within a species, that is, micro-evolution; although he considers Orr's macro-evolutionary model a valid theory and within theological orthodoxy.

[6]Strong, *Systematic Theology*, 226, 228, 235 (unorthodox view of Scripture); 117–8 (unorthodox view on miracles); 660–4 (universal infant salvation at variance with [Amyraldian or Calvinist] view of Ps. 58:3; Rom. 9:11–13); 465–76 (theistic evolution); 476–83 (humanity's descent from Adam and Eve); 514–32 (original righteousness); 488–97 (human's soul on a traducianist model); 582–628 (humanity's fall in Adam on an Augustinian model); 676–8 (Christ's sinless human nature). (I also find his—and Orr's—treatment of humanity's monogenetic origin with respect to Eve unsatisfactory; although they accept "Eve ... became the mother of every living person" Gen. 3:20, Berkeley Version.)

[7]E.g., in 1558 Reformation Anglicanism defined "heresy" as teaching contrary to: (1) "the words of the canonical Scriptures," (2) "the first four General Councils, or such others as have only used the words of the Holy Scriptures,"or (3) whatever is "hereafter ... so declared by the Parliament, with the assent of the clergy in convocation" (*Blackstone's Commentaries*, vol. 4, 48). The Roman and Antiochian Churches are also Semi-Pelagian having misunderstood elements in the condemnation of Pelagianism (*Ephesus*). E.g., Coelestius taught "the law, as well as the Gospel, leads to the kingdom," and they both devalue original sin's effect and the creed's "We believe ... in one Lord Jesus Christ" by rejecting justification by faith (Acts 16:31; Rom. 1:17; 7:18, 19; 10:3–13). Moreover, in condemning the Nestorian heresy, *Theotokos* (Gr., *Ephesus & Chalcedon*) means "God-bearer" and stresses the Son's deity while in the bearer's womb; but Romanists and Antiochianists (and Puseyites) alter this to an emphasis on the bearer, translating it as "mother of God" and misusing it to develop unbiblical Marian theology.

[8]The Nicene Creed is the creed of the 150 Fathers, to which is added the words "God of God" from the creed of the 380 Fathers, the final "Amen," and in the Churches of Rome and the Reformation (but not the Antiochian Church—who "have erred" [Art. 19, *The 39 Articles*]), the *filioque*, that is, "and the Son" (John 14:26; 15:26; 16:7; Acts 2:17, 32, 33, NASB; 16:7, NASB; Rom. 8:9; Gal. 4:6, RV; 1 Peter 1:11) in harmony with The Athanasian Creed, named after, but not written by Athanasius (like the Apostles' Creed was named after, not written by, the Apostles). Providing The Athanasian Creed's references to "the universal faith" are understood to mean *on the matters specified*, it is biblically sound and reminds us that wilfully unrepentant persons bearing the fruit of deadly sin (1 John 5:16–18) such as: (1) unbelief (Mark 16:16; Rev. 21:8), e.g., Mohammedans, Hindus, and Buddhists or (2) heresy (n.b. "let him be anath-

ema" Gal. 1:6–9, RV and "heresies" Gal. 5:19–21, RV), are damned (see *The Three Creeds*, Art. 8, *The 39 Articles*), e.g., Antiochian/Eastern Orthodox (denial of the Holy Spirit's double procession from the Father *and the Son*), Jehovah's Witnesses (denial of the Trinity, e.g., Arianism and denial of the Holy Spirit's Personhood. Since the Second Person has *always* been the First Person's Son, he is "neither made nor created, but" "begotten from eternity" see Micah 5:2; John 1:1, 14, 3:16–18; 1 John 4:9. Also denial that a human being has "a rational soul" and associated denial of hell or that Christ "descended into hell"); and religious liberals (e.g., those denying that a human being has a soul, the reality of hell, or the Second Advent).

[9]While I am a creationist (like Calvin), rather than a traducianist (like Luther), I think genetics, at least chiefly, creates a human. See Strong, *Systematic Theology*, 488–97 (A Traducianist's View) and Berkhof, *Systematic Theology*, 196–201 (A Creationist's View). Francis Crick claims "scientific findings" have "discredited the ... notion ... humans have a soul" (*ASA Newsletter* 40:6 [1998]: 1). In fact, they have only discredited *one particular model* of the soul. To "kill the body, but ... not ... the soul" in Matt. 10:28 pictures the brain as part of the body (cf. Acts 2:27). Angels, the Holy Spirit, or a human being's spirit are invisible to natural science and referred to by the Greek word *pneuma* in Heb. 1:7; 10:29; 12:9, 23. The invisible soul preserves a copy of a human's brain—in areas science might discover—as it goes to God for judgment at death. The soul allows human beings to recognize the spiritual realm; and so is one part of being in God's image.

[10]*The Papal Encyclicals* 1939–1958, McGrath, USA, 1981, 240: 36–7. *The New [Roman] Catholic Encyclopedia* 1(Catholic University of America, 1967), 115 says "speculation on" monogeny or polygeny remains "open" to Roman Catholics after *Humani Generis*. Orr's *Christian View of God & the World*, 7th ed., 416.

[11]The Book of Romans is St. Paul's *magnum opus*. In it, the universality of the human condition and the universality of the Gospel to *both* Jews and Gentiles (Rom. 1:16, 17, NASB) shows St. Paul understands all humanity to be Adamites. In Rom. 5:12–19, depending on how one translates vss. 16b and 18, "one" is used nine times (NASB), ten times (RV & ASV), or twelve times (AV) to show the Fall of the human race through "one" man, Adam, means God can redeem the race through "one" man, Christ. Thus Rom. 5 limits salvation to Adamites and so excludes fallen angels (cf. Heb. 2:9–17). "[F]lesh" is Gr. *sarx* and it includes a racial component, e.g., St. Paul says he is of the Jewish "race" (*sarx*, Rom. 9:3, NIV). This is relevant since in Rom. 5–8, St. Paul says Adamites are in racial slavery to sin and death. In Rom 6:1–14 (NASB) sin (singular) is pictured as a slave-driver but "shall not be master over you" (vs. 14, NASB); and the picture in Rom. 6:15–23 (NASB) is that of the slave-market in which every human is either a slave of sin or a slave of God. But this side of glorification, the believer has a conflict between the fact that in Christ we have "been freed from" the slave-driver of "sin" (Rom. 6:7, NASB), and in Adam we are "of flesh" (*sarkinos*, from *sarx*), "sold" as racial slaves "into bondage to sin" and "nothing good" "dwells" "in" our "[Adamic] flesh" (*sarx*, Rom. 7:14, 18, NASB). Thus St. Paul looks forward to emancipation from racial slavery at glorification, but until then says "with the [Adamic] flesh" (*sarx*) he must "serve ... the law of sin" (Rom. 6:18, NASB, 7:14, 18, NASB, 25). Since the opposite of racial slavery to sin and death is a sinless nature and immortality, it follows that Rom. 5–8 teaches a historic Fall by human's progenitor from a state of original righteousness and bodily immortality (Rom. 5:12–14; 7:14, 18, 25).

[12]Berkhof, *Systematic Theology*, 217, 225; Orr, *The Christian View of God & the World*, 447. See my article, "Soteriology: Adam & The Fall," *PSCF* 49 (December 1997): 252–63 (and corrections, *PSCF* 50 [March 1998]: 78). While we do not know what the forbidden fruit was (traditionally it was an apple, which is not contrary to Scripture), I do not object to it. Likewise the phraseology of "the Fall" is extra-biblical (2 Esdras 7:48, Apocrypha).

[13]J. Denney, *Studies in Theology* (London: Hodder & Stoughton, 1899), 80, 88; C. Gore, *Can We Then Believe* (London: John Murray, 1926), 197; Coelestius is referred to in Augustine, *Anti-Pelagian Works* (Grand Rapids, MI: Eerdmans, 1956), 193; Scorgie, *A Call For Continuity*, 115–20; J. Orr, *Sin as a Problem of To-day* (London: Hodder & Stoughton, 1895), 140, 224–5, cf., e.g., 129–85; J. Polkinghorne, *Science & Christian Belief* (London: SPCK, 1994), 15; and *Reason & Reality* (London: SPCK, 1991), 71–3, 99–104.

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Essay Review

WHATEVER HAPPENED TO THE SOUL? Scientific and Theological Portraits of Human Nature *by Warren S. Brown, Nancey Murphy, and Newton H. Malony, eds. Minneapolis: Fortress Press, 1998. 252 pages, index. Paperback; $19.00.*

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Departing from organismic systems and appealing to top-down aspects of transcending nature, Fuller Theological Seminary authors have edited this provocative and challenging book. Brown is a highly respected neuropsychologist who has done much work at the University of California Los Angeles' Neuropsychiatric Institute; Murphy is a well-known participant in the philosophy-science-theology dialogue; and Malony is an emeritus professor of psychology, prolific in the integration of psychology and theology. The authors reflect collegiality, interdependence, and interdisciplinary respect in their approach, which may be attributed to the intensive days they spent together exploring the issue under a generous grant by the Templeton Foundation. In such context, the consonance, agreement, and confluence of diverse backgrounds and philosophies seem to aggregate and display an "emergent property" of its own. They cite each other in their arguments and conclusions, thus giving the reader a glimpse of group dynamics that reveals both the unique contribution of each author and a continuous flow of a complex theme. This allows for a diversified yet mutually illustrating, sequential unraveling.

In this book, the soul is treated as a subject matter from philosophical, scientific, and theological perspectives. The authors trace the development of notions and interpretations given by Christian thinkers and theologians throughout history, including contemporary theologians. Genetics, the neurosciences, and evolutionary theory are invited and given ample room and the same defining power, in an attempt to present portraits of a complex, yet unified nature. In sum, the soul is seen as an aspect of the whole person in a physicalist, nonreductionistic definition that, in the authors' purpose and intention, does not appear to violate scriptural data, but rather reformulates dualistic notions into scientifically appropriate perspectives.

The opening chapter by Nancey Murphy introduces the subject matter with a succinct preview of the following chapters, setting the frame for the pictures of the human being from the perspective of "nonreductive physicalism." The secular scientific and philosophical fields have opted for either dualism or reductive materialism. In agreement with the current trends in philosophy and science, Murphy chose to depart from dualistic notions, without falling into materialistic reductionism. Thus, for her, Christian thinkers and scientists have the option to follow along nonreductive physicalism (arguably consistent with theological, biblical, philosophical, and scientific disciplines) in which the person is a physical organism whose complex functioning is capable of higher capacities (such as conscious self-awareness and relatedness) as well as supervenient capacities for morality and spirituality not present at basic organismic levels.

Chapter two deals with human nature through the eyes of Francisco Ayala's naturalistic epistemology. Continuity with the animal world is stressed with no sharp distinction drawn between us and other primates, except that small anatomical differences in the brain have enabled the process of cul-

*ASA Member

tural evolution in humans. Ayala gives us an introductory glimpse in reference to God's image as being somehow present in the human, rendered as an emergent property related to cultural evolution. Such a process transcends biological evolution in shaping human's abilities to anticipate behavioral consequences, to make value judgments, and to choose among alternative courses of action, thus allowing for the development of morality.

Chapter three deals with genetics, in which V. E. Anderson presents the notion that genes, while ontologically necessary for human uniqueness and characteristics, are not sufficient determinants of such. Scientific understanding of genetics does not entail reductionistic materialism.

Malcolm Jeeves in chapter four emphasizes nonreductionistic physicalism as expressed in "one set of events" seen from different perspectives, leading to "aspects" (vs. divisible "parts") of human nature portrayed by descriptors at various levels of analysis. Thus, understanding the role of neurological substrata of human higher cognitive and spiritual capacities helps us understand ourselves as well as others. The role of the brain and localization studies are presented as being open to diverse interpretations, such as the polar opposites of Sir John Eccles, a dualist; and Francis Crick, a "nothing-but" physicalist; and, in the middle, Roger Sperry, a secular nonreductive physicalist. The logical complementarity of Donald MacKay is presented to buttress the notion of duality of aspects within a complex system (vs. substance dualism), regarding mental activity as embodied in the brain but not being identical with its activity. In Jeeves' view, such emphasis rules out neither free will nor accountability. His lectures at Fuller in the past have been functional in provoking members of the faculty to engage in the integrative task along nonreductionistic physicalism that culminated in the publication of this book.

In "Cognitive Contributions to the Soul" (chapter five), Warren Brown rejects mind-body dualism and presents the uniqueness of human capacities once attributed to the soul in terms of relational and cognitive avenues. The most important function of the human involves personal relationships—to self, to others, and to God. In terms of cognitive capacities, language, a theory of other minds, episodic memory, conscious top-down agency, future orientation, and emotional modulation of social behavior are seen as emergent properties, enabling the relational processes. These emergent properties are dependent upon, but not reducible to, the neurobiological structures and processes that enable higher cortical functioning and affective valence. The embodied integration of such aspects is seen as the alternative construct to the notion of a separate soul indwelling the body.

Murphy takes the lead again in chapter six. In arguing her points, she recognizes that the scientific evidence gathered so far does not amount to a conclusive proof for physicalism, but the existence of enough data corroborates the reasonability of such a doctrine. Following Jeeves' argument, she poses the dilemma: if neurobiological processes are governed by natural laws, and mental events depend upon such for their existence and expression, then the conclusion should be that mental events are just the product of blind biological processes. She answers this dilemma by introducing the issues of emergence and top-down causation previously argued by Brown. She argues that the same faculties that enable higher cortical/cognitive and deeper affective experience also account for the human capacity for relatedness and religious experience.

A re-examination of human nature in the Bible is presented by Green in chapter seven. Texts drawn from Luke and Paul are interpreted in ways that reject dualistic notions in favor of ontological monism. Notions such as being disembodied or escaping from a corporal medium are discarded. Instead the human is considered a complex yet unified entity. Struggles with the reconstruction of a human portrait from Old Testament and New Testament writings are presented. The task is a challenging one, given the diverse and complex nature of the currents of philosophy, cultural tones, and contextualization in view of our present lenses and the nature of a post facto analysis of such texts. The issue of "Greek dualism vs. Hebrew holism" receives a fair treatment, pointing to the diversity in both camps and to the lack of consensus in the field. The inadequacy of word-studies is pointed out (e.g., the terms *nephesh, ruach, psyche, soma*, etc.) in favor of more comprehensive constructs drawn from co-textual analysis. In Green's opinion, the New Testament writers are concerned with soteriological holism, treating the human beyond mere "soul" saving.

In chapter eight, Ray Anderson presents the saga of a creaturely soul in theological perspective as the whole, or some aspect of the person, that never exists outside a person. In his view, the concept of an immortal soul is without clear biblical support. In line with Barth, Bonhoeffer, Torrance, and Pannemberg, Anderson's notion of the human being is based on relational premises, contingent upon God's life. Beyond substantial definitions and dualistic understandings, the self exists as a personal, social, and spiritual being who denotes the *Imago Dei*, emerges

from the physical properties of the cosmos, but engages in social interactions and is grounded in God for his or her existence and definition. Several informative and clarifying points are made with suggested conclusions that concisely present a summary of Anderson's treatment of the subject matter. In his interpretation, different emphases in the Bible represent aspects of the self (soul, spirit, body), destined to die and resurrect, after the resurrection of Jesus, the prototype of humankind's hope and continuity.

Chapter nine deals with practical considerations of nonreductionistic physicalism as related to ethics. Here Stephen Post examines the historical connotations of dualism in its positive and negative aspects. He shows the positive role it has played in the respect for human life (e.g., in the issues of abortion, euthanasia, and regard for people with diminished capacities) and the negative role it has played in the justification of practices such as slavery, the inferior status of women, and the degradation of marriage. Without the necessity of a separate soul indwelling the body, an approach is postulated based on inclusivity and regard for community as expressions of human capacity for relatedness, with agape mutuality.

Finally, Warren Brown summarizes the chapters of the book and provides further thrust to the issues of the integration of faith and science, in attempts to reconcile portraits of human nature drawn from both fields. If an integrative label is sought, such would be either an egalitarian version in which science and faith issues are given the same credit; or a hierarchical integration in which the findings of science are corrective to views held by tradition based upon erroneous interpretations. Some qualifiers are given to convey a supervenient status to theology, a top-down process that gives credit to notions of God's creative endeavor and sustaining power over a lower-level analysis of reality.

In sum, at the basic substructural levels of analysis, Darwin's concepts are expressed "right from the front porch" in Ayala's chapter, and subtle versions "come out of the closets" of evangelical writers endowed with academic freedom. The core philosophy that animates the endeavors aimed at portraying human beings as refined physical organisms reflects a close philosophical-scientific kinship with naturalistic epistemology and also an emphasis on theological notions of top-down nature. The supervenience of emergent, higher-level explanations achieving transcendence by virtue of connectedness to God and others, is grounded in a perspective outside space and time, revealed by a Creator to creatures, who uses evolution as a means to accomplish a transcending purpose. To regard humans alone as having the gift of a soul from God (either in traducianistic or creationistic versions) seems to force an arbitrary distinction among scientists working with the brain, where there is much evidence for continuity of the species. Yet, the issue of human distinctiveness is a major theme in the book, approached in a nonreductionistic fashion.

The book succeeds in stirring further avenues of inquiry in open-minded thinkers. It has the potential to elicit responses, "provoking to love and good works" by challenging the ruts of established traditional stereotypes. An important aspect for integrators of Christian belief and anthropology is a differential notion, a qualitative "distinctiveness within distinctiveness" of being a "redeemed" human. Thus, "knowing" and actually (not just potentially) relating to God (or not) is perceived as a major determinant of character and conduct. Any rendering of the human that includes the need for the redemption paradigm has to deal with a consequential result of salvific belief and obedience to God. Such relatedness in faith leads to a differential, qualitative human existence defined scripturally as "being a new creation," (with discrete allusions of being a "believer," "born again," "born of the Spirit," "saved," a "disciple," and so on).

In what qualitative ways is such human existence changed? The book emphasizes quite emphatically the aspect of "salvation" as a holistic endeavor (beyond "saving souls") by pointing to examples of the restoration of the human to community, to relatedness, and to physical well being (Green). Yet, basic to an overt behavioral repertoire, a "change of mind" is descriptive of personal, substantial (hypostatic) conversion (from an hypostatic-apostatic to a hypostatic-ecstatic endeavor, or change in the direction and thrust of the relating being, with reference to the object of love). How is that realized? At ontological, substructural, or hypostatic levels, as well as relational ones, how is it that a person "without God," "dead (incapable, unresponsive to relatedness) in trespasses and sin" is changed after an encounter of transcending, transforming nature? Such a question needs addressing in any anthropology that seeks to integrate faith into the paradigm of "soulical" aspects.

The authors sought to elucidate questions of old: Where is the soul when the body is being formed, or diminished by physical contingencies, or at death? What happens to the soul in the body's intermediate state and resurrection? Such questions arose from dualistic traditions, regarded now as obsolete. The authors seem to convey the notion that the soul has

vanished as a separate entity, being the expression of nonreductionistic physicalism manifested in development, functioning, and final decay. The "intermediate" state is seen as a nonexistent one, with notions of resurrection as "re-creation" under the auspices of God, who knows, remembers, and can reprint the same person on nonbiodegradable stuff.

Theologians in the book allude to a Christocentric anthropology, which is a progressive move vs. the regressive trends to recapture and elucidate Adam's original state of being. If Jesus is not only the guarantee of resurrection and eternal life, but also the standard for our humanness in the present (as the target of imitation in terms of being, doing, relating, etc.) as well as our eschatological destiny (the hope of acquiring his bodily likeness), what happened at his death? Ontological monism as expounded in the chapters stresses the interpretation that a person can only be or experience reality exclusively "in the body," as over against a dualist statement such as being "out of the body." Some differentiation would be helpful, as we read in Scriptures that Jesus' body was placed in a real tomb. Was he disintegrated totally, a nonbeing analogous with his dead body, and reintegrated at the third day? Was his dead-time (three days) "compressed" while awaiting resurrection or was he in disembodied fashion elsewhere? Was he "asleep" or consciously actualizing some redemptive work anywhere? (Compare credal allusions to "descending" somewhere.) Was his continuity "in the mind of God" to be reprinted on a nonbiodegradable medium and not an intrinsic capacity for "being" during this apparent intermediate state? Further inquiry can be made with regard to Jesus' statement to one of the crucified criminals at his side, "*Today* you will be *with me* in *Paradise*," as to convey the hope of life after death in proximal, not yet resurrected aspects. Thus, although silent in such matters, the book succeeds in fostering cognitive and spiritual appraisal of such dilemmas.

The authors (e.g., Anderson, Brown, and Green) emphasize the relational aspects of the *Imago Dei* in the human, prompting further questions as what is to be understood as being a human "indwelt" by the Spirit. To "indwell" is to intrinsically coparticipate somehow in the process of "internal dialogue" and relate to the human without being just an introjection construed by the human mind. It should not be equated with the natural emergent property of the evolved capacity for transcendence. Such would be a case of solipsistic (if not self-fabricated, delusional) phenomena. Thus, for a relational dialogue to take place between the Indweller and the indwelt, a dynamic contact between the two entities needs to take place. Can a nonmaterial entity causally affect a material one? Science would negate such a possibility. The Spirit (really, a person *without a body*) is presented scripturally as a causal force. It is said to empower and renew, being coparticipatory in reshaping the human's character and conduct and in transforming the human into the creature envisioned by God and molded into a "Christlike" resemblance (a process known as "sanctification" of a progressive, asymptotic nature). The "point of contact" in physicalism is the brain's substratum that allows for higher, emergent properties. Some empirical measures might be gathered as to measure the interaction, at least in terms of operationalized variables describing the human reaction to such prompting. This proves to be a formidable task. Furthermore, the authors would agree that any attempt to ascertain the promptings of a transcending, yet immanent variable, the Holy Spirit, would prove to be a more difficult, even impossible, task. Though ascertained by the observable effects in the person in the cosmos, the Spirit defies final scrutability at an ontological, substantial level. Along such conjecture, the portrait of the *Imago Dei* may refer to such ontological challenge with respect to the human, not mentioned in the book: As God has been revealed to creatures, yet is ultimately incomprehensible, perhaps the human is "revealed" to the sciences and philosophy, but ultimately incomprehensible as well. Such a statement places this reviewer in the field of "mysterians" alluded to by Dennett, but also in line with humble theologizing/physicalizing.

This is a relevant, challenging, and important book for philosophers of the mind, theologians, neuroscientists, and psychologists written with thoughtfully-developed positions. It demands a thorough reading to capture a multifaceted, yet cohesive portrait of the human. It challenges the reader to consider comparisons and contrasts about the nature, capacity, and functions of the proposed soul's functional equivalents. ❄

Upcoming ASA Conferences

July 30–August 2, 1999: John Brown University, Siloam Springs, AR
"Testifying to God's Goodness Through Science & Technology"

August 4–7, 2000: Gordon College, Wenham, MA
Theme: Oceanography

July 20–23, 2001: Kansas State University, Manhattan, KS
Tentative Theme: Prairie Grass Restoration and the Local Fossil Record

Book Reviews

SCIENCE INCARNATE: Historical Embodiments of Natural Knowledge by Christopher Lawrence and Steven Shapin, eds. Chicago: University of Chicago Press, 1998. 342 pages. Paperback; $19.00.

Science Incarnate is a collection of eight essays that examine how the process of thinking is affected by bodily influences. The chapters vary between examining a single famous individual in detail (Newton, Descartes, Darwin, Ada Lovelace) to surveying the effect of a particular physical regimen on a group of scholars (such as Victorian mathematicians at Cambridge who were expected to be great sportsmen). The examples are often humorous, making the book enjoyable reading while addressing an issue that effects all those involved in the pursuit of science.

Shapin's opening chapter draws from the old adage "you are what you eat." The abstemious diet of ancient Greek philosophers and the early church Fathers was generally thought to be conducive, if not essential, for intensive study. A correlation is developed between the absentmindedness of some great thinkers and their indifference to food. Shapin recounts an incident where a friend eats Newton's dinner while waiting for Newton, and when Newton finally arrives he remarks "How absent we philosophers are. I really thought I had not dined" (p. 1).

While much of the book is interesting from a historical perspective, some of the authors fall short in the stated aim of connecting the relationship between a thinking mind and the physical body. For example, the excessive details of Descartes' life in "A Mechanical Microcosm" generate a chapter that meanders far from the main theme but is an interesting biography.

Lawrence directly addresses the relationship between brain and brawn. Early surgeons are portrayed as stout and strong men capable of the rigors of a demanding job, while their physician colleagues were regarded more as intellectual gentlemen. The numerous figures strongly support the butcher and gentleman thesis that Lawrence develops, although neither profession enjoyed particularly high success rates: "How merrily we live that Doctor's be. We humbug the Public and pocket the fee" (p. 181).

The chapters on Lovelace and Darwin both examine the relationship between thinking and illness. Darwin "suffered from incessant retching or vomiting, usually brought on by fatigue; and from painful bouts of wind that churned around after meals and obliged him to sit quietly in a private room until his body behaved more politely" (p. 243). Darwin's writing and public image were affected by his illness, but also used to his own advantage.

> It allowed him to fall asleep during piano recitals and novel readings. It excused him from boring evenings at scientific societies ... [and in] these subtle ways, he let ill health carry the brunt of displaying a preoccupation with other more intellectual concerns (p. 248).

The style of this collection of essays makes them appealing reading for scientists and humanists alike. The chapters personalize many great scientists while making this reader, at least, think deeply about how the environment affects the way people think. *Science Incarnate* is a unique contribution for those interested in thinking about thinking.

Reviewed by Fraser F. Fleming, Associate Professor of Chemistry, Duquesne University, Pittsburgh, PA 15282.

SUMMER FOR THE GODS: The Scopes Trial and America's Continuing Debate over Science and Religion by Edward J. Larson. New York: BasicBooks, 1997. 336 pages, index, illustrations. Hardcover; $25.00.

Larson is a former associate counsel for the U.S. House of Representatives Committee on Education and Labor. He is now a professor with a joint appointment in history and law at the University of Georgia. Larson has also written *Trial and Error: The American Controversy Over Creation and Evolution;* its readers' comments compelled Larson to write a book devoted solely to the Scopes trial. *Summer for the Gods* is the first new book on the Scopes trial in forty years.

The book is essentially divided into three major parts: before, during, and after the Scopes "Monkey Trial" which took place in the summer of 1925 in Dayton, Tennessee. The first part (chaps. 1–3) delivers appropriate background for the controversy to come. Chapters four through seven offer an engaging description of what Larson called the "Trial of the Century." The final part (chaps. 8–10) are in a way the most interesting, as Larson retells the tale and reminds us that the echoes of the Scopes trial are not as distant as we may initially believe. The book has an index, extensive endnotes, and several illustrations that are mostly photographs taken from 1925 newspapers.

Besides the breaking of an anti-evolution law, so much was at stake: academic freedom, the right of states and local bodies to control the content of education, the credibility of evolutionary theory in the wake of new discoveries, as well as the classic debate over science and religion. To reveal the behind-the-scenes trial action, Larson uncovers rare archival material, including scarce personal letters and papers, newspaper clippings, and minutes of backroom meetings. Larson carefully reconstructs the events surrounding one of the most explosive trials in the history of America's legal system. The author goes far beyond the courtroom in his analysis when he follows the players through the aftermath of the trial. Larson assesses why the Scopes trial became an American legend with an insightful retelling of the 1960 film version of the trial, *Inherit the Wind.* Discussion is also given to continuing legal battles over the teaching of evolution today.

The Scopes trial was about much more than the science-religion debate, and Larson has clearly done his research to make this point clear. The book's main strength lies in the detail of the accounts of events, attitudes, and thoughts of both the key players and the lesser-known figures. Chapters two and three were moderately dry, but the remainder of the book was excellent. After reading *Summer for the Gods*, I felt as if I had actually experienced the trial event in Dayton myself!

Larson does not attempt to sway the reader in either direction. He does not record any personal decisions, nor does he explicitly answer the question, "What *should* the schools be teaching?" Larson truly writes as an unbiased fact supplier. If reading Larson's book causes a person to change his or her mind about the teaching of evolution, it is merely a response to the retelling of a true story; the book could be labeled as neither "creationist" nor "Darwinist" literature.

In the preface, Larson says that the tale is "worth telling as [a] story of our time." He had access to new archival material about the trial not available to earlier historians, as well as additional hindsight. Larson easily succeeds in explaining how the effects and attitudes emanating from the Scopes trial have been immersed in the 1990s society. Plainly, science-religion issues have not been fully resolved. *Summer for the Gods* keeps the readers thinking about these questions and their application to their lives.

Larson's book is a detailed account of what has been left largely unsaid by the nation's media for over seventy years since the trial. *Summer for the Gods* would interest any historian who craves to know the technical details of the Scopes trial. ASA members undoubtedly welcome new insights into an episode which was—in theory, at least—governed by an honest and open study of God's dual revelation. *Summer for the Gods* is recommended for anyone who would like to wrestle with the timeless controversy of the intellectual freedom of human beings.

Reviewed by Ryan O'Connor, Graduate Student in Chemical Engineering, University of Minnesota, Minneapolis, MN 55455.

GOD, THE EVIDENCE: The Reconciliation of Faith and Reason in a Postsecular World by Patrick Glynn. Rocklin, CA: Prima Publishing, 1997. 216 pages. Hardcover; $22.00.

Glynn is a philosopher who has been active as a politician, journalist, and TV commentator. He is currently associate director and scholar at a political institute in Washington, DC. Like many other young Christians, Glynn lost his faith during his university studies, and even became a staunch atheist and postmodern thinker. However, after many years of atheism and nihilism, Glynn found some scientific evidence that brought him back to the faith. Glynn's evolution is strikingly similar to C. S. Lewis's, who was raised a Christian, became an atheist at the university, and uncovered at a later stage in his life some evidence that led to his conversion.

In this breath-taking book, Glynn recounts his spiritual journey. With philosophical, scientific, and historical insights, he shares the evidence that convinced him. He covers different fields: the design of the universe, the correlation between traditional religion and psychic and physical health, near-death experiences, and the moral bankruptcy of atheism. His book has received praise from Sir John M. Templeton, who is well known to ASA members, and also of personalities such as Michael Novak, Hans Küng, and George Weigel. I highly recommend this book to those interested in apologetics, or in matters of faith and reason. This book may also be a formidable weapon for those interested in spiritual warfare. I cannot think of a better initial evangelistic gift for agnostics, atheists, nihilists, or for those who are indifferent to religious questions. This book is not, however, a systematic presentation of arguments and counter-arguments, but is rather an excellent mind-opener that should be supplemented by the systematic apologetics works of Norman Geisler, Richard Swinburne, J. P. Moreland, and William Craig.

Reviewed by Bruno D. Granger, Patent Examiner, European Patent Office, The Hague, The Netherlands.

GALILEO: His Science and His Significance for the Future of Man by Albert DiCanzio. Dover, NH: ADASI Publishing Company, 1996. 389 pages. Hardcover; $38.50.[1]

DiCanzio writes about the science and significance of Galileo from the perspective of a "man in the street." He explains this phrase by describing himself as a "curious, literate, non-academic individual operating independently of any organization that dominates the thought processes of its members." While DiCanzio openly admits that he is not a historian, academic, or theologian, he does possess several qualifications for writing a book of this nature. These include his nine years of studying the science of Galileo at Jesuit institutions, his contagious enthusiasm for intellectual discovery, and the fact that Galileo is one of his personal heroes.

As the title implies, a good portion of the book is devoted to a presentation of the science of Galileo. After tracing the historical development of Greek science in chapter one, DiCanzio spends the next ten chapters relating the illustrious scientific career of Galileo Galilei. He describes Galileo's discoveries, inventions, and publications in great detail. Included in his presentation are a number of diagrams, mathematical equations, and quotes from translations of important historical Latin documents. DiCanzio has visited all of the significant historical sites associated with Galileo's life and scientific career and many of his own photographs are included at the end of each chapter. He also spends several chapters describing Galileo's confrontation with the Catholic church which eventually led to his trial and condemnation for defending a Copernican understanding of the solar system.

The past, present, and future significance of Galileo's science is the central theme of the last two chapters of the book. DiCanzio thinks that Galileo's contributions to

science have been understated and even sometimes misunderstood. By linking Galileo's science to a multitude of more recent inventions and discoveries, he attempts to set the record straight. He begins by explaining how Galileo was instrumental in reshaping the "abstract clay of Aristotelian logic and natural philosophy" that had dominated western thinking in science for centuries. This revolution in scientific thinking was accomplished through his synthesis of inductive, deductive, hypothetical, and empirical methodologies. DiCanzio then relates some different ways in which the unfinished work of Galileo, particularly in the fields of dynamics and mechanics, laid the foundation for the discoveries of Isaac Newton. After making connections between the work of Galileo and the science of Albert Einstein, the author summarizes a number of other ways in which Galileo has impacted more recent discoveries in science. Included in this summary are Galileo's contributions to astronomy and the physics of black holes, his groundwork in the field of computing technology, and his application of mathematics to a variety of practical matters which foreshadowed the science of operations research.

In the epilogue, which is more than thirty pages in length, DiCanzio concludes his book by debunking seven present day "myths" surrounding the life and work of Galileo. Also included in the epilogue is a scathing attack on what the author believes to have been Galileo's most formidable foe: the indoctrination and inflexibility of the Catholic church. DiCanzio includes two modern-day case studies (one from his own experience as a student within the Jesuit educational system) that vividly illustrate the fact that institutional indoctrination and inflexibility is a threat to individual freedom of expression even today. The final pages of the book are devoted to a discussion of the current relationship between science and the (Catholic) church. DiCanzio applauds the recent efforts of Pope John Paul II, who is seeking to redefine the role of his church in a way that is consistent with Galilean philosophy. He writes of Pope John Paul II:

> Of all Popes in history, he is first to issue a mandate for Church teachings to conform to scientific findings, one that is motivated by Galileo's philosophy of science. This is nothing less than a clarion call for the eventual abandonment of indoctrination (p. 330).

In the author's opinion, Galileo is not only one of the greatest scientists of all time and a pioneer in the development of a rational epistemology, but he is also the supreme champion for the cause of individual freedom of expression.

This book is recommended to anyone with an interest in the history of science, to science instructors in general, and to those intrigued by past and present interactions between the disciplines of science and religion. DiCanzio's style of writing is informative, engaging and often interspersed with bits of humor. His thorough research is documented by the numerous footnotes which are found throughout the book at the bottom of nearly every page. Other important pieces of information are included in four appendices which are followed by a bibliography and an extensive index. While readers of this book may not always agree with the author's conclusions, they should come away with a greater appreciation for Galileo, whose work fanned the flames of the seventeenth century scientific revolution in spite of the vigorous attempts on behalf of the Church and the contemporary scientific community to stamp those flames out.

Reviewed by J. David Holland, Instructor of Biology, Springfield College in Illinois, Springfield, IL 62702.

[1]Subscribers who mail orders prepaid by check or money order to: ADASI Publishing Co., Dept. PSCF, 1465 Woodbury Ave. #261, Portsmouth, NH 03801 are entitled to an all-inclusive price of $29.50 and may return the book for a refund within 30 days if not satisfied.

EVANGELICALISM IN BRITAIN 1935–1995: A Personal Sketch by Oliver Barclay. Leicester: InterVarsity Press, 1997.

Today's evangelical situation in Britain has changed dramatically from the late 1920s when Bishop Hensley Hensen described evangelicals as "an army of illiterates generalled by octogenarians" (p. 9). No longer are evangelicals a beleaguered, shrinking minority, but a major force to be reckoned with in British Christianity.

Since 1938, Barclay, a zoologist and former General Secretary of University and Colleges Christian Fellowship and former Secretary of Christians in Science, has been an active participant in the life of British evangelicalism. *Evangelicalism in Britain 1935–1995* is an eyewitness account of many of the organizations, leaders, and events that have made evangelicalism a prominent movement within British Christianity. Although events and figures in Wales, Scotland, and Ireland are mentioned, most of the narrative deals with developments in England.

Barclay first seeks to define classical evangelicalism using four distinctives set forth by historian David Bebbington: biblicism (all of life is ruled by the teaching of Scripture); crucicentrism (the substitutionary death of Christ for sinners, the benefits of which are received by grace alone and through faith alone); conversionism (new birth by the work of the Holy Spirit); and activism (primarily in the area of evangelism). To these distinctives one more is added: evangelicalism is Christ-centered, "The cross can become a cold doctrine, the Bible a mere collection of precepts, and the new birth a merely psychological experience, if they do not depend totally on a personal relationship with the living Jesus Christ" (pp. 10–2).

Classical evangelicals are distinguished both from liberal evangelicals, who do not share the same commitment to the total reliability of the Bible or the substitutionary atonement, and from fundamentalists, whose corporate life is marked by withdrawal from, and not constructive engagement with, modern culture (pp. 12–3).

Barclay's reflections begin with the prewar period, which is described as the "doldrums." Evangelical pastors

were a small minority in most denominations and evangelicals were declining in overall numbers. Only 3% of Anglican ordinands were evangelical (p. 18). Evangelicals fought for survival. Theological education was neglected; preaching and teaching generally lacked depth of biblical doctrine; evangelical leadership was characterized by anti-intellectualism; and evangelicalism was often defined, for the most part, by its reaction against the prevailing scientific, moral, and cultural climate of the day (pp. 42–3). Yet, the strengths were many, too.

> The ordinary members of the (classical evangelical) churches had a knowledge of the Bible that far surpasses ours in the 1990s. They also had a willingness to apply what they found, if need be, with a level of self-sacrifice that puts us to shame in our much more comfortable generation that will not risk careers, financial security, or comfort. Their vision may have been narrower than ours, but it went deeper in important ways. They would have thought of much modern evangelicalism as dangerously complacent and superficial. They knew that they were in a battle for the gospel nationwide (p. 44).

Barclay chronicles the years during and following World War II which saw the emergence of a new generation of evangelical leadership marked by intellectual competency in the academic world (particularly in the area of biblical studies) and committed to a renewed emphasis of biblical doctrine. Expository preaching characterized the ministries of an increasing number of pastors, such as Martyn Lloyd-Jones, William Still, and John Stott. Student ministries grew rapidly. InterVarsity and other evangelical publishers began to provide quality commentaries and Christian literature that would give direction to a new generation of students and future leaders. A renewed evangelical social activism began to organize and expand during the 1960s.

Observations are made on significant divisions within evangelicalism: the tensions between evangelicals who chose to remain in more liberal denominations, particularly the Anglican Church, and those who left; turmoil surrounding the emergence of the charismatic movement in non-Pentecostal denominations; and the theological division over social involvement that arose between evangelicals who acknowledged all acts for social good as manifestations of the kingdom of God, and those who refrained from using the term "kingdom" to describe "righteous acts done by unbelievers" (pp. 110–1).

If Barclay's story began with an evangelicalism that was small, besieged, and defensive, it ends with a present day evangelicalism that is increasing numerically and expanding in influence. As church membership in Britain continues to decline, many evangelical churches are growing. However, the growth is not without problems and challenges. It has the potential of leading to a dangerous triumphalism (p. 114), and the "deficit of biblical knowledge" among younger evangelicals is alarming (p. 115). Evangelical worship is increasingly marked by the methods of the entertainment world, and the seriousness of the Gospel can be lost (p. 116). While short-term Christian service is popular, evangelicals of the 1990s, like the culture at large, are "not inclined to be committed to anything long-term, either in planning their future careers or in their friendships" (p. 117). Concerns are raised about methods of biblical interpretation among more liberal evangelicals, for "in the name of hermeneutics, the ethical teaching of the apostles (as traditionally understood) on such matters as church order, male-female relationships in the home and the church, and more recently on homosexual practice, is set aside by some and treated as merely the first-century expression of practical policies that we can apply quite differently today" (p. 122).

Barclay argues that evangelical reemergence in the 1940s and 1950s was due, in large part, to a recovery of love for biblical doctrine; to the development of a "whole biblical outlook that was derived from careful study of the text and focused in Jesus Christ;" to wonder before a God who is holy, majestic, and sovereign; and to a grasp of certain biblical themes that enabled them to grapple with the challenges of contemporary culture (pp. 135–6).

Evangelicals of the 1990s, Barclay concludes, need a widespread recovery of the final authority of Scripture, and its centrality in daily life.

> There must be commitment to biblical Christianity in dependence on the Holy Spirit to enable us to understand the Bible, and to apply its teaching to ourselves and to the hearts and minds of believers and unbelievers alike. Given that foundation, it should be possible to recapture for a more nearly biblical position much more of the life and thought of the churches and, from there, of the life and thought of the community (p. 142).

Several editorial blemishes need correction in future reprints. Chapter 5 is incorrectly denominated following its initial page. Names of several individuals referred to in the text are absent from the index.

Books such as Barclay's are important companions to the works of professional historians. The mature reflections and thoughtful assessments of those who have been major participants in the evangelical struggle are invaluable. The book is highly recommended.

Reviewed by Charles Wingard, Pastor, First Presbyterian Church North Shore, Ipswich, MA 01938.

THE ROVING MIND by Isaac Asimov. Amherst, NY: Prometheus Books, 1997. 350 pages. Paperback; $18.95.

Many readers of this journal will have read books by Isaac Asimov. His output of almost five hundred volumes (and thousands of essays) before his death in 1992 included many popular books about science, many collections of essays on a wide range of topics, and some of the classics of the science fiction genre. He was a biochemist but spent much of his life writing to make science widely accessible and influential, rather than doing scientific research himself.

This book is a re-issue of a volume first published in 1983. The new edition includes tributes by many well-

known scientists and authors who were Asimov's friends or collaborators. The sixty-two essays here are arranged in seven sections: the religious radicals, other aberrations, population, science: opinion, science: explanation, the future, and personal. These essays immediately demonstrate Asimov's roving mind, his wit, his intelligence, and his directness of expression.

There are places in these essays where some of his musings about the future already seem limited, but that is the risk associated with prediction. And there are places where Asimov's commitment to a position makes him treat those committed to opposing viewpoints in a harsh or heavy-handed manner. He certainly did not believe in a Creator of the cosmos whose scientific study so captivated him. Nonetheless, this book can be recommended as a stimulating and entertaining diversion. And, I suspect for many of you, as for me, a source of insight into a complicated personality who was the author of many books that have been sources of fascination and delight.

Reviewed by David T. Barnard, Professor of Computer Science and President, University of Regina, Regina, SK S4S OA2, Canada.

DARWIN'S LEAP OF FAITH by John Ankerberg and John Weldon. Eugene, OR: Harvest House Publishers, 1998. 392 pages, index. Paperback; $10.99.

Darwin's Leap of Faith is a very fine review of historic and contemporary source materials relevant to the position represented.

The stated "central thesis" of the book is "to show that the theory of evolution is *scientifically* in error and that, therefore, its overarching consequences are also in error" (p. 17; emphasis mine). Accordingly, the authors claim that "the heart of this book" is "*scientific evaluation*" (p. 18; emphasis mine). But in their introductory "Note to the Reader," they admit that they "are not scientists" and "do not have science backgrounds" (p. 7). Thus predictably, the bulk of the book's presentation may be characterized as opinions of the authors integrating and summarizing assertions and opinions by scientists and nonscientists, supplemented by voluminous citations from secondary and popular sources. One searches in vain for actual "scientific evaluation" and just where "scientific error" is demonstrated may be entirely a matter of opinion. The authors rightly point out that "... the interpretation of the data is the key issue. The same data can be interpreted either way, depending on one's assumptions" (p. 286).

We recognize almost immediately a patient reworking of all the old standard young Earth, flood geology, recent creation, and anti-evolutionary arguments. These arguments are based on the convictions of the authors of these arguments which have been quoted in discussions of such matters for one hundred years. Included, however, are many more recent authors with supporting observations and perspectives. Ankerberg and Weldon do not seem to offer any original contribution of their own, but are very dependent upon their compilation of an overwhelming proportion of supporting citations. In most cases, references contained within the numerous quotations are neither cited anywhere in their bibliography nor in the thirty-eight pages of "Notes," thus limiting the reader's access to the alleged confining literature. Indicative of this marked dependency are the citations of one valuable two-volume work, for example, numbering over 130!

Ankerberg's and Weldon's position may be recognized by a few of the authors who are the most frequently cited in support: Bolton Davidheiser, 23 citations; Henry Morris, 31 citations; Duane Gish, 40 citations; Marvin Lubenow, 54 citations; and the *Institute for Creation Research Quarterly* and publications of allied societies, 76 citations.

Another revealing sequence is demonstrated in chapter fourteen, "More Monkey Business; Human Evolution and Missing Evidence," whose material this reviewer would know best. Almost every one of this chapter's fifty-five paragraphs deals with opinions or assertions from fifty-four citations and the authors' affirming commentary, yet with scarcely any attempt at analysis of data or "scientific evaluation."

But let us deal with a few less trivial observations:

(a) The discussion of the Genesis Flood (pp. 301–8) contributes nothing new and somehow manages to repeat the avoidance of the significant issues. The authors follow Morris here, even quoting his more vulnerable admissions as when he finds:

> ... many difficulties in applying Flood geology to the entire geological column. These become especially troublesome in trying to correlate all of the local columns of the world with each other and all within the context of one global flood ... (pp. 303–4).

The difficulty could hardly have been expressed better! I have always tried to point out in such discussions the simple observation that, though there are many great geological evidences of floods, there do not seem to be any cases where such a significant phenomenon may be traced with any continuity or correlation across or between continents.

Having stated the obvious fact of these "many difficulties" but, saddled with his basic assumptions, Morris is forced to simply decide that the Genesis Flood is not only *Providentially, but geologically unique: "it cannot really be compared with later geological processes—not even other major geological catastrophes"* (p. 304, emphasis mine).[1]

But there seems to be a hesitation on the part of Morris and all those who dogmatically stand with him to apply his concluding caution to themselves:

> It is better to leave some geological problems for further study than to let uniformitarian [or Flood-based] pseudo-science and our own limited understanding dictate our biblical interpretations (p. 304, bracketed paraphrase mine).[2]

The question (or issue) is, as has long been recognized, not primarily one of a local versus a worldwide flood emphasized by Morris, Ankerberg and Weldon, and oth-

ers, but rather the assumed implications of *how long ago* a worldwide flood could have taken place. It is in this arena that the desperate manipulation of the interpretation of geological data and the conspicuous avoidance of Western Hemisphere archaeology and its documented, ancient continuity of human occupation is found. For if it included North and South America, humanity could only have reached there *after* the Flood of Noah.

(b) The much overworked argument of circular reasoning, that fossils are dated by their strata; and the strata by the contained fossils (pp. 297–8), is offered with no updated or improved insight whatever; only the same assertions from the same superficial observation and misapplied logic.

(c) On pp. 142–4, the authors present "logical fallacies" of evolution. It is obviously gratifying to illustrate 12 specific types of such fallacies. But to readers of either or any persuasion, it is perfectly obvious that most of them (in this case nine out of the twelve) apply equally to the arguments of the principal creationists!

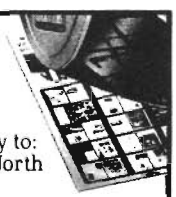
(d) The categorical denial of the role of genetic mutations in evolution (pp. 276–7) brings the authors close to denying their role in the very process of the development of human races from Adam to Noah and from Noah to the present diversity of humanity. Here, again, the concern with the opposition to the larger philosophical issues clouds the handling of the factual elements.

(e) In their discussion of evolution being considered tantamount to a religion, the authors cite almost exclusively those anti-evolutionists who call evolution a "religion" or who cite those who do, with no reference to evolutionists themselves treating evolution as religion or embracing it or responding to it as "their own" religion.

In summary, if the references cited within the multitude of quotations of the book could be documented in the "Notes," this volume would provide a valuable compendium of resource materials for those of the authors' particular creationist interpretation of the Bible. However, for those creationists who do not share their interpretations, but who accept a more conventional view of an astronomical, geological, and palaeontological antiquity as compatible with the biblical text, this volume would probably have no value.

[1]Quoted from Henry Morris, "The Geological Column and the Flood of Genesis," *Creation Research Society Quarterly* (June 1996): 54–7.
[2]Ibid.

Reviewed by James O. Buswell III, Professor of Anthropology and V.P. for Academic Affairs, The Wm. Carey Intl. Univ., Pasadena, CA 91104.



THE CREATION/EVOLUTION CONTROVERSY: An Annotated Bibliography by James L. Hayward. Lanham, MD: The Scarecrow Press, 1998. 188 pages; author, title and subject indexes. Hardcover; $37.50.

Hayward holds a Ph.D. in zoology and teaches courses in genetics, ecology, and the history of life at Andrews University, Berrien Springs, Michigan. He has done research in the nesting ecology of ancient dinosaurs and living gulls.

This volume contains 447 annotated references that address the subject indicated in the title. Its purpose is to provide information concerning the various approaches vis-a-vis science and Christian faith.

Chapter one gives an introduction to the creation/evolution controversy. Discussed are the substance of William Paley's "argument from design" and the rejection of this view by Charles Darwin as well as the development of

evolutionary thought and the creationist movement. In chapter two, Hayward includes historical references to the aforementioned subjects arranged chronologically by date of original publication. Chapter three offers works that detail the progression of the creation/evolution debate.

Chapters four through seven are divided into theistic and nontheistic works. Chapter four contains philosophical, theological, and general references and chapter five deals with volumes that address physics and cosmology. Chapter six deals with "earth science" which is " the view that huge crustal plates move around on the earth's surface ..." (p. 164). Biology and anthropology are the disciplines addressed in chapter seven.

This book is "user friendly" in that the indices make it easy to find material addressing every aspect of the creation/evolution controversy. Each reference is accompanied by a concise description of the view presented.

I found few errors. One worth mentioning is found on p. 45 where Pierre Teilhard de Chardin is described as a "theistic evolutionist." He is more correctly identified as a "naturalistic creationist," after the fashion of Fred Hoyle and N. Wickranasinghe, who were pantheists (or panentheists). Works not included that come to my attention are Herbert Butterfield's *Origins of Modern Science* (1957), Aldert van de Ziel's *The Natural Sciences and the Christian Message* (1960) and *Genesis and Scientific Inquiry* (1965), and Michael Beauman, ed., *Man and Creation* (1993).

This work is highly recommended. It may be a bit "pricey" for individuals, but should be available in university and seminary libraries.

Reviewed by Ralph E. MacKenzie, 5051 Park Rim Dr., San Diego, CA 92117.

OBJECTIVES SUSTAINED: Subversive Essays on Evolution, Law & Culture by Phillip E. Johnson. Downers Grove: InterVarsity Press, 1998. 188 pages. Hardcover.

Johnson has become well known to the members of the ASA and readers of this journal. He has taught law at the University of California, Berkeley, for 30 years. His previous books include *Darwin on Trial*, *Reason in the Balance*, and *Defeating Darwinism by Opening Minds* (all IVP).

This book is a collection of essays most of which have appeared in one or the other of two journals: *First Things* and *Books and Culture*. Part I includes nine chapters discussing issues concerning Darwinism and the physical sciences. Part II (22 chapters) involves the influence that Darwinism has had in law and cultural issues. Johnson points to divisions within the naturalistic camp—the Darwinists vs. the Huxleyists. However, "both contending parties made it clear that what unites the warring factions of evolutionists is faith in evolutionary naturalism and opposition to the possibility of divine creation" (p. 17).

Chapter two, "What is Darwinism?" when originally delivered as a lecture provoked a furious reaction from theistic evolutionists present. Johnson defines terms such as creationism, evolution, science, religion and truth. He accuses Darwinists of "imperialism"—the view that science can explain everything (p. 24). Social Darwinism is covered in chapter three where Johnson shows how its innate racism and misogyny embarrasses the larger Darwinism community. In "Daniel Dennett's Dangerous Idea" (chap. 6), the point is made that in the academic world, "Darwinism is not merely a biological theory but a way of thinking about the world that generates powerful conclusions all the way up and all the way down" (p. 57).

Chapter seven, "The Unraveling of Scientific Materialism," addresses the "macro" vs. "micro" issue and Johnson observes: "For scientific materialists, *the materialism comes first; the science comes thereafter*" (p. 72). "The Gorbachev of Darwinism" (chap. 8) reveals the "in house debate" in Darwinism between Stephen Jay Gould and Richard Dawkins. In chapter nine, the "intelligent design" thesis is addressed in "A Metaphysics Lesson." The philosophical naturalism which provides the underpinning for statements coming from the U. S. National Association of Biology Teachers is revealed and the resulting criticism forces Darwinists to attempt to put a "theistic spin" on their materialism.

Part II (chap. 10—22) includes mostly book reviews dealing with the effect that philosophical naturalism has exerted on law and culture. "Engaging the Third Culture" (chap. 10) is a review of a book written by John Brookman, *Engaging The Third Culture: Beyond the Scientific Revolution* (Simon & Schuster, 1995). It is a collection of interviews with 23 scientists who, while representing different disciplines, share a belief in metaphysical naturalism. Johnson discusses the distinction between "methodological" and "metaphysical" naturalism; the former position held by theistic evolutionists causes some consternation between them and their "creationist" brethren. (Also see: "Appendix: Naturalism, Methodological & Otherwise" in *Reason in the Balance*.)

"The Law & Politics of Religious Freedom" (chap. 11) looks at the Supreme Court's decisions on religious issues in academic institutions. Johnson's conclusion: "Protestants are at last realizing what Catholics understood all along: the notion that a religion-free secular knowledge is all we really need is anything but neutral on religious questions" (p. 111).

"How the Universities Were Lost" (chap. 12) reviews two books: George Marsden's *The Soul of the American University* and Douglas Sloan's *Faith and Knowledge*, both of which "show how and why Christians forfeited their standing in the intellectual world" (p. 114). (This same topic is addressed in James Turner's *Without God, Without Creed* [John Hopkins University Press, 1985].)

In "Wundergadfly" (chap. 13), Johnson examines the life and career of Paul Feyerabend. Feyerabend began his academic journey in physics, then moved into the study of philosophy of science. After beginning as a student of Karl

Popper, he "became notorious as the leading voice for 'epistemological anarchism,' the precursor of what today we call postmodernism" (p. 122).

"Gideon's Uncertain Trumpet" (chap. 14) concerns the options of Anthony Lewis, a garden-variety political liberal who writes for the *New York Times*. "Left Behind" (chap. 15) is a review of a book by Todd Gitlin, *The Twilight of Common Dreams: Why America is Wracked by Cultural Wars*. Gitlin is a sociologist who was a founding member of the Berkeley "New Left" and bemoans the demise of the silliness that we now call political correctness.

In "Pomo Science" (chap. 16), Johnson looks at postmodernism which is the newest rage on the current philosophical scene. "Harter's Precept" (chap. 17) is an essay on the first principle all beginning scientists should heed: "You must not fool yourself, and you are the easiest person to fool" (p. 157). (Also on this topic, see Johnson's *Defeating Darwinism by Opening Minds* [IVP].) "In the Circus of Death" (chap. 18), Johnson shows that ideology can affect the objectivity of the scientific community, in this case concerning the plague of AIDS. "Genius and Plot" (chap. 19) is an essay addressing the personal qualities that enabled Winston Churchill and Michael Polanyi to be successful in their respective fields.

"Facing Orthodoxy" (chap. 20) deals with the allure that Eastern Orthodoxy has had on believers from other communities. "The Law Written on the Heart" (chap. 21) is an examination of the doctrine of "natural law" which is the subject of a book by J. Budziszewski, *Written on the Heart* (IVP, 1997). In chapter 22, "Making Law Sane," Johnson reviews a book by James Q. Wilson which deals with current criminal law.

Johnson has made a significant impact on themes addressing Darwinism, evolution, creation, and theism. He urges Christians to put our intramural differences (theistic evolution, young earth, old earth) aside and address the central philosophical premise that threatens orthodox Christianity—namely "Darwinian materialism." This book is highly recommended.

Reviewed by Ralph MacKenzie, 5051 Park Rim Dr., San Diego, CA 92117-1042.

SCIENCE FOR A POLITE SOCIETY: Gender, Culture and the Demonstration of Enlightenment by Geoffrey V. Sutton. Boulder, CO: Westview Press, 1997. 391 pages, index. Paperback; $23.00.

Sutton earned a Ph.D. in the history and philosophy of science from Princeton University. A postdoctoral appointment at the Bakken Library of the University of Minnesota and more permanent work running physics laboratories and demonstrations at Macalester College allowed him to expand his thesis research into the present volume.

The thesis of *Science for a Polite Society* is that entertainment in the form of popular lecture-demonstrations contributed much to the Enlightenment deification of science as the ideal pattern for human thought. Enlightenment was demonstrated in the lecture hall, and entertaining lecture-demonstrations convinced doubters and advanced the causes of science and liberal thinking. Sutton presents science as an important element of intellectual culture in post-Renaissance France. Organizations—middle-class as well as aristocratic—sprang up for the discussion of natural and other philosophies. Everyday people expounded and debated important ideas in natural philosophy; the *polite society* of the title refers to the emphasis on *politesse* in speech and debate in these gatherings.

Sutton makes much of the fact that Enlightenment science was not accepted—contrary to the science- historical mythos—because of experimental results, but because of the way it dovetailed with current systems of thought. Based on the real situation in the seventeenth and eighteenth centuries AD, Sutton believes that several theories may be able to account for the same facts. His book concentrates on France, where until the mid-eighteenth century the Cartesian system of vortices and subtle matters dominated, and thinkers prided themselves on their ability to invent "pretty novels of physics."

For Sutton, since theory is underdetermined by fact, theory is an accident of society. While I cannot agree with Sutton's strong social constructionist view with regard to theory, he makes a very good case for experiment as subsequent, not antecedent, to theory during the Enlightenment. Yet the mythos claimed, and still claims, that theory was constructed from experimental results; in the teeth of the evidence around and within them, contemporary natural philosophers claimed *hypotheses non fingo*. Sutton makes a case for the adoption of Newtonian mechanics, not because it fit the facts better—measurement was not yet good enough—but because it was associated with political liberalism. Partisans of the *ancien régime* seemed to be largely Cartesian, while such radicals as Voltaire were convinced Newtonians because they admired English political liberality.

Instead of deriving theory from experiment, lecture-demonstrations and other experiments were used to confirm and explicate existing theory while providing public entertainment and overruling skeptics, very much in the manner of science educators, amateur scientists, and museum visitors down to our own day.[1] For example, the cover story of the September 19, 1998, *Science News* (vol. 154, pp. 184–6) points out that "people tend to use museums ... to confirm or solidify ideas they already have."

Sutton presents a chatty yet careful exposition of the development of science, and more specifically experimental science, in seventeenth- and eighteenth-century France. He documents the preeminence of female "amateurs" in Enlightenment science. Female-headed, fashionable *salons* were top-heavy with science demonstrations and discussions during the reign of Louis XIII, and the "amateur" Émilie du Châtelet produced a first-rate reconciliation of

the competing Newtonian and Leibnizian systems in her *Institutions de Physique* in the mid-eighteenth century.

One of Sutton's main theses is usually kept a closely-guarded trade secret: science is fun, and amateur scientists have just as much fun as professionals. They may even have more. As Mark Twain observed: "Work consists of whatever a body is *obliged* to do, and Play consists of whatever a body is not obliged to do." Professional scientists then and now would consider "electrified kisses," the rage in eighteenth-century salons, beneath their dignity, and many of the best experimental results in the new science of electricity were ignored because they smacked too much of sheer fun. Even the spectacular lecture-demonstration, beloved of the public for three hundred years and with the high goal of spreading scientific knowledge, has only recently been rescued from one and a half centuries of withering professional scorn.

Science for a Polite Society is an important addition and correction to the supposedly well-known story of the development of modern science from its Renaissance roots. More important, it's an entertaining read, and well worth a look by those interested in the history of science and in debunking the mythic superiority of scientific thought and practice.

[1]A good deal of the professional science of the modern age is also devoted to confirming and explicating existing theory, if only by pushing the theory until it breaks.

Reviewed by Daniel J. Berger, Associate Professor of Chemistry, Bluffton College, 280 W. College Ave., Bluffton, OH 45817-1196.

SCIENCE, THEOLOGY AND CONSCIOUSNESS: The Search for Unity by John Boghosian Arden. Westport, CT: Praeger, 1998. 189 pages. Hardcover; $55.00.

Arden is the Chief Psychologist at the Kaiser Permanente Medical Center in Vallejo and Vacaville, California. In this book, he makes the fundamental point that simple materialism or simple dualism is unable to adequately describe the nature of consciousness, but that one must take full account of the interconnectivity of human beings and the coevolution of their biophysiological and psychological processes. He also questions such terms as "determinism," "linearity," "objectivity," and "reductionism." He seeks to use a "multidimensional process in which multidirectional causal interrelationships occur." Also, he seeks to incorporate inputs from evolutionary theory, physics, theology, philosophy, and psychology. Unfortunately, he does this in a repetitive and multisyllabic formalism, which detracts from the readability of the book. His key word is "coevolution," which seems to occur on almost every page; the Index lists thirty-one references for "coevolution." "Because human beings coevolve with many dimensions in the environment we have constructed exceedingly complex coevolutionary relationships with one another. Human consciousness reflects the complexity of these coevolutionary relationships." His overall approach is summarized: "an evolutionary theology that includes elements of the perennial philosophy with new developments in science and the study of consciousness."

Although one might well agree with the general emphasis of the book, namely, the importance of complexity and interaction, it is difficult to see how this book could be directly helpful to one seeking to understand the interaction between authentic science and Christian theology in the search for an understanding of consciousness. "The antiquated belief that there is an objective reality out there about which all observers can agree conflicts with the contextual nature of all phenomena." His goal appears to be more consistent with a New Age approach: "one may envision an evolutionary theology in which the natural sciences, psychology, and the perennial philosophy achieve a coherent synthesis." In a chapter on the meaning of dreams, he concludes that "dreams represent a sensitive state of consciousness through which the dreamer may have psi type experiences." While he is inclined to reject reincarnation, he feels that "the preponderance of evidence suggests that *some* of these (psi phenomena) ... may be valid." He indicates that "I view God ... as the totality of the universe itself."

His references to Christian theology are very limited. "Very few people achieve complete 'openness'—Christ and the Buddha perhaps exemplify this extreme." He prefers to refer to "sociotheological systems" rather than to "theological systems." He separates world religions into three types. One is the Judeo-Christian-Islamic religion in which "God is a hybrid, evolved over thousands of years as several cultures coevolved. It is an amalgamation of myths." The New Testament records can be considered "crude approximations and distortions of the message." The story of Jesus blends the themes of renewal, growth, and new life myths into the story of the Crucifixion and the Resurrection. The other two types of religion considered are the Hindu-Jainist-Buddhist spectrum and the Confucianist-Taoist-Buddhist spectrum. "Perhaps the energy of highly evolved individuals, such as Christ and the Buddha, is widely absorbed into the consciousness of others."

At times, the author's lack of familiarity with some key issues strikes the reader with surprise. In describing modern physics, he writes: "Particles, such as electrons, are neither just waves nor just particles, but a mixture of both in appropriate contexts. They are commonly thought to exist in a 'wavepack' (sic)—a probability wave." Psi-phenomena "may also reflect a connection between the wave functions of matter and consciousness." "Because of the unfortunate concept of original sin, theologians needed to resolve the problem that this concept created." In referring to Teilhard de Chardin's concept of "the omega point," using the final letter of the Greek alphabet, omega, as the ultimate result of evolutionary process transforming matter to spirit to personality to God, the author writes: "The term omega point is derived from the Greek letter *O*. He added 'mega' to denote greatness."

This may be a useful book in providing insight and information about how the viewpoint advanced by the author can be described and propounded. But it is not a useful book to help relate the relationship among "science, theology, and consciousness."

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

LIMNING THE PSYCHE: Explorations in Christian Psychology by Robert C. Roberts and Mark R. Talbot, eds. Grand Rapids, MI: Eerdmans Publishing Company, 1997. 373 pages, including collated references and subject index. Paperback; $24.00.

Despite its puzzling title, *Limning the Psyche* comprises a stimulating and illuminating collection of essays reflecting on human nature and experience from a Christian perspective. According to the editors, Christian psychology needs to be nurtured by "interdisciplinary conversations" (p. 19) contained in this book. Ostensibly, their intention is to model that important process and to contribute to the substance of those conversations. On both counts, the book is a success.

Although the seventeen chapters making up the book are written by fifteen different scholars (one of the editors contributes three chapters) who represent nearly a dozen institutions and four or five different academic disciplines, the overall message is remarkably unified. Several themes readily emerge. One is the crucial place of agency in defining human personhood. Although this theme is most fully developed in "Human Agency and its Social Formation" (chap. 8) in which Johnson links agency with qualities of embodiment, co-agency, inwardness, will, moral choice, and responsibility, it is also prominent in several other chapters (particularly chaps. 5, 6, 9, and 10) and implicit in all. A second strong theme is that of our interdependence upon and relatedness with each other. Prominent in several chapters (e.g., chaps. 2, 4, 5, and 11), this theme is particularly emphasized in Vitz's treatment of Christian personality theory (chap. 2). It contrasts sharply with the radical individualism of contemporary psychology. A third major theme is the pervasive place and influence of sin in human experience. This theme is central to the chapters entitled "Sin and Addiction" (chap. 13) and "Sin and Psychosis" (chap. 14) respectively, and figures prominently in chapters one and five as well.

Less explicit, yet still very evident, are several other threads running throughout the book. The call for Christians to apply biblical principles to psychology is emphasized in Griffith's essay, "Metaphysics and Personality Theory," and illustrated in several other chapters. We are urged to construct our psychology on the firm foundation of Christian theology and to make no apology for doing so. A related point is the acknowledgement of valuable insights which ascetic and spiritual theology traditions can offer to modern psychology, admirably illustrated in chapters 16 and 17 and alluded to in others. In addition, the very composition of the book recognizes the contributions of various disciplinary perspectives and historical periods to the creation of a broad and balanced Christian psychology. Finally, by their example, the contributors affirm the value of grappling with both large human nature questions and more focused topics, such as addictions, as part of our efforts to form Christian psychology.

In my view, the book has one nonfatal yet troubling weakness. For an edited work, its coherence and internal consistency are commendable. However, the ordering of chapters seems rather arbitrary and no real conclusion is provided. In general, the book proceeds from the broader framework of personality theory to more focused topics such as attachment, addictions, and gluttony, though even that pattern has exceptions (e.g., conflict resolution is the topic of chap. 4). Perhaps this is deliberate, and the editors hope to leave their readers eagerly engaging in further "interdisciplinary conversations" of their own. Nevertheless, having been deeply stirred and challenged, I was left dangling after the final chapter, wondering how to fit it all together. It seems to me that chapter two ("A Christian Theory of Personality") or chapter five ("Parameters of a Christian Psychology") would fit better at the end, since subsequent topics do not particularly build on them, and either of them could provide a measure of closure. I am still pondering this point.

Perhaps the aforementioned weakness is really a disguised strength. The task of exploring psychology Christianly is by nature one in which consensus will not readily be achieved, and may not even be desirable. The diversity of theological perspective, topical coverage, disciplinary angle, and even tone of writing represented in the book is a realistic reflector of the multitude of ways in which we, in our fallenness and fallibility, go about seeking truth. I expect that any reader will connect with the perspectives of some (but likely not all) of the writers. Indeed, while all the contributions are scholarly and credible, some include more personal reflections and insights as well. Two examples are Alien's description of his own struggles to manage anger (chap. 14), and Neal's suggestions about parenting sensitively in order to foster intelligent agency in our children (chap. 9). I found these and other insights to be of more than academic interest alone.

This book will appeal to thoughtful Christians wishing to deepen their grasp of the ways in which disciplines such as theology, philosophy, and history can enlighten contemporary psychology. If you would like to know more about how historic Christian faith enriches our psychology, and you don't mind having your thinking challenged, *Limning the Psyche* should definitely go on your reading list. If you need to (as I did), use the dictionary to find out what the title means!

Reviewed by Harold W. Faw, Professor of Psychology, Trinity Western University, Langley, BC Canada.

END-TIME VISIONS: The Road to Armageddon? by Richard Abanes. New York: Four Walls Eight Windows, 1998. 326 pages, index, notes, appendices. Hardcover; $25.95.

Here is a book that will appeal to academics who deal all too often with adolescents caught up in the frenzy of yet another end-times movement. At the least, this work ought to be in a nearby library; it is one which may find an honored place in your own bookshelf.

The author, a Christian journalist specializing in cults and new religious movements, focuses on society's obsession—apparently growing—with the end of the world.

His treatment is broadly historical, includes several non-U. S. groups, and names names as he demonstrates, in a scholarly yet readable manner, how end-time movements are born, grow, and survive their inevitable falsifications.

Among the "prophets" exposed in this work are Jack Van Impe, Tim LaHaye, William Goetz, Pat Robertson, Hal Lindsey, and others, including several "prophets" of past generations. Excerpts from their writings are quoted to show how their messages change as the dates they confidently predict arrive and the events they expect are not manifested. In many cases, Abanes documents direct and blatant lies told by some of these "men of God."

The author concludes with a sober chapter on what Scripture clearly teaches about end times. That Scripture is found in Acts 1:7, as well as in other places.

This book is a "keeper" and is highly recommended to ASA members.

Reviewed by John W. Burgeson, 6731 CR 203, Durango CO 81301.

SKEPTICS ANSWERED by D. James Kennedy. Sisters, OR: Multnomah Publishers Inc., 1997. 203 pages. Hardcover; $18.99.

Kennedy, pastor of Coral Ridge Presbyterian Church in Fort Lauderdale, Florida, has written more than thirty books, including *Why I Believe, Evangelism Explosion*, and *What if Jesus Had Never Been Born?* Kennedy earned a doctorate in comparative religions at New York University.

In this book, Kennedy attempts to answer common questions put forth by skeptics: "Why should I believe the Bible—isn't it just a bunch of myths?" (pp. 19–30), "How do we know Jesus really lived?" (pp. 71–8), "Why do Christians insist Jesus is the only way to God?" (pp. 101–10), and "If God is good and all-powerful, why does evil exist?" (pp. 111–36).

This last question also covers human suffering as a result of natural catastrophes. Kennedy comments:

> All of these terrible events ultimately are a consequence of human sin as well. In the beginning, God's creation was good. Humankind lived in paradise, but Adam and Eve traded it all away in a poor exchange with the devil. They were expelled from paradise. Furthermore, a curse is manifest in nature, which is now "red in tooth and claw," to quote Alfred Tennyson, but it wasn't that way in the beginning, and it won't be that way later when Christ returns (Rom. 8:21–22). Meanwhile, we live on a planet that writhes under God's curse (p. 133).

Kennedy tackles the most difficult questions put forth by skeptics with solid answers. However, the best strength of this book may be the revealing quotes from the skeptics themselves: Carl Sagan (p. 60), John Stuart Mill (p. 92), Thomas Huxley (pp. 93–4), H. G. Wells (p. 95), H. L. Mencken (p. 96), Bernard Russell (p. 138), Robert Ingersoll (p. 151), and Julian Huxley (p. 154).

For instance, Kennedy quotes Will Durant concerning Christ. Durant writes:

> The contradictions [in the gospels] are of minutiae, not substance; in essentials the synoptic gospels agree remarkably well, and form a consistent portrait of Christ. In the enthusiasm of its discoveries Higher Criticism has applied to the New Testament tests of authenticity so severe that by them a hundred ancient worthies—e.g., Hammurabi, David, Socrates—would fade into legend (p. 78).

Durant was a historian whom skeptics respected. In fact, he received the 1976 Humanist Pioneer Award. Yet he admitted what most skeptics today would deny. Many of the quotes in *Skeptics Answered* are excellent and well documented with primary sources. However, this strong point does have some weak spots. For instance, Kennedy fails to give any source but attributes the following quote to Voltaire: "O Christ, O Lord Jesus I must die abandoned by God and man" (p. 145). John George is author of *They Never Said It!* and an expert on fake quotes. Concerning this quote he comments: "Voltaire died rather peacefully and, indeed, when asked 'Do you recognize the divinity of Jesus Christ?' the life-long deist replied: 'In name of God, let me die in peace.'" George cites two sources: Jonathan Green, *Famous Last Words* (London: Omnibus Press, 1979), p. 203; and Joseph McCabe, *Biographical Dictionary of Ancient, Medieval, and Modern Freethinkers* (Girard; KS: Haldeman-Julius, 1945).

Also Kennedy relates the story told about "a man in 1895 who survived a day and a half in a whale's belly" (p. 33). However, Edward B. Davis, professor of science and history at Messiah College, Pennsylvania, completely exposed this story as a tall tale in his article, "A Whale of a Tale: Fundamentalist Fish Stories," (*PSCF*, Vol. 43, no. 4 [December 1991]: 224–35).

Skeptics Answered is a good book for those who want short, easy-to-understand answers to difficult questions. I used the study guide in the back of the book for a lesson series with my ten- and eleven-year-old sons. They found it very interesting. *Skeptics Answered* has a few bad quotes, but the vast majority of the book equips Christians with intelligent answers for the questions skeptics may ask.

Reviewed by Everette Hatcher III, P.O. Box 23416, Little Rock, AR 72221.

THE ONE PURPOSE OF GOD: An Answer to the Doctrine of Eternal Punishment by Jan Bonda. Grand Rapids: Eerdmans Publishing, 1998. 267 pages. Paperback; $25.00.

This book, written by a retired Dutch Reformed pastor and translated from the original Dutch, is a challenge to the historic doctrine of eternal punishment. It contains a full index of Scripture references and bibliography. The author admits that he has always been troubled by the question of how a loving God could predestine most of humanity to eternal torment in hell. This motivated him to search the Bible to determine if this doctrine was scriptural. Bonda is obviously a committed believer with a high

view of Scripture. It was refreshing to see that this was no liberal who felt free to ignore difficult Scripture passages, but rather a person committed to Scripture and yet wrestling with it. One had the impression Bonda was a Jacob wrestling with God to understand what the church has always declared a mystery.

Bonda's main points are: (l) Eternal punishment has been taught from the earliest times in the church; (2) We are called not to acquiesce in the "lostness" of our neighbors; (3) God wants all to be saved; (4) Christ's sacrifice was sufficient to save the whole world; (5) God has not given up on the Jews; (6) Old Testament prophets speak about judgment and hope for salvation after judgment; and (7) The purpose of God's punishment is always to make people turn to him. He makes these points by examining the teachings of church fathers and especially Paul's letter to the Romans. Bonda believes that references to eternal punishment are in accordance with what the Old Testament prophets wrote about it: God's punishment of wrongdoing is complete. It does not mean that his punishment lasts forever. Bonda says there is no scriptural reason to believe that there is no chance to repent after death. In fact, the majority of the human race will not die as believers and will undergo purging punishment until they come to faith in Christ. This especially applies to the Jews who reject the Messiah. God's promise to them is that "all Israel will be saved" and it does not do justice to the context of Romans to spiritualize "Israel" to mean "all believers."

The book was very effective in making the case that we are called to work, pray, and hope for the salvation of everyone. It convinced me that the Jews are not rejected by God, but that Paul had hope they would come to faith in Christ. It also convinced me that the word "eternal" does not always mean "everlasting" in the Bible, but rather denotes fullness or completeness. The book's major weakness is that it tends to ascribe clear meanings to Scriptures that do not obviously contain Bonda's meaning (e.g., 1 Corin. 15:28 is interpreted to mean that "all in all" refers to everyone eventually being saved). He also misses the difference between Christ's victory over the first death and God's final judgment in the "second death" (1 Corin. 15:54–55, Rev. 20:13–15; 21:8).

I highly recommend this book to every adult reader. It will stimulate thought and help you realize that God actually wants us to wrestle with him over the hard questions! (See Gen. 18 and Exod. 32.)

Reviewed by David Condron, Aerospace Engineer, 11678 Melcombe Ct, Woodbridge, VA 22192.

THE COMPLETE BOOK OF BIBLE ANSWERS by Ron Rhodes. Eugene, OR: Harvest House Publishers, 1997. 384 pages, index. Paperback.

Rhodes is president of Reasoning from the Scriptures Ministries, "a discipleship ministry that exists to help Christians grow strong in the Word of God and equip them to become knowledgeable in the application of biblical wisdom." He holds a Th.D. from Dallas Seminary. From 1988 to 1995 he was heard on Christian Research Institute's *Bible Answer Man* radio call-in show. He served as the associate editor of the *Christian Research Journal*, and wrote *The Heart of Christianity, The Culting of America, Angels Among Us,* and *The New Age Movement.*

The Complete Book of Bible Answers deals with three hundred of the most common questions raised by his radio audience. The questions are classified by subjects like Bible, God, Jesus Christ, humanity and sin, salvation, angels and demons, the future life, apologetic issues, and ethics. Rhodes answers each question with a definite yes or no followed by a brief explanation of his position. The bibliography recommends books by John Ankerberg, Norman Geisler, Josh McDowell, Charles Ryrie, John Walvoord, and Ron Rhodes (thirteen entries).

Bible Answers employs biblical rationalism as its method for defending the truth. Rhodes believes the Bible is God's Word offering clear coherent answers to most questions. He continues: "I believe that nature and Scripture, properly interpreted, do not conflict ... Since both of these revelations come from God—and since God does not contradict Himself—we must conclude that these two revelations are in agreement with each other" (p. 19). Contradictions are *apparent* and explainable by *clear* biblical passages and use of the original languages (p. 17).

Theologically, the book is Dispensational and will appeal to many conservatives in his audience. However, at several points his theological reasoning appears unreasonable. For example, Rhodes makes an inductive leap to prove that all New Testament writers knew their writings were inspired by God. He bases his conclusion on four verses from Paul and John (p. 15). Rational coherence is further strained when stating that God's sovereignty controls all causes and effects (p. 160). Therefore, lost persons who are not chosen by God still get what they deserve (pp. 195–8). But what is objectionable about believing in the limited atonement theory (that Jesus died for the elect only) if God has chosen the elect (pp. 199–206)? As a theologian, I question this reasoning especially when coherence is his test for truth (pp. 302–3).

Scientifically, *Bible Answers* follows the creation science perspective. Rhodes calls for a literal reading of the Genesis creation and flood stories. Were humans created or did they evolve from apes? After restating the account of Gen. 1–2, the book outlines problems in the evolutionary hypothesis. No sources are cited. And there is no evidence that the author is aware of current developments in science. After reiterating problems with the missing links, he concludes: "You can't breed two dogs and get a cat" (p. 154). I am not aware of any evolutionist who believes this. Furthermore, according to the original languages the flood of Noah in Gen. 7 covered the whole earth (pp. 47–8). Rhodes holds that the scientific evidence for the universal flood is based upon worldwide diluvian deposits and universal flood legends. His source? *The Ryrie Study Bible.*

Rhodes makes the correct observation that theological and scientific discoveries are fallible human interpreta-

tions. But his conclusion is incomplete: "Hence the secularist cannot simply dismiss certain parts of the Bible because science and the Bible contradict" (p. 20). The belief that his biblical interpretations are more objective than most others is presumptuous (pp. 33–5). Readers who accept this false certainty will encounter a crisis of faith when thoughtful theologians or scientists ask the questions. That was my experience in graduate school.

Commendably, Rhodes seeks thoroughly biblical answers for important questions of faith. He supports many evangelical doctrines with quality biblical references. And the book has some helpful popular responses to the cults. Readers sympathetic with the work of Christian Research Institute will find quick answers to many biblical questions. Popular audiences will be attracted to his common sense biblical approach. However evangelicals more familiar with critical biblical scholarship and current scientific theories know better than to search in *The Complete Book of Bible Answers.*

Reviewed by Tony G. Hiebert, Steinbach Bible College, Steinbach, MB R0A 2A0, Canada.

Letters

A Plea for a More Scholarly Journal

An article by Robert F. DeHaan ("Do Phyletic Lineages Evolve from the Bottom Up or Develop from the Top Down?" *PSCF* 50, no. 4, [1998]: 260–71) provoked a very strong reaction within me and some questions as to the nature of the ASA's journal. Dealing with the latter issue first, how does the PSCF compare within the spectrum of science journals and bulletins? I had hoped it would resemble a peer-reviewed scholarly journal with perhaps a little more allowance for the unique worldviews of its readers and contributors. However, this freedom should be tempered with a careful review/editorial process. Surely, a controversial article refuting the conventional view of stars (thermonuclear galactic bodies generating successively heavier chemical elements from hydrogen to iron) would not be published unless several important safeguards were followed. These precautions could include a serious review by experts in the field and perhaps a companion piece to provide a counter-point to the critique of stellar evolution. Moreover, any author venturing a major challenge to an established theory should bear in mind the rigor required to distinguish genuine critique from a sloppy misapprehension of the theory. Thus, the editorial process also needs to consider the unique expertise of the author; that is, the criticism of stellar evolution should be crafted by a physicist. These precautions are especially crucial within an interdisciplinary journal such as *PSCF* whose articles will be read by people with interests that range beyond their own experience and specific expertise.

Moving on to content of the article itself, I would like to make three short points. First, the notion that "top-down" evolution (when adequately understood) "challenges the scientific validity" of Darwinian evolution is contentious. The scientists cited who appear to challenge "bottom-up" evolution do not think a naturalistic explanation of evolution is threatened by their research. Surely the creationist abuse of the punctuated equilibrium position suggests caution here. We need to be careful how we use and apply concepts like "top-down" evolution, especially when they form part of a technical discussion in the academic world. Secondly, how do platypuses or lung-fishes fit in within a typological portrait of nature suggested by DeHaan's "top-down" approach?

The diversity of life on earth does not fit a "body plan" approach—this view properly died out with the German transcendalists in biology over one hundred years ago. For instance, there are many organisms (transitional fossils) who are impossible to classify into any one order (or other contemporary high-level taxonomic category) due to the intermediate nature of morphological features. This fits in with some sort of naturalistic evolutionary process (whether the mechanism is Darwinian or not) and not with a body-plan view of life.

Finally, the misunderstanding of taxonomy as a historical process pervades the analysis. Organisms exist(ed). We classify them into categories. Our conceptual categories often fail to do justice to the historical and messy process. If an early hooked bill bird progenitor (which was itself a species—a breeding collection of genes with some sort of stability over space and time) diverged into raptors and vultures then we have "bottom-up" evolution (a species diverging into what are now classified as the Cathartidae and Accipitridae families). But each of the two new species would then experience adaptive radiation which would indeed produce new varieties in a "top-down" manner to produce new families, sub-families, and genera. This is what Darwinian evolution predicts and retrodictively explains; these two approaches (bottom-up and top-down) are not antithetical as DeHaan maintains.

DeHaan's article calls attention to many of the questions dealing with the history of life on earth. The origin of many evolutionary novelties has yet to be adequately explained, and its true (or even likely) history might never be retold by hominids with six-pound brains. Nevertheless, the search for "internal developmental processes" need not be posited as an alternative to Darwinian mechanisms to account for the change in phyletic lineages. I wonder if a desire for a gap for God to fill lurks in some of the popularity of these types of Darwinian challenges. How does DeHaan account for the origin of these fundamental phyla found in the Cambrian explosion if he dis-

counts Darwinian gradualism acting on species? Science proceeds by comparing alternatives to the prevailing theory, not by sniping from a safe sideline.

I urge readers who might be persuaded by this type of critique as a legitimate critique on Darwinian evolution (with philosophical and theological implications) to pursue peer-reviewed journals for further discussion and analysis.

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Response to Kuehn

Monica Marcinko Kuehn raises two major concerns in her letter: (1) the need for *PSCF* to be a peer-reviewed journal and (2) the content of my article, "Do Phyletic Lineages Evolve from the Bottom Up or Develop from the Top Down?"

With regard to the first concern: My article was reviewed by two anonymous referees who provided criticism and suggestions. Also, before completing the final draft, I sent the manuscript out to two other readers for additional comments and criticisms.

Kuehn mentioned a second set of concerns about my article. The article is "contentious." That depends on one's point of view: to a confirmed evolutionist, probably yes; to someone who is dissatisfied with the Darwinian paradigm and who is open to alternative explanations, probably no.

Moreover, the naturalistic explanation of evolution held by scientists whose research I cited was not threatened by their research showing the top-down direction of change in phyletic lineages. Of course, it wasn't. Yet their research is not cited in standard evolutionary literature because it does not fit the dominant paradigm. But that's not what is important. What is important is that their findings are open to an alternative explanation, which I attempted to provide. My explanatory theory lies within naturalistic boundaries of science.

Kuehn stated further: "The diversity of life on earth does not fit the body-plan view of life." I am not discussing diversity. I am dealing with the hierarchical organization of life, as I emphasized. That life is hierarchically structured is recognized by evolutionary authors, notably Dobzhansky. The fossil record shows that phyla originated in with the body plans of the individual Cambrian animals which established the top-most structure of the phyla. Everything that followed historically in a given phylum occurred at successively lower hierarchical levels, but the characteristics of the body plan were never lost.

This top-down hierarchical shape of a phylum has an uncanny resemblance to the top-down process of development in the embryo and early stages of individual development. This suggests that developmental processes were at work in the formation of phyletic lineages. Diversification through natural selection came later to enhance the adaptiveness of the hierarchically structured animal group.

Kuehn admits that the "origin of many evolutionary novelties has yet to be adequately explained." She asks how I account for the origin of the fundamental phyla found in the Cambrian explosion. My article did not address this question. My purpose was to show that the later post-Cambrian history of the phyla cannot be adequately explained without reference to developmental processes. So what's the problem with my offering an alternative, non-Darwinian developmental explanation? I invite Kuehn and others to compare the evidence for a phyletic developmental theory and the prevailing Darwinian theory of how phyla changed over geologic time after the Cambrian explosion as presented in my article.

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Tanner on the Red/Reed Sea

In his article, "Did Israel Cross the Red Sea" (*PSCF* 50, no. 4 [December 1998]: 211–5), William F. Tanner repeatedly argues there is a tension between the translations "Red Sea" and "Sea of Reeds." For example, in Exod. 10:19 we read "Red Sea" in such reputable (though admittedly not inerrant) translations as the Authorized (King James) Version (1611), (English) Revised Version (1881–5), American Standard Version (1901), and New American Standard Bible (1st ed., 1971; 2d ed., 1977; 3d ed., 1995). But Tanner argues there is an inconsistency between, e.g., the fact that the NASB and NIV have "Red Sea" in the main text, and "Sea of Reeds" in the footnote readings (NASB 1st and 2d eds. and NIV). Thus he asks, "If the translators" of the NASB and NIV "... knew the correct rendition and could show it in footnotes, why did they deliberately use an erroneous one in the text?" This claim is intensified in his conclusion where he asks "why translators continue to use 'Red Sea,' when the manuscripts provide a totally different identification, and ... the available sources require 'Sea of Reeds' and do not permit 'Red Sea'?"

The first point I would make is that the term "Red Sea" (AV, NASB, and NIV) or "Sea of Reeds" (NIV ftn) is used for the Gulf of Akaba (1 Kings 9:26—"Eloth" and Jer. 49:20, 21—"Edom"). That is, the Bible here conceptualized the Red Sea and this Gulf as the same basic body of water. Tanner says "the Red Sea" does not have "extensive coverage of salt grass" and "'Sea of Reeds' ... is a descriptive term ... not appropriate for the ... Red Sea." What "reeds" would Tanner point to in order to justify this description of the Gulf of Akaba on his line of thinking? (WARNING: THIS IS A TRICK QUESTION! If, on the one hand, Tanner

finds a reason for calling the Red Sea the Reed Sea, he thus undermines his central idea that the Red Sea cannot be called the Reed Sea. If, on the other hand, he maintains his argument the Red Sea cannot be called the Reed Sea, he thereby shows that it must have been so named due to its association with the Bitter Lakes and so undermines his central idea that the Bitter Lakes cannot also he called the Red Sea.)

Thus, it was once conjectured that the marshes at the Gulf of Suez must in ancient times have extended c. 90 km or c. 50 miles further north over what is now covered by the Bitter Lakes (e.g., G. J. Brett's *Encyclopedic Index, Concordance, & Dictionary* [Illinois: Consolidated Book, 1961]). But the "view that in antiquity both gulfs extended further north" has now "been disproved. No appreciable change in geographical extension has taken place in the last 3,500 years" (*Interpreter's Bible* [New York: Abingdon Press, 1962], "Red Sea"). But this is not fatal for maintaining the linguistic connection. That is because we know that in the ancient world of Moses' day, people sometimes called two separate bodies of water that were geographically near each other by the same name. In fifteenth century B.C. Egypt, both the Mediterranean Sea and the Red Sea were known as the "Great Green (Sea)" (*Illustrated Bible Dictionary*, vol. 3 [Downers Grove: IVP], 1323–4). (This raises the interesting *possibility* when Moses said: "the Pison ... compasseth the whole land of Havilah" and the "Gihon ... compasseth the whole land of Ethiopia," he included in this picture, under the names Gihon and Pison, at least some of the water of the Mediterranean Sea, e.g., that which is north of the Horn of Africa. [See my map in *PSCF* 49 (1997): 259.] If so, the Mediterranean Sea was still usually known as "the Great Sea" or "Uttermost Sea" [AV] or "Western Sea" [NASB and NIV], Num. 34:6; Deut. 11:24; 34:2; Josh. 15:47).

Without entering the debate as to just where the crossing of the Red Sea occurred, if, for the sake of argument, we work with the Bitter Lakes model, then the area considered by Tanner and many others as the place of the Exodus around the Bitter Lakes, plus the Red Sea with its Gulfs of Suez and Akaba would both be called the Red/Reed Sea as they were geographically proximate to each other. Tanner misses this point and so erroneously sees a tension between the main text and footnotes of the NASB (1st and 2d eds.) and the NIV (although these translations also leave open the possibility of the Israelites crossing elsewhere in the Red Sea).

While I agree that in our culture we do not conceptualize these two distinct bodies of water as being the same due to geographical proximity, it seems to me that Bible translators would be going beyond their task to start translating *Yam Suph* as "Red Sea" in, e.g., 1 Kings 9:26, but then as "Reed Sea" in, e.g., Exod. 15:22. To do so would be to anachronistically give the idea that the Hebrews of Moses' day conceptualized these two bodies of water as in some way disunited due to their geographical separateness, when—if the Bitter Lakes model is correct—they actually thought of them as in some way united due to their geographical proximity. Thus Tanner's assertion that "printed commentaries" which show "a hypothetical route across Great Bitter Lake ... yet state ... that the pertinent water body was the Red Sea" are in "contradiction"; and his similar claims about the NASB or NIV translators putting "the correct rendition ... in footnotes but not in the main text" are somewhat misdirected, since they are premised on the invalid presupposition that the ancients always conceptualized bodies of water under such names as "Red Sea" (Hebrew) or "Great Green Sea" (Egyptian) the same way Tanner does.

The second point that I would make about Tanner's article concerns the Septuagint and New Testament Greek usage of "Erythrean Sea" which Tanner notes is found in Acts 7:36—although (unlike myself) Tanner thinks "Stephen" may not have thought carefully as he was "in a stressful situation." In answer to Tanner's claim that there is "no compelling reason" for translating it "Red Sea," I note the Greek word *eruthros* means "red" and so "Erythrean" Sea is literally "Red" Sea. This—together with *thalassa* meaning "sea"—is used in the Septuagint and New Testament for the Hebrew *Yam Suph* (e.g., Exod. 10:19). The Septuagint is a very uneven translation, ranging from very good to very bad, and everything in between. But some of its accurate parts are quoted in the New Testament. Does Tanner also suggest that the writer of the Book of Hebrews (whom I think was St. Apollos under the immediate supervision of St. Paul, and beyond that the overriding supervision of the Holy Ghost), who frequently cites the Septuagint, was also writing in "a stressful situation"? If so, he is surely in trouble since it is very good Greek and very carefully written. Yet the writer too says the Israelites crossed the "Erythrean" or "Red Sea" (Heb. 11:29).

Furthermore, Tanner rejects any idea of "'walls' of water on each side" of the Israelites being accomplished by "a supernatural mechanism" as opposed to "a supernatural cause ... *timing* ... a natural mechanism." It seems to me that Tanner is too dogmatic here. Since we do not know how God dried up the Red Sea, I think that even if the Bitter Lakes model were used (rather than, e.g., the Gulf of Suez model), one should keep an open mind to the idea that *one possible* way God did this was to form two temporary dams either side of the Israelites—perhaps by freezing the water to create ice walls. If so (and possibly this is not how God did it), then admittedly such Bitter Lakes' "walls" would have been more modest than Cecil B. De Mille's ones. (This epic 1956 Hollywood movie, "The Ten Commandments," contains a number of historical inaccuracies, e.g., it uses the late date for the Exodus at somewhere around c. 1300 B.C.; whereas I support the earlier fifteenth century date—I date it at c. 1,486 B.C., whereas Brown's Bible dates it at 1,491 B.C., or Leon Wood dates it to 1,446 B.C.)

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AUSTRALIA

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Books. ASA titles such as *Teaching Science in a Climate of Controversy* and the *Membership Directory* are sent to all new members when available. Other books and resources are sometimes available for purchase through the home office. We now offer the books, *God Did It, But How?* by Robert B. Fischer that suggests we separate Who? and Why? from What? and How? and *Being A Christian in Science* by Walter R. Hearn that looks at what scientists do and addresses the hard questions Christians face as scientists. We also offer the leaflet, *God and the Big Bang* by Michael Poole

Fellowship. The spiritual and intellectual stimulation of ASA meetings is a distinctive feature of ASA membership highly valued by those who participate. An Annual Meeting, which usually includes three days of symposia, papers, field trips, and worship together, is held each year (since 1946) in late July or early August. For the convenience of members, the location moves across the country on a regular cycle. Local and regional meetings are held throughout the country each year. Members keep in contact with each other through the Newsletter, Internet, and at ASA get-togethers at national scientific meetings.

Church Affiliation _____

How did you learn about the ASA? _____

If you are an active overseas missionary, please give the name and address of your mission board or organization to qualify for complimentary membership.

Name _____

Street _____

City _____ State _____ Zip _____

I am interested in the goals of the American Scientific Affiliation. Upon the basis of the data herewith submitted and my signature affixed to the ASA Statement below, please process my application for membership.

Statement of Faith

I hereby subscribe to the Doctrinal Statement as required by the ASA Constitution:

1. We accept the divine inspiration, trustworthiness and authority of the Bible in matters of faith and conduct.
2. We confess the Triune God affirmed in the Nicene and Apostle's creeds which we accept as brief, faithful statements of Christian doctrine based upon Scripture.
3. We believe that in creating and preserving the universe God has endowed it with contingent order and intelligibility, the basis of scientific investigation.
4. We recognize our responsibility, as stewards of God's creation, to use science and technology for the good of humanity and the whole world.

Signature _____ Date _____
(required for Member, Associate Member, Student member status)

I have enclosed (Please check one):

____$55, Full Member ____ $55, Friend of the ASA ____ $55, Associate Member

____$20, Student Member ____ $20, Student Associate ____ $10, Spouse

Credit Card #: _____ (MasterCard or VISA only)

Expiration Date: _____ Signature: _____

Please mail to: American Scientific Affiliation, P.O. Box 668, Ipswich, MA 01938-0668

Opportunities for Service. The ASA sponsors and encourages individual and group efforts to serve both the Christian community and the scientific community. Major efforts are made to clear up misunderstandings of one group by the other, but speaking and writing are not the only forms of ASA ministry. We seek opportunities to witness as a body of people with a grasp of biblical truth wherever that witness is needed.

Affiliations and Commissions. Each member is 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 help plan Annual Meetings, report to the membership through the Newsletter, and have a chair with four to five other members as a steering committee. Each of the commissions is asked to relate its discipline toward science.

a. Affiliations

Affiliation of Christian Biologists
Affiliation of Christian Geologists

b. Commissions

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

The ASA is a member of The Evangelical Council for Financial Accountability.

WHAT EXACTLY IS THE AMERICAN SCIENTIFIC AFFILIATION?

The American Scientific Affiliation (ASA) is a fellowship of men and women of science and disciplines that can relate to science who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. ASA was founded in 1941 and has grown significantly since that time. The stated purposes of the ASA 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, communicate, and facilitate 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. It is the only American evangelical organization 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 interacting and affecting one another in a positive light.

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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* 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.

Local Sections

Local sections of the ASA and the CSCA have been organized to hold meetings and provide an interchange of ideas at the regional level. Membership application forms, publications, and other information may be obtained by writing to: American Scientific Affiliation, P.O. Box 668, Ipswich, MA 01938-0668 or by contacting the ASA web site at: http://asa.calvin.edu or Canadian Scientific & Christian Affiliation, P.O. Box 40086, 75 King St. S., Waterloo, ON, Canada N2J 4V1 or by contacting the CSCA web site at: http://www.csca.ca

Chicago–Wheaton	D.C.–Baltimore	Guelph, ON	Los Angeles	New York–New Jersey
Rocky Mountain	San Diego	San Francisco Bay	Southwest (AZ)	Toronto, ON

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A keyword-based on-line **subject index** is available on 5 1/4" or 3 1/2" computer disks for most IBM compatible computers with a hard disk or two floppy disk drives. It includes all software and instructions, and can be ordered from the ASA Ipswich office for $20.

Articles appearing in *Perspectives on Science and Christian Faith* are abstracted and indexed in the CHRISTIAN PERIODICAL INDEX; RELIGION INDEX ONE: PERIODICALS; RELIGIOUS & THEOLOGICAL ABSTRACTS, and GUIDE TO SOCIAL SCIENCE AND RELIGION IN PERIODICAL LITERATURE. Book Reviews are indexed in INDEX TO BOOK REVIEWS IN RELIGION. Present and past issues of *Perspectives* are available in microfilm form at a nominal cost. For information write: University Microfilm Inc., 300 North Zeeb Rd., Ann Arbor, MI 48106.

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