

PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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

Editor

ROMAN J. MILLER (Eastern Mennonite University)
4956 Singers Glen Rd., Harrisonburg, VA 22802
millerrj@rica.net

Incoming Editor

ARIE LEEGWATER (Calvin College)
Grand Rapids, MI 49546
leeg@calvin.edu

Managing Editor

LYN BERG (American Scientific Affiliation)
PO Box 668, Ipswich, MA 01938-0668
lyn@asa3.org

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richardanne@cox.net

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1. After June 30, 2007, submit all manuscripts (except Book Reviews) to: **Arie Leegwater, Editor, Calvin College, De Vries Hall, 1726 Knollcrest Cir SE, Grand Rapids, MI 49546-4403. E-mail: leeg@calvin.com.** Submissions are typically acknowledged within 10 days of their receipt.
2. Authors must submit **an electronic copy of the manuscript formatted in Word** either on a floppy disk or as an email attachment. Typically 2–3 anonymous reviewers critique each manuscript submitted for publication.
3. Use endnotes for all references. Each note must have a unique number. Follow *The Chicago Style Manual* (14th ed., sections 15.1 to 15.426).
4. While figures and diagrams may be embedded within the Word text file of the manuscript, authors are required to also send them as individual electronic files (JPEG or TIFF format). Figure captions should be provided as a list at the end of the manuscript text. Authors are encouraged also to submit a sample of graphic art that can be used to illustrate their manuscript.

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Introduction to Papers from the Redeeming Reason II Conference

Terry Morrison with assistance from John Mulholland

In Swift Hall on the campus of the University of Chicago, in an ecclesial looking room with a hammered beam ceiling, professors, graduate students and others gathered November 8-10, 2006, to consider Redeeming the Reason employed in "doing" science. Outstanding speakers read papers, answered questions, and spoke "off the cuff" to disturb, to challenge, and to encourage us. The conference was entitled "The Redemption of Reason: Intentional Christian Scholars in Conversation with the Sciences and Scientists Today." Its purpose was to encourage, equip, and inform Christians in science, and others, about the opportunities to engage in science as service to Jesus Christ, the Lord of science.

This was the second conference in what is hoped will become a long series. The first conference was prompted by a lecture entitled "The Redemption of Reason" given in 1998 by Dallas Willard, professor of philosophy at the University of Southern California. After discovering a tape of this lecture and transcribing it, John Mulholland, formerly a graduate student at the University of Chicago and now working in the law library, shared the lecture with Craig Gartland, then senior InterVarsity (IV) staff and now Midwest Coordinator for IV's Grad and Faculty Ministry. In turn they discussed the lecture with a professor in their church. All agreed that this lecture was a provocative summary of many issues concerning the Christian faith and the academic enterprise, especially a major secular research university like the University of Chicago. They resolved to invite Prof. Willard to speak on the issues he addressed.

After making a presentation to the IV grad group, John organized a study group of graduate students and IV staff at the university to study Willard's original lecture and other works Willard cited in that paper and later ones.

In the course of two years of study, they decided to develop a conference to address the many issues and problems Willard presented. [One can read the papers from the first conference held in November 2005, as well as Willard's lecture at the conference website, www.redeemingreason.org, and Willard's website, <http://dwillard.org>.]

Though they had originally thought only of inviting Willard to speak, and then only of a single conference, it became ever more apparent how much work lies ahead for Christians seeking to be salt and light within their academic disciplines. Mark Noll's *Scandal of the Evangelical Mind* loomed large, as people considered the results of the first conference.

Spurred on by Jeff Hammond, a graduate student in computational chemistry at Chicago who knew Henry "Fritz" Schaefer from professional meetings, John and Jeff set to work to see what could be done by focusing on the sciences. Were there enough major scientists who were also Christians who could help us learn how we might proceed? Would they be willing to attend and speak?

The result of this work was the second conference, "The Redemption of Reason: Intentional Christian Scholars in Conversation with the Sciences and Scientists Today." We were blessed with presentations from ten major scholars: Cal DeWitt, environmental science (Wisconsin); Ard Louis, biochemistry and physics (Oxford); Ian Hutchinson, nuclear science and engineering (MIT); Alan Padgett, theology (Luther Seminary); Alvin Plantinga, philosophy (Notre Dame); Pattle P. Pun, biology (Wheaton); Patricia Reiff, astronomy and astrophysics (Rice); Henry F. Schaefer III, computational chemistry (Georgia); John Suppe, geology (Princeton); and Donald York, astronomy and astrophysics (Chicago).



Terry Morrison received a Ph.D. from Syracuse University. Formerly a professor of chemistry at Butler University, Terry joined the staff of InterVarsity Christian Fellowship in 1974 and has held a number of different leadership roles within the organization, the most recent one as the Director of Faculty Ministries since 1990. As of January 2004, Terry became the Director of Faculty Ministries Emeritus. He is an active member of the American Scientific Affiliation, formerly a Board member of the Au Sable Environmental Institute, a Wilberforce Fellow and a participant in many conferences and seminars. Terry has offered courses and talks on various aspects of the university curriculum and life, specializing in science and Christian faith discussions. He lives in Madison, WI with his wife, Shirley. They are the parents of three adult children and two grandchildren.

Guest Editorial

Introduction to Papers from the Redeeming Reason II Conference

Kindly invited by the editor of *PSCF*, we share with you, four of the major papers and a brief summary of the rest. Two of the papers have been reworked and edited from the verbal presentation of the speakers, with their cooperation and permission. Following this introduction you will find the papers of Ian Hutchinson, Pattle Pun, Calvin DeWitt, and Alan Padgett. We hope to publish some of the other papers at a later date. I have included below very brief sketches of these latter papers. I recommend listening to them on the Redeeming Reason Conference website, www.redeemingreason.org/2006.

- Dr. Schaefer began the conference by asking the question, is it possible for a scientist to be a Christian? Can a unified worldview encompassing Christianity and other intellectual pursuits be developed? He gave many examples of scientists who have, in fact, developed such a unified worldview. Even the physicist Richard Feynman concluded that a Christian can be a scientist without contradiction.
- Dr. York was interested in the systematics of science, interpreting the world of astronomy, for his examples. He showed us how long a time period is involved in the study of astronomical questions. It turns out that major questions in astronomy are still far from being answered. In fact, he showed us how many discoveries have come from accidental investigations not from existing theory. His visuals were awesome.
- Dr. Suppe intrigued us with the idea of "rich knowledge." Rich knowledge is obtainable in science when the data lead us deeper into understanding and help us discover unexpected new insights. Just so, God's revelation and his ongoing relationship with us lead us to new understandings and link together areas of understanding that surprise us.
- Dr. Reiff told us of her research in "space weather," for instance, the behavior of the Sun, and of her activities as a science educator. She shared with us how she has structured her life as a scientist and as a Christian engaged in public education in science via astronomy. She also had stunningly beautiful planetarium visuals such as a description of the Big Bang, a program she made with the help of Steven Weinberg.
- Dr. Louis talked to us about biological complexity, and how we can think Christianly about it. He discussed the cultural barriers Christians have dealing with this and traced it to what in Noll's book is called the "populism" of the Christian Church.

Three submitted student papers were presented:

- Mr. John Ferrer read his paper, "Christian Freedom," in which he attempted to justify and apply the concept of "Christian Freedom" in regards to academia in general and to an academic ministerial calling specifically.
- Mr. Benjamin Ruddell gave a paper entitled "Coming to Grips with Science and Spirituality in America."

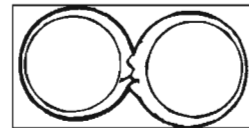
The secularization of the American scientific culture has crystallized and hardened to its current state, such that many contemporary scientists and practitioners are both unfamiliar and uncomfortable with the religious factors in the implications of their work. The result ... is a self-imposed alienation of the scientific community from mainstream spiritual currents and cultures in the USA, which in turn contributes to further mistrust and discomfort with science by the general public.

- Mr. Don Smedley read his paper, "Science and Religion: Some Observations, Opportunities and Obligations." He gave us an interesting contrast between a 1974 conference he attended as a senior in college that focused on Creation Science and the 2006 Terry lectures at Yale, which were entitled "The Religion and Science Debate: Why Does It Continue?"

The conference organizers want to encourage as many people as possible, in all academic disciplines, to work on the problem of integrating their Christian faith and academic work, redeeming reason (Willard), and becoming faithful scholars (*Educating for Shalom: Essays on Christian Higher Education* by Nicholas Wolterstorff, Clarence W. Joldersma, and Gloria Goris Stronks, Eerdmans, 2004). In addition, we want to encourage Christian scholars in all disciplines to organize for support in this important task—join existing organizations or start chapters in your locale. If the Body of Christ is needed for witness and the life of the Church in general, certainly that is true for all of us in the academic world.

As a scientist and the former director of InterVarsity's faculty ministry and longtime member of ASA, it has been a pleasure to be engaged with Jeff, John, Craig, Loren and Deborah Haarsma (Calvin College), David Cook (Wheaton), and all the others who helped to make this conference a reality and a success, and to join with the speakers to encourage all who read this work to take up the enterprise of redeeming reason in service to and witness for our Lord and Savior, Jesus, the Christ. ♦





Warfare and Wedlock: Redeeming the Faith- Science Relationship

Ian H. Hutchinson

The interaction of science and faith has most popularly been portrayed for over 100 years as warfare. This characterization, perhaps plausible as a competition between worldviews, and certainly a convenient simplification for rabble rousers in both camps, is a travesty of the logical and historical relationships that actually exist between these areas of life. This talk¹ seeks to give a sound intellectual basis for understanding the distinction between science, which grew from the fertile soil of a Christian view of creation, and scientism, the philosophical position that science is all the true knowledge there is. Christianity does indeed repudiate scientism, but a case can be made that science is already meaningfully Christian, recognizing the foundational values that science and faith hold in common.



Ian H. Hutchinson

I think it is fair to say that when the relationship between science and faith is discussed today, the dominant view is that they are in conflict. This is not a new view. It has been an abiding part of the academic scene for at least 100 years. But, contrary to what is widely assumed, it is not historically the view that held sway prior to the mid-1800s.

Warfare

What happened in the late nineteenth and early twentieth centuries in academia was that a myth became widely accepted: that science and faith had always been at war intellectually with one another. Of course, this myth was initially promoted largely by those who felt that this was a war that science was in the process of winning, or had already won. Probably the best known proponent of this position was Andrew Dickson White, who published in 1896 the famous book titled *A History of the Warfare of Science with Theology in Christendom*.² In it, White gathered and recounted numerous historical examples of areas in which the growth of what he called "science" encroached upon traditionally religious intellectual territory, initially meeting with stubborn resistance from the entrenched theological power structures, but eventually from sheer force of evidence and argument overthrowing that

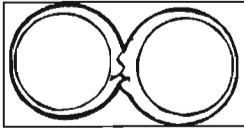
resistance and moving forward into greater knowledge and enlightenment. The theme is repeated over and over in this rather long book, but it is stirring stuff, complete with martyrs, heroes, and villains; intrigues and battles; all the elements that go to make a good story.

The first thing to realize about White's book is that, as White himself emphasized in his introduction, it was part of a much wider campaign.³ White was, for a substantial period, the president of the newly founded Cornell University. He and his patron were determined that Cornell would represent a new model of university in which religious doctrine was to have no place.⁴ His book, much of whose material he had previously published in pamphlets and other articles, was more a compendium of propaganda in support of the campaign than it was a work of scholarship.

Considered simply as a work of history, White's book has over the years been shown

In the late nineteenth and early twentieth centuries in academia ... a myth became widely accepted: that science and faith had always been at war intellectually with one another.

Ian Hutchinson is professor and head of the Department of Nuclear Science and Engineering at MIT. His primary research interest is the magnetic confinement of plasmas: seeking to enable fusion reactions, the energy source of the stars, to be used for practical energy production. He and his MIT team designed, built, and operate the Alcator C-Mod tokamak, whose plasmas, with temperatures reaching beyond 50 million degrees Celsius, are prototypical of a future fusion reactor. Ian is a well-known commentator on the relationship between science and the Christian faith, as well as an enthusiastic choral singer.



Conference Talk

Warfare and Wedlock: Redeeming the Faith-Science Relationship

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to be full of errors, misinterpretations, and in some cases apparently, fabrications. For example, talking about the Galileo affair, White says:

Years before, the opponents of Copernicus had said to him, "If your doctrines were true, Venus would show phases like the moon."

Copernicus answered: "You are right; I know not what to say; but God is good, and will in time find an answer to this objection." The God-given answer came when, in 1611, the rude telescope of Galileo showed the phases of Venus.

This is a pure fabrication that can be traced to a textbook of 1718.

Not to leave Protestantism out of the criticism, White cites a condemnation of Copernican cosmology by John Calvin who, according to White, referenced the Ninety-third Psalm ("Thou hast fixed the earth immovable and firm ...") and asked: "Who will venture to place the authority of Copernicus above that of the Holy Spirit?" Owen Gingerich comments: "No doubt White's quotation from Calvin increased the readership of Calvin's works, for it set historians of science off on a frustrated search to find where the Genevan reformer mentioned Copernicus."⁵ He never did. Whatever may be the weaknesses of White's scholarship, there can be no denying that the campaign of which he was a champion ultimately succeeded.

As a modern illustration of the place where this attitude leads, let me give a personal example. I was at my son's graduation from Bates College in May 2002. The speaker was Steven Weinberg, outstanding scientist, Nobel prize-winner in physics, and a highly articulate advocate of secular materialism. The gist of his commencement message was to welcome the students to the enlightenment, explicitly disparage all religions as superstition and medievalism—Islam came in for special criticism, which was at least a change from the usual academic anti-Christian bias—and debunk postmodernism while praising science. Although I think White would probably be horrified at Weinberg's position, it seems to me, and evidently to Weinberg, to be the logical conclusion of White's campaign.

The Challenge of Scientific Truth

Although as I say the warfare myth has some pretty shady roots, I do not want to minimize the fact that there are some serious challenges that we as Christians and scientists need to face up to. I summarize them in this way: If (as I believe) science is discovering deep truths about the natural world, and if (as also seems to be the case) science is constructing a picture of our world in which the God of the Bible is not plainly revealed, why is that so?

I take that to be the heart of the science and faith discussion. We cannot start with details about how this or that biblical incident or doctrine could be consistent with modern science. We must recognize that in so far as there is a confrontation that could be called warfare, it is a confrontation not so much of detailed facts as of worldviews.

The Distinction with Scientism

It is not without significance that White, like many of his contemporaries, used the word science with an enormously wide meaning; so that it encompassed the entirety of liberal scholarship. In addition to astronomy, chemistry, geology, and the other natural sciences, his book has chapters on Egyptology and Assyriology, philology, comparative mythology, economics, and biblical criticism, referring to all as science, and implying that the intellectual methodologies of all are similar.

The intellectual and practical prestige that lends to science the status of a compelling explanation of the world is almost entirely attributable to the natural sciences. In other words, it is in physics, chemistry, biology, geology, astronomy, and similar disciplines that we find the really persuasive scientific explanations. On this Weinberg and I completely agree. Where we profoundly differ, however, is that his position, and White's before him, is essentially that the methods of science, as exemplified by these natural sciences, are the *only* way to obtain rational knowledge of the world. That position is not science. It is a purely philosophical position that I call *scientism*.

Scientism is the belief that the methods of science, by implication modeled on the natural sciences, are the only source of true

knowledge. In more philosophical discussions, aspects of this belief are called Logical Positivism (referring to the method by which the knowledge is to be acquired) and sometimes Materialism (referring rather anachronistically to the assumption that the account of the world in terms of matter is complete), and sometimes Naturalism (which begs lots of other questions that cannot be discussed here).

When White includes various disciplines that are plainly not natural sciences in his polemic about science and religion, he is exemplifying the capitulation and accommodation of these nonscientific disciplines to scientism. For if science is all the rational knowledge there is, then the liberal arts, social studies, and humanities, if they want to retain their intellectual authority, better turn themselves into sciences. And that is what many of them sought to do in the late nineteenth century.

What I conclude, then, is that there is an intellectual confrontation that could reasonably fit the warfare metaphor. It is not between science and theology, however. It is between scientism, the predominant faith of the twentieth century academic, and other faiths, including Christianity.

Science without Scientism

Defining Science

A large fraction of the problems of science and faith are generated by misunderstanding or misuse of the word science. Therefore, I need to be explicit that from here on I am using the word science to mean the natural sciences. I believe that there are some characteristics of science and scientific knowledge that distinguish it from other forms of knowing. Modern science starts with the fundamental presupposition that the world can be described by models which are basically invariant as to time or place. If I do an experiment in such a place on such a date, it ought to be possible, by attention to all the relevant factors, to get the same result if someone else does it somewhere else at some other time. Thus *reproducibility* is vital in science. A second characteristic is that science restricts its attention to matters on which it is possible for rational observers to agree on the results of any experiment. The results of a scientific experiment, even if not necessarily its interpretation, have to be in a form that is universally accepted and understood by scientists. I will call this requirement of universal comprehension *clarity*. These two criteria, reproducibility and clarity, are the ground on which all science is built.

Michael Faraday is a fascinating character in the history of science. He was probably the most prolific experimentalist in the first half of the nineteenth century. It was said of him that whenever he heard of some new result or phenomenon which had been discovered in those heady days of nineteenth century discovery, the first thing he would do was to attempt to reproduce the effect in his own laboratory. This was not because he was what might

be thought of as a skeptic. In actual fact, he was a firmly convinced Christian, deacon of a nonconformist evangelical church for most of his adult life. No, the reason he always tried to confirm an effect by his own experiments is, I believe, in part because he understood that science is concerned with reproducible phenomena which can be studied anywhere under controlled conditions and give confirmatory results.

A fascinating episode in the sociology of science occurred more recently. In March 1989, two electrochemists, Stanley Pons and Martin Fleischmann, at the University of Utah, called a press conference to announce that they had achieved controlled fusion at room temperature. Now, my own main research interest is in controlled fusion energy, the energy source of the sun and stars. As I said on a later occasion, it was as if a jet aircraft designer had read one day in the morning paper that others were claiming to have discovered anti-gravity! It was a claim that if true would make obsolete the whole field in which I was working, but a claim contradictory to many principles of physics that we take for granted. Cold fusion experiments are very easy to do; and soon there were thousands of attempts to reproduce the results. Some of these came up with their own puzzles and anomalies, but it quickly became clear that the original claims could not really be reproduced.

This incident is an example of the power of science, that it can produce such a high degree of unanimity so quickly. It is also a classic example of the way in which science relies on the principle of reproducibility to settle matters of dispute. It is precisely because "cold fusion" proved to be incapable of being demonstrated reproducibly that the overwhelming majority of responsible scientists have concluded that there is nothing in it.

Demarcation

At this point I want to interpolate a few philosophical remarks about what is called the problem of demarcation. For much of the twentieth century, philosophers generally and especially philosophers of science struggled with trying to come up with definitions of science. They were looking for general principles that one could point to and say were the things that demarcate the boundaries between science and nonscience. To make a very long story short, the current opinion in philosophical circles is that this program has failed. Every attempt to identify a process by which one could establish what is science and what is not science is judged to have been found wanting.

Now what I have just said is that I think there are two identifiable characteristics of science, repeatability and clarity. If these are sufficient to define science (which is not what I am claiming—I am claiming approximately that they are necessary, not sufficient) then it would seem that I am claiming to have solved the problem of demarcation. Such a claim would call down upon me the wrath of most



Conference Talk

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philosophers of science, since I would appear to be claiming to have solved a problem some of them have spent their professional lives on. So I need to justify myself a bit more. I will make two related arguments that I hope will mitigate, but I am sure will not entirely dissipate, their criticism.

First, I believe that the problem of demarcation is made impossible partly by scientism. What I mean is this. Demarcation between science and nonscience in the context of scientism is equivalent to the demarcation between sense and nonsense, rationality and irrationality, knowledge and superstition. If one accepts scientism, then that demarcation of meaningfulness is what one is trying to solve. I believe that many philosophical arguments are about that demarcation. I claim that the demarcation of meaningfulness is beyond my interests here. I have a much narrower intent which is to identify (some of) those principles which characterize natural science—regarded as a subset, not the totality, of all valid rational knowledge. I think that this problem is solvable, at least in part, and that one should not discount the identifiable characteristics of natural science just because of failures of a wider program.

Second, I am content if necessary to regard the characteristics of repeatability and clarity as partial *definitions* of what I mean by science. In doing so, I might be ruling out some studies that claim to be or perhaps even widely are regarded as science. If so, then I say, so be it. I believe these characteristics are possessed by those sciences which are responsible for the high epistemological prestige and compelling explanations of the natural world that we attribute to science. It is those natural sciences which are being implied in practically all science and faith discussions. So if I have by definition ruled out some disciplines that have a reasonable claim to being scientific, I have ruled out only those that are irrelevant to this particular debate.

Finally, I need to be crystal clear that I have no intention to discount or disparage academic disciplines that I regard as not being science. I do not subscribe to scientism. I believe there is deep meaning, truth, relevance, and insight in nonscientific studies pursued with intelligence and rigor. Indeed I believe that my Christian faith brings

knowledge that is equally as compelling as my science but is nonscientific.

Science and Nonscience

Science, then, operates with systems in which either repeatable tests are possible (laboratory science) or else so many highly similar examples are available for observation that, in effect, repeatable tests are available (observational science, e.g., astronomy). For this reason, history, for example, even though it may use some scientific techniques, cannot rightly be considered a science because it concerns itself with the essentially singular events of the past. Indeed, it is often the most unusual (*least* reproducible) types of events which attract the most historical interest.⁶

The notion of clarity, and the fact that not all topics possess it, may be illustrated by an example. Consider the question, “Do you love your wife?” This is a question that fails as scientific enquiry not because it deals with singular types of events but because it is a type of question that does not lend itself to tests whose results could be universally agreed upon. It might be possible to devise a battery of tests such as: does your heart beat faster when you see her, do you buy her flowers, do you kiss her each morning, do you do the dishes, and so on. However, I think we all suspect that these would fail to go to the heart of the matter and that a concept such as love is too subtle to be quantified and encapsulated into what would be acceptable and universally agreed upon as a scientific test.

The extent to which science insists on these two characteristics, reproducibility and clarity, is often taken for granted. What the two previous examples (history and love) illustrate, however, is that this insistence constitutes a substantial restriction of science’s field of application. It is not obvious that the world has to behave at all so as to provide for results that are reproducible, or that can be agreed upon by observers. What the success of modern science demonstrates is that a vast amount of important knowledge can be gained by taking as a *presupposition* that it does. What science’s success does not demonstrate, however, is that all of the world’s behavior is in fact describable in this way. Science has left out of consideration *a priori* any aspects of the world that do not exhibit these characteristics.

Reductionism

One important element of scientism is ontological reductionism, or, as it has been dubbed by Donald MacKay “nothing buttery.” This is the view that if a scientific explanation of a situation exists, then no other explanation can be valid. For example, we may perhaps concede that “man is a complicated biochemical machine.” The ontological reductionist says “man is *nothing but* a complicated biochemical machine.” The innocuous sounding phrase *nothing but* rules out the possibility of crediting discussions of the nature of what we are considering, at any level other than the most elementary, the most reduced. This aspect of scientism is obviously detrimental to faith, but once identified it is also seen to be inconsistent with any kind of meaning, including the very act of thinking itself. If my brain is nothing but a complicated set of interacting biological components, then there is no justification for attributing any meaning to my thoughts—including the thought I just expressed. You see the self contradiction.

The most extreme form of scientism (Logical Positivism) holds that the only worthwhile knowledge is scientific and testable by scientific approaches, and that anything that does not fall into this scientifically testable domain is meaningless. Let me give you an example from the writing of Carl Sagan. In his book *Broca’s Brain*, he calls the question of why the laws of nature are what they are “... a still more fundamental and exotic question, which many scientists would say is essentially untestable and therefore meaningless.” Notice how the doubt he implies here is whether the question is or is not testable; the issue of whether untestability implies meaninglessness appears to be regarded as not in doubt!

I hope it is now clear that this view is untenable because it discounts vast tracts of human knowledge and learning which concern matters that are not susceptible to the scientific approach because they lack repeatability or clarity. There are undoubtedly aspects of history, politics, economics, law, art, literature, and so on that can be discussed scientifically. However, the heart of these topics is not scientific because their subject matter does not lend itself to the methods of science. Nevertheless, and I need to be emphatic here in case you might misunderstand me, we *can* have a vast amount of knowledge in these areas. It is real knowledge; it is worth having. But it is not scientific.

The Two Books and Their Collation

Francis Bacon (1561–1626) is often considered the father of modern science. His emphasis was on obtaining *useful* knowledge, by which he meant the knowledge that can be turned into what today we would call technology. Since technology demands the reproducibility that I have identified as one major characteristic of science, you can see that Bacon could be considered to have brought that characteristic to prominence. Did that make Bacon a believer in scientism? Did Bacon therefore think that the only useful

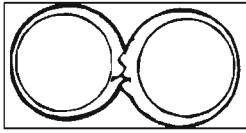
knowledge was science? On the contrary, the way that Bacon expressed his view is “Let no one think or maintain that a person can search too far or be too well studied in either the book of God’s word or the book of God’s works.” In other words, for Bacon there are two ways in which God has expressed himself: his Word, the Bible, and his works, the universe. Both of these are worthy of the most serious study. Bacon made popular the two-book view of science and faith, which I alluded to a few moments ago.

This two-book outlook [the book of God’s word or the book of God’s works] was probably the predominant approach of scientists at least until the 1800s.

As an example of scientists during the scientific revolution, Isaac Newton (1642–1727), who is certainly one of the most celebrated scientists and mathematicians of all time and who can be considered to be a founder of mathematical physics and astronomy, took much the same view. Despite being a prolific writer about optics, mechanics, and, of course, the laws of motion that explain the orbits of the planets, he wrote more about theology and Bible interpretation than he did about science. He obviously spent at least as much time thinking about the Bible as he did about the scientific description of the world.

This two-book outlook was probably the predominant approach of scientists at least until the 1800s. However, there was a difficulty with this approach that led to disillusionment. The common belief grew up that the knowledge gained through science and through revelation were and should be rapidly converging into a complete synthesis. All knowledge is one, the train of thought went, and so as we discover more about the scientific aspects of the world, we will find that these support what we know of God through the Scriptures and the revelation of Jesus and the prophets.

But in the 1800s, that did not seem to be happening. Astronomy had shown that the universe had to be understood in much grander and subtler ways than implied by the worldview of the scripture writers. Geology seemed to be discovering that the world was far older than the Bible implied. The success of mechanical explanations of the world seemed to lead to a deterministic view that left no room for free will. Humankind was “dethroned” from being a supernatural creature in a purposeful world to



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... God's
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a mere animal, product of purposeless mechanistic processes, and eventually himself seen as merely (nothing but) a biological machine.

It was forgotten that the whole approach was supposed to be *two separate* readings. People found that the two books could not be readily collated together, despite the mighty efforts of the concordists. Many sprang to the false conclusion that one book had to be thrown away.

Spiritual Knowledge

Let me start my discussion of spiritual knowledge, or how we know matters of faith and the spirit, by saying that *faith is not science*. That is why I have taken some trouble to emphasize that science is not the only valid knowledge, that scientism is a great intellectual mistake.

It might be fair to ask then, why not? Why is faith not science? Why, if there is a God, does he not make himself scientifically provable? Why does God seem to be only rather obliquely discoverable in science? A big part of the answer, I maintain, is that a transcendent God can never be scientifically testable, for otherwise he would not be transcendent. Suppose there was some aspect of God which was sufficiently repeatable to allow tests about which all could agree on the results (clarity). For example, if I pray in such and such words, then I will always get such and such an answer. This would hardly be considered a revelation of God. It would actually be more like magic! Or, to put it in the manner of modern science, it would indicate some additional force acting in the world, perhaps hitherto unknown, but now available for scientific study because of its repeatability. Paul said it this way in Rom. 1:20: "Ever since the creation of the world his invisible nature, namely his eternal power and deity, has been clearly perceived in the things that have been made." You see, God's eternal changeless dealings with his creatures *are* the laws of nature.

So then, I would say that science reveals only some aspects of the Creator, ones that we generally do not think of as the key characteristics addressed by our religious teachings and faith. It reveals only those

aspects that are accessible to the methods of science which require the repeatability and clarity of the questions under consideration. This is what we call science. There is a very clear and simple reason why the other aspects of our faith, for example, God's acts in history, his personality, his purposes, and so on, are not proved by science. It is that science is incompetent, because of its choice of method and topic, to address these matters in religion, just as it is incompetent to do so in secular life.

Let me emphasize here, that I do not mean that these are certain aspects of the world about which science gives us the answers and certain others about which it does not and that it is in these latter areas where we find God. In other words, I am emphatically not advocating a "God of the Gaps" approach. No, I believe that the way to make sense of the world and see the scientific and nonscientific descriptions in correct context is to give full credit to the different levels of description.

So, yes, I am an assembly of electrons and quarks interacting through quantum chromodynamics and the electroweak forces; yes, I am a mixture of a wide variety of chemical elements predominantly hydrogen, oxygen, and carbon; yes, I am a wonderful system of biochemical processes guided by genetic codes; yes, I am a vast and astoundingly complex organization of cooperating cells; yes, I am a mammal with hair and warm blood; yes I am a person, husband, lover, father; yes, I am a sinner saved by grace. I am all of these things and not one of them is less true than any other. Not one of these descriptions rules out the others, once we set scientism aside.

The trouble is that it might seem that this is just special pleading on my part. That since science turned out not to confirm the Christian God, Christians like me are obliged to invent excuses for why this must be the case. In other words, is the affirmation of other ways of knowing, and the appeal to explanations at different levels just an ad hoc fall-back position forced on religion by the failure of modern science to validate its doctrines? To illustrate that this is not just a view invented to save religious faith, let's think for a moment about the question of purpose.

Purpose Deliberately Ruled out by Science

Consider this quote from the Nobel Prize winning biologist Jacques Monod:

The cornerstone of the scientific method is the postulate that nature is objective. In other words, the systematic denial that "true" knowledge can be got at by interpreting phenomena in terms of final causes—that is to say, of "purpose."⁸

I use this quote first because it is a classic example of scientism in populist scientific writing. Monod identifies "true" with what I should call "scientific" because he implicitly assumes that all true knowledge is scientific. I have drawn attention to Carl Sagan and Steven Weinberg, as two other distinguished scientists whose popular writing is also full of this type of implicit assumption.

But secondly, I use this quote because I think it *does* correctly characterize science. Science rules out explanation in terms of personality, and hence rules out purpose, from the beginning, as an operational postulate. Therefore, it should be no surprise that science fails to find personality and purpose in the world. It could not possibly do so because it rules them out from the beginning. There can never be a scientific explanation of personality or purpose as such. There can be a scientific description of the material substrate in which personality is embodied; brain science is at the beginnings of such a description for humans; but this does not prove that there is no such thing as personality. It is mere presumption, not based on scientific results, to suppose that a scientific description "explains away" personality, in the sense of rendering descriptions in personal terms meaningless.

Exodus, a Biblical Example

Moreover, the Bible teaches this multi-level view of the world. It sees God at work, not just in the aspects of nature that were not understood, but also in those that were understood.

The best example I know to illustrate this contention is the biblical description of the founding event of the Hebrew faith, namely the exodus. That dramatic scene, made famous by Charlton Heston, Cecil B. de Mille, and a cast of thousands, where the Red Sea parts and the Israelites go across, tends to make us forget that the original account says that there was a perfectly "natural" explanation of what happened: "Then Moses stretched out his hand over the sea; and the Lord drove the sea back by a strong east wind all night, and made the sea dry land, and the waters were divided" (Exod. 14:21). The fact that there was a natural, in a crude sense a scientific, explanation of the event to which the passage refers—the persistent east wind—does not prevent the writer from seeing God at work. In other words, different levels of explanation are regarded as equally valid.

This incident illustrates that it has always been a characteristic of biblical faith to see God not just in some supposed gaps but in all the events of life, whether they have a scientific explanation or not.⁹ To emphasize that the personal God must be sought in higher level descriptions, which are valid simultaneously with other more reductionistic or scientific ones, is not just a defensive reaction to the progress of science. It is what has always been the case implicitly in religious experience.

Distinctively Christian Science

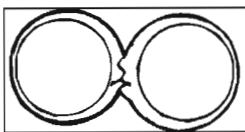
Now I turn explicitly to what I take to be the main thrust of this conference on Redeeming Reason. Is there such a thing as a Christian Science? By this phrase, I mean not the peculiar sect it has unfortunately become associated with, but natural science, within the mainstream of scientific thought (or at least not off in some fantasy land like so-called "Creation Science") that is distinctively Christian.

In thinking, over the years, about this question with students and other Christians, I soon came to two conclusions. The first is that there are many aspects of science that are obviously the same whether pursued by Christians or atheists. It is not possible, I hold, to solve a differential equation (for example) by techniques that are different for a Christian than for someone else. Some knowledge and thought is truly common, regardless of conviction. Scientific knowledge perhaps more than any other discipline, is common because of its methods of investigation. The second conclusion is that if Christian Science means an approach to natural science that seeks scientific data in the Scriptures or some other religious authority rather than in nature itself, then I am deeply suspicious of it. That would sound too much like a return to the sterile Aristotelian and Scholastic philosophizing that modern science has overthrown. I hold that the book of nature contains different aspects of revelation than the written Word of God. God intends the unwritten book to be read, as he intends the Bible to be read: on its own terms, before all else.

Going further, though, I believe there is a constructive case to be made for the phrase Christian Science.

Christian Pioneers

First, we should recognize that modern science is built upon the foundational work of people who more than anything else were Christians. Christians were the pioneers of the revolution of thought that brought about our modern understanding of the world. MIT (Massachusetts Institute of Technology), my home institution, the high-temple of science and technology in the United States, has a pseudo-Greek temple architecture about its main buildings. The fluted columns are topped not with bacchanalian friezes, but with the names of the historical heroes



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of science (not to mention William Barton Rogers, the founder). A rough assessment was carried out by a few of us some years ago of the fraction of the people listed there who were Christians. The estimate we arrived at was about 50 to 60%.

Any list of the giants of physical science would include Copernicus, Galileo, Kepler, Boyle, Pascal, Newton, Faraday, Maxwell, all of whom, despite denominational and doctrinal differences among them, and opposition that some experienced from church authorities, were deeply committed to Jesus Christ.

Christian Scientists in Modern Academia

Second, I observed over the years in my interactions with Christians in academia, that far from scientists being weakly represented in the ranks of the faithful, as one would expect if science and faith are incompatible, they are strongly over-represented. There are more scientists than nonscientists among Christians in academic communities.

For many years, this was simply a personal observation, and though my friends and colleagues confirmed the observation, the evidence remained anecdotal. However, eventually I discovered that the sociological evidence has been studied systematically, for example, by Robert Wuthnow,¹⁰ who established that while academics undoubtedly tend to be believers in lower proportion than the US population as a whole, among academics, scientists were proportionally *more likely* to be Christians than those in the nonscience disciplines. He cites several studies as follows:

Carnegie data on faculty members showed that 49% of faculty in the social sciences [sic] were indifferent or opposed to religion, compared with 46% in the humanities, 41% in the biological sciences and only 37% in the physical sciences. Another study of faculty members showed similar patterns: 41% of the social scientists did not believe in God, compared with 36% of those in the humanities and 20% in the natural sciences; similarly 48%, 45%, and 34% respectively, said they never attended church.¹¹

If it really were the case that science and faith were inevitably at war with one another, then surely one would expect it to be rarer for [natural] scientists to be Christians than other academics. In fact, the opposite is true. The common misconception that scientists were or are inevitably sundered from the Christian faith by their science is simply false.

Christianity the Fertile Soil in Which Science Grew

Third, the question arises, why did modern science grow up almost entirely in the West, where Christian thinking held sway? There were civilizations of comparable stability, prosperity, and in many cases technology, in China, Japan, and India. Why did they not develop science? It is acknowledged that Arabic countries around the end of the first millennium were more advanced in mathematics, and their libraries kept safe eventually for Christendom much of the Greek wisdom of the ancients. Why did not their learning blossom into the science we now know? More particularly, if Andrew White's portrait of history is true, that the church dogmatically opposed all the "dangerous innovations" of science, and thereby stunted scientific development for hundreds of years, why did science not rapidly evolve in these other cultures?

A case that has been made cogently by Stanley Jaki,¹² amongst others, is that far from being an atmosphere stifling to science, the Christian worldview of the West was the fertile cultural and philosophical soil in which science grew and flourished. He argues that it was precisely the *theology* of Christianity which created that fertile intellectual environment.

The Bible teaches that the world is the *free contingent creation* of a rational Creator and that God had free choices about how the world was to be. Such a teaching implies that the world cannot be understood simply by theoretical philosophy, in the way that the Greeks thought it could and should. We need to do experiments to find out how God chose to create it. Experiments are the foundation of modern science. The Bible teaches that God *declared the Creation "good."* So it is worthy of detailed study and investigation on its own merits. The Bible teaches

that the world is not itself God. That permits Christians to investigate the physical and biological universe without fear of violating the divine.

The Bible teaches that humans have been given a degree of authority and responsibility over the Creation. Therefore it is permissible to probe its secrets, provided we are truly acting as stewards of it, and respecting God's creatures. The Bible teaches that our rationality is in the *image of the Creator*. This gives encouragement and expectation that we are capable of understanding the creation. These are *theological* encouragements to the work of empirical science.

When intermingled with the desire to benefit humankind for Christian charity's sake, and enabled by the printing press to record and communicate results for posterity, the work of science became a force that gathered momentum despite any of the strictures of a sometimes defensive religious hierarchy.

So I suggest that there is a deeper reason why scientists are puzzled about how one might pursue a Christian Science distinguished from what has been the approach developed over the past half millennium. It is that modern science is *already* in a very serious sense Christian. It germinated in and was nurtured by the Christian theology of creation, it was developed and established through the work of largely Christian pioneers, and it continues to draw Christians to its endeavors today.

Wedlock: A Constructive View of Christianity and Science

A church friend of mine, named Dick, who has been married for close to forty years, was asked recently what the secret of a long-lasting marriage is. I suspect the question was provoked partly because he and his wife, both delightful people, seem so totally different that superficially they would seem rather incompatible. Dick is never at a loss for words, but even so, I was impressed that his immediate answer showed that he had thought deeply about this question. His answer was this: in a marriage the couple should have shared fundamental principles and complementary characters.

I have to agree. The essence of marriage is the joining of the different to make a greater unity. At its most basic level, this means physically different, a man and a woman, but often also it means different in skills, in personality, and in interests. I give thanks that my wife brings to our marriage many outstanding attributes that I lack. Of course, her shortcomings in the areas of my strength are sometimes terribly aggravating to me! I am sure that some of you who are married can identify there. But it is often in working out those aggravations that we grow most. We are both stronger, better people because of our marriage to a person with complementary character.

And when it comes to bedrock principles—our common Christian faith, and the moral and ethical values which undergird our outlook—we share an almost complete unity.

I think that the idea of shared principles and complementary characters is what I see most clearly in the relationship between science and faith. I have tried to show that science has a distinctive character which lends itself to important but incomplete understanding of the world. Science is different from faith, and as a result, there is sometimes friction between them. But at those points of friction are signs, I believe, not of conflict but of complementarity. What, though, are the shared core principles? I want to mention just two types: first, the belief in truth; and second, the practice of truth.

Faith, Science, and the Postmodern World

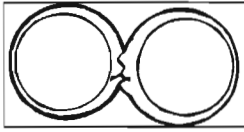
I hope most of you know approximately what I mean in referring to postmodernism.¹³ One can view some of the postmodernist agenda as a justified repudiation of scientism. Unfortunately the baby tends to go out with the bathwater. Whenever someone says "that is true for you," implying that it is not true for them, they are displaying a postmodern spirit. Truth is not universal, the postmodernist says, it is local, or even personal.

Here is revealed, by its contrast with postmodernism, one of the shared fundamental principles of science and the Christian faith. Both believe that there is universal truth. Science says the world is this way, and it is this way there, then, and for that other person, just as it is here, now, and for me. That is a foundational principle of science, the universality of the laws of nature. Christianity very much shares this perspective. "Jesus Christ is the same yesterday, today, and forever" says the writer of the letter to the Hebrews (13:8). Jesus says, "I am the way the truth and the life." St. Paul insists on the objective factual nature of the resurrection when he says:

I delivered to you as of first importance ... that Christ died for our sins in accordance with the scriptures, that he was buried, that he was raised on the third day in accordance with the scriptures, and that he appeared to Cephas, then to the twelve. Then he appeared to more than five hundred brethren at one time ... Then he appeared to James, then to all the apostles (1 Cor. 15:3-13).

These are not seen as local, personal truths. They are universal and in a sense objective.

It should be no surprise that science and Christianity share these principles, because a Christian theological outlook often inspired scientists to think about the world in the way that they did. For example, Faraday, like most of his contemporary scientists, was preoccupied with nature's laws. And he attributes that preoccupation to his Christian perspective. "God has been pleased to work



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in his material creation by laws," he remarked, and "the Creator governs his material works by definite laws resulting from the forces impressed on matter." This is part of the designer's art: "How wonderful is to me the simplicity of nature when we rightly interpret her laws." It was not obvious a priori that consistent laws should govern the natural world, despite the assumption that we tend to make today. For Faraday, God's sovereignty was the basis for his assumption.

Moral Character in Faith and Science

Well, I did not leave enough time to talk in detail about the practice of truth, but let me just outline what I want to get at. There has been much debate and concern in recent years about truth and deception in science. The concern that is voiced about deliberate falsification of data is well justified. Science simply cannot function properly in an atmosphere of suspicion, where we cannot be sure that what a person reports is not deliberately made up. The peer review process that governs scientific publication does not assume that all reports are correct, but it does assume that we do not have to root out deliberate deception.

While I was growing up, this was a topic that was rarely if ever raised. Truthfulness was assumed. I think that was in many ways a legacy from Christianity, from the Christian influence in education and from the norms of society. But today we are seeing that it cannot be assumed that people subscribe to the principle.

So my point is that moral teaching, "thou shalt not bear false witness," is a vital support to the operation of science, which Christianity historically provided, but which today's scientists find, to their dismay, cannot be necessarily assumed. Again, science and faith find they have shared values and principles.

Conclusion

So how may I conclude? There are differences between the ways that science and other disciplines seek knowledge. Science describes the world in so far as it can be described in terms of repeatability and clarity. Not all knowledge is of that type. So science cannot be all the knowledge there is.

Faith is not science, but it can nevertheless be about true knowledge.

I have pointed out that science grew up in the fertile climate of Christian theology, which lent it many of its original motivations and inspired many of its practitioners. Thus it is not stretching the facts of history to suggest that there is a deep sense in which science as we know it is Christian science. During the nineteenth and twentieth centuries, the disappointment of the earlier expectations of immediate convergence and the tactical efforts of the secularizers led to the wide acceptance of a myth: that science is and always has been at war with theology. That myth was associated with the philosophical position of scientism. If there is warfare, it is actually between the competing worldviews of scientism and Christian faith. But while some scientists, and especially science popularizers, do subscribe to and promote scientism, many do not. Among academics, you find more Christians who are scientists than are nonscientists.

And when one views modern science as it really is, rather than through the scientistic lens, one sees much in the fundamentals that is consonant with Christian theology and with the Bible. In many ways in the academy today, science and Christianity have more in common with one another than either does with the swirling fashions of postmodern thought. When I consider science and Christian faith then, what I see is shared principles and complementary characters. For me, the closest analogy to this is wedlock. ♦

Notes

¹This talk from the Redeeming Reason Conference is mostly a compression of my Templeton Lectures, first presented in 2004 at Baylor University.

²A. D. White, *A History of the Warfare of Science with Theology in Christendom* (New York: Appleton, 1896).

³White was careful to draw a distinction between *sectarian theology*, meaning broadly doctrinal or confessional Christian faith which his book condemned, and his own vaguer liberal religiosity, which he regarded as enlightened, but which excluded any requirement of Christian orthodoxy.

⁴I use White here as a representative of the much wider forces at work. These have been treated in detail by George Marsden in *The Soul of the American University* (New York: Oxford University Press, 1994).

⁵Owen Gingerich, *The Book Nobody Read* (New York: Walker, 2004).

⁶John Suppe's talk at the Redeeming Reason meeting is a valuable corrective against too narrow an interpretation of repeatability. He rightly emphasizes that scientific techniques *can* give very important information about the past.

⁷<http://www.fbrt.org.uk/pages/quotes/quotes/quotes-divinity-philosophy.html> has several similar quotes. This quote is cited opposite the title page of Darwin's *Origin of Species* and comes from Bacon's 1605 book, *The Advancement of Learning*.

⁸Jacques Monod, *Chance and Necessity* (New York: Vintage Books, 1972), 21.

⁹Do not misunderstand me. I am not saying there are no miracles that "violate the laws of nature," just that such violation is not necessary for us to identify God's hand at work. And by the way, here is a very important biblical one that seems to be "natural."

¹⁰Robert Wuthnow, *The Struggle for America's Soul* (Grand Rapids, MI: Eerdmanns, 1989), 146.

¹¹A more recent, as yet unpublished, study by Elaine Ecklund, finds a somewhat different spectrum of opinion in answer to different questions, but the point remains that survey data do not support the view that scientists are substantially less religious.

¹²Stanley L. Jaki, *The Road of Science and the Ways to God* (Chicago, IL: University of Chicago Press, 1978).

¹³J. Richard Middleton and Brian J. Walsh, *Truth Is Stranger Than It Used to Be* (Downers Grove, IL: InterVarsity Press, 1995), gives a sympathetic account of postmodernism and a Christian response.

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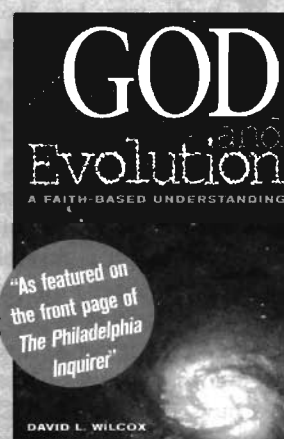
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—from the Introduction

Wilcox's book is a must-read for those who want to reach a point in their faith where they don't have to choose between God and science, but rather recognize God's divine plan in nature. The author, who is a Christian biologist, addresses such topics as the age of the earth and the origins of life, including human life, exploring from a scientist's perspective what we know and how we know it.

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Conference Talk

Integration and Confrontation of Contemporary Worldviews: Evolution and Intelligent Design

Pattle Pun



Pattle Pun

Evolution and Intelligent Design (ID) are two opposing worldviews from which many contemporary intellectuals discuss the issues of origins of life. By evaluating the various Christian views of origins and the weaknesses of the evolution paradigm, an attempt is made to present ID as an alternate paradigm. Possible research programs based on the ID paradigm are proposed.

*I would like
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worldviews.*

Thank you for the opportunity to address such an impressive group of scholars, Christians, and seekers, and to be in the company of such renowned scholars as Dr. Schaefer, Dr. Plantinga and Dr. Hutchinson. Although I am very knowledgeable in science, I cannot claim to be a world renowned scientist. I am doing my science as much as possible to keep up. But at the same time, I am relating my science to my Christian faith daily as a professor of biology at Wheaton College. Wheaton exists for the sole reason of integrating faith and learning, as do other Christian colleges. I would like to discuss with you some of the issues I am trying to tackle and also to introduce the currently hotly debated issue of Intelligent Design (ID). This issue has been portrayed in the media critically and negatively. I would like to put the discussion in a slightly positive spin according to my calling as a scientist and my knowledge in theology. I would like to suggest to us that the issue of ID is not only an issue of science, but also of worldviews.

*Professor of Biology **Pattle Pun** has taught at Wheaton College since 1973. His research, publications, and professional experience focus on microbial and molecular genetics, using primarily bacterial systems. He has recently devoted more time to the studies of genomics. He is also interested in the integration of the Christian faith with professions and obtained a theology degree from Wheaton College. He has had numerous opportunities to address integrative issues in the United States and abroad, most recently in several universities in China. He is actively involved in Sunday School teaching as well as outreach to international students. He has two sons who graduated from Wheaton College, one is on the medical faculty of Duke University and another is a seminarian preparing for pastoral ministry.*

Most of the people who are propagating the evolutionary paradigm have a worldview more amenable to atheism or naturalism. The alternative worldview which Christians espouse stipulates a Creator who created the world and is involved in it. So I would like to suggest that it is a confrontational issue as well as an integration issue for those of us who are Christians.

I will divide my talk into four categories. Firstly, I will discuss the biblical foundation of integration: what is the biblical injunction to be a Christian? Secondly, I will evaluate the various Christian positions on creation and evolution. Thirdly, I will address the philosophical aspect of the issue, namely, methodological naturalism and inference to the best explanation. Fourthly, I will discuss the enigmas of Neo-Darwinian evolution from my perspective as a biologist. Finally, I will suggest what we can do with ID if we accept it as an alternate paradigm.

The Biblical Basis of Integration

In Genesis, we are told that we are created in God's image. One of the meanings of the image of God is that humans are representatives of God to the rest of creation. We are called to multiply, fill, and subdue the earth and to be a steward of God's creation.¹ We are much better at carrying out some aspects of this creation mandate, particularly in China, my ethnic background, and in America also, which just reached the landmark

of 300 million people recently. Unfortunately, as stewards we have not taken care of the earth well with problems of pollution and global warming. In the New Testament, we are also admonished to invest the talents given to us, with rewards for the investors and reprimands for those who do not invest.

We are called to be a steward of God's creation, to be in the world but not of the world, to live a life worthy of our calling, and to recognize that all truth is God's truth ... We have to start with these premises in terms of our biblical bases of integration.

Second, Jesus prayed for his disciples in the upper room because they are *in the world but not of the world*.² There goes the saying that liberals are *in the world and of the world*, conservatives are *not in the world and not of the world*. Evangelicals and Christians, then, should be *in the world but not of the world*. Jesus Christ is *in the world*, as the Word becoming flesh. He is *not of the world*, being sinless and having been conceived by the Holy Spirit and born through a virgin. This is not only true for Jesus Christ but also for Christians. As Christians we are light and salt of the world, to be *in the world but not of the world*. This is the essence of incarnational theology.

We have to live a life worthy of our calling as Paul has admonished us in several of his epistles.³ We are put on a pedestal for the world to see. Unfortunately, some famous evangelicals have sinned and have not lived up to their calling. However, we are supposed to do so as admonished by Paul and Jesus Christ.

Finally, *all truth is God's truth*. Our God is the God of reality. Our God is the God of the philosophers. Our God is the God of the scientists. Our God is the God of the atheists, even though they do not acknowledge him. Our God is the God of creation. All truth if originated from God has to be true. Our God is the God of the miracles of Christ's incarnational birth and resurrection. He is also the God of quantum theories and the big bang. It seems to me that we have to start with these premises in terms of our biblical bases of integration.

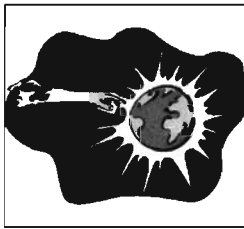
As Christians, we believe in revelation. Revelation is the basic assumption of a theistic, especially a Christian, worldview. We believe in a transcendent God, a Creator that is outside of creation, not part of nature. Yet he is constantly revealing himself to us through the wonders of his creation. In addition, he also sustains it with the Word of his power.⁴ Unfortunately, we have sinned. This biblical injunction of the human condition has been seldom recognized by the scientific world. However, it is the reality for those of us who believe in it. Science cannot lead us to God because the creation has been tainted by human sin. Creation has been brought under the condemnation of human sin. Creation has been groaning for the deliverance with the sons of God. Therefore we have to know God through his special revelation, through Jesus Christ, who has become one with us in his flesh, full of truth and grace. Science can only lead us to know that God is our Creator. Only through Jesus Christ, the Incarnate God, can we know God as our Redeemer. This is the revelational truth that Christians believe. To the rest of the pluralistic world, we may appear as bigots. But fortunately or unfortunately, Jesus Christ is the only one who claims to be the only Way, the only Truth, and the only Life. As Christians, we believe in it and defend it.

Evangelical Views on Creation and/or Evolution

Various Christian views of evolution differ according to the believer's views of revelation and biblical interpretation. The idea of creation as science has been linked to court decisions which struck down state laws that require the teaching of creation or design alongside evolution in public schools because creation is religion and evolution is science. Personally, I do not agree with the legal approach to the debate. Of course, there are various Christian views on the interpretation of biblical creation. Table I is a summary of these views.⁵

Consider first the pre-Adamite theories that include the gap theory in which a gap exists between Gen. 1:1 and 1:2. In Gen. 1:1, God created all of the fossils, which included the early hominids. In Gen. 1:2, God created the recent humans. The pre-Adamite theories also include the two Adams theory. It attempts to avoid all of the conflicts between science and Genesis. However, there is no exegetical justification for inserting a gap between Gen. 1:1 and 1:2.

Most of us are very familiar with the fiat creationist view, which stipulates that God created the world in six 24-hour days, Adam was created 6,000 years ago, the earth is young, and the big bang is a farce and an evolutionist tool that extended the age of the earth to accommodate evolution. In my studies, I find this to be only a minority view amongst evangelical scientists. It accepts a literal interpretation of Genesis to arrive at the young-earth posi-



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tion. However, there are other exegetical principles that allow us to interpret the Genesis days to be more than 24-hour days. For example, Adam waited for a long time to see Eve, so that he proclaimed, "at last this is bone of my bones, flesh of my flesh," (Gen. 2:23, RSV). The Hebrew word here signified a long wait as indicated in other passages in the Old Testament.⁶ It would not have been used here if Adam had waited for only a few minutes in the sixth day when God created a mate for him. Young-earth creationists also accept the apparent age of the earth, that God created the earth around 6,000 years ago although it looks old. This puts God in a very awkward position of lying to the scientist in creation.

A theistic evolutionist position is accepted by most academically active evangelical scientists. They believe in God's using the natural law of natural selection to create humans. It has the strength of stressing God's omnipresence and providence by his actively guiding the evolutionary process to create humans. However, it has the weakness of straining the interpretation of Genesis 2 and 3 in terms of Adam and Eve not being historical figures. They may be symbols representing the human race because populations evolve, not individuals. This view puts a lot of strain on the theology of soteriology, especially as addressed by Romans 5 in

which Jesus Christ is juxtaposed as the second Adam. If the first Adam is not real, then Jesus Christ may not be real and his redemption work for Adam's sin is called into question.

The creation myth theory of neo-orthodoxy stipulates that the creation is a myth. It is not real as we are real. Yet it is a theological myth that is more real than reality, although I do not know what that means. The creation myth idea emphasizes the existential encounter between God and humans in salvation. The historical reality of Jesus Christ is not necessary. Jesus Christ can be found in our encounter of him in our experience. Thus it emphasizes our religious experience divorcing it from natural revelation. Is there not a lack of integration between God's action in history and God's salvation through encounter in this position?

A more recent theory based on hope theology champions the hope of Christ's resurrection. God indwells creation. Humans are both the representative of God to creation and the representative of creation to God. Humans are involved with God in creation as a co-creator. It emphasizes humans as co-regents with God in his creation. The problem with this position is the sacrifice of God's transcendence and sovereignty in creation.

	Premises	Strengths	Weaknesses
The Pre-Adamite Theories	The Gap Theory The Two Adams Theory	Avoid conflict with science (old earth and fossils)	Weak exegetical basis; Unity of human race
Fiat Creationism	Young earth or apparent age, no macroevolution	Accepts a certain literal interpretation of Genesis	Conflicts with well established science (old earth, limited flood); Gaps in biblical chronology; God misled men?
Theistic Evolutionism	God created matter and natural law. Accepts macroevolution and synthetic evolution	God's immanence and omnipresence in providential involvement through evolution	Historicity of the first human parents and the Fall, Figurative interpretation of the First Adam in juxtaposition of Christ, the Second Adam; Evolution is deficient
The "Creation Myth" of Neo-orthodoxy	Myth of creation and existential realities of evil and sin	Existential emphasis of sin and salvation	Lack of integration between God's action in history and God's salvation through encounter
"God in Creation" of the Theology of Hope	Resurrection centered God indwells creation	Human as image of God and image of the world; Human participation in God's creation	God's transcendence and sovereignty
Progressive Creationism	Complementarity between science and Scripture; Accept microevolution; Day Age or Framework	Least conflicts with science; maintain historicity of the first human parents and the Fall	Chronology of creation, i.e. light before stars; Civilization of the early humans

Table I. Christian Views on the Interpretation of Biblical Creation.

The final position is my own, namely, progressive creationism, which I suggest is complementary to science and theology. It accepts microevolution, i.e. gene frequency changes, mutations selected by the environment, and so forth. The interpretation of the Genesis day is day-age or framework, which is borne out by famous theologians such as Henri Blocher, Augustine, and Aquinas. It has the least conflicts with science and maintains the historicity of the first human couple. However, the chronology of creation and civilizations of early humans are still issues to be resolved.

Methodological Naturalism and Inference to the Best Explanation

The next issue that I would like to address is philosophical. I will just introduce these concepts. Methodological Naturalism (MN), according to Plantinga,⁷ is a pragmatic way to be most inclusive of all worldviews in order to cooperate in the pursuit of scientific knowledge. It is the practical idea that excludes the supernaturals. Historically, it is not true that MN is the only way to do science. Newton, Faraday, Maxwell, and Copernicus referred to the Creator in their scientific writings. Copernicus actually saw the sun as an enthroned king ruling over his court of planets in formulating his heliocentric theory. It was only after the Enlightenment that the supernaturals were excluded from science.

Science has been taken as an investigation of nature and there is nothing outside of nature. This was based on a naturalistic worldview. Also, the idea of historical vs. empirical sciences may be important. In historical sciences such as cosmology and organic evolution or the origins of the universe and the origins of life, the worldviews of the scientists play a significant role in the investigation. There will be a clash in the answers given by atheists or theists to these questions. However, in empirical sciences such as DNA analysis and the human genome project, the technology has been so established that scientists with various worldviews could perform the same analysis, i.e. microarray, and come up with similar results independent of their presuppositions. Therefore MN is more relevant and applicable in the empirical sciences. But when we come to historical sciences, the worldviews of the scientists will greatly influence the outcome of the research.

The advocates of ID would like to promote another philosophical idea, the inference to the best explanation (IBE). IBE refers to examining the evidence without any preconceived ideas and let the evidence tell you where it leads. If one believes in a creator, the fine tuning cosmology leads one to the handiworks of the Creator. If one believes in no creator, the same evidence will lead one to the concept of multiple universes in which the big bang only happens in the universe in which we live. It seems to me IBE by itself may be a good scientific tool if one is not

restricted to the naturalistic view. In practical science such as the human genome project, if one is able to use the design paradigm which has been heretofore deemed to be only religious, one may come out with different results. May I suggest that it can be a useful paradigm. I will share with you some of the research I am doing using the design paradigm.

In philosophical sciences such as cosmology, geology, anthropology, and psychology in which origins and morality and human participation may be important, the worldviews of the scientists will play prominent roles in the studies. I would like to suggest that the evolution paradigm dominated biology for over 150 years while any design arguments have been deemed to be religious and thus not scientific. However, in my humble opinion, the Neo-Darwinian paradigm is approaching an end of the tunnel and we do not know whether there is light on the other side. If we are stuck there, we may not be able to make much progress. The ID people would like to bring out the enigmas that plague evolutionists, which are there all the time. They were just ignored. The ID people would like to highlight these issues and try to suggest alternative paradigms for their investigation.

"Enigmas" for Neo-Darwinian Evolution

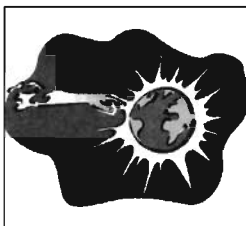
The Mystery of the Origin of Life

In the famous experiment performed by Miller,⁸ he synthesized amino acids by passing an electric discharge, for seven days, through a closed system containing methane, ammonia water, and hydrogen. Porphyrins, important structural components of the photosynthetic and respiratory apparatus of living cells, were also obtained in a similar manner. Adenine, an important base in nucleic acids, was formed by chemical polymerization of hydrogen cyanide and ammonia. Carbohydrates, including the sugar backbones of nucleic acids, were also synthesized by incubating formaldehyde with an inert polar polymer, alumina, in the presence of some naturally occurring minerals.

Compounds, however, were synthesized only when sufficient starting materials were incubated with the right kind and right amount of energy in a *closed* system. On the other hand, in the primordial earth's *open* system without human supervision in which all processes were random, the synthesis of these bio-organic compounds by *chance* alone is extremely improbable. Moreover, the organic compounds synthesized in Miller's experiments were all in a mixture whereas they assume certain chirality in living cells.

Problems of abiogenesis theories which are unresolved today are:

1. Polymerization of chemical monomers does not start new life processes capable of self-reproduction.



The current evolutionary models proposed to account for the origin of fossils and sequence patterns are monophyletic gradualism ... and monophyletic punctualism ... Let me suggest a third model, namely, polyphyletic punctualism, multiple lineages originating at the same time.

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2. A self-reproducing *internal* control characteristic of the cell does not come from the chemical evolution triggered by *external* forces.

3. None of the "selective conditions" for chemical evolution persist in the primordial condition. Darwinian natural selection cannot be applied at the molecular level.

4. Random physiochemical forces operate to decrease the formation and interaction of the complex molecules. Interacting chemical systems reproduce persistently and overcome disruptive changes at very low probability.

5. Self-organization theories do not address the *origin of information* in genetic materials. Darwinian evolution has no explanation.

6. Algorithms have to be pre-existent to select for the emergence of metabolism. A theory developed by biochemist Morowitz and his colleagues (not with the ID camp) accounting for the origin of intermediary metabolism presupposes a pruning or constraining algorithm, which may be physical, chemical, biological, and informational, or a combination thereof.⁹ The thermodynamic constraints thus applied resulted in the selection of 153 organic molecules from *Beilstein*, the most comprehensive encyclopedia of organic chemistry. These molecules contain all eleven members of the most basic network of intermediary metabolism.

By using a technique called global mutagenesis in which a transposon is used to randomly insert itself into various parts of the genome using the smallest cell *mycoplasma*, scientists have discovered that the minimal number of DNA base pairs for a surviving cell to replicate and propagate its information is around 500,000.¹⁰ Human DNA has three billion base pairs. Bill Gates is quoted as saying, "Human DNA is like a computer program but far, far more advanced than any we've ever created." Such information cannot be originated by the random process of natural selection.

Discontinuities of Fossil Record and Molecular Sequence Analysis

Cambrian "Explosion"

The sudden appearance of major animal forms (phyla) in the fossil record during the

Cambrian period of geologic time is called the evolution's big bang in *Time*.¹¹ They were soft body animals which are hard to preserve. They did not appear to be accidents in the fossil. The Darwinian theory would predict the gradual appearance of more complex body plans in the fossils preceded by simpler intermediate forms. However, the fossil shows unicellular organisms such as cyanobacteria around three and one-half billion years ago and then suddenly the Cambrian explosion 530 million years ago, with nothing much appearing in-between. This discontinuity poses a problem for gradualistic evolution.

A new paradigm of punctuated equilibrium was proposed to explain this abrupt phenomenon. However, this paradigm lacks empirically documented mechanisms. Simon Conway Morris, a theist, has published *Life's Solution: Inevitable Humans in a Lonely Universe*,¹² in which he suggests that the fossils evolved with the various body plans to finally bring about humans as a goal. This idea is similar to the fine-tuning model in cosmology—the universe is fine tuned in such a way so that the earth is in the condition to allow life to emerge. The fossils are evolving in accumulating the complexity such that the ultimate appearance of humans is made possible.

Molecular "Strategies" in Biological Evolution

More recently, in the discussion of genome comparison and sequence analysis, a new characterization scheme of three domains instead of the traditional five kingdoms of life has developed. They are the domains of Bacteria, Archaea, and Eukarya. The current discussion in evolution is the search for a universal cellular ancestor. However, the data do not necessarily support the single origin of these domains, but rather three separate cellular origins. I did an analysis myself to investigate the sequence patterns by examining close to 5,000 proteins and thoroughly tracing 250 of them on the basis of similarities by using the search engine BLAST. I found sixty-eight proteins that fulfilled three criteria:

1. Functional for the whole cell. Thus, with very few exceptions, I excluded putative sequences as well as proteins from mitochondria or chloroplasts.

2. Diverse origins. Diverse proteins were selected with at least four species represented in each of the three domains. Gram positive and gram-negative bacteria, plants, and animals were selected when available.

3. High degree of structural similarities. Of the 420 total analyses performed, almost 85% conformed to grouping into three monophyletic domains. Only 5.43% are indistinguishable. The rest distinguishes two but not three of the domains.¹³

The current evolutionary models proposed to account for the origin of fossils and sequence patterns are *monophyletic gradualism*, single origin with a gradualistic appearance of multiple complexity, and *monophyletic punctualism*, single origin with sudden appearance of multiple lineages. Let me suggest a third model, namely, *polyphyletic punctualism*, multiple lineages originating at the same time. This third model may be more consistent with the currently available data. (See Figure 1.)

Lynn Caporale, an evolutionist who is by no means a sympathizer of ID, has recently proposed that there are mechanisms which are being selected in evolution.¹⁴ She suggests that natural selection is not only acting on individual mutations, but also on patterns, such as those in the Cambrian fossil explosions, or on the sequence homologies of the three domains. They are being selected at once. One of these patterns called *homeobox* is found in all cells except bacteria which are not complex enough for this differentiation. Homeobox has similar sequences in all organisms but it regulates different developmental pathways. In fruit flies, it regulates the development of antennae. In mice, it regulates another pathway unrelated to the fruit fly's antenna. Evolution suggests that it is being passed on by natural selection. But the question is what is being passed on? *Homeobox* is a switch that turns on and off certain functions without making any product. Only when a gene makes a product will it be selectively advantageous or selectively disadvantageous. These switches are found in most cells as algorithms which emerge and

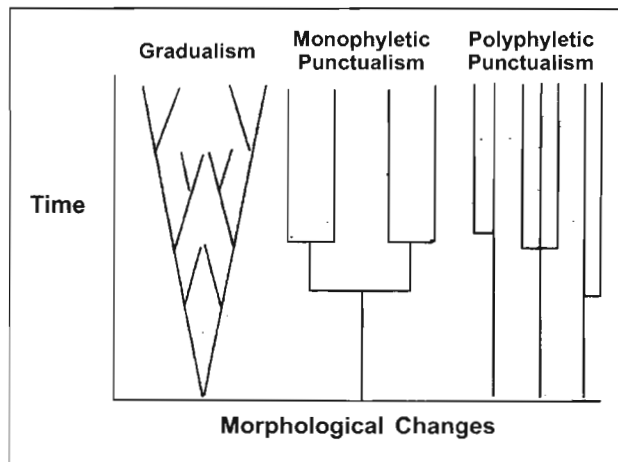


Figure 1. Proposed Evolutionary Models to Account for the Origin of Fossils and Sequence Patterns.

have to be selected as patterns although we do not know how they get there. The ID theorists would suggest that we look for these patterns without worrying about their evolutionary origins. This approach may become more productive in finding other similar genes.

Multiple Point Mutations in Duplicated Genes May Be More Efficient in Microevolution

Some other empirical research, which is informed by the ID paradigm, done by Behe and Snoke suggests that multiple mutations may be more efficient in gene duplication mechanisms in evolution.¹⁵ In other words, instead of the gradualistic accumulation of point mutations, patterns of multiple mutations occurring simultaneously according to the algorithms they developed may be more efficient in protein evolution in this simulation. Patterns have to be present at once before selection can occur.

"Irreducible Complexities" of Biological Systems

The irreducible complexity idea made famous by Behe¹⁶ has been criticized by others such as Miller.¹⁷ It has been said that the components of the flagella system claimed to be unique and irreducibly complex in the flagella can be found in other organisms and used for other functions. However, the point is the corporate integrity of all of these components put together at once to work for the bacteria for chemotaxis. The fact that these components can be used in other organisms for other functions is beside the point. The lack of step by step gradualistic mechanism by natural selection makes the flagella system irreducibly complex. Although there are recent attempts to try to provide such an explanation,¹⁸ they are merely reiterations of the old argument that they were used in other organisms for other functions but were co-opted by the bacteria for chemotaxis. The detailed step by step gradualist mechanism that can be tested experimentally is still missing. In other words, we do not know how the system gets there but it is there.

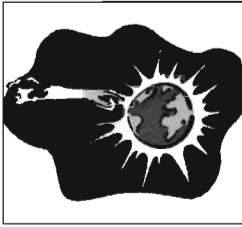
Finally, although I am not necessarily an advocate for ID, I would like to ask you to consider it as a possibility instead of eliminating it as not being a rule of the games. It needs time to develop as a scientific paradigm. First of all, let me clarify four misconceptions:

(1) ID is not primarily an apologetic tool.

What the ID people are saying is that ID is not an apologetic tool for the theologians or creationists to defend the Bible although it is consistent with it. It is a way of looking at the data. They are interested in the pattern, the design, but not necessarily the designer. *The concept of the Designer is a philosophical and theological question. The detection of patterns or design is a scientific question.*

(2) ID is not young-earth creationism.

Although there are young-earth creationists who are among the ID supporters, ID itself is not synonymous



Before we rule out ID as scientific because of its religious overtone [let us] examine

- *Whether its arguments are sound,*
- *Whether its evidence for design is solid,*
- *Whether its critique of materialistic accounts of evolution holds up,*
- *Whether it is developing into a fruitful scientific research program, and*
- *Whether it is convincing to people with no stake in the outcome of this debate.*

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with young-earth creationism. I know of an ID advocate who does not believe in a creator, that is, an atheist who is interested in looking at the design, but not the designers.

(3) ID is not against microevolution.

The microevolution theory, namely, diversification by natural selection, has been amply documented. The fact that we have at least two races in this room is a good illustration. If we are descended from Noah's three sons, they cannot be one white, one yellow, and one black, or else there may be something wrong with Noah's wife. The development of the major human races from one source is well explained by the process of microevolution. Darwin has made a great contribution in proposing the mechanism of natural selection to help us understand species diversification.

(4) ID is not a God-of-the-Gap stopper.

ID is providing an alternate research program to examine available data. It is "methodically developing a line of research about which creationism has been ambivalent."¹⁹ Dembski proposed an explanatory filter which can eliminate phenomena explainable by natural laws or by chance before we can assign patterns such as those I have suggested in the three domains of life. In other words, ID is a research program. It is not a God-of-the-Gap science stopper: "God says it. I believe it. That settles it for me!"

Stephen Meyer, a philosopher of science claimed recently in a controversial paper published in an evolutionary journal:

An experience-based analysis of the causal powers of various explanatory hypotheses suggests purposive or intelligent design as a causally adequate—and perhaps the most causally adequate—explanation for the origin of the complex specified information required to build the Cambrian animals and the novel forms they represent. For this reason, recent scientific interest in the design hypothesis is unlikely to abate as biologists continue to wrestle with the problem of the origination of biological form and the higher taxa.²⁰

(The editor was fired after publishing the article, and it was found by a Congressional

investigation to be a case of religious discrimination because the editor is an Orthodox Christian who is skeptical of Darwinian theory.²¹)

In fact, not only philosophers, but theologians and knowledgeable intellectuals are opposing Darwinian evolution. Over seven hundred scientists, including Dr. Schaefer in our midst today and scientists from the US National Academy of Sciences; the Russian, Hungarian, and Czech National Academies; as well as from universities such as Yale, Princeton, Stanford, MIT, UC Berkeley, UCLA and others, have signed the following statement since its inception in 2001:

A Scientific Dissent From Darwinism

*We are skeptical of claims for the ability of random mutation and natural selection to account for the complexity of life. Careful examination of the evidence for Darwinian theory should be encouraged.*²²

Some Research Projects Using ID Presuppositions

In conclusion, I would like to suggest some research programs that can be followed by using the ID paradigm instead of the evolutionary paradigm.

1. *Possible functions of "junk DNA" in the human genome.* It is interesting that after the sequencing of the human genome was completed, we discovered that we have only 30,000 or fewer genes in our chromosomes while the worm *C. elegans* has 19,000 genes. David was very prophetic in the Old Testament to suggest that we are just like a worm since we have similar numbers of genes. Ninety-five percent of our DNA is categorized as so-called "junk DNA" which is repetitive and to be spliced out as introns. But they may be involved in some sorts of regulatory mechanisms such as alternate splicing. The evolutionary paradigm would suggest they are vestigial sequences which can be eliminated. The ID paradigm would look for useful patterns in these sequences which may prove to be functional. These are different research programs that can produce different research answers.

2. *Nonrandom mechanisms in genomic evolution.* Nonrandom mutations and evolution is a novel and yet very controversial idea.²³

Whether there are some "purposeful" mutations and mechanisms that do not happen at random is being brought up as a research program which is consistent with the ID paradigm.

3. *Endosymbiogenesis of mitochondria and chloroplasts.*²⁴ Chloroplasts and mitochondria are organelles of eukaryotic cells. How do they develop in the first place? They may be considered to be developed from a pattern of symbiosis between a protozoan such as an amoeba engulfing a bacterium without digesting it. The evolution paradigm would predict survival of the fittest. They should have killed each other in order to survive. Somehow they develop as symbiosis. So they may be dependent on each other. This is better explained by the ID paradigm, which suggests the pattern of symbiosis may be pre-existent in the mutually dependent cells for them to evolve together.

4. *Unique gene expression related to particular organisms or species in microarray studies.* Unique gene expression in human chromosomes may be used as diagnostic tools in human diseases. I am personally involved in such a project in collaboration with my former student who is the head of thoracic surgery at Harvard Medical School.²⁵ They have developed a microarray platform for analyzing human gene expression and found patterns of human genes based on the analysis of the genomes of tissues collected from his cancer patients over the years. His laboratory is performing the clinical and experimental studies. Students in my bioinformatics class and research are involved in analyzing the patterns.²⁶ The discovery of these patterns allows us to categorize different kinds of cancer at different stages. This kind of research has diagnostic application, and in some cases, maybe even prognostic and therapeutic applications, if the cancer is discovered early enough.

Therefore, as open-minded intellectuals, let me suggest that before we rule out ID as scientific because of its religious overtone that we examine

- Whether its arguments are sound,
- Whether its evidence for design is solid,
- Whether its critique of materialistic accounts of evolution holds up,
- Whether it is developing into a fruitful scientific research program, and
- Whether it is convincing to people with no stake in the outcome of this debate.²⁷ ♦

Notes

¹Genesis 1:26–28.

²John 17.

³2 Thessalonians 1:11, Ephesians 4:1.

⁴Hebrews 1:2.

⁵P. Pun, "Evolution" in *Evangelical Dictionary of Theology*, 2d ed., ed. Walter A. Elwell (Grand Rapids, MI: Baker, 2001), 415–22.

⁶P. Pun, *Evolution: Nature and Scripture in Conflict?* (Grand Rapids, MI: Zondervan, 1982), 256. Electronic version, copyright © 2002 by Interdisciplinary Biblical Research Institute is available at www.ibri.org/DVD-1/Books/Pun_Evolution/Pun_Contents.htm Last accessed March 6, 2007.

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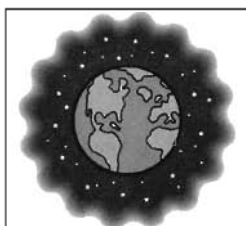
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Conference Talk

Epiphany for a Small Planet: Christology, Astronomy and Mutuality

Alan Padgett



Alan Padgett

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This published lecture builds upon a mutuality model for the relationships between theology and science. The basic idea is that theology and science (natural and social) are colleagues in helping to develop a Christian worldview. Because both use informal reasoning, there are avenues in which they can reasonably influence each other. I also discuss what it means to "redeem reason" since this lecture was originally part of the Redemption of Reason conference. These preliminary moves set up a focused example, drawn from Christology and astronomy. Accepting the view that the cosmos is bio-friendly, and assuming there may well be intelligent life on other planets, I discuss what the implications of this are for Christology. I conclude that we do not need to alter our orthodoxy Christology, but we do need an expanded Christian imagination.

One of my passions as a theologian and someone who loves science is reflection on the current debates and dialog between theology and the sciences. What I propose to do this afternoon is talk about the science and theology relationships from the point of view of Christian thought or from the perspective of Christian theology. I will present a *mutuality model*. This replaces the old medieval idea that theology is the queen of the sciences and the other disciplines are handmaidens. I propose that today we think of theology and science as working together as colleagues. What we are working on together is reforming and developing Christian worldviews that are spiritually deep and scientifically sound. This is an ongoing task, and what I am interested in as a theologian.

Redemption of Reason

The topic for our conference is the redemption of reason. But we have not said that much about what we mean by the redemption of reason. So I thought at the beginning I would address that from my perspective.

After a general discussion, and as an example of this kind of mutuality, I am going to discuss astrobiology and Christology.

Theologians and Christian evangelicals of all kinds are rightly interested in the teachings of Scripture as the Word of God, so we will begin with two verses from the Bible. One that is not so well known is 2 Cor. 10:5 where Paul says in addition to destroying the enemies of God, they are destroying speculation and every lofty thing that is raised up against the knowledge of God, taking every thought captive to the obedience of Christ. That is maybe one metaphor about what it is to redeem reason—to take it out of slavery and bondage. You are buying it out, you are redeeming it, you are liberating it, you are going to bring it from obedience to other powers, other spirits, and other goals and bring it into a Christian perspective. But I think my favorite verse comes from Jesus' teaching about what is the greatest commandment in the whole Old Testament. "Jesus replied, 'Love the Lord your God with all your heart and with all you soul and with all your mind'" (Matt. 22:37, NIV). To love the Lord with your mind is something that any scholar can do.

One of the things I noticed in our conversations over dinner last night is this idea that some people may have a special calling from

Alan G. Padgett is currently the Crosson Fellow at the Center for Philosophy of Religion, University of Notre Dame. He is on sabbatical from Luther Seminary (Minnesota) where he serves as Professor of Systematic Theology. Author and editor of eight books and over seventy-five chapters and articles, he published *Science and the Study of God: A Mutuality Model for Theology and Science* (Eerdmans) in 2003.

God, a "religious vocation." I agree with that but I would just like to remind everyone here that all of us are called by God. All of us have a religious vocation. It is one of the fundamental breakthroughs of the Reformation and the evangelical tradition that all activities are equally spiritual when we do them unto Christ: car mechanic, astronomer, pastor, or theologian. There is nothing more spiritual about being a theologian than there is about being a computer scientist. Both can be spiritual when they are done in the right Spirit, that is, the Holy Spirit. At this conference, we are all academics, we are all interested in the life of the mind, and so we are all called by Christ to do this as a way of being obedient to the greatest commandment. Redeeming reason then begins with these kinds of reflections, recognizing that everything we do, we want to do out of the joy of the Spirit and out of the knowledge of the Father and surrendering to the Word of God, that is, the Living Word, Jesus the Messiah.

To redeem reason is to re-orient the life of the mind toward its proper end or goal, making it obedient to Christ.

Central to the notion of redeeming reason is talking about worldviews. The term "worldview" has been around since Immanuel Kant (the German term is *Weltanschauung*), and the notion in broad terms is something like a philosophy of life. Any adult who can read and write and think is going to have some kind of worldview. The worldview may perhaps be implicit: some picture, some understanding, and some framework of values, meanings and basic concepts that guides his or her action in the world. To be involved in the life of the mind then is to be self-critical about our own worldview. We all have slightly different worldviews but it is possible to broadly classify them in terms of beliefs, traditions, and perspectives. So when we say "Christian worldview," there is really not just one Christian worldview but there are all these different worldviews which we can broadly say are Christian. They are Christian because they are oriented on Jesus Christ, they are founded on the Christian faith, they take divine revelation, Scriptures, seriously, and so forth. We will come back soon to this notion of worldview.

Now to redeem reason is to re-orient the life of the mind toward its proper end or goal, making it obedient to Christ. Part of the purpose of reasoning is to discover the truth, to figure out reality, to know the world and what is real. And of course from a Christian point of view, God is ultimately the source of all reality. So the ultimate

end of reasoning is to come to know God and the things God has made. I am not a Calvinist or Reformed but I do like the beginning of the Westminster Shorter Catechism. The first question is "What is the chief end of man?" (And of course by man, they meant men and women.) So what is the chief end of human existence? The answer is "To know God and enjoy him forever." So the first part of redeeming reason from a biblical, Christian theological point of view is to say we want to orient our reasoning and our rationality not just on any old thing but on the ultimate and proper end, to know God. This does not imply a rejection of knowledge concerning the world, but rather implies putting such world-oriented knowledge in a broader perspective. The ultimate end, the highest goal, in all human knowledge is to recognize and know God by means of knowing all these other things.

Thus we want to see in God and find in God the final ground of all reality, the ground of all being and therefore to understand truth in a way that is not limited to just the natural world, so that there is more to truth than what the scientist can discover. There is spiritual truth, there is moral truth, there is social and historical reality that goes beyond what lab science is able to figure out. In no way does this devalue the scientific method or achievements of science; rather it places it in a proper system of values with Jesus Christ as the center. It does not allow science and technology to be our savior, for we already have one!

There is an important caveat here: by beginning with Christian faith and then seeking understanding, which is one of the mottos of Saint Anselm, *fides quaerens intellectum*, we are not going to be smarter than other people. We ought not to assume or imply that Christians are better musicians, scientists, authors, or computer programmers than non-Christians. That strikes me as intellectual arrogance. Instead, because we know the source of all truth, we understand and know some things beyond what our friends who are not religious or are not Christians can know. We have truth that goes beyond their truth. We have greater access to the whole of reality, which they do not have.

Worldviews: Christian or Materialist

What is necessary then to redeem reason from my perspective is this idea that there is a Christian worldview in which all the disciplines of the academy work together from a Christian perspective to give us a complete and wholistic understanding of reality, including God as the source and ground of truth and reality. It was in the late nineteenth century that Christian thinkers began to appropriate and use this idea of worldview. One was a Scot named James Orr, a very influential Bible scholar, theologian, and editor of the *International Standard Bible Encyclopedia*. He contributed the paper on science and theology to the five volumes, *The Fundamentals*, which is where we get the name fundamentalist. Yet Orr was no fundamentalist.



*We might
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Conference Talk

Epiphany for a Small Planet: Christology, Astronomy and Mutuality

He did not really like a lot of the things that were being taught at Princeton, for example. He gave a series of lectures called *The Christian View of God and the World*. Not only did he use the words “Christian worldview” throughout the whole book but he argues that theology and the sciences need to come together and help us to have an academically respectable Christian worldview. Theology and biblical studies take their place as one of many disciplines.

Probably better known today than James Orr is another Calvinist, Abraham Kuyper. I think he is better known in this area just because of Calvin College and the influence of Dutch reformed thinking on evangelical thought. Kuyper was an amazing individual. He started his own newspaper, he was the prime minister of the Netherlands, and he founded the Free University of Amsterdam where he was the chancellor and a professor. One of his most famous quotations on this topic implies that no single piece of our mental world is to be hermetically sealed off from the rest. “There is not a square inch in the whole domain of our human existence over which Christ as sovereign over all does not cry, ‘Mine.’” What he is saying is there is no world of the university that is sealed off from theology, philosophy, or Christian thought. So there is no science, in other words, that is foreign to Jesus Christ. All sciences can be done from a Christian perspective.

The main alternative to the Christian worldview in the academic world in North America today seems to be *naturalism*. This can also be called materialism or scientific materialism. It is a philosophy—not a science—that claims that all that exists is natural things and phenomena that are wholly dependent upon natural objects. For many who hold to naturalism, science itself provides us with a complete worldview. This is a philosophical position that Christian academics have to question.

We can agree that the sciences are complete in principle, given the domains they have chosen to study. Take biology which studies living organisms on this planet. Now given the domain that biology has chosen to study, it may finally be complete in the area it has chosen to analyze—but there are plenty of questions we have about life that

biology will never answer. There are limits to what biology *per se* is going to be able to do. Even all of the empirical sciences taken together will not discover all the truth that is out there. There is much that we do not know in any of the natural sciences. But even if you think that eventually we might be complete in principle, there are still going to be many things science does not tell us. No, the sciences do not give us the total worldview.

We have to value the principles that go into science, into the practice of science, like telling the truth, even though these principles cannot be proven true by science itself. A major part of scientific materialism is simply scientism, that is, treating science and technology in quasi-religious ways. Two assumptions in scientism are that science will, in the end, tell us all we can actually know, and that the scientific method is the only method by which we can answer genuine questions. We might have many questions that just have no answer and one cannot go there, but scientism claims that any real question that has an actual answer is going to be answered through the scientific method. So it is a scientific worldview that we are standing against as Christian scholars, not science itself.

Mutuality in Theology and Science

I want to reflect a little about the relationship between worldviews and theories and theory choice in the particular sciences, even though science is a lot more than theories. Theory choice is an important part of the rationality in any academic discipline. Theories and theory choice are embedded in what Thomas Kuhn called paradigms. The academic disciplines have these larger paradigms that guide research and help us understand what counts as good work in that discipline. Paradigms themselves are part of a history that I will call a “tradition of inquiry” or an academic discipline. Each of the academic disciplines is a tradition of rational inquiry that is limited and focused. This narrowing of the field of study and approved methods provides power in that you can now focus inquiry in a powerful way. Of course, you are limited in what you can discover, since you have already limited it methodologically.

We should also notice that all rationality is based on tradition. The Enlightenment idea was that there is pure universal reason and that every method, every science, everything that dares to call itself academic has to follow this method. I find that philosophy highly dubious. Part of developing a Christian worldview is to see that this does not make sense philosophically. But then these ideas are themselves grounded in the worldview of *individual* scholars.

The great thing about being in a scientific discipline or in one of the social sciences or in the humanities ... is that you are invested in your discipline of inquiry but you can share it with lots of people with different worldviews.

I want to emphasize the individual because it might look like the disciplines themselves are grounded in a particular worldview—but that is not true. The great thing about being in a scientific discipline or in one of the social sciences or in the humanities like American history is that you are invested in your discipline of inquiry but *you can share it with lots of people with different worldviews*. Of course the worldview may influence the way you look at American history and the way you interpret it but there is this common rationality, this common approach that you can share. This is important for questions like: How do I demonstrate the truth of my theory to my colleagues, say, in astronomy? To drag out the book of Genesis is going to be a mistake because you do not share that data, you do not share that insight with your other colleagues in astronomy. You are going to have to go to what you were trained in during your apprenticeship as a grad student in astronomy and the way that you make an argument in the larger discipline. So worldviews are pluralistic, while disciplines are unifying. At this conference, we have common worldviews as Christians and this brings us unity despite our many different academic specialties. On the other hand, when geologists get together, what unifies them is their tradition. The worldviews that they bring to geology are some of the things that make it interesting and different for them.

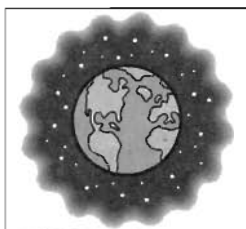
Now I do agree that theory choice and the interpretation of the theories, especially to a broader audience, can only be done by drawing upon larger worldviews or philosophies of life. So when scientists write popular

books about their science they never just do science. They are always doing science plus their own philosophy of life which they draw on to interpret that science. Thus in popularizing books to broad audiences of thinking human beings, there is always a worldview perspective that is being drawn on. That is the place where Christian scholarship comes in. We are going to interpret the results of the science from a Christian point of view. Even if it is not as explicit and obvious in the way we make our arguments, there will be a deep resonance with Christian truth in the way we understand the data and the theories that are currently being developed in our science.

Another way of talking about Christian scholarship is Christian learning. This is a project of interpreting and forwarding all of the arts and sciences on Christian grounds. To do that is not something that we do alone. We need the community of academics who share our Christian perspective. I think it is interesting that in many disciplines, almost all the ones I can think of, there are already Christian organizations of scholars who meet together to forward Christian learning in their disciplines. Many people have already talked about the American Scientific Affiliation, but there are Christians in the visual arts, too. I was just talking to a grad student today doing an MA in history who did not know there was the Conference on Faith and History and a journal called *Fides et Historia* that forwards Christian scholarship in history. There are many other examples, such as the Society of Christian Philosophers or *Christianity and Literature*. Get involved with them. They can help you understand what it means to redeem reason in your own specialties, as part of the great commandment which says to love God with our minds.

Theology as “Science”?

In all of this, then, where is theology? I will give you two meanings of theology: the traditional one is “the study of God.” I like that because the words “*theos*” and “*logos*” mean the study of God. But at places like the University of Chicago Divinity School, which is one of the top spots for the academic study of Christian theology, they would think of theology as “second order academic reflection on faith.” I am going to argue that both of these are correct, to some degree. The root purpose of theology is in seeking to know God and all other creatures as they relate to God. Take one of the great works of theology, *Summa Theologiae* of Thomas Aquinas. The structure of this massive book is from the start of the world leading up to the belief that there has to be a creator; then one studies God and his relationship to creatures, the culmination of which is the Incarnation. Aquinas then teaches us about Christology, the Church, and the sacraments. He stopped writing this when he had a mystical vision of God. He died soon after that. But he would have gone on to talk about the restoration of all things in God and the way that all creation has the ultimate goal to return to God.



Conference Talk

Epiphany for a Small Planet: Christology, Astronomy and Mutuality

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Ecology and ethics are important themes for theology today, and I am very happy to know that Cal DeWitt is here. He is going to help us think about what it means in the present to think about God and creation from a Christian point of view. Theology is interested in all creation – but specifically in creation and all things that are real and exist *as they are related to God*. So it is God's relationship to everything that is specifically theological.

Aquinas says, writing in Latin, that theology is a sacred science, *Sacra Doctrina*, which was a *scientia*, that is, a science or a knowledge. If we were speaking in Greek, we can say, "Well, yes, theology is *episteme*, it's a science." But in modern American English, science really means empirical science, natural science, and especially the physical sciences. Sometimes it means nothing more than a lab science. To that degree, I would have to say theology is not a science, not an empirical study of the natural or the social world. Because Christian theology is founded upon spiritual truth and supernatural revelation, it is, therefore, not a science in the way I think most Americans use the word "science." But it is an academic discipline. It is what the Germans call *Wissenschaft*. I will insist on that but that is only one level of theology. I like to think of theology on at least three levels. One level is the one where we are all living right now. All of you are theologians right now. Everyone in this room is a theologian in that you have a theology that you live out in your everyday life.

A second level of theology is the language of the Church. There is a load of theology in worship, preaching, prayer, and liturgy. In the Methodist tradition, one of the great ways that Methodists have taught theology is through hymns. Charles Wesley wrote over 5,000 hymns and poems. When the Methodists taught the people who could not read, the ordinary coal miners and workers, their theology came through preaching and through the hymnal. Congregational singing was a very Methodist thing to be doing. So there is theology there already. Theology is not done only at the divinity school.

Finally, there is a level of theology that is an academic discipline. It is like a science. It is an academic discipline with a tradition of inquiry, but unlike all of the natural and social sciences, theology has a rationality

which insists on faith in Jesus Christ and the Holy Scripture as the Word of God. Without these things, you do not have Christian theology. What that means is that theology is a kind of worship. I love this quotation from Deodorus found in the four volumes called the *Philokalia*, some writings of the Greek Fathers: "Divine theology brings into harmony the voices of those who praise God's majesty." The idea here is that theology brings together the voices of all the Church as we all think about and pray to God. That is, the heart of Christian theology is praise.

To praise or to worship someone is related to the English word, "worth," to tell the worth of somebody – unlike flattery or marketing where you do not really need to speak the truth about the person. So worship, praying, and truth speaking are connected for Christian theology, understood as a spiritual discipline. This brings us back then to theology as *praxis* because this is lived out in all that we do, including our academic callings and vocations. Really all of you are already theologians in the way you live your lives, in the way you pray, in your spiritual practices, in your teaching, and in your Bible study.

Theology and Science as Colleagues

What about theology versus science? How can they ever work together? The aims and methods of different sciences and disciplines are distinct but theology and science do have some similar methods and approaches. I like to sometimes think of theology as Christian doctrine, the academic discipline called "Dogmatics." I have a very broad conception of the natural sciences as the study of natural things, living and inorganic, according to natural properties and explanation. So theology and science are different. How can they work together if they are so different? They have different approaches, different methods, and a different focus. Yet they work together because the Church needs a Christian worldview on the basis on which they can understand and love God and proclaim the Gospel. This is a task that is ever new. Each generation has to be constantly updating both theology and science in the sense that we are learning new things and have new situations. We need this larger

perspective on truth in order to wisely praise and worship God, to see the mission of the Church, and to live out our obedience to Christ.

There is a direct influence of science upon theology, and vice versa, at the level of presuppositions and at the level of larger interpretation. This is just what we mean when we talk about theology and science being colleagues in the development of a Christian worldview.

One thing that leads to mutuality is the theologian's need for Christian scholars in science. As a theologian, I will never understand all the stuff you guys know about your disciplines. But I need to know enough as a theologian to be aware of what is going on in the sciences so when I talk about the meaning of the Scriptures and theology for our world today, which is a scientific age, I am not talking about something that is completely nonsense. To understand what the world is like and to see how God is related to the world I need to know enough about the world so it does not look like I am a nut when I am talking about God's relationship to creation. In trying to develop a doctrine of creation, for example, it is very important to have some understanding of natural science. But of course no natural science interprets itself. We need Christians who are thoughtful scientists, who can do the interpretation which theologians can rely on. It makes my life a whole lot easier. So I believe that a theologian needs scholarship in the arts and sciences.

On the other hand, it seems to be also true that scholars who are Christians need some theology in their discipline. Someone just asked me how much theology he needs to know. I answered, "How much time do you have?" I do not think any of us need to be experts in other people's disciplines. There are a few examples of people who are, like John Polkinghorne or Arthur Peacocke, but they are very few in number. So we need to depend on what we learn from Christian scholars in other disciplines without pretending to know everything. To be a Christian and to be in chemistry, you are going to want to think about some things in chemistry from a Christian point of view and to that degree you want to know some theology. I do not think you need to become an expert unless you have

a specific calling to retire from your career and take on another one. The Christian disciplines of systematic and moral theology, what I call Christian doctrine, help us to understand, develop, and update core concepts in our Christian worldview. As a theologian, I want to point out that theology is not fixed any more than science is. There are certain core doctrines which define orthodox biblical traditions over the centuries but how we perceive and understand those doctrines has to be updated. The Gospel is not frozen in time. God's Word is always moving forward and being developed, so theology is an ongoing discipline.

Inspired by Bob Russell's chart of the relationships of mutuality between theology and the sciences,¹ I recently constructed the following diagram (Figure 1) at another conference. I reproduce it here because I found this process forced me to think more clearly about my understanding of the multifaceted, mutual connections between theology and the sciences in a Christian worldview.

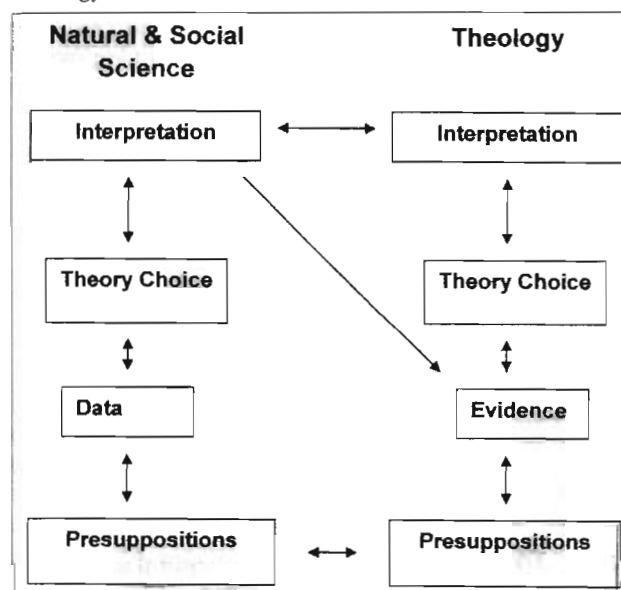


Figure 1. Theology and Science Connections.

It is important to realize that the arrows go both ways in every part of this diagram *with one exception*. It is naive to think that one moves directly from data to theory choice, for example, or from theory choice to the larger interpretation of results in either theology or science. No, these rational connections are more complex, more dialogical and dialectical than the "scientific method" many of us learned in high school. Notice, too, that there is a direct influence of science upon theology, and vice versa, at the level of presuppositions and at the level of larger interpretation. This is just what we mean when we talk about theology and science being colleagues in the development of a Christian worldview. The worldview issues are most obviously at work in the presuppositions and in the larger interpretation of results in any Christian view of the sciences (or of theology, for that matter).



There is
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I think
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We want
to interpret
the world in
a different way.

Conference Talk

Epiphany for a Small Planet: Christology, Astronomy and Mutuality

The only one-way arrow goes from the *interpretation of the results of the sciences* into *evidence for theology*. In other words, what the sciences are telling us about the human and natural worlds provides important evidence for the evaluation of theological constructs (theories). Now this evidence is secondary to that of Scripture and the creeds for any theology centered on Christ and the Word of God, but it is still a vital element in the rationality of Christian theology.

Epiphany for a Small Planet

I have given an overview, and now I would like to give specific examples of the theories I have been talking about. Are we alone in the universe? Here the focus is, on the one hand, on astrobiology and, on the other, on Christology. Is there any mutuality here? Can we learn from each other? How does one shape our thinking about the other? I am calling this section "Epiphany for a Small Planet." After Christmas is Epiphany, the celebration of the fact that God has come to us in history as a human being. God has appeared to us, to be with us. I was giving a lecture at an evangelical Episcopal church in the Twin Cities—I happen to have a deep love for the Church of England and the Anglican liturgy—and as part of the worship service, they had in their prayers:

Grateful as we are for the world we know and the universe beyond our reach, we particularly praise you, who Eternity cannot contain, for coming to earth and entering time in Jesus.

That is a beautiful sentiment about what is wonderful about Epiphany. Here is this vast, incredible universe and this amazing, deep time, the billions of years it had taken for the universe to evolve to the point it is right now. In this whole vast universe, the God who is beyond time and space, Creator of all things, has come to us in person in the womb of Mary. That is amazing news! That is the most amazing event in the history of the universe.

But what about other life forms on other planets. What about SETI? (SETI = the Search for Extra-Terrestrial Intelligence.) What if there is intelligent life on other planets? The background of this, I think, is this long tradition of trying to be stoic about looking at the vastness of the cosmos and the depth of time and the fact that we may be the

only beacon of intelligence in the universe. Maybe the universe is the cold, dark swirl of meaningless matter, and out of the jumble of chaos, the universe happens to cough up you and me. Of course we will die and that will be the end. The sun will super nova or we will run into a black hole and all that we have done will be totally meaningless at that point. There is this dark, stark sense that everything is just meaningless because the cosmos is very big and very old. I think we as Christian thinkers have to respond to that view.

One way we respond is by thinking in a different way about the vastness of the universe and the depth of deep time and asking, "Could it be that the universe is bio-friendly, that there is a kind of purpose that you can detect here, not as a proof, of course, but as an interpretation of the data? Could part of the purpose of the universe be to bring forth life in vast array?" That would be very different from thinking that the universe is this dark, cold material chaos that happened to burp up a few naked apes who are like digital watches, the way that Douglas Adams puts it. I use Stephen Weinberg, too, as an example. He writes: "The more the universe seems comprehensible, the more it seems pointless." This is the kind of worldview I am talking about. As Christians, as scholars and academics, we want to interpret the world in a different way. We cannot let this view of astronomy go without challenge.

Though not as well known, Weinberg's book, *Dreams of a Final Theory*, includes some religion and science. He offers this sentence, "The more we refine our understanding of God to make the concept plausible, the more it seems pointless." Not only is the universe pointless but Weinberg says that "if you're going to believe in a god, it seems like he doesn't do anything—it's all pointless." As a theologian I am going to object to that. I do think there are views of natural science that are not only bio-friendly but Christian friendly. It is not like there is a one-to-one relationship between being Christian and thinking that the universe has the point of bringing forth life, but it does seem to be more in keeping with the overall Christian perspective.

What evidence do we have for a bio-friendly universe? One thing that has changed people's minds in the scientific

community is the fact that there are fine-tuning arguments from cosmology. Also, on this planet we have found amazing life-permitting environments. For instance, miles below the ocean surface, we have found incredible life, far away from the sun, energized by volcanic action, hot water, and minerals spewing forth—and there is life! People begin to say, maybe life is not such a big deal. Maybe the whole structure of the natural universe is set so that life can happen even in some very strange places. The physicist, Freeman Dyson, and the Nobel Prize winning biologist, Christian DeNeuve, have argued that the universe is bio-friendly and therefore life will likely exist in various forms throughout the universe. This is where theology comes into play. Of course, we have absolutely no evidence that there is life anywhere except on this little planet that we happen to inhabit and call home. If we are going to take this other perspective on how big the universe is, how old it is, plus all these chemicals, it just took billions of years to get around to life; what then do we think about Christ? As I put it, Jesus or ET? Which are you going to think about?

For the sake of argument and theological reflection, let us just imagine that there is life on other planets and some kind of intelligent life. What does this mean for theology? I want to give you an example of how science and theology can work with each other. The Christian worldview would want to think in terms of seeing the world and life as one of the purposes of the universe, so that it is not all pointless and meaningless. So what does this tell us about Christology?

At this point, I want to bring back Arthur Peacocke, because in one of his books, *Theology in an Age of Science*, Peacocke argues that the modern scientific world picture is going to radically alter what he calls the traditional Christian paradigm, including the significance of Jesus Christ. What he has in mind is something like this: If there is life on other planets and intelligent beings, how can Christ really be God Incarnate? We would have to think of Christ in the way Muslims think of Mohammed, as the Great Prophet or something like that. But classic Christianity holds that in Jesus Christ, God has come to the world. This is the truth of Epiphany. With Peacocke's suggestion that would have to be suppressed. That light of Epiphany would have to be put under a bushel. I think Peacocke is wrong about that. I do think that, assuming there is life on other planets, we need to enlarge our Christian imagination, our understanding of God, and the role of God in the universe. But this does not require altering our biblical or orthodox faith. It does mean seeing God in a new way, maybe a bigger way than we have before.

Interestingly it is in science fiction that some of this Christian imagination has already taken place. Dr. Hutchinson reminded me of a novel by James Blish, *A Taste of Conscience*. I had forgotten about it. This book explores the

odd relation between religion and life on other planets. Most people know about C. S. Lewis and his trilogy of science fiction books, *Out of the Silent Planet*, and so forth; but you may not know about a new book by Maria Russell, who is a linguist and a social scientist living in the Midwest. She wrote a novel entitled *The Sparrow*, which has been getting a lot of press. The difference is that while Lewis is a deeply Christian writer, Russell, who went to Catholic schools, is very critical of the church in this book. I will not give away the whole story because the book is worth reading. The point is that in science fiction these ideas are often explored. How can theologians just go on and ignore them and just keep doing nothing but, say, biblical exegesis? I think that is a mistake. Theologians often prefer to not speculate too much. There is a lot of speculation that is not helpful but when these ideas come up, we need to have some response.

Assuming there might be life on other planets, the Christian is going to insist that the God we know through Scripture in Jesus Christ is the one true God of the universe ... There is no other God.

The first thing I want to say, then, is that assuming there might be life on other planets, the Christian is going to insist that the God we know through Scripture in Jesus Christ is the one true God of the universe. The blessed Trinity is the one true God. There is no other God. So whatever experience intelligent beings may have on other planets with God, they are going to have an experience that is relevant to them of the One that we know as Father, Son and Holy Spirit. The Creator we know in Jesus is the true God.

The other thing to think about is that science does not matter if you are an infinite Being. Time does not matter either. To God, the world is one week old, one thousand years old, 15 billion years old; the amount of finite time does not matter to an eternal God. Size does not matter either. I know in some things size does matter but in this case, it does not. The fact that the universe is huge is not significant. We tend to think the bigger a thing is the better it is. But it could be that for God a child is more valuable than a super nova. I think we need to get away from the idea that because the universe is very old and very large, it means that our little planet is just an obscure third rock revolving around the sun. That may not be the case.



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imagination,
beyond our
understanding,
beyond our
knowledge.*

Conference Talk

Epiphany for a Small Planet: Christology, Astronomy and Mutuality

God is going to relate to different beings in different ways.

There is no reason to believe that God the Son has to come to every planet incarnate. That does not follow from what we Christians believe. We are going to want to begin with the idea that this infinite God of the universe comes to us as a human in the womb of Mary. I do not think Christian theology as an ecumenical tradition of inquiry is going to give up on Incarnation. We might recognize that this is God's way of dealing with our planet and that God is free to deal in other ways on other planets, in ways that are beyond our imagination, beyond our understanding, beyond our knowledge. The Bible was written by human beings for this planet, even though the writers were inspired by the universal Holy Spirit. This is a serious limitation for what we as theologians can say with any certainty on this topic.

The fact is we do not know how God will deal with intelligent life on other planets. For example, intelligence does not necessarily imply morality. Dolphins are intelligent, chimpanzees are intelligent, and yet they do not make moral decisions. They engage in group bonding and behaviors, including shame and so forth, but that is just not the same thing as the application of ethical principles. Group-think and moral philosophy are not the same.

Another possibility we might think about is this: if there is intelligent life on other planets, they could be vastly more intelligent than we are, so intelligent and spiritually sensitive that it is obvious to them that God exists. On such a supposition, their faith would be radically different from ours. They are so rational and so spiritual that they all grow up knowing that there is a God and always acting in morally proper ways. So they never go through the challenges of sin and redemption that we go through. This is perfectly possible. It could be that we humans fit in a range of beings, in what the medievalist would call "a great chain of being," where some extra-terrestrials are smarter and more spiritual than us, and are never tempted. Others are intelligent but not complex enough for genuine moral consciousness. The point is that we cannot predict how God, the blessed Trinity, will deal with other intelligent life. Already in

classical theology, we have angels and animals, intelligent beings whose relationship with God we can only glimpse at a distance. There is another whole order of beings that God deals with, in a way that we do not know anything about. If this is true, then why do we expect God to be identical in every universe, in every planet that has life?

What I am trying to argue against is this idea that for every planet where there is intelligent life, God is going to be stuck in some kind of incarnation/crucifixion cycle. We do not know that this is true. We know that all of God's actions are and will be fair, just and life-giving. Why do we know this? Because we know the truth of Epiphany; because we know the fact that in Jesus Christ the True Light that enlightens the entire cosmos has come to us to love and redeem our wayward planet. I think that everyone in this room is going to agree with me. We are called to share that Light with the world that is still far too much in darkness. The light of the living *Logos*, God the Son, shines on every discipline, on every human, and on every intelligent being in this vast and beautiful cosmos. ♦

Note

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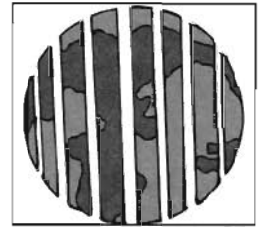
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The Professor and the Pupil: Addressing Secularization and Disciplinary Fragmentation in Academia

Calvin B. DeWitt

Secularization, fragmentation of the disciplines, and reductionism in academia increasingly pose a problem for our ability to understand and to engage responsibly the highly connected world system in which we live and work. The separations that divide disciplines, departments, science and humanities divisions, colleges, and seminaries help establish and perpetuate this problem. Also perpetuating this problem is staffing of our institutions with professors whose training immediately prior to taking their first faculty position has been highly specialized and "focused." They are caught in the disciplinary web that constrains them from rectifying this problem. Moreover this problem is re-enforced by college administrators and academic policy that seeks to give courses and programs for undergraduates that are understood and accepted by graduate and professional schools. Beginning with what I hope is a thought-provoking epigraph, my paper works from the thinking of Michael Polanyi on "irreducibility" to considering the structure and controls of complex systems, and from this develops a consideration of the necessity of holding together – in one integrated system – scientia, ethics, and praxis.

Submerging into molecular biomechanics in a class of six hundred, someone whispers to their neighbor, "How much deeper are we diving today?" Their teacher—decades-removed from a similar but forgotten thought—wonders, "Will I ever resurface in this academic sea?" The first is the repeated whisper of the Student, the second a passing thought of the Professor.

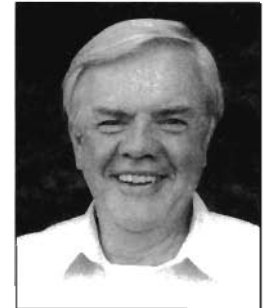
As I write this New Year's morning on the great marsh, the grass beneath the black oak out my study window is turning green, buds are swelling on the shrubs on and around Oak Knoll, and the geese are calling as they move from lake to lake. News reports are filtering into my study from the kitchen proclaiming "peace on earth." It is winter in Wisconsin.

I am reflecting on a talk I gave at the University of Chicago in November 2006 that now is the raw material for my writing today. While I reside this morning on Waubesa Marsh, my work embraces the Nelson Institute seven miles north—where I serve as professor in an institute whose namesake is a fine former Wisconsin governor and US Senator, Gaylord Nelson, a leader

who helped so many Americans support Earth Day and an unprecedented series of comprehensive environmental legislation.

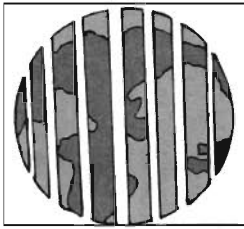
I am celebrating two gifts today that enable and inspire my vocation: first, "The Wisconsin Idea" that has my university view its boundaries as those of the entire state and on to include the whole biosphere;

Cal DeWitt is an environmental scientist at the University of Wisconsin-Madison and member of graduate faculties of Land Resources, Conservation Biology and Sustainable Development, Water Resources Management, and Limnology and Marine Science; is a Fellow of the Teaching Academy and recipient of the Chancellor's Award for Distinguished Teaching. He developed Au Sable Institute as its Director and President from 1979 to 2005. Cal has degrees in biology and zoology from Calvin College (BA) and the University of Michigan (M.A. and Ph.D.). In 2005 he received the National Wildlife Federation's "Connie" Award for his work in bridging environmental science and ethics.



Calvin B. DeWitt

Why is
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that level.*

Conference Talk

The Professor and the Pupil:

Addressing Secularization and Disciplinary Fragmentation in Academia

and second, Chancellor H. Edwin Young's creation of a blue ribbon task force in the late 1960s to correct the "fragmentation of the academic disciplines" – the academic disintegration that has been developing as universities become increasingly reductionist. As I began my work at Wisconsin, the first of these gifts gave me the freedom to serve the environment and society – across a wide geographic, ethical, and religious range. The second – one that produced the Nelson Institute in 1970 – was my appointment to the University of Wisconsin-Madison faculty in 1972 without a department. This second gift gave me the commission to address "disciplinary fragmentation" and – using the new Institute's integrative theme of "the environment" – I joined with colleagues in 1972 to help put the disciplinary pieces back together again.

As I reflect on my experience at Chicago and the "The Redemption of Reason" conference to which I contributed, I bring to mind its two stated purposes: (1) to address the problem of secularization in academia, and (2) to report on practical examples of how we can deal with this problem. Stimulated earlier by a provocative 1968 essay on secularization by Dallas Willard – as was a conference in 2005 where the first question had largely been addressed and extended – the focus of the 2006 conference was on the second question, enlarged to incorporate disciplinary fragmentation and reductionism. This defines the content of this paper, and it raises the fundamental question: Why is it vital to bring the disciplines together into an integrative framework; why is defragmentation important and necessary?

The answer clearly has something to do about fulfilling one's vocation. No one who has set out to pursue the Ph.D. has done so merely to "get a job." There is a higher purpose – a purpose that can be lost in the busyness of a vocation-less occupation. In achieving this higher purpose – as one commences from receiving the Ph.D. and its narrowed and highly focused work – there is a kind of redemption needed, a kind of "buying back" of one's life and work to assure that it is dedicated to one's calling, one's vocation. Such redemption is not abandonment of what one has gained in graduate study and research; instead, it is a re-purchase of a real and full-orbed life,

made worthy by doing grateful work and pursuing effective service. Beyond our question's dealing with vocation as this might classically be defined, it goes beyond it to working thoughtfully within the constraints and opportunities of our 8000-mile diameter planet and our sensitive sharing of its life and integrity with each other and the rest of creation. And, speaking of vocation, it also has to do with the whisper of a student immersed in reductionism and the fleeting thoughts of a professor who is delving deeply ...

Life's Irreducible Structure

In proceeding to address our problem of secularization, fragmentation of the disciplines, and reductionism in academia, it would be helpful to call in an authority whose work might help us understand the nature of our problem and this fundamental question. For this, I think of Michael Polanyi and particularly his "Life's Irreducible Structure" published in 1968 in *Science*. Polanyi (1891–1976) earned a doctorate in physical chemistry from the University of Budapest in 1917, moving to Germany's Kaiser Wilhelm Institute for Fiber Chemistry in Berlin, and next to the University of Manchester in England as professor of physical chemistry. At Manchester he extended his work into social science and philosophy and accordingly was appointed Professor of Social Sciences at Manchester (1948–1958).¹

In "Life's Irreducible Structure," Polanyi thoughtfully reflects on the structure of life, finding in the hierarchy of living things – from the sub-cellular level to tissues, organisms, ecosystems, and beyond – that any level being investigated has two sets of controls: one within that level and another above that level. This "dual control" means that living cells, for example, have their own internal controls that in many ways make them what they are. But the same cells also are controlled by the particular tissue of which they are part; they are typically constrained from being anything other than what the cells in that particular tissue are and do. Similarly at the next higher level, tissues, with their own internal controls, are controlled by the organ of which they are part, and so up the hierarchy to organisms,

biotic communities, ecosystems, the biosphere, the solar system, and beyond.

Polanyi's insight here is important in addressing our problem and question because when we reduce our study to very small levels, without considering the controlling levels above, it is necessarily "reduced." Such "reduction" is done as a matter of convenience and of "focus" and intentionally sets aside the controls that operate at one or more levels above it. It is a convenient "fragmentation" that allows for gaining deeper and deeper insights into the internal controls operating within a specific level in the structure of life. Such fragmentation, however, also leads to fragmentation of knowledge into disciplines that are increasingly narrow in their scope, so much so that we may become unable to ask the big questions. The big questions—questions that depend upon higher levels of control—have been disconnected, and reductionism and secularization result. This process can go so far that the fragments under study—now deprived of their relationships to one another—may even be assigned to different schools and colleges, and separated institutionally between universities and seminaries.

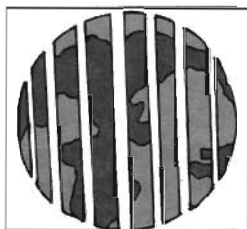
Polanyi's insight ... is important in addressing our problem and question because when we reduce our study to very small levels, without considering the controlling levels above, it is necessarily "reduced."

I recall reading in the late 1960s an article by Albert Szent-Györgi, a scientist I very much admired because of his great breadth of knowledge and methods of discovery. His was an illuminating contribution to recognizing scientific reductionism in the context of life's "irreducibility." Szent-Györgi is another Hungarian-born scientist² and a Nobel Laureate who, reflecting on fifty years as a researcher, wrote in *Perspectives in Biology and Medicine* how he went into biology because of his excitement and wonder for life, but came late in his career to discover—after he had descended the levels of complexity to the molecular biomechanics of glycerinated rabbit psoas muscles—that he had lost life in the process. He wrote in 1966 that he was working to climb back up the ladder he had descended, in order to discover life once again—the vibrant life that had so much attracted him to a vocation in science.³

Both Polanyi and Szent-Györgi contribute to helping us address our problem and question. What they help us to see is that "diving deeper"—through the series of levels each with their successively smaller components—results in the loss of our consideration of the properties and characteristics of the higher levels. Well before life is lost in this descent, moreover, even higher levels of control—for example, the things that hold systems of living things together such as social constructs and trophic relations—are also lost. So too are the things that hold human societies together such as ethics, justice, and common endeavor. And this, of course, is where secularization comes in. If secularization is defined as separation of the ethical and spiritual from the rest of knowledge, then confining our attention below the ethical and spiritual levels will find that ethics and spirituality are lost in our descent.

In bringing these contributions of Polanyi and Szent-Györgi into the context of our problem and question, I find it interesting and helpful to use the human foot as a heuristic metaphor. When looking at the structure of the foot, one might first recognize that it ceases to be a foot as soon as it is disaggregated. As a functioning foot, it has various sets of components that include bones, ligaments, and muscles. Its inflexible components (heel bone, metatarsal bones, etc.) are bound together by slightly more flexible components (ligaments) both of which are made interactively dynamic by contractile components (muscles). While the set of inflexible components (bones) have their own internal controls (nourishment of the bone tissue, etc.) they are integrated by a set of somewhat more flexible components (whose internal controls provide strength with limited flexibility) and by a set of contractile components that bind and dynamically connect the least flexible components together (whose internal controls nourish and energize the constituent actin and myosin of their muscle fibers). The connecting components (ligaments and muscles) thereby contribute to providing the capacity of the system (the foot) to bring all components under the control and thereby behave in concert. The foot, made up of these three (and other) parts, controls its components within limits that allow the foot to maintain its structural and functional integrity. And the foot in turn is controlled by the higher systems above.⁴

To continue with this metaphor, we know that the ligaments can be frayed, torn, and broken. (This may happen when the controls of the level above the foot are violated, as may occur in some sports events, for example.) When connections between components are broken, fragmentation of the higher system (the foot) results, and the system is restored to full structural and functional status only when the dissociated components are re-ligated (the ligaments are restored)—the process to which we can give the name, "re-ligation" or "defragmentation."⁵ In unpacking this metaphor, it is worthwhile to note that any member of the sets of bones, ligaments, and muscles must be of such



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Conference Talk

The Professor and the Pupil:

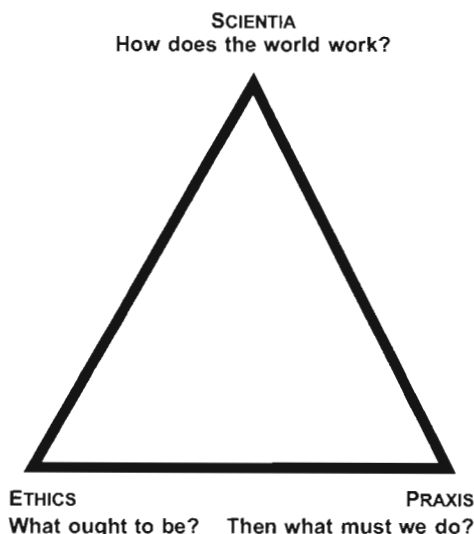
Addressing Secularization and Disciplinary Fragmentation in Academia

form, shape, strength, and function that it is *complementary* to all the other components of the system. Such *complementarity* is basic to the *integrity* of the system. And integrity here means very much what is suggested by its root word *integer*—an indivisible system that only fully is a system when it is whole.⁶ It is this integral system that conceivably could be called “the ligament-heel bone-metatarsal system” or “L-H-M Triad.”

With this metaphor as a prologue, I would now like to propose that—in the secularization, disciplinary fragmentation, and reductionism of the academy and the broader society—*scientia*, ethics, and praxis have been largely disconnected from each other. I propose that this comes from the academy’s descent down the cascade of systems and subsystems and their controls, and that the connections between *scientia*, ethics, and praxis have been frayed, torn, and broken. Reconnecting these appears to be requisite for right living and restoring right living on earth.

A Framework for Right Living and Restoring Right Living

The interactive engagement of *scientia*, ethics, and praxis that is basic for shaping and reshaping human behavior in the direction of right living and restoring right living on earth can be depicted as follows:



I propose, in the interest of nonreductionist integrity, that the questions at each corner

of this triad framework must be addressed interactively and coherently to understand what sustains, degrades, and restores a system at any level in the hierarchy of life’s and the world’s structure, and are basic to understanding right living on earth.⁷

Scientia

Knowledge and understanding of how the world works, as one of the three corners of the triad, requires a kind of “reading” of the “text” of the world system comprising the earth and earth’s biosphere,⁸ or reading and reciting texts that are written about it. *Scientia* includes what we call *natural science* but goes beyond this to include what we learn in social sciences and humanities, and beyond this again to whatever other things human beings learn from living in the biosphere. *Scientia* is the body of knowledge whose elements we strive to make *coherent* within this body and with the ways things are in the operations of the earth and the biosphere.

To do this in my course in Environmental Science, I present a series of thirty-five to forty-five models and representations of the components of the world, ranging from molecules to the biosphere. These models are given and studied in the form of images, equations, figures, diagrams, maps, verbal descriptions, and more. Each is described so that it not only can be mentally grasped in itself but also has the right “handles,” “connection sites,” or “coupling points” by which it can be connected and related with the other components of the system. My aim is to build coherently from the individual components on to sets of components that interconnect with each other, and on to the point where the full system is described—in this case, the biosphere.

Important here is the well-understood practice in the natural sciences, that each of these component models, and the ultimate system of interconnected models, necessarily are abstractions. None of the models is an exact representation (replica). Such abstraction not only makes each understandable and their assembly possible, it also makes the system of models useful in developing an understanding of how the world works. The goal is to provide, as best can be achieved, a means for representing our knowledge of the world as an undivided

whole, without fragmentation. This then becomes the “scientia part” of developing a scientific, ethical, and practical world and life view.

Ethics

Knowledge and understanding of what ought to be with respect to human actions in the biosphere requires reading of the “text” of the biosphere together and coherently with the written and oral ethical texts that have stood the test of history. From this we may come to realize, for example, that human activity which poisons food supplies, human behavior that renders homes uninhabitable, or human practices that destroy the regenerative capacity of forests ought not to be. The culture that incorporates into itself a system of beliefs about what ought to be and what ought not to be—its *ethos*—develops a corresponding body of ethical knowledge—its *ethic*. This ethical knowledge is passed from generation to generation through oral traditions and written texts as the gift derived from long-standing beholders and intentional and unintentional experimenters and participants interacting with each other and with and within the biosphere. The body of this knowledge is *ethics*.

In helping to discover this body of knowledge in my teaching, I begin with academic ethics and review some of its content, including such things as doing our own work on exams and reports, not representing the work of others as our own, maintaining a decorum in the classroom conducive to and not disruptive of teaching and learning, and respecting the rights and privileges of other members of the class. I then utilize an environmental science textbook to help my students understand the ethical underpinning from which it is developed, leading them, for example, to understand that the chapter on air pollution is not only scientifically and socially interesting but is ethically based and ethically motivated—and similarly for other chapters like those on biodiversity, the world climate system, toxicology, etc. In selecting the textbook for this ethical analysis, there of course is the need to assure that the text represents well our current understanding and is rooted as deeply as possible in the primary refereed literature and reliable sources based upon this literature. In putting the undergirding ethics of such a textbook into perspective, I distinguish between the primary refereed literature, the secondary gray literature, and the popular literature as sources of knowledge and understanding.

The underlying ethics are made explicit. For example, from a chapter on air pollution, I might make explicit the underlying ethic that such pollution ought not to be, that it ought not to be above certain levels, or that it should not be allowed at levels that sicken, maim, or kill people. Similarly, if the text deals with soil erosion, including gully erosion, sheet erosion, and raindrop erosion, the underlying ethic might be that erosion ought not to be or ought not to exceed certain levels. A chapter on biodiversity may

have as its underlying ethic that extinction ought not to be or that extinction ought not to exceed “background extinction rates.” This “mining” with an entire textbook for its undergirding ethics can be used to produce a summary. Or, if this is the text being used for a course being taught, the underlying ethics need only be recognized as being present even if not made explicit.

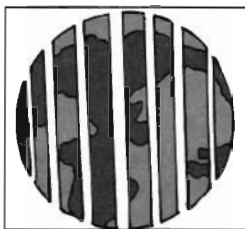
Praxis

The actions of human beings in the world, or *practice*, derive from a body of knowledge of how things can be accomplished and are being accomplished in the world. *Praxis* incorporates both this practice and the body of practical knowledge and understanding upon which it depends. *Praxis* is informed by tradition, scientia, and ethics. In turn, praxis informs science on what more we need to know about the world, and ethics informs us on what more we need to consider on “what ought to be” before we act in the world.

Praxis informs science on what more we need to know about the world, and ethics informs us on what more we need to consider on “what ought to be” before we act in the world.

Praxis, in its most robust and rich sense, flows from the fullest understanding of scientia and ethics, and is controlled by the interactions and interrelationships among all three corners of the triad. With these sources of knowledge, and the overarching control of the three interacting, praxis directs human actions in the world toward shaping and reshaping human behavior in the direction of right living and restoring right living on earth. One term that can be applied to actions that come from such informed and controlled praxis is *stewardship*. But it should be noted that it need not have this or any other name. In my own tradition, I found it interesting that one of my professors described our religion not as something that was merely believed, but as *a way of life*. He was using this concept of religion in a way that accords with the idea of dynamic ligation and re-ligation of scientia, ethics, and praxis.

So, whatever we may call this system of interactive dynamic relations among scientia, ethics, and praxis—re-ligation, religion, the SEP Triad, or whatever—right living and spreading right living require that all three interact, each informing the others. All three need to be



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a platform
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held together interactively. If they are “reduced,” for example, to two of the corners of the triad, there may be serious consequences. For example, if a two-component *scientia to praxis* path is taken, bypassing ethics, to proceed from scientific knowledge of rivers and electricity to the construction of hydroelectric dams, serious consequences may result such as severely reduced soil fertility due to exclusion of riverine sedimentary deposits from river flood plains, stoppage of nutrient input to a downstream estuary and its fishery, or flooding of homes and habitations. If a two-component *ethics to praxis* path is taken, bypassing *scientia*, to move directly from ethical concerns about year-round water supplies to the drilling of tube wells, serious consequences may result such as converting nomads into sedentary people whose permanent residence in one place may deplete grazing resources, firewood supplies, biodiversity, and habitat availability.

Right Living and Spreading Right Living

I have three suppositions that relate to science, ethics, and praxis that I now present for heuristic purposes. The first is that very few would object to a broad goal of education being the promotion of right living and the spreading of right living. A second is that very few might object to the need for maintaining a system of dynamic interrelationship among *scientia*, ethics, and praxis. And a third supposition is that many might object to bringing religion into consideration here. These suppositions are heuristic in the sense that they raise some fears and concerns about religion—many or all of which are well founded based as they might be upon knowledge of religious history and interreligious warfare. However, since this paper deals with secularization—defined here as the separation of the ethical and spiritual from the rest of knowledge—and since ethics and spirituality are very much related to religion and religions, we do have to consider what we mean by *religion* and how we understand it.

As Polanyi helped us at an earlier point in this paper, Huston Smith, a pre-eminent scholar of world religions, I believe, can help us here in gaining insight into understand-

ing religion and its importance for finding how rightly to live on earth. After concluding that science cannot provide counsel “concerning things that matter most,” and that not all contents of the great wisdom traditions are “enduringly wise,” he passes “a strainer through the world’s religions” in order “to lift out their conclusions about reality and how life should be lived.” His sifting and winnowing to find the “enduringly wise” wisdom of the human race finds three realms: *ethics*, *virtues*, and *vision*, whose content he gives as follows:

Ethics. This addresses what we ought (and ought not) to do. Smith finds that the Hebraic Decalogue “pretty much tells the cross-cultural story” for this realm.

Virtues. This addresses “the kind of people we should strive to become.” Smith finds basically three virtues: “humility, charity, and veracity” where:

Humility is “the capacity to regard oneself in the company of others as one, but not more than one”;

Charity is “to regard one’s neighbor as likewise one, as fully as oneself”;

Veracity is truth telling that extends beyond the minimum “to sublime objectivity, the capacity to see things exactly as they are ...” To live authentically, we must conform our lives to the way things are, in accord with the way that things actually work in the creation and the cosmos.

Vision. This addresses “the ultimate character of things” as rendered by the wisdom traditions. The “highest common denominator of the wisdom traditions’ reports” makes three claims about reality: “Things are more integrated than they seem, they are better than they seem, and they are more mysterious—more awe-inspiring—than they seem ...”

Smith views these three realms—*ethics*, *virtues*, and *vision*—as a baseline of the wisdom tradition that forms a platform for life. This tradition brings people to “a particular kind of joy, the prospect of a happy ending that blossoms from necessarily painful beginnings ...” and it holds out “the promise of human difficulties embraced and overcome ...”

Smith summarizes his findings by inviting us to imagine that we are viewing a tapestry from its underside and see there a maze of variously colored threads in patterns from which we can only infer the beauty of the other side. The wisdom traditions are our "most prolonged and serious attempts to infer from the maze on this side of the tapestry the pattern ... on its right side ..." Smith concludes that this brings meaning to the whole, "paves the way for a higher power"—the power of love. Love is "the only power that can quench the flames of fear, suspicion, and prejudice ..." Love can "provide the means by which the people of this small but precious Earth can become one with another."

This brings us to Wayne C. Booth, the late distinguished Emeritus Professor of English Language and Literature at the University of Chicago—from whom I have borrowed the phrases "right living" and "spreading right living." These phrases he uses in his definition of religion, which he gives as follows:

Religion is the passion, or the desire, both to live right—not just to live but to live *right*—and to *spread* right living, both desires *conceived as responses* to some sort of cosmic demand—that is, to a demand made to us by the *way things are*, by the way the world is, by the nature of Nature (as some would say) or by God himself (as explicitly religious people put it).⁹

Remarkable here is the presence of the three corners of our triad, each of them complementary to the other two: the *way things are* (scientia), the desire to *live right* (ethics), and to *spread right living* (praxis). Therefore, *within* religion—as Booth defines it—we find the need both for scientia and ethics, each completing the other, enabling us to understand and perform right action, *praxis*, in the world.¹⁰

If at this point we reflect on the metaphor from podiatry I have used above, we can ask, "Why not call a foot a foot?" And we also can ask, "Why not call the re-ligation of scientia, ethics, and praxis religion?"

Professing Professors

Whether or not we think of religion in this manner, we can proceed to ask how people committed to right living and spreading right living might pursue their life and work. Or, putting this differently, we can now ask how professors who are committed to professing from an integrative framework of interconnected and interacting scientia, ethics, and praxis might do so—in their courses, their lives, and their landscapes.

An interview with my daughter after her being a student both at a liberal arts college and a large research university is helpful in introducing this subject. I had asked, "At what school did you have the best teaching?"

While I thought I knew the answer, hers was wholly unexpected. Surprised that she identified the best teaching with the research university, I asked her why. "Dad," she replied, "the professors at the university were so in love with their subject, so engaged with it, that they just had to tell! The professors at the college were great, but they mainly just told you what you had to know."

A professor committed to the re-ligation of scientia, ethics, and praxis in academia will not only ascend the full scale of controls within which his or her research resides, but will make cross-connections at various points in this hierarchy of controls.

While professors may well have followed a reductionist path in their graduate research, and may continue to do so in research universities and colleges, they also live lives that are more comprehensive—lives from which they have full potential to profess beyond the confines of their research. While this does not mean that any one of us should jettison reductionist research, it does mean always putting this research into the context of the hierarchy of levels above it. Such as is done in a professor's wider life—a professor committed to the re-ligation of scientia, ethics, and praxis in academia will not only ascend the full scale of controls within which his or her research resides, but will make cross-connections at various points in this hierarchy of controls. A professor so committed might find it necessary to ascend to the highest control imaginable in this hierarchy. (All of us are professors, of course, no matter what our "profession.")

In so professing, we not only manifest the driving curiosity and vital passion for learning of our particular subject matter, but also our driving curiosity and vital passion for putting this into the context of how the world works and what to do with that knowledge—as it is directed toward right living and the spreading of right living. Professors may well expect that students may "catch" the spirit of such professing, be inspired to pursue knowledge with curiosity and passion, and be motivated in right living.



*"Daring to do
our duty"
with "faith
that right
makes might"
and ever
encouraging
"that continual
and fearless
sifting and
winnowing
by which
alone
the truth
can be found"
is at the
heartbeat
of the
university
in its mission
to the universe.*

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Enabling Students and Colleagues

As we engage in our search for ways to achieve "de-fragmentation" and "de-secularization" in the various ways we profess and publish in our lives and landscapes, we can find and utilize approaches that make this search a fruitful one. My personal search has produced four "enabling approaches" that are but a few of many. These are approaches through which I invite my students to participate with me in developing awe and wonder, in nurturing curiosity, and in fueling passion.

1. Open up the university of the creation to life-long learning.

This enabling work brings students into marshes and prairies, cities and countryside, landfill sites and power plants, and wherever we can be brought to develop our curiosity and understanding by direct study and experience. This enabling approach is not only designed to open up this "university," but to keep it open throughout our lives.

2. Provide authentic opportunity for developing awe and wonder.

Entrance into the natural world can enable students to develop awe and wonder for the creation. With development of awe and wonder as the primary purpose of this enabling approach, care is taken not to allow taxonomy, systematization, and objectification to stand in the way of achieving joy and appreciating the wonder of creation. Contemplation, beholding, listening, taking the time—all of these are important in achieving this.

3. Serve the college and university vocationally.

Joining in doing the work of the college and university in a "non-reward" mode is important for contributing positively to the institution, including having it address the problems of disciplinary fragmentation and reductionism. In this, professing professors can model leadership that works to put and keep the three parts of the triad together.

4. Provide continuing opportunity for discussing any and all things.

Following through on the generation of joy, curiosity, and passion needs to be fostered so that it will set root and grow. This can be

arranged, for example, by having something like a "coffee hour" after every lecture—at a convenient and comfortable place to be—in a relaxed atmosphere of friendliness and hospitality.

Daring to Do Our Duty

At the top of the hill at the University of Wisconsin is Bascom Hall—named, like the hill, after its early Puritan president, John Bascom. Centered in front of this building is a statue of Abraham Lincoln, behind which is the large arc of a great stone bench with a message on its massive backrest. It says, "Let us have faith that right makes might and in that faith dare to do our duty."

It is carved in stone.

It joins another message on a plaque on the front face of Bascom Hall:

"WHATEVER MAY BE THE LIMITATIONS WHICH TRAMMEL INQUIRY ELSEWHERE, WE BELIEVE THAT THE GREAT STATE UNIVERSITY OF WISCONSIN SHOULD EVER ENCOURAGE THAT CONTINUAL AND FEARLESS SIFTING AND WINNOWING BY WHICH ALONE THE TRUTH CAN BE FOUND." (TAKEN FROM A REPORT OF THE U.W. BOARD OF REGENTS IN 1894)

MEMORIAL, CLASS OF 1910.

It is cast in bronze.

"Daring to do our duty" with "faith that right makes might" and ever encouraging "that continual and fearless sifting and winnowing by which alone the truth can be found" is at the heartbeat of the university in its mission to the universe.

What we have cast in bronze and carved in stone not only here, but at many of our educational institutions, are messages that bring us from our reductionist burrows and raise us above the surface where once again we can see the broad and wonderful context within which we do the work of our life—the context of the whole creation, and this within the context of what oversees all of it, Love.

Having descended down the cascade of systems and subsystems and their control

by the systems above them, time must be taken and effort put forth to “buy back one’s life and work to assure it is dedicated to one’s calling.” Huston Smith’s sifting and winnowing to find the “enduringly wise” wisdom of the human race can be one path to lead us in a “redemption of reason” to consider *ethics*, *virtues*, and *vision*. Wayne C. Booth can provide a path also in his defining religion as “the passion, or the desire, both to live right—not just to live but to live *right*—and to *spread* right living ...”

[These] messages ... bring us from our reductionist burrows and rise us above the surface where once again we can see the broad and wonderful context within which we do the work of our life—the context of the whole creation, and this within the context of what oversees all of it, Love.

Following these paths, we might “redeem reason” not only by what we profess in our classrooms and publish in our professional journals, but also by what we profess and publish in our lives and landscapes. In so professing, we would inspire driving curiosity and vital passion for learning in those whose lives we affect, including our children and students who might well “catch” the spirit of such professing, be inspired to pursue knowledge with curiosity and passion, and be motivated to live rightly on earth. Even perhaps praying, “Thy Kingdom come, Thy will be done, on earth ...”

It is February now, and winter appears finally to have come to Wisconsin, as snow covers the landscape and the temperature is -20°F. Yesterday, at Geneva Campus Church, Prof. James Bockheim said that daytime temperatures at his research site in Antarctica were 10–15°C (50–59°F) and water is flowing and rushing everywhere. “Warmest January in thirty years,” said Jim. It is summer in Antarctica. When writing the first of this paper back on January 1, the temperature had risen to 48°F and I had moved my South African *Clivia* outside to help induce flowering. Inside a radio caller’s voice had drifted into my study from the kitchen saying something about “moving forward.” Forward! That is a good idea for January 1 and for every day. ♦

Notes

¹Among Michael Polanyi’s other works is the book, *Science, Faith, and Society* (1946). His brother was the economist, Karl Polanyi, and his son, John C. Polanyi, won the Nobel Prize in chemistry in 1986.

²Albert Szent-Györgi discovered vitamin C and the proteins actin and myosin and their operation of muscle contraction. He was born in Budapest in 1893 and received the Nobel Prize in physiology or medicine in 1937.

³Albert Szent-Györgi, “In Search of Simplicity and Generalizations (50 years Poaching in Science)” in *Current Aspects of Biochemical Energetics*, Fritz Lipmann dedicatory volume, ed. N. O. Kaplan, and E. P. Kennedy (New York: Academic Press, 1966), 63–75.

⁴This description can be re-written without reference to the foot and its components, as follows: One or more sets of components are held together with one or more sets of connecting components. While the components of each of these sets have their own internal controls, they are integrated within the higher system of which they are part and are controlled by that higher system. The higher level system controls the behavior of its component parts within limits that allow for the higher system to maintain its structural and functional integrity as it in turn is controlled by the higher systems of which it is part.

⁵Of additional interest here is that the heel bone of the foot is connected to the metatarsal bones, but only indirectly. What this tells us is that the system (the foot) depends upon ligation (and re-ligation) of components that may not be contiguous but yet are part of the whole.

⁶*Complement*, from which the word *complementarity* is derived, means “to make whole, to fulfill, to complete.” A *complement* is “something which, when added, completes or makes up a whole; each of two parts which mutually complete each other, or supply each other’s deficiencies.” The verb, *complement* means “to make complete or perfect, to supply what is wanting,” and the adjective, *complementary*, means “completing, perfecting.”

⁷The descriptions of Scientia, Ethics, and Praxis that follow come from my paper, “Stewardship: Responding Dynamically to the Consequences of Human Action in the World,” in *Environmental Stewardship: Critical Perspectives—Past and Present*, ed. R. J. Berry (New York: T&T Clark International, 2006), 152–3.

⁸I use *world system* to encompass the whole of the earth together with its biosphere—the thin fabric of life that envelops it. When I use the word *world*, I use it ambiguously—meaning either the biosphere or the world system. When I use the word *earth*, I also do so ambiguously—meaning either the geophysical earth or the world system. My use of the word *biosphere* however, is not used ambiguously and incorporates the entire habitable earth, including human beings, cultures, and societies.

⁹Wayne C. Booth, “Systematic Wonder: The Rhetoric of Secular Religions,” *Journal of the American Academy of Religion* LIII, no. 3 (1984): 677–702. What he gives here is his translation of Ernest Hocking’s definition:

If, to agree on a name we were to characterize the deepest impulse in us as a “will to live,” religion also could be called a will to live, but with an accent on solicitude—an ambition to do one’s living well. Or, more adequately, *religion is a passion for righteousness, and for the spread of righteousness, conceived as a cosmic demand.* (William Ernest Hocking, *Living Religions in a World of Faith* [New York: MacMillan, 1940], 682).

¹⁰For explicitly religious people, God is responsible for the way things are and a demand made by God for right living also means living in concord with the way God created and intends all things to be. This also puts science *within* the definition of religion rather than outside it.

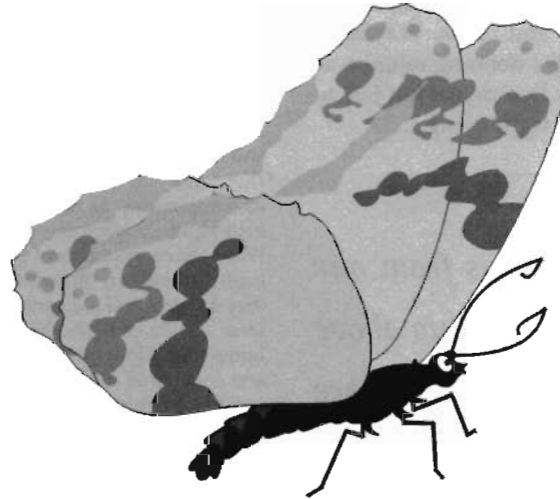
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Art Eyes Science

About the Butterfly



About the Butterfly

by Harry Lee Poe

*N*ow about the butterfly ...

Why, oh why, can the butterfly fly?

With so many legs

and so many joints,

why do its wings sprout

at so few points?

From species to species

is change of one kind,

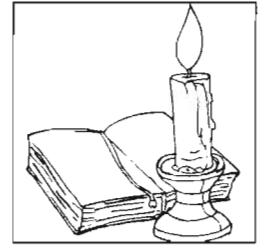
but why can't the butterfly

make up its mind?

November 4, 2004

Jackson, TN

Harry Lee Poe serves as Charles Colson Professor of Faith and Culture at Union University in Jackson, Tennessee. He has published several books on science and religion, including *Designer Universe* and *Science and Faith: An Evangelical Dialogue with Jimmy Davis* and *What God Knows: Time and the Question of Divine Knowledge with Stan Mattson*. In his spare time, Poe serves as president of the Edgar Allan Poe Museum of Richmond, Virginia.



A Third Alternative to Concordism and Divine Accommodation: The Worldview Approach

Carol A. Hill

The author offers a third alternative to the concordist and accommodation positions of Hugh Ross and Paul Seely, as presented in the March 2007 issue of PSCF: the worldview approach. The basic premise of the worldview approach is that the Bible in its original text accurately records historical events if considered from the worldview of the biblical authors.

This article is in response to Editor Roman Miller's comment on page 2 of the March 2007 *Perspectives on Science and Christian Faith* (PSCF) regarding the articles of Paul Seely and Hugh Ross: "Maybe some readers will want to continue this dialogue." I do want to continue this dialogue, and in the same spirit of friendly interaction. I think most highly of Hugh Ross, whose ministry we have supported for years, and of Paul Seely, who has supplied me with reference material any time I have asked.

I would like to offer a third alternative to "concordism" (Ross's position) and "divine accommodation" (Seely's position). I call it the "worldview approach." The basic premise of the worldview approach is that the Bible in its *original* text accurately records *historical* events if considered from the world-

view of the biblical authors. By "historical" I mean not only history and pre-history in a traditional sense, but also the historical, time-related, scientific disciplines such as archeology, geology, and astronomy. If the Bible is to be trusted for its theology, then it must also be trusted for its historical accuracy.

By "original" I do not mean the King James version of the Bible nor do I necessarily mean the Hebrew Masoretic text, which is a later translation of more ancient texts. What I mean is that the archeological evidence from the time of the biblical authors must also be considered when evaluating the "original" meaning of the text.

By "worldview" I mean the basic way of interpreting things and events that pervades a culture so thoroughly that it becomes a culture's concept of reality—what is good, what is important, what is sacred, what is real. Worldview is more than culture, even though the distinction between the two can sometimes be subtle. It extends to perceptions of time and space, of happiness and well-being. The beliefs, values, and behaviors of a culture stem directly from its worldview. Thus, to really understand the Bible (specifically in this discussion, Genesis), one must try and understand the mindset of the people who wrote it.

The basic premise of the worldview approach is that the Bible in its original text accurately records historical events if considered from the worldview of the biblical authors.



Carol Hill hiking up to Bat Cave, Grand Canyon.

Carol A. Hill is an ASA Fellow who has written previous articles for PSCF on Noah, the Garden of Eden, and the Numbers of Genesis. She presently has a National Science Foundation grant for geological work in the Grand Canyon. She and her husband Alan live in Albuquerque, New Mexico, and attend Heights Cumberland Presbyterian Church. Carol can be reached at carolannhill@aol.com.



The theological position of the worldview approach is that God has interacted with humans throughout real history, allowing them to write down his revelation according to their own literary style and from their own cultural and worldview perspective.

Article

A Third Alternative to Concordism and Divine Accommodation: The Worldview Approach

The theological position of the worldview approach is that God has interacted with humans throughout *real history*, allowing them to write down his revelation according to their own literary style and from their own cultural and worldview perspective. That is, it considers that the pre-scientific knowledge base of the biblical authors is a prime factor to be considered when *literally* interpreting the Bible. This theological position does not deny the giving of divine inspiration or revelation to the biblical authors, nor does it exclude God's divine intervention into human history. Does this position make the Bible untrustworthy, in that it has incorporated the naive scientific views of the ancients? No, because these naive scientific views are part of *real history*. If the Bible does not conform to real history, it is not a historical document, and it is *then* that the stories of Genesis become mythological and thus untrustworthy.

Now, how does this position fit with those of "concordism" and "divine accommodation" (as Seely calls his accommodation hypothesis in other articles he has written)?¹ It means that our concepts of modern science are *not* contained in Genesis, and that we should not read our twenty-first century scientific worldview into the text. It means that when the Bible says that Abel and Cain were agriculturists and keepers of domestic livestock, and that Tubal-Cain was the "father of bronze," that these texts pinpoint these men in time to the Neolithic (<10,000 YBP). It also means that Noah could not have possibly built his ark with Paleolithic (50,000–20,000 YBP) scrapper tools, and that the stories of Adam and Noah could not have been passed down for tens of thousands of years before the advent of writing, etc.

This sounds like the position advocated by Seely. However, the worldview approach does *not* subscribe to Seely's "divine accommodation" interpretation either; i.e., that the Genesis text is an inspired version of an ancient myth. Does God, the Creator of the universe, accommodate us? Listen to the Lord interrogate Job (37:3–4) and put him in his place: *Gird up thy loins like a man; for I will demand of thee, and answer thou me. Where wast thou when I laid the foundations of the earth? Declare, if thou hast understanding.* Clearly, God does not accommodate us—we accom-

modate God. Furthermore, if God actually teaches through fiction, cleverly disguised as factual history, how can we separate fact from myth when reading the Bible?² How can we trust God as a God of truth? If we cannot trust the historical accuracy of the Flood story, how can we trust the story of the death and resurrection of Jesus Christ? Hebrews 11 traces the whole history of the Old Testament from Abel up to the time of Christ, all of which points to Jesus on the cross (Heb. 12:1–2). Did Jesus really rise from the dead, or is this story only an accommodation of God to a culturally-based belief in a prophesied Messiah?

The worldview approach essentially agrees with the methodology of archeologist Kenneth Kitchen in his book, *On the Reliability of the Old Testament*.³ That is, it tries to establish the historical (cultural) facts, and then interprets the biblical stories in light of that evidence. Or, to quote Kitchen:

By and large, the ancients did not *invent* spurious history, but normally were content to *interpret* real history, in accord with their views ... Once detected, the viewpoint can be "peeled back" if need be and the basic history made clear (p. 63, italics in original).

In other words, when God speaks and acts, he does so within the human drama as it is being played out at a certain time and place, with all the cultural trappings that go with it.⁴ These "cultural trappings," or worldview, get incorporated into the text alongside God's revelation. Let's briefly discuss four of the hardest-to-interpret parts of Genesis from a worldview approach: Genesis 1, Adam, Noah's Flood, and the patriarchal ages.

Genesis 1

A concordist approach to Genesis 1 is that the sequence of events described in this chapter concurs with modern science. But does it? Putting aside the notorious "fourth day" problem of the sun being created after plants, let's examine the text of Genesis 1 from the viewpoint of geology (since I am a geologist). In Gen. 1:11–12 (Day 3), the text indicates that plants were formed (before the sun was visible), and one might assume that these must have been very early forms of plant life such as algae that existed in the Archean or Proterozoic Eras of geologic

time. But instead Gen. 1:11 continues: "... and the fruit tree yielding fruit after its kind, whose seed is in itself ..." According to the geologic record, seed-bearing fruit trees do not appear until the Cretaceous Period (~100 million years ago)—much, much later than simple plants and also long after fish appeared in the Ordovician Period (~480 million years ago). Yet, the Genesis text has fish appearing in Day 5 along with whales (Gen. 1:21). In addition, there is a reversed sequence in the appearance of birds and reptiles. According to the geologic record, primitive reptiles first appeared in the Mississippian (~340 million years ago), whereas birds did not appear until about the middle Jurassic (~155 million years ago). And whales are mammals that did not appear until much later in the Cenozoic Era (~50 million years ago). When the Genesis 1 "days" are carefully scrutinized with respect to the fossil record, the correlation is superficial at best.

Now let's look at the text from a worldview approach, or what has been termed the "literary view." This view is *not* new. The parallel construction of Genesis 1 has been noted by scholars for centuries, but it was not until the Mesopotamian cuneiform texts were found and deciphered in the late nineteenth and early twentieth centuries that the significance of these texts to Genesis 1 became recognized. Table 1 shows the parallel construction of Genesis 1.

In the literary view, the "days" of Genesis 1 are figurative days, where the divine works of creation are narrated in *topical* order rather than in a strict *sequential* order. The narrative involves temporality (i.e., it starts "In the beginning" and works toward the creation of humans), but the narrative style is not constrained by a temporal sequence of events. The most important aspect of the literary view is that it maintains that Genesis 1 was written following the convention and style of literary works prevalent in the ancient Near East about 4,000 years ago. And that is where the worldview approach comes in because in order to correctly interpret Genesis 1, one must understand the mindset of the people who wrote the *original* Genesis text.

Here is the worldview approach to Genesis 1. The whole chapter of Genesis 1 is based on a system of numerical harmony.⁵ Not only is the number *seven* fundamental to its main theme (God created the world in six days and rested on the seventh), but it also serves to determine many of its details. To the Mesopotamians, seven was the number of fullness and perfection, and thus the basis of ordered arrangement; also, particular importance was

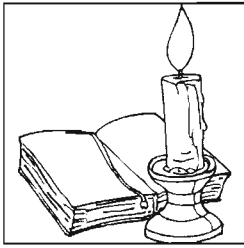
attached to it in the symbolism of numbers. It was considered a perfect period (unit of time) in which to develop an important work, the action lasting six days and reaching its conclusion and outcome on the seventh day. It was also customary to divide the six days of work into three pairs; i.e., into two parallel triads of days. So, a completely harmonious account of creation, in accord with other ancient examples of similar schemes in the literature of that time, and using the rules of style in ancient epic poetry and narrative prose of the ancient Near East, would be the parallel form of symmetry found in Genesis 1. In Genesis 1 the first set of three days represents a general account of creation, while the second triad is a more specific account of the first three days (refer to Table 1).

The most important aspect of the literary view is that it maintains that Genesis 1 was written following the convention and style of literary works prevalent in the ancient Near East about 4,000 years ago. ... [In the worldview approach] the whole chapter of Genesis 1 is based on a system of numerical harmony.

Much debate has revolved around the Genesis 1 topics: (1) Are the days of Genesis long epochs of time or 24-hour periods? (2) How could the sun have been created on the fourth day after plants? (3) Does the phrase "after its kind" refer to the fixity of species and refute evolution? and (4) Is modern science in concordance or discordance with the "days" of Genesis 1? If taken in the proper and intended context of literature written in the ancient Near East of around 2000 BC, there is no conflict with any of these topics. The Genesis author was simply writing in the "politically-correct" cosmogenic and prose-narrative style of that day.⁶ Thus, the Genesis 1 text was not meant to represent a sequential order of creation or one that needs to fit with modern science. It was simply the literary way

Table 1. A "Literary" Approach to Genesis 1

Day 1. Light	Day 2. "Waters"; sea and heaven	Day 3. Earth or land; vegetation
Day 4. Light emanating from luminaries (sun, moon, stars)	Day 5. Fish (whales) and fowl	Day 6. Land creatures that eat vegetation; man
Day 7. Rest		



For Genesis
to be
historically
accurate,
as maintained
by the
worldview
approach, the
people, places,
and events
mentioned in it
must be real.
However, the
description
of these people,
places, and
events are
necessarily
colored by the
worldview
of the authors
who wrote
the text.

Article

A Third Alternative to Concordism and Divine Accommodation: The Worldview Approach

that writers of that day wrote down their narrative thoughts. In other words, God gave the revelation to the people mentioned in Genesis, but then the biblical authors wrote this revelation down in their own literary style.

Adam

The “divine accommodation” position of Seely would say that Adam was not a real person and that this story is just a myth that God accommodates into his Bible. The “concordist” position of Ross would say that Adam was a real person and the *biological* father of the whole human race, so to be in concord with science Adam had to live 50,000 years or so ago (or almost 200,000 years ago if one is talking about the first *Homo Sapiens* found in the fossil record). The worldview approach does not ascribe to either position. It would say that Adam lived in the Neolithic (because the Bible puts him there in real time) and that he was not a mythical person, but a real historical person whom God made the *spiritual* father of the whole human race.

If the people of Genesis are not real, then why does the Bible go to such great lengths to establish the genealogies of Genesis, Chronicles, Ezra-Nehemiah, Matthew, and Luke? First Chronicles begins with *nine* chapters of “begots.” If these genealogies are not real then where do the mythological people end and the real people begin? Do real people start with Abraham, which lineage Matthew 1 says leads to Christ? The so-called “critical scholars” would say no—Abraham and the patriarchs were *invented* by scribes during the Israelite monarchy or exile. What about Moses and the Exodus from Egypt? Archeology has found no evidence for this event, so was Moses also “invented”? Mark 9:4 has Elijah and Moses talking to Jesus, so were these people—if not historically real—only a figment of Jesus’ and the disciples’ imaginations? What about Solomon and David? Is the whole history of Israel to be denied—the history that Jesus attests to many times in the New Testament?

For Genesis to be historically accurate, as maintained by the worldview approach, the people, places, and events mentioned in it must be real. However, the *description* of these people, places, and events are neces-

sarily colored by the *worldview* of the authors who wrote the text. To “beget” someone necessitates a *physical* act—either it happened or it did not. But a description of an event is a *cultural* act that stems from a particular worldview—or as Kitchen terms it, the ancients *interpreted* real history in accord with their views. Therefore, the worldview approach considers Adam and Eve, the Garden of Eden, Noah and the Flood, Abraham, etc. to be real people, places, and events, but as stories told from the worldview perspective of the biblical authors. There must be a basic historical core that underlies the entire Bible, otherwise the integrity of the Bible is compromised.

Noah’s Flood

Following this same logic, the worldview approach considers Noah’s Flood to have been a *real* flood that occurred within the Mesopotamian hydrologic basin around 2900 BC; that is, it was a local flood, not a universal flood such as is the young earth creationism position but which is not supported by the science of geology. I will not elaborate on the historical and biblical justification for a local flood because I have already done so in three other articles I have written for *PSCF*: “A Time and Place for Noah,” “The Noachian Flood: Universal or Local?” and “Qualitative Hydrology of Noah’s Flood.”⁷ I just want to mention that other ancient Mesopotamian texts also attest to this same flood,⁸ with the Sumerian King List naming eight kings before the flood and other kings after the flood down to Sargon, who was known to be a real king in Mesopotamia ca. 2300 BC. From an accommodation view, are these stories also mythological, as supposed for the biblical flood? Or, from a concordist view, how does a flood that took place tens of thousands of years ago in the distant past relate to kings that are known to have lived in the third millennium BC?

The most amazing thing about taking a worldview approach to biblical interpretation is that, when applied to the Genesis text, these stories actually start to make sense. I will give one example from the Genesis flood account. If the “second month, seventeenth day of the month” of Gen. 7:11 is interpreted as denoting the season of the year when the flood started, rather than a month-day extension of Noah’s age,⁹ then the text is

in remarkable accordance with the weather patterns that actually exist and have existed in the Mesopotamian (Iraq) area for millennia. If the ancient Mesopotamian sidereal calendar is coordinated with today's tropical calendar, then this puts the "second month, seventeenth day" in about the middle of March when meteorological conditions bring the most abundant rain to the Mesopotamian region. Genesis 7:12 implies that it was a "heavy" rain which fell upon the earth (land) for forty days and forty nights, and this is the type of continuous downpour that can result from the activity of maritime air masses characteristic of this season. The duration of rain (up until 150 days; Gen. 8:2) could have been caused by the stalling of a Mediterranean cyclonic front over the Mesopotamian area in combination with maritime air masses moving up from the Persian Gulf and Arabian Sea/Indian Ocean. This stalled storm would have been associated with southerly winds (the sharqi and/or suhaili), not with the northwesterly shamal wind, and these could have been very intense winds both in strength and duration.

The most amazing thing about taking a worldview approach to biblical interpretation is that, when applied to the Genesis text, these stories actually start to make sense.

Genesis 8:1 records that five months after the flood began—or about in the middle of August assuming a middle-of-March start-date for the Flood—a wind passed over the earth causing the waters to subside. This wind could correspond with the northwest shamal wind that blows almost continuously during the summer months down the plain of Iraq. In spring, the melting of snow and steady rain in the mountains of northern Iraq produces flooding in the valleys of the south. Then in summer, the wind howls southward along the narrow fertile strip between the Euphrates and Tigris Rivers, and the drying process begins. This anecdote on the Flood is but one example of the historical core of the Genesis text. The ancients were not inventing history, they were describing a real historical event.

But does a historical core preclude God's intervention or interaction with people in the Bible, such as with Noah in the Flood account? No, because God was performing what I call a "nature miracle." Noah's Flood was a miracle because God *intervened* into his physical laws. One does

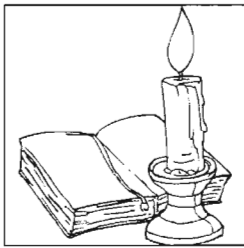
not have to invoke the notion of the suspension or violation of natural laws in nature miracles. Divine action can simply be understood as higher-order laws (God's ultimate purpose) working seamlessly with lower-order laws (God's physical laws).¹⁰ Is it any less a miracle because it can be explained by natural processes? This is the nature of "nature miracles": to have the *timely* intervention of God into natural processes.¹¹

One of the best examples of a "nature miracle" that comes to mind is Jesus rebuking the winds and sea. In Matt. 8:23-26 the calming of the winds and sea could be explained by a sudden change of barometric pressure—which was probably the case. But it was God who caused this change to take place *exactly* when Christ commanded the waves and wind to be still. Another example is that of the Israelites crossing the Jordan River, where the stoppage of water lasted long enough for them to get across the river in the day (Josh. 3:1-4:18). That this type of blockage has happened historically is a well-known fact: in 1267, 1906, and 1927 landslides upstream from Jericho have dammed the river for up to 21 hours.¹² The miracle of the Jordan is that God caused the blockage to happen *exactly* when the Israelites needed to cross the river.

Patriarchal Ages

I have also covered this topic extensively in my *PSCF* article "Making Sense of the Numbers of Genesis,"¹³ and will not elaborate further except to try and show how the Mesopotamians' worldview of numbers can explain the incredibly long ages of the patriarchs mentioned in Genesis. From a worldview perspective, longevity was not due to a supernova explosion, as suggested by Ross as a possible explanation for the patriarchal ages in his *Genesis Question*,¹⁴ nor do these incredible ages demonstrate that the Genesis text is mythological, as from an accommodation viewpoint. The reason is because the Mesopotamians incorporated two concepts of numbers into their worldview: (1) numbers could have real values, and (2) numbers could be symbolic descriptions of the sacred. "Real" numbers were used in the everyday administrative and economic matters of accounting and commerce (receipts, loans, allotment of goods, weights and measures, etc.), construction (architecture), military affairs, and taxation. But certain numbers of the sexagesimal system, such as *sossos* (60), *neros* (600), and *saros* (3600), occupied a special place in Babylonian mathematics and astronomy, and these symbolic numbers were the ones used in sacred texts.

The Mesopotamians (and other ancient peoples in the Near East such as the Egyptians) had a totally different concept of numbers than we have today. To us a number is just a number, and one number is no better than another number. But to the ancients numbers had intrinsic meaning beyond their being numbers. Just as a name held a special significance to the ancients (e.g., Noah, Gen. 5:29),



*The Bible
is not
mythological.
It is
a true story,
but told from
the viewpoint of
the people who
wrote it ...
To faithfully
interpret
Genesis
is to be faithful
to what it
really means
as it was
originally
written, not to
what people
living in a later
time assume or
desire it to be.*

Article

A Third Alternative to Concordism and Divine Accommodation:

a number could also have significance in and of itself. That is, the purpose of numbers in ancient religious texts could be *numerological* rather than *numerical*. Numerologically, a number's *symbolic* value was the basis and purpose for its use, not its secular value in a system of counting. One of the religious considerations of the ancients involved in numbers was to make certain that any numbering scheme worked out numerologically; i.e., that it used, and added up to, the right numbers symbolically. This is distinctively different from a secular use of numbers in which the overriding concern is that numbers add up to the correct total arithmetically. Another way of looking at it is that the sacred numbers used by the Mesopotamians had honorific value, which gave a type of religious dignity or respect to important persons or to a literary text. Thus Noah is said to have been 600 (60×10) when the Flood started. The numbers 60 and 10 are the basis for the Mesopotamians' combined sexagesimal-decimal numbering system and were considered to be "perfect," just like Noah was considered perfect (Gen. 6:9).

Let's Get Real

In conclusion I want to say—in the manner of Kitchen—that it is time to "get real" with respect to biblical interpretation. To try and extend Adam and Eve back into the Paleolithic is a position that can never be made to jive with the historical setting of the Bible. We also need to heed the words of Hugh Ross when he says: "God, by his nature, does not lie, deceive, or contradict" or I would add, "accommodate" us. The Bible is not mythological. It is a true story, but told from the viewpoint of the people who wrote it. This conclusion is especially applicable to young earth creationism, whose insistence on so-called "literalism" has made the Bible mythological to millions of people. The final question that I would like to pose is: Which is more literal, to interpret the Bible from our twenty-first century way of looking at things, or from the worldview of the original authors? Or, to paraphrase Conrad Hyers: To faithfully interpret Genesis is to be faithful to what it really means as it was originally written, not to what people living in a later time assume or desire it to be.¹⁵ ♦

Notes

- ¹For example, P. H. Seely, "Noah's Flood: Its Date, Extent, and Divine Accommodation," *Westminster Theological Journal* 66 (2004): 291–311.
- ²T. J. Godfrey, "On the Hills of Concordism and Creation Science," *Perspectives on Science and Christian Faith* 55, no. 4 (2003): 277.
- ³K. A. Kitchen, *On the Reliability of the Old Testament* (Grand Rapids: Eerdmans, 2003).
- ⁴P. Enns, *Inspiration and Incarnation* (Grand Rapids: Baker, 2005), 160–1.
- ⁵U. Cassuto, *A Commentary on the Book of Genesis*, pt. 1, translated from Hebrew by Israel Abrahams (Jerusalem: Magnes Press, 1972), 12–7.
- ⁶C. Hyers, "The Narrative Form of Genesis 1: Cosmogenic, Yes; Scientific, No," *Journal of the American Scientific Affiliation* 36, no. 4 (1984): 212.
- ⁷C. A. Hill, "A Time and Place for Noah," *Perspectives on Science and Christian Faith* 53, no. 1 (2001): 24–40; C. A. Hill, "The Noachian Flood: Universal or Local?" *Perspectives on Science and Christian Faith* 54, no. 3 (2002): 170–83; C. A. Hill, "Qualitative Hydrology of Noah's Flood," *Perspectives on Science and Christian Faith* 58, no. 2 (2006): 120–9.
- ⁸For example, W. G. Lambert and A. R. Millard, *Atra-Hasis: The Babylonian Story of the Flood* (Oxford: Oxford University Press, 1969), 1–28.
- ⁹U. Cassuto, *A Commentary on the Book of Genesis*, pt. 2, 83–4.
- ¹⁰H. S. Choi, "Knowledge of the Unseen: A New Vision for Science and Religion Dialogue," *Perspectives on Science and Christian Faith* 53, no. 2 (2001): 100.
- ¹¹W. F. Tanner, "How Many Trees Did Noah Take on the Ark?" *Perspectives on Science and Christian Faith* 47, no. 4 (1995): 262.
- ¹²K. A. Kitchen, *On the Reliability of the Old Testament*, 167.
- ¹³C. A. Hill, "Making Sense of the Numbers of Genesis," *Perspectives on Science and Christian Faith* 55, no. 4 (2003): 239–51.
- ¹⁴H. Ross, *The Genesis Question* (Colorado Springs: NavPress, 1998), 119.
- ¹⁵C. Hyers, "The Narrative Form of Genesis 1," 209.

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Theme: "New Frontiers in Science and Religion"

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Article



Davis A. Young

Because FTRZ (fission-track retention zone) temperature ranges of minerals differ, it is possible to determine when rocks cooled to various temperatures and depths to reconstruct uplift history of mountain ranges.

How Old Is It? How Do We Know? A Review of Dating Methods— Part Three: Thermochronometry, Cosmogenic Isotopes, and Theological Implications

Davis A. Young

This final installment of the three-part series examines U-Th/He and fission-track dating, so-called thermochronometric methods that provide cooling times from which uplift and erosion chronologies can be constructed. Also discussed is a range of methods based on the decay of cosmogenically produced isotopes such as ^{10}Be , ^{14}C , ^{26}Al , and ^{36}Cl that provide insight into the ages of sediments, glaciers, organic materials, and erosion surfaces. The article concludes with a brief reflection on the theological implications of an Earth that is billions of years old.

Thermochronometry

In Part Two we noted that ^{40}K - ^{40}Ar data may provide an indication of how long it has been since a given body of igneous rock cooled below the closure temperatures of various minerals. If we know that the closure temperature for Ar retention in biotite is around 325°C and around 475°C for hornblende, it is possible to estimate the depths at which a given biotite- or hornblende-bearing rock attained these temperatures. For example, if the geothermal gradient, the rate at which temperature increases with depth, is determined to be 30°C per kilometer, then a rock body would attain a temperature of 325°C at a depth of approximately 11 kilometers, whereas a temperature of 475°C would be reached at a depth of approximately 16 kilometers. The K-Ar cooling age for hornblende will normally be

older than the cooling age for biotite from the same rock, and from those ages one can calculate the approximate rate of uplift from 16 to 11 kilometers for the rock body in question.

The $^{40}\text{Ar}/^{39}\text{Ar}$ method also provides insight into the cooling ages of biotite and hornblende and the uplift history of the rocks in which they are contained, but space limitations prevent further discussion.¹

The U-Th/He Method

Although U-He was the first radiometric dating method to be developed, its use was soon discontinued because of the problem of He loss from the minerals in which it was being produced by decay of uranium. In recent decades, detailed studies of He diffusion in the mineral apatite indicated that apatite begins partial retention of He as it cools and eventually completely retains He. Subsequent studies that clarified the relationships among closure temperature, grain size of apatite, and cooling rate have suggested a He closure temperature in apatite of about 70°–75°C for apatite grains with a radius around 70–90 μm and cooling rates on the order of 10°C per million years. For larger grains, the closure temperature is slightly higher, and for faster cooling rates,

*After graduating from Princeton University, **Davis A. Young** received an M.S. degree from Penn State and a Ph.D. degree in geological sciences from Brown University in 1969. Dave then taught geology for five years at New York University, five years at the University of North Carolina at Wilmington, and 26 years at Calvin College. Upon retirement from Calvin in 2004, Dave and his wife Dottie moved to Tucson, Arizona, where they enjoy the view of the Santa Catalina Mountains and Dave vigorously pursues his hobby of birding. A fellow of ASA, Dave continues service as a member of the Editorial Board of Perspectives on Science and Christian Faith. Dave's latest book, John Calvin and the Natural World, has just been released by University Press of America.*

the closure temperature is somewhat lower. He-diffusion studies have also been conducted for other common minerals such as titanite, monazite, hematite, and zircon, all of which are common accessory minerals in igneous and metamorphic rocks.² Available data indicate that titanite has the highest closure temperature ($\sim 200^\circ\text{C}$), whereas zircon has values a few degrees lower, and apatite lower yet. Because these minerals have somewhat different He closure temperatures, it is now possible, by measuring the amounts of U and Th isotopes and He in apatite, titanite, and zircon, to calculate "cooling ages," that is, amounts of time that have elapsed since each mineral cooled to the pertinent closure temperature at which He was completely retained.³

Because the closure temperatures in these minerals differ, each mineral in a rock reaches its He closure temperature at a different depth. In general, apatite achieves complete He retention at a shallower depth than titanite, and, therefore, the cooling age of apatite is normally less than that of titanite from the same rock sample. Because He closure temperatures in apatite, titanite, and zircon are much lower than Ar closure temperatures of feldspar, mica, and hornblende, the depths at which complete He retention becomes important are much shallower than the depths at which complete Ar retention occurs. Thus, biotite should retain Ar at a greater depth than the depth at which apatite from the same rock retains He. As a result, U/Th-He dating of apatite, titanite, zircon and other minerals in rock samples from a given region of high relief, especially when coupled with K-Ar and $^{40}\text{Ar}/^{39}\text{Ar}$ dating of biotite, hornblende, and feldspar, makes it possible to reconstruct the uplift and cooling history of such regions.

Rates of uplift and erosion in the western Basin and Range province of the United States have been evaluated by means of U-Th/He dating. The pattern of He ages from apatite collected from the White Mountains of eastern California suggests a period of gradual uplift, erosion, and cooling followed by an episode of rapid uplift, erosion, and cooling about 12 million years ago. In western Nevada, He ages from both zircon and apatite in the Wassuk Range indicate an episode of rapid uplift, erosion, and cooling about 15 million years ago.⁴

Fission-Track Dating

Fission-track dating is another method that is used in conjunction with the K-Ar, $^{40}\text{Ar}/^{39}\text{Ar}$, and U-Th/He methods for reconstruction of the uplift and cooling histories of mountain belts.⁵ Fission tracks are produced in minerals that contain trace amounts of uranium, such as zircon, apatite, titanite, allanite, garnet, and micas as well as in U-bearing silicic volcanic glasses. In such materials ^{238}U atoms undergo infrequent spontaneous fission events into two less massive nuclides that generally have atomic numbers (Z) between those of zinc ($Z = 30$) and terbium ($Z = 65$) accompanied by a few light particles. The prod-

ucts of a fission event, propelled through a mineral or glass at very high energies that depend on the atomic mass of the nuclides involved, leave behind tracks of radiation damage. Positively charged ions produced by the passage of these high-energy particles repel one another to create numerous vacancies in the crystal structure.

Fission tracks rapidly fade in minerals at high temperatures as ions fill the vacancies upon return to their normal positions in the crystal structure. In addition, if a zircon or garnet is re-heated to a few hundred degrees Celsius, fission tracks that accumulated at lower temperatures will be obliterated. As a result, the simplest application of fission-track dating concerns minerals or glasses that have not been re-heated subsequent to their original formation. As a rock cools, any fission tracks that form fade until each U-bearing mineral reaches a critical temperature, the value of which depends on cooling rate, at which the mineral begins to retain a very small fraction of the fission tracks.⁶ The mineral cools through a temperature interval called a fission-track retention zone (FTRZ) in which the percentage of fission tracks formed increases as temperature drops (Figure 1). Eventually, the mineral cools below a

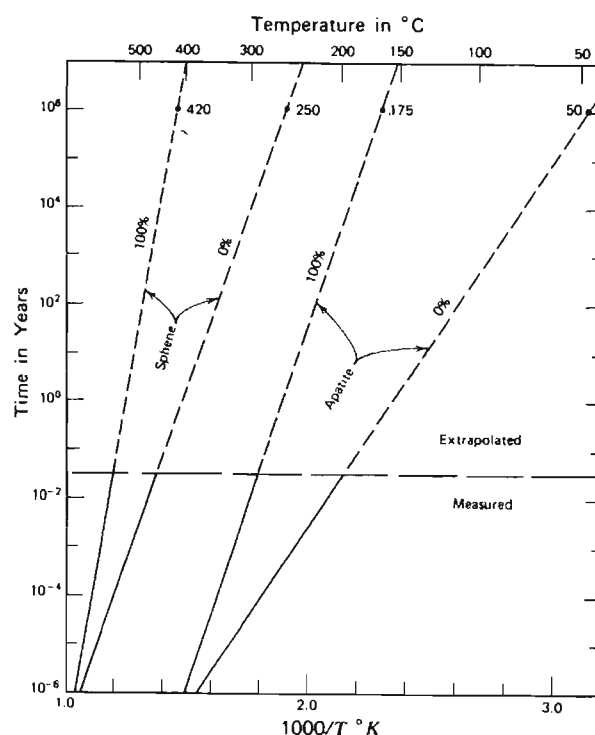
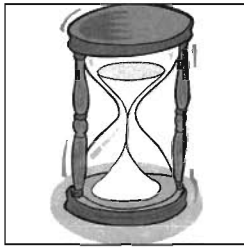


Figure 1. Percent of loss of fission tracks upon heating and percent of retention of fission track upon cooling for apatite and sphene (titanite). Fission-track fading (loss) and retention are functions of temperature and rate of cooling. Thus, for example, sphene (titanite) begins to lose its fission tracks if heated to 250°C for one million years and will lose all its tracks at 420°C . In contrast, apatite that is cooled for one year at 275°C just begins to retain tracks and if cooled for one year at 160°C retains all its tracks. Reproduced from Fig. 20.2 in G. Faure, *Principles of Isotope Geology*, 2d ed. (New York: John Wiley and Sons, 1986), p. 349, by permission of John Wiley and Sons.



Article

How Old Is It? How Do We Know? A Review of Dating Methods – Part Three: Thermochronometry, Cosmogenic Isotopes, and Theological Implications

[Dating]
methods
involving
cosmogenic
isotopes
typically entail
measurement
of the present
activity of
a radioactive
isotope
in a sample
by counting
disintegrations
or
determination
of the isotopic
concentration
by mass
spectrometry.

temperature, again dependent on cooling rate, at which 100% of fission tracks are retained. Because the FTRZ temperature ranges of minerals differ, it is possible to determine when rocks cooled to various temperatures and depths and to reconstruct uplift history of mountain ranges.

The fission-track method has been used in some cases for determining the ages of volcanic ash layers and archeological artifacts and implements such as obsidian tools or ceramics. Because volcanic ash, composed of glass shards, and obsidian cool extremely rapidly to surface temperature, virtually all fission tracks in glass or zircon should be retained such that the time of eruption can be determined. Fission-track dating can yield both the age of manufacture of an obsidian tool and, in other instances, the solidification age of obsidian, in which case such information can provide clues to the source region of an obsidian fragment. Fission tracks in fired pottery, in contrast, can indicate only the age of the pottery but not the geologic age of its minerals, because fission tracks present in mineral grains will be obliterated upon firing.

Determination of fission-track ages entails counting fission tracks on a specified polished surface for a given volume of sample. The fission tracks are rendered more readily observable by optical microscopy by chemical etching with acids. The fission-track age is calculated from the fraction of decays of ^{238}U that produce a fission track within a given volume of sample; the amount of ^{238}U in the sample volume; the areal density of fission tracks on a polished surface produced by spontaneous fission of ^{238}U in the natural sample; the areal density of fission tracks on the polished surface that have been induced by irradiation of ^{235}U in the sample by thermal neutrons; the thermal neutron flux of the reactor in which the sample is irradiated; and the capture cross-section of ^{235}U for thermal neutrons. Terms that are difficult to determine directly are evaluated by irradiating the sample of interest together with standard minerals or glasses of known age and similar if not identical properties to the sample. Age corrections for track fading are also applied on the basis of analysis of track-size distributions.

In the Afar triangle in Ethiopia, a sequence of Pliocene sediments rich in vertebrate

remains, including hominid fossils, contains several beds of tephra (volcanic ash). Glass shards from the uppermost BKT-3 tephra, covered by Acheulean gravels, gave a fission-track age of 2.05 million years.⁷ Approximately 125 meters below BKT-3 is the Sidi Hakoma Tuff which yielded a fission-track age of 3.53 million years, in fairly good agreement with a more precise $^{40}\text{Ar}/^{39}\text{Ar}$ age of 3.40 million years old. About 45 meters beneath the Sidi Hakoma Tuff is the Moiti Tuff, fission-track dated at 3.89 million years, in very good agreement with a more precise $^{40}\text{Ar}/^{39}\text{Ar}$ age of 3.89 million years. Not only do the data provide an indication of the approximate age of the hominid remains, but the fission-track ages are also consistent with the stratigraphic position of the ash layers—the oldest at the bottom, the youngest at the top.

At the Choukoutien cave in China, layers 3 (younger) through 11 (older) contain fossil remains or other evidence of *Homo erectus pekinensis* including evidence for the use of fire.⁸ Several hundred grains of titanite were collected from fired ash in these layers, and the fission-track records of the grains were completely reset by the firing. Fission-track dating of titanite from layer 4 yielded an age of 306,000 years, and titanite from layer 10 yielded an age of 462,000 years, consistent with the stratigraphy.

Cosmogenic Isotopes

Several dating methods take advantage of radioactive and stable isotopes produced by the interaction of cosmic rays and cosmic-ray induced neutrons with atoms in the atmosphere or in common minerals exposed at Earth's surface.⁹ Cosmic rays, typically consisting of protons, neutrons, and alpha particles, originate in the Sun and in distant sources outside the solar system. Galactic cosmic rays, that is, those originating beyond the solar system, generally have higher energies than solar cosmic rays and are, therefore, more likely to produce cosmogenic isotopes during collisions. Among the more important radioactive cosmogenic isotopes are ^{10}Be , ^{14}C , ^{26}Al , and ^{36}Cl , all of which are radioactive.

Methods involving cosmogenic isotopes typically entail measurement of the present activity of a radioactive isotope in a sample

by counting disintegrations or determination of the isotopic concentration by mass spectrometry. Cosmogenic isotopes have a wide array of geological and archeological applications including determination of ages of marine or lacustrine sediment layers, glacial ice, coral reefs, organic material, and exposure to the atmosphere or to space. Several of the methods are useful for determination of ages ranging from only tens to hundreds of years, whereas others are suitable for dating materials that may be tens of millions of years old. Some methods also provide information about rates of processes such as sedimentation.¹⁰

Radiocarbon Dating

Radiocarbon (^{14}C) atoms are produced by collision of cosmic ray-induced thermal neutrons with ^{14}N atoms in the atmosphere where they combine with oxygen to form $^{14}\text{CO}_2$ molecules.¹¹ Atmospheric circulation thoroughly mixes $^{14}\text{CO}_2$ on a global scale before plants remove CO_2 during photosynthesis. All living plant material is radioactive because it contains ^{14}C . As long as a plant is alive, it continues to take up $^{14}\text{CO}_2$, while some of the ^{14}C already taken in decays. Eventually equilibrium is established between intake and decay. After the plant dies, no more ^{14}C is taken up, and the remaining ^{14}C gradually disintegrates to ^{14}N . By measuring the activity of ^{14}C in a dead plant by counting β emissions and comparing the activity with standards of known ^{14}C concentration, one can calculate the time elapsed since the death of the plant.

By the same token, animals eat living plants and, therefore, ingest $^{14}\text{CO}_2$ from the plants. The animals also exhale $^{14}\text{CO}_2$, and equilibrium is established between ingested and exhaled ^{14}C . When the animal dies, breathing and metabolism stop, and ^{14}C is no longer released. The ^{14}C in tissues decays through time and, again, the measured activity of ^{14}C indicates age. Samples to be dated must be free of contamination by radiocarbon from groundwater, precipitation, or other sources. Because atmospheric ^{14}C production has not been constant through time due to changes in intensity of Earth's geomagnetic field, variations in sunspot activity, bomb testing, and other factors, deviations between radiocarbon ages and accurately known ages of various artifacts are commonplace. A radiocarbon age on material of unknown age must, therefore, be corrected with the use of calibration curves that are constructed by plotting radiocarbon ages obtained from materials of known age versus those known ages. The most recent set of calibration curves is based on carefully cross-dated tree-ring sequences that go as far back as 12,460 BP (BP = before present with the present defined as the year 1950).¹² Data on marine corals that have been dated by U/Th methods and foraminifera collected from dated varve sequences extend the calibration curves back to 26,000 BP.¹³

Radiocarbon has a half-life of 5,730 years. As a result, ^{14}C in a sample decays to virtually undetectable amounts

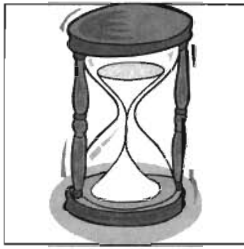
in a few tens of thousands of years. In the late 1970s, accelerator mass spectrometry (AMS) was developed for direct measurement of ions of carbon isotopes accelerated to very high energies in a particle accelerator and then passed through a mass spectrometer. Because the new method can measure much lower concentrations of ^{14}C than is achievable by direct measurement of the ^{14}C decay rate, it has the potential for modest extension of the time range of radiocarbon dating. AMS also allows for analysis of smaller samples and provides faster analyses.

Because radiocarbon dating is capable of providing reliable ages up to a few tens of thousands of years, the method has been extremely useful both in archeological applications and in providing ages of extinct organisms and of geologic events, such as glaciation and lake formation, from the end of the Pleistocene Epoch to the present. Among the more widely publicized ^{14}C results are dates on material obtained from the Shroud of Turin ranging from AD 1260–1390. An extinct bison, Blue Babe, that was unearthed from frozen ground in 1979 and is now on display in the Museum of the North in Fairbanks was radiocarbon dated at 36,000 BP.¹⁴

Exposure-age Methods

Among the methods based on cosmogenic isotopes are several that yield information about the length of time that a rock surface has been exposed to the atmosphere or that a meteorite has been exposed to cosmic rays as it travels through space from the asteroid belt or from Mars to Earth. This information concerns so-called *exposure ages*. Below we will discuss only terrestrial exposure ages.¹⁵ For example, ^{10}Be is produced in the atmosphere by the fragmentation of stable isotopes of oxygen and nitrogen when impacted by cosmic rays. Because the great majority of rocks in Earth's crust are composed of silicate minerals such as quartz, feldspar, mica, and olivine, the likelihood of production of ^{10}Be by interaction of cosmic rays with silicon and oxygen atoms in these minerals is great.²⁶ Al is produced by neutron bombardment of silicon atoms in quartz and other silicate minerals in the rocks. ^{36}Cl forms by the impact of cosmic rays on potassium and calcium atoms that are abundant in common minerals such as feldspar, pyroxene, and mica. Production of cosmogenic isotopes in rocks on Earth's surface opens the possibility for determining the time at which a rock face was first exposed to the atmosphere.

Because cosmic rays are deflected by Earth's magnetic field toward the poles, the intensity of cosmic rays striking the surface at a specific elevation above sea level increases at higher *geomagnetic latitudes*. Therefore, production of cosmogenic isotopes in a rock surface is greater at high latitudes, *all other factors being equal*. As cosmic rays descend through the atmosphere they interact with atmospheric atoms in various ways, and a particle may ultimately be completely absorbed before reaching the surface so that it



If we are serious about the implications of the biblical doctrines of creation and providence, then we are driven to accept the Earth's great antiquity. The incessant disclosure of God-created and God-sustained data and principles forbid us from cavalierly dismissing the powerful evidence that has been discovered about Earth's vast history ...

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cannot interact with a rock face. Therefore, the intensity of cosmic rays at Earth's surface is also a function of altitude, or, in other words, the thickness of atmosphere through which a cosmic ray travels. As a result, the production rates of cosmogenic isotopes in a rock face are also affected by the altitude at which a rock is exposed. The production rate of cosmogenic isotopes should be higher for rock surfaces at high elevation than those at low elevation, *all other factors being equal*.

For a constant flux of cosmic rays, a steeply tilted rock face will experience fewer interactions with cosmic rays per unit area than a gently tilted rock face, and a gently tilted rock face will experience fewer interactions with cosmic rays per unit area than a horizontal rock face. Hence, the production of cosmogenic isotopes will be greater on a horizontal rock face than on a steeply tilted rock face.

The mineral composition of a rock face also affects the production rates of individual cosmogenic isotopes under identical conditions because these rates differ for different minerals. For example, ^{26}Al is produced at more than twice the rate in quartz than it is in the mineral olivine for the simple reason that there are more silicon atoms in a given mass of quartz than there are in olivine, and it is silicon atoms that are impacted by the cosmic rays to produce ^{26}Al .

Exposure dates are calculated from equations that take into account these and various other factors along with the decay constant and the amount or activity of the isotope that is present in the exposed mineral sample. The variables are generally more numerous and more difficult to assess in the case of cosmogenic isotopes than with the methods we discussed in Part Two for determining the ages of rock crystallization. Hence, exposure ages are not always as precise or accurate as crystallization ages. The age is calculated from the number of product atoms such as ^{10}Be , measurable by mass spectrometry; the production rate evaluated from the various factors noted above; and the decay constant of the cosmogenic isotope.

The dating of glacial deposits was formerly dependent almost entirely on stratigraphy and paleontology, but it is now possible to

determine, by means of cosmogenic isotope methods, the amount of time that has elapsed since a boulder, deposited in a moraine at the margin of a melting glacier, has been exposed to the atmosphere.¹⁶ In the Wind River Range of western Wyoming, the most recent moraines of the Pinedale stage contain large angular boulders and are much less thoroughly weathered than the older moraines of the Bull Lake and Sacagawea Ridge stages on which they are superposed. The dating of fifty-six samples of boulder fragments by the ^{36}Cl method has shown that the Pinedale moraines have ages ranging 15,000 to 23,000 years, the Bull Lake moraines have a minimum age of 120,000 years, and the Sacagawea Ridge moraines have a minimum age of 232,000 years.¹⁷

As another example, consider Meteor Crater in northern Arizona. A meteorite approximately 150 feet in diameter collided with the Arizona desert and excavated a giant crater that is about three-quarters of a mile in diameter and 550 feet deep. Horizontal bedrock layers of Coconino Sandstone, Kaibab Formation, and Moenkopi Formation that underlie the area around the crater were tilted upward as material was ejected upon impact to cover the adjacent landscape. Surfaces of samples of Kaibab Formation yielded ^{10}Be ages ranging from 51,600 to 14,600 years indicating various times when ejected material was removed by erosion from the underlying rubble of Kaibab Formation. The highest ages, ranging from 44,700 to 51,600 years, were obtained from the "summits" of large ejecta blocks of Kaibab Formation. All of these ages are in excellent agreement with ages obtained by ^{26}Al dating that range from 52,700 to 14,500 years.¹⁸ The same sample yielded the youngest age by both methods, and the four samples with the greatest ^{10}Be ages also yielded the greatest ^{26}Al ages. The ^{36}Cl ages of five Kaibab Formation samples range from 50,400 to 36,500 years. The next lowest value is 47,100 years. The average age of the samples with the four highest values is 49,000 years. The investigators regarded that as a best estimate for the time of impact.¹⁹

One additional study of Meteor Crater employed the non-radiogenic thermoluminescence method (see Part One of this series). Quartz from four sandstone samples yielded a range of ages from 53,600 to 45,100 years

with a mean of 50,400 years.²⁰ Quartz from four samples of dolomite yielded ages ranging from 50,800 to 37,700 years with a mean of 46,000 years. Several lines of evidence strongly suggest that Meteor Crater was formed around 49,500 years ago. The agreement of the age results obtained by various methods, such as those we have pointed out, has been critical in establishing the scientific community's confidence in the reliability of the dating methods now commonly in use.

Theological Implications

Any assessment of the theological implications of the ages of geological and archeological features far in excess of 6,000 years disclosed by the plethora of dating methods must begin with the recognition that the spectacular successes of the natural sciences are possible only because the message of the Bible is true. The biblical doctrines of creation, providence, covenant, and humanity alone provide a satisfactory basis for the presuppositions of orderliness, uniformity and stability, and intelligibility of the universe that make all the sciences possible. When followed through consistently, competing worldviews like deism or materialistic atheism cannot provide a satisfactory basis for holding all of these presuppositions that are essential to scientific inquiry. Even deism cannot guarantee uniformity and stability.

As adherents of a Christian worldview, we should believe that established scientific data and well-supported theories are giving us a window on *reality*. Thus, the remarkable consistency of the vast complement of dating methods now available reveals something *real* to us about the world, namely the vastness of created time. If we are serious about the implications of the biblical doctrines of creation and providence, then we are driven to accept the Earth's great antiquity. The incessant disclosure of God-created and God-sustained data and principles forbid us from cavalierly dismissing the powerful evidence that has been discovered about Earth's vast history every bit as much as it forbids us from dismissing Stokes' law, the law of mass action, or cell theory.

Geological and archeological dating methods are a divine gift that has given us better insight, not just about our world, but also about the teaching of Scripture. The dating methods are important tools that have led us to recognize that the traditional view of Genesis 1 as a strictly historical and scientifically valid account of the first 144 hours of Earth's (or the universe's) existence must be fatally flawed. If so, it should be abandoned.²¹ But God in his providence has not left us in the dark regarding a more acceptable interpretation of Genesis 1 with which to replace the traditional view. By means of another divine tool, namely, archeology, God has also granted us over the past century and a half previously unrecognized knowledge of the cultures, worldviews, cosmologies, and literary conventions and symbolisms of the ancient Near

East. If we take that knowledge seriously, we can begin to see Genesis 1 as a theological critique of the false polytheistic religions of Israel's neighbors that was cast in the literary characteristics of the ancient Near East rather than as a report of a sequence of scientifically verifiable geological and astronomical events.

John Calvin, *contra* Augustine, observed that God created the world in six days rather than all together in one moment in order to give us opportunity to reflect more deeply on God's marvelous works. May we not, along the same lines, suggest that an earth that has journeyed through an incredibly long, complex, dynamic 4.55-billion-year history provides us, by God's grace, with far more material for reflection on his majesty, power, and breathtaking imagination than an earth that is only a few thousand years old? ♦

Notes

¹On argon-argon dating, see Ian McDougall and T. Mark Harrison, *Geochronology and Thermochronology by the ⁴⁰Ar/³⁹Ar Method*, 2d ed. (New York: Oxford University Press, 1999).

²Accessory minerals typically form very tiny grains that normally comprise only a fraction of one percent of the rock in which they are found. Zircon, apatite, titanite, magnetite, ilmenite, and hematite are the most abundant accessory minerals.

³For a summary of U-Th/He dating, see Kenneth A. Farley "U-Th/He Dating: Techniques, Calibrations, and Applications," *Reviews in Mineralogy and Geochemistry* 47 (2002): 819–44.

⁴On the White Mountains, see Daniel F. Stockli, Kenneth A. Farley, and Trevis A. Dumitru, "Calibration of the Apatite (U-Th)/He Thermochronometer on an Exhumed Fault Block, White Mountains, California," *Geology* 28 (2000): 983–6, and on the Wassuk Range, see Daniel F. Stockli, "Application of Low-Temperature Thermochronometry to Extensional Tectonic Settings," *Reviews in Mineralogy and Geochemistry* 58 (2005): 411–48.

⁵For a brief review of fission-track dating including relevant equations and procedures, see John Westgate, Amanjit Sandhu, and Philip Shane, "Fission-track dating," in R. E. Taylor and Martin J. Aitken, eds., *Chronometric Dating in Archaeology* (New York: Plenum Press, 1997), 127–58. For more detail on fission-track dating, see Günther A. Wagner and Peter van den Haute, *Fission-Track Dating* (Stuttgart: Ferdinand Enke Verlag, 1992). On ⁴⁰Ar/³⁹Ar, U-Th/He, and fission-track thermochronometry generally, see Peter W. Reiners and Todd A. Ehlers, eds., *Low-Temperature Thermochronology: Techniques, Interpretations, and Applications (Reviews in Mineralogy and Geochemistry 58)* (Chantilly, VA: Mineralogical Society of America, 2005).

⁶The slower the rate of cooling, the greater percentage of tracks that can be formed and retained at a given temperature.

⁷On the Ethiopian tephra layers, see R. C. Walter and J. L. Aronson, "Age and Source of the Sidi Hakoma Tuff, Hadar Formation, Ethiopia," *Journal of Human Evolution* 25 (1993): 229–40, and T. D. White, et al., "New Discoveries of *Australopithecus* at Maka in Ethiopia," *Nature* 366 (1993): 261–4.

⁸On Choukoutien cave, see Guo Shilun, et al., "Age and Duration of Peking Man Site by Fission Track Method," *Abstracts, 15th Annual Conference on Particle Tracks in Solids*, Marburg.

⁹For a good review of cosmogenic isotope dating, see T. E. Cerling and H. Craig, "Geomorphology and In-Situ Cosmogenic Isotopes," *Annual Review of Earth and Planetary Sciences* 22 (1994): 273–317.

¹⁰¹⁰Be is especially useful for dating marine and sediments because it is swept by precipitation into the ocean where it is adsorbed onto clay particles that gradually accumulate on the sea bottom.

Article

How Old Is It? How Do We Know? A Review of Dating Methods – Part Three: Thermochronometry, Cosmogenic Isotopes, and Theological Implications Methods

Another set of methods that have important applications to sediments deposited within the past few hundred thousand years are based on disequilibrium between different isotopes in the ^{238}U decay scheme.

¹¹On radiocarbon dating, see Royal Ervin Taylor, *Radiocarbon Dating: An Archaeological Perspective* (Orlando, FL: Academic Press, 1987).

¹²On the calibration of radiocarbon dates, see Paula J. Reimer, et al., "INTCAL 04 Terrestrial Radiocarbon Age Calibration, 0–26 cal kyr BP," *Radiocarbon* 46 (2004), 1029–58.

¹³For calibration of radiocarbon dates to tree-ring chronologies, see Michael Friedrich and seven others, "The 12,460-year Hohenheim Oak and Pine Tree-Ring Chronology from Central Europe—A Unique Annual Record for Radiocarbon Calibration and Paleo-environment Reconstruction," *Radiocarbon* 46 (2004): 1111–22.

¹⁴On the Shroud of Turin, see Paul E. Damon, et al., "Radiocarbon Dating the Shroud of Turin," *Nature* 237 (1989): 611–5. On Blue Babe, see R. Dale Guthrie, *Frozen Fauna of the Mammoth Steppe: The Story of Blue Babe* (Chicago: University of Chicago Press, 1990).

¹⁵For further information on exposure ages of meteorites, see chapter 23 on cosmogenic nuclides in Gunter Faure and Teresa M. Mensing, *Isotopes: Principles and Applications*, 3d ed. (New York: John Wiley and Sons, 2004).

¹⁶A terminal moraine is an accumulation of gravel consisting of rock fragments of a wide range of sizes that were deposited at

the leading edge (margin) of a glacier where the ice is melting. Other moraines form along the sides or base of a glacier.

¹⁷Fred M. Phillips, Marek G. Zreda, John C. Gosse, Jeffrey Klein, Edward B. Evenson, Robert D. Hall, Oliver A. Chadwick, Pankaj Sharma, "Cosmogenic ^{36}Cl and ^{10}Be Ages of Quaternary Glacial and Fluvial Deposits of the Wind River Range, Wyoming," *Geological Society of America Bulletin* 109 (1997): 1453–63.

¹⁸K. Nishiizumi, C. P. Kohl, E. M. Shoemaker, J. R. Arnold, J. Klein, D. Fink, and R. Middleton, "In situ ^{10}Be – ^{26}Al Exposure Ages at Meteor Crater, Arizona," *Geochimica et Cosmochimica Acta* 55 (1991): 2699–703.

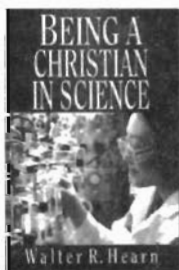
¹⁹Fred M. Phillips, Marek G. Zreda, Stewart S. Smith, David Elmore, Peter W. Kubik, Ronald I. Dorn, and David J. Roddy, "Age and Geomorphic History of Meteor Crater, Arizona, from Cosmogenic ^{36}Cl and ^{14}C in Rock Varnish," *Geochimica et Cosmochimica Acta* 55 (1991): 2695–8.

²⁰S. R. Sutton, "Thermoluminescence Measurements on Shock Metamorphosed Sandstone and Dolomite from Meteor Crater, Arizona: 2, Thermoluminescence Age of Meteor Crater," *Journal of Geophysical Research* 90 (1985): 3690–700.

²¹I have documented how the Christian Church has adjusted its understanding of the Flood narrative in light of extra-biblical information drawn from geological, archeological, and other studies. See Davis A. Young, *The Biblical Flood: A Case Study of the Church's Response to Extra-biblical Evidence* (Grand Rapids MI: William B. Eerdmans, 1995).

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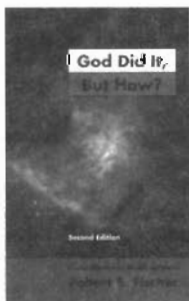
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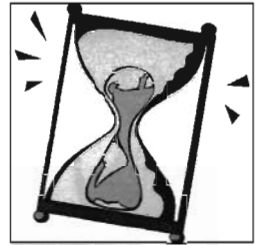
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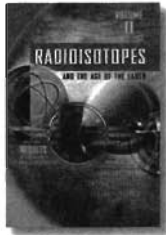
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Assessing the RATE Project

Randy Isaac



Larry Vardiman, Andrew A. Snelling, and Eugene F. Chaffin, ed., *Radioisotopes and the Age of the Earth*, vol. II (Waco, TX: Institute for Creation Research, 2005). 818 pages, index. Hardcover; \$79.99. ISBN: 0932766811.



In 1997, the Institute of Creation Research (ICR) and the Creation Research Society initiated an eight-year research program to investigate the validity of radioisotope dating of rocks. The project was named RATE for Radioisotopes and the Age of The Earth. Preliminary investigations carried out in the first three years were summarized in volume I of this work, published in 2000. Volume II, published in 2005, represents the final report. At \$79.99, 818 pages, and 3.5 pounds, the book is a heavy investment. For most interested parties, the final five pages of text, pp. 765–9, are sufficient to grasp the essence of the book. A nontechnical version of this book, authored by Donald DeYoung, and a video documentary have also been prepared. Both are titled *Thousands Not Billions: Challenging an Icon of Evolution*.

The first chapter is an introduction and provides an overview of the RATE program. Funding was provided by the ICR (\$250,000) and by more than one million dollars of donations. This chapter also provides guidance for carrying out creation science research. An appendix to this chapter, written by Henry Morris Jr., defines guidelines for peer review. Criteria for selecting reviewers include, whenever possible, those who are in agreement with the biblical viewpoint of the researcher. Though the RATE project has formally ended, a research council has been established to pursue a broader inter-disciplinary program in the future.

Chapters 2 through 8 present the technical work of the RATE project. Chapter 9 covers a statistical determination of genre in biblical Hebrew to substantiate the young-earth interpretation of Genesis. Chapter 10 summarizes the project with conclusions and recommendations.

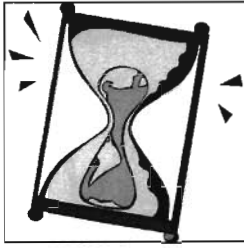
The key points of the book can be summarized as follows:

1. There is overwhelming evidence of more than 500 million years worth of radioactive decay.
2. Biblical interpretation and some scientific studies indicate a young earth.
3. Therefore, radioactive decay must have been accelerated by approximately a factor of one billion during the first three days of creation and during the Flood.
4. The concept of accelerated decay leads to two unresolved scientific problems, the heat problem and the radiation problem, though there is confidence that these will be solved in the future.
5. Therefore, the RATE project provides encouragement regarding the reliability of the Bible.

That there is overwhelming evidence for massive radioactive decay in the past is substantiated by an analysis of fission tracks in zircons and by repeated measurements of the usual radioisotopic dating methods. The data presented are not controversial and represent a small fraction of the data available. The RATE researchers concede that there is evidence for "more than 500 million years worth (at today's rates) of nuclear and radioisotope decay" (p. 284). This is a key departure from previous creationist claims

In 1997, the Institute of Creation Research and the Creation Research Society initiated ... [a] research program [RATE for Radioisotopes and the Age of The Earth] to investigate the validity of radioisotope dating of rocks.

Randy Isaac is the executive director of the American Scientific Affiliation. For twenty-eight years he worked in the silicon technology industry at IBM, where he held various posts such as VP of Science and Technology at the IBM Thomas J. Watson Research Center. Randy received his B.S. in physics at Wheaton College and M.S. and Ph.D. in solid-state physics at the University of Illinois at Urbana-Champaign. In the fall of 2005, he became director of the ASA and moved to the North Shore Boston area where he enjoys lobsters, clams, scallops, and other local seafood.



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Essay Review

Assessing the RATE Project

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The claim that the earth is approximately 6,000 years old is supported from biblical interpretation and from four areas of scientific studies: helium diffusion in zircons, radiohalos in granites, isochron discordances, and the presence of trace amounts of carbon-14 (C-14) in pre-Cambrian material. An entire chapter is devoted to presenting the technical data in each of these four topics.

The authors argue that by extrapolating data on the rate of helium diffusion in minerals, the high concentration of helium in zircons can only be explained by a young earth. However, the data presented were taken in conditions of laboratory vacuum and actual diffusion rates in field conditions are known to be considerably lower, by as much as a factor of one thousand or more. The RATE researchers claim to have meticulously accounted for all crystallographic features. However, the diffusion rate of noble gases in minerals is so complex both theoretically and experimentally that helium concentrations are not considered by geochronologists to be reliable for any dating implications.

The chapter on radiohalos presents details of halos found in granites. These darkened spherical areas in minerals are due to damage induced by alpha particles from radioactive decay products of uranium and thorium, most notably from polonium. Since polonium has a short half-life and granite is thought to be formed by a long period of cooling, such damage should have been annealed by the time the granite hardened. Therefore the authors argue that the granite must be much younger and have cooled rapidly. From the relative abundances of uranium and polonium halos, they deduce that the granites must have formed during the Flood and that there must have been highly accelerated decay rates. They acknowledge the unresolved dilemma of extraordinary heat production from such high decay rates with their assertion of a rapid cooling rate to form the granite. What they did not recognize is that the presence of uranium also seems to provide a reasonable explanation for the source of the polonium and polonium halos with normal decay rates and standard ages of granite.

In the chapter on isochron discordances, the authors present a large amount of data that date rocks in the range of hundreds of millions of years. The isochron method relies on selecting minerals from different regions of a particular rock formation. The different minerals are all the same age since they come from the same rock but likely have different concentrations of radioactive material due to non-uniform environmental interactions. By plotting the isotope concentrations of all these minerals, geochronologists can obtain an age of the rock. The accuracy of the age can often be improved by using several different radioisotopes. Here the authors painstakingly show cases where different minerals and different radioisotopes lead to ages that differ by as much as 10–15% after allowing for maximum error bars. Without an obvious explanation for these discordances, the authors claim that standard radioisotope dating techniques are fundamentally flawed. Yet they fail to explain why there are so many cases where there is good concordance of isochrones, something which would never happen if radioisotopic dating were not valid. Discordances are not at all unusual and the source of discordance is not always understood but these fail to invalidate the vast amount of concordance. Furthermore, no argument is presented why differences of 15% would justify the claim that radioisotope dating is in error by a factor of one million or more.

Based on the detection of trace amounts of C-14 in rocks such as diamond that have been dated as hundreds of millions of years old, the authors argue for a young earth. Accelerator mass spectroscopy is a technique that can detect very low concentrations of C-14 which has a half-life of 5,730 years. The argument is that after 100,000 years there should be no C-14 left in a sample which has not been exposed to external sources of carbon. Therefore the presence of approximately one tenth of one percent of C-14 as a percentage of the total carbon indicates an age for these rocks of approximately 50,000 years.

The difficulty, however, is in assuring there is and never has been another source of C-14 for that sample since it was originally formed from organic material. It is known that there are many subtle sources of C-14 such as contamination, microbial

action, and some nuclear interactions. For example, neutrons from uranium decay can produce C-14 from nitrogen impurities. The authors declare that since they used extraordinary care in handling the samples and are studying diamond, no extraneous source is possible. However, it is virtually impossible to eliminate such sources and chronologists discount the reliability of C-14 dating if the concentration is below approximately 0.5 percent.

The technical evidence in support of the argument for a young earth is ... not based on any accepted scientific methodology. All of the four radioisotopic areas discussed involve aspects which the scientific community feels are not reliable for dating.

The authors also acknowledge that if the C-14 dating on these samples were valid, there would still be a problem because the rocks are ten times older than expected from some biblical interpretations. To achieve the desired age of 5,000 years, it must be postulated that the relative concentration of C-14 to total carbon in the atmosphere was 500 times lower before the Flood than it is today. John Baumgardner rationalizes that the total amount of carbon in the biosphere must have been "300-700 times the total C relative to our present world" on the basis of the vast amount of carboniferous material in the earth. Assuming that the total amount of C-14 was approximately the same as today, the ratio of C-14 to total C would have been 1/500 of today's value, bringing the age of the rocks to the preferred value of 5,000 years. The isotopic ratio might have increased dramatically during the Flood because "accelerated nuclear decay during the Flood would have converted substantial amounts of crustal N to C-14" (p. 619). This circular reasoning and the lack of credibility of interpreting traces of C-14 for dating purposes make it evident that C-14 does not provide evidence for a young earth.

The technical evidence in support of the argument for a young earth is therefore not based on any accepted scientific methodology. All of the four radioisotopic areas discussed involve aspects which the scientific community feels are not reliable for dating. Only one of the four areas discussed, helium diffusion in zircons, is claimed to yield

a measurement of the age of the earth on the order of 6,000 years. This is merely a fitting parameter in a complex system of many unknown parameters. The other three areas all lead to ages much older than 6,000 years. The authors claim that the results cast doubt on standard dating techniques, making the young-earth scenario more credible.

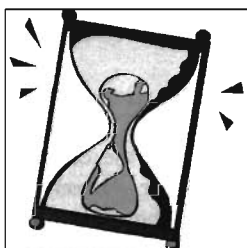
There is no direct evidence provided for accelerated decay. It is inferred solely from combining the evidence for massive decay with the young-earth position. As noted above, the evidence given in this book for a young earth is not based on any reliable techniques and so the argument for accelerated decay crumbles. Nevertheless, the authors explore theoretically how such an increase in the decay rates might have occurred. Through an analysis of nuclear forces, they indicate that only a small change in the strength of the coupling constant that characterizes the so-called strong force between nucleons would lead to a change in decay constants of many orders of magnitude.

While this may be correct mathematically, the authors fail to explain how such a fundamental constant of particle physics could change even a tiny amount. Experimental data and theoretical considerations have shown the strong coupling constant to be indeed a constant. Furthermore, to explain their results, the authors must speculate that this coupling constant took a different value in at least two time periods in the past: the first three days of creation week and the year of the Flood. At other times, it was the same as today. A further complication is the need to postulate that some nuclei were affected but not others. They state that C-14 did not have an accelerated decay constant while heavier nuclei did. As a result, not only have the authors failed to make a case for accelerated decay, they must assert an extraordinary variation of the strong coupling constant as a function of time and of nuclear weight to force-fit the data.

The authors report that faced with this evidence, a young-earth advocate must address at least two key scientific problems resulting from a one-year period of accelerated decay rates during the Flood. The first is the heat problem. Thermal energy from radioactive processes is a major source of heat in the earth. If those processes were accelerated by many orders of magnitude, the earth would have quickly evaporated from the heat had there not been an extraordinary mechanism of cooling. The authors state:

The removal of heat was so rapid that it likely involved a process other than conduction, convection, or radiation ... We believe it may be possible to discover how [God] did it (p. 763).

Future research is suggested along the lines of Russell Humphrey's idea of volumetric cooling based on relativistic principles even though this known phenomenon, the basis for red-shifting of starlight, does not apply to bound



*The expectation
of a future
solution to
a major
scientific
impasse
is being
translated into
conferences,
books, and
videos
proclaiming
the good news
that the RATE
project has
demonstrated
the scientific
validity of a
young earth.*

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Assessing the RATE Project

particles such as the earth. It is acknowledged that this approach, even if it were valid, has the difficulty of being uniform rather than selective as would be needed to cool only radioactive material and not, for example, the oceans. In other words, the authors acknowledge that accelerated decay requires a most unusual heat removal mechanism that is outside the known laws of thermodynamics. The second unresolved problem cited in the book is the radiation problem. How did Noah and his passengers survive a year in which radioactivity was one million times greater than it is today? No known solution exists, they state. Nevertheless, "The RATE group is confident that these issues will be solved ..."

The leap to the conclusion is never made clear. Confidence in a future resolution of extraordinary scientific contradiction moves smoothly to a message "to Christians in general to encourage them regarding the reliability of the Bible" (p. 768). In other words, the expectation of a future solution to a major scientific impasse is being translated into conferences, books, and videos proclaiming the good news that the RATE project has demonstrated the scientific validity of a young earth.

The conclusions of the RATE project are being billed as "groundbreaking results." This is a fairly accurate description since a group of creation scientists acknowledge that hundreds of millions of years worth of radioactivity have occurred. They attempt to explain how this massive radioactivity could have occurred in a few thousand years but admit that consistent solutions have not yet been found. The vast majority of the book is devoted to providing technical details that the authors believe prove that the earth is young and that radioisotope decay has not always been constant. All of these areas of investigation have been addressed elsewhere by the scientific community and have been shown to be without merit. The only new data provided in this book are in the category of additional details and there are no significantly new claims.

In this book, the authors admit that a young-earth position cannot be reconciled with the scientific data without assuming that exotic solutions will be discovered in the future. No known thermodynamic pro-

cess could account for the required rate of heat removal nor is there any known way to protect organisms from radiation damage. The young-earth advocate is therefore left with two positions. Either God created the earth with the appearance of age (thought by many to be inconsistent with the character of God) or else there are radical scientific laws yet to be discovered that would revolutionize science in the future. The authors acknowledge that no current scientific understanding is consistent with a young earth. Yet they are so confident that these problems will be resolved that they encourage a message that the reliability of the Bible has been confirmed.

In *Thousands Not Billions*, the incompatibility of the young-earth position with current scientific understanding is glossed over in the final four pages of the book. The thermodynamic dilemma is dismissed with

Possible mechanisms have been explored that could safeguard the earth from severe overheating during accelerated decay events. One of these involves cosmological or volume cooling, the result of a rapid expansion of space. Many details remain to be filled in for this and other proposed processes of heat removal (p. 180).

Unfortunately for young-earth advocates, cosmological expansion does not cool material on earth nor does it cool some materials and not others. Yet DeYoung concludes: "Young-earth creation is neither outdated nor in opposition to science" (p. 182).

The ASA does not take a position on issues when there is honest disagreement among Christians provided there is adherence to our statement of faith and to integrity in science. Accordingly, the ASA neither endorses nor opposes young-earth creationism which recognizes the possibility of a recent creation with appearance of age or which acknowledges the unresolved discrepancy between scientific data and a young-earth position. However, claims that scientific data affirm a young earth do not meet the criterion of integrity in science. Any portrayal of the RATE project as confirming scientific support for a young earth, contradicts the RATE project's own admission of unresolved problems. The ASA can and does oppose such deception. ♦



Book Reviews



ANTHROPOLOGY & ARCHEOLOGY

ALONE IN THE WORLD? Human Uniqueness in Science and Theology by J. Wentzel van Huyssteen. Grand Rapids, MI: Eerdmans Publishing Co., 2006. 365 pages, bibliography and index, 15 color plates. Hardcover; \$40.00. ISBN: 0802832466.

South African theologian J. Wentzel van Huyssteen is the James I. McCord Professor of Theology and Science at Princeton Theological Seminary and the author of many books. The book under review is the 2004 Gifford Lectures delivered at the University of Edinburgh. Wentzel van Huyssteen believes that scientists and theologians are both talking about the uniqueness of humans, so he sets out to explore what he considers the uncharted waters of the interdisciplinary relationship between theological anthropology and paleoanthropology. He accepts current evidence from paleoanthropology at face value and seeks to understand it from a theological perspective.

The author's theoretical persuasion is what he calls "postfoundationalism," which he believes allows for interdisciplinary dialogue between science and theology. "Postfoundationalism" resembles the concept of post-modernism where reality is perceived and interpreted, not something that is fundamentally true or false. A post-foundationalist approach invites the theologian to acknowledge the contextuality of religious experience and the crucial role of one's own interpretation of that experience. Here he would be critical of an evangelical approach to biblical exegesis that takes the Word of God as true on its own terms.

Wentzel van Huyssteen is critical of historical theological conclusions which he considers to be abstract and esoteric. He wants theologians to interpret theology from the current physical lived experience of humans. He writes:

The most responsible Christian theological perspective on human uniqueness requires a distinct move away from esoteric and overly abstract notions of human uniqueness and a return to embodied notions of humanness where our embodied imagination, sexuality, and moral awareness are directly linked to the fully embodied self-transcendence of believers who are in a relationship with God.

Following the thinking of Pascal Boyer, van Huyssteen considers religion an example of humans over-detecting signs from the world around them, so that sensing the existence of God is actually a type of "false positive." He argues that religion is a result of human imagination as humans search for the meaning of their existence. The earliest religious experience was that of shamans, who received their perceptions through altered states of consciousness and recorded their experiences in the art they created during the Upper Paleolithic period 45,000 to 35,000 years ago on the walls of caves in Western Europe.

He uses an evolutionary epistemology to interpret all things. Religion is argued to be a result of human evolution that expressed itself through cultural evolution. He considers cultural evolution to be on par with and not entirely dependent on biological evolution, so here he parts ways with Richard Dawkins and Stephen Gould.

If our genes do not completely determine our culture and our rational abilities, then we are also freed from our genes determining our metaphysical (religious) faith. The author wrote:

... instead of asking what kind of mind is required to know the world, we should rather ask what kind of world the world must be to have been able to produce the sort of minds we have.

In this way human evolution is a product of the human genetic entity in interaction with the world in which it found itself, both the physical and the cultural (religious) world.

Chapter three, "Human Uniqueness and the Image of God," was of most interest to me, as he revisited the history and origins of the doctrine of *imago Dei*. However, he argues that Christian theologians' concept of the "image of God" is an overly complex theological abstraction, which he finds of limited value today. He considers most Christian doctrine out of step with modern science and calls these doctrines "pieces in a museum."

Van Huyssteen is an excellent writer, and this book is excellent according to his purpose and context. However, he would not qualify as a member of the ASA, holding to little or nothing of the ASA statement of faith, and this book would be of limited interest to most ASAers. It would be of most interest to anthropologists and archaeologists, or those interested in the history of evolutionary biology. Few evangelical theologians I know would appreciate this book.

Reviewed by Mark A. Strand, Shanxi Evergreen Service, Yuci, Shanxi, China 030600.



ENVIRONMENT

AN INCONVENIENT TRUTH: The Planetary Emergency of Global Warming and What We Can Do About It by Al Gore. New York: Rodale, 2006. 321 pages. Paperback; \$21.95. ISBN: 1594865671.

Whatever one's political leanings, it is evident that Al Gore, the Democratic presidential candidate in 2000, is passionate about the causes he believes in—and one of these is the current world problem of global warming. Following the release of his documentary movie of the same name, this book has appeared. Partisan comments are few—his thesis is fourfold: (1) Global warming is real; (2) Global warming is a potential catastrophe to human civilization; (3) We *can* do something about it if we act both quickly and responsibly; and (4) We are all in this together. It is not (or should not be) a political debate.

This book is directed to a nonscientific audience, and, as such, is a quick read for one scientifically trained. It is a "pretty" book, including many color illustrations and

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photographs, but unfortunately it is printed on thick, glossy, colored paper and is poorly bound (seeing the text on inside margins is difficult without spine-breaking). This publishing choice has led to a book which is heavy enough to make reading uncomfortable, but it has also allowed many substantial illustrations, drawings, and maps. The melting glacier pictures are particularly impressive.

Gore argues forcefully and reasonably throughout the book for his claims. In spite of its printing problems, I highly recommend it, even to scientists, for it shows pictorially just what all the fuss is about. Go ahead, break the spine.

Reviewed by John W. Burgeson, 36633 Road P.8, Mancos, CO 81328.



ETHICS

CHRISTIAN ETHICS AND THE MORAL PSYCHOLOGIES by Don S. Browning. Grand Rapids, MI: Eerdmans Publishing Company, 2006. 254 pages, index. Paperback; \$30.00. ISBN: 0802831710.

Can Christian ethics and the social science of evolutionary psychology be allies, and not enemies? That is central question motivating this deeply thoughtful book.

Don S. Browning, Alexander Campbell Professor Emeritus of Religious Ethics and the Social Sciences at the University of Chicago Divinity School, has crafted a complex and perceptive portrayal of the way that a significant trajectory of traditional Christian thought can successfully interact with a dominant contemporary scientific practice—in this case, the practice of psychology.

The “moral psychology” that Browning is most committed to is evolutionary psychology. The author argues that evolutionary psychology contains insights into human nature that can strengthen traditional models of Christian ethics. In particular, Browning points to the growing literature in evolutionary psychology demonstrating that the moral beliefs and conduct of individuals are shaped by the narrative traditions of “authoritative communities.” Browning rightly argues that a prime example of such an “authoritative community” is the variety of Christian church bodies, which all possess in assorted ways the fundamental faith stories that can inform and govern genuinely ethical lives.

Some people will think that, for all of Browning’s desire to create a “thick” version of Christian ethics by absorbing evolutionary psychology into it, his presentation of the “Christian” aspect of his proposal is noticeably “thin.” It consists largely of the injunction to heed the significance of the *imago Dei*, which reveals that all human persons are equally loved by God. Browning eschews any sort of divine command theory of ethics, substantially rejects the notion of a sacrificial ethic, and insists that a Christian love ethic only makes sense in relation to its purported origins in a primeval “kin altruism.” He does invoke Christian theologians like Reinhold Niebuhr, Paul Ricoeur, and the Roman Catholic Louis Janssens, but offers their various contributions as Christian adumbrations of basic observations of evolutionary psychology. Perhaps Browning too easily assumes his readers’ prior acquaintance with the traditional formulations of Christian ethics, or perhaps

he is simply wary of the incoherence into which much modern thought on Christian ethics has fallen.

Browning does provide an interesting discussion of the value for Christians of science as a social practice. He speaks of science as expressing “distanciation,” which means that science posits a separation between the observer and the object observed. The natural world is not received as a sacred object fit only for worship; rather, the natural world is to be treated as a collection of objects suitable for study and assessment. Science thus serves a critical function, and this critical attitude pervades scientific cultures such as ours. Browning argues that the influence of “distanciation” in our culture also contributes to a proper understanding of ethics, including Christian ethics. Just as an attitude of critical scrutiny is necessary in science, so is it also necessary in ethics, lest our moral convictions become a misguided fanaticism.

In the end, what makes Browning’s work so valuable is his insistence that Christian ethics needs to be practical and realistic, formative and critical, an ethic that guides everyday judgments rather than an ethic that merely invokes abstract ideals. In that sense, Browning’s arguments here are part of the recent tradition of “embodied morality” (or, in Christian parlance, of “incarnational morality”) that includes thinkers like Niebuhr and Ricoeur, Mark Johnson and Owen Flanagan. At a time such as our own, reading the works of contemporary Christian ethicists makes one despair that Christian ethics any longer exists. Browning’s salutary encouragement of an ethic that is rigorously rooted in the science of human nature as it seeks to approximate a divine moral goodness, is refreshing indeed.

But the general reader should be warned—this is a dense book, with a host of abstruse arguments and analyses of myriad moral philosophers and theologians, as well as of those engaged in the endeavors of evolutionary psychology. It may be best suited for those readers who have some background in philosophical or theological ethics, and a familiarity with the basics of evolutionary psychology.

And so the question remains: Can Christian ethics and evolutionary psychology consummate a successful marriage? Don Browning makes the best case I have seen yet for an affirmative answer to that question.

Reviewed by Thomas D. Pearson, Associate Professor of Philosophy, The University of Texas-Pan American, Edinburg, TX 78539.



FAITH & SCIENCE

PERIL IN PARADISE: Theology, Science, and the Age of the Earth by Mark S. Whorton. Waynesboro, GA: Authentic Media, 2005. 233 pages. Paperback; \$16.99. ISBN: 1932805230.

Whorton (Ph.D., aerospace engineering) formerly worked for NASA and once held a young-earth creationist (YEC) position. His book discusses what “very good” in Gen. 1:31 means—and *does not* mean. The book is divided into four parts.

Part I (“A House Divided”) notes how charged the age of the earth issue is for some Christians who view anything but young earth as unbiblical and compromising.

There are two paradigmatic approaches to what “very good” means. The YECs assert it means absolutely perfect with no death/pain (animal or human) until after the Fall, which shattered God’s ideal; so God instituted a plan of redemption to restore all things to his original intent (“Perfect Paradise Paradigm”). The other (“Perfect Purpose Paradigm”) sees a *planned obsolescence* in a very good (but not fully-perfect, permanent) creation; God will transform this into a permanent new heavens and earth—complete with resurrection bodies and no animal death. (Compare the “good” Mosaic covenant [Rom. 7:12]—a deliberate forerunner to the new covenant.) The Lamb’s being slain from *before* the earth’s foundations reveals a higher purpose beyond the Fall—not a “Plan B,” to which God had to resort after human sin in idyllic Eden.

Part II (“Theology of an Ancient Creation”) elaborates on the differences between these paradigms. Whorton points out, for instance, that prophecies about creation’s restoration (wolves with lambs, calves with lions [Isa. 11:6]) are not a *literal* return to Eden, as YECs maintain. Indeed, Isa. 35:9 declares that *no* lion will be there! Such passages should be viewed *figuratively* (especially Isa. 65:20: “the youth will die at the age of one hundred”!). Scripture paints a picture of peace, tranquility, and harmony. The food chain and animal predation *were* part of the original creation, as depicted in Psalm 104 (a creation psalm) and Job 38–41, not the result of the Fall.

Part III (“The World before the Fall”) sees the garden in Eden, unlike the world around it, a haven without weeds, thorns, or harmful animals; these were kept outside the garden. Only with the Fall did God withdraw his protective care. Ample scientific indicators show that the world before humans appears to have operated by the same natural laws as today. Also, the world God created is ancient; God did not create things with an appearance of antiquity (e.g., light from an exploding star 169,000 light years away reaching the earth in 1987). Tornadoes, hurricanes, earthquakes, and volcanoes—though now dangers for post-Fall humans—occurred before humans appeared and actually play a part in keeping the earth habitable. Physical pain was also part of God’s original creation, serving as protection from further injury.

Interestingly, YECs who believe that all animals were herbivores before the Fall, like to point to the bombardier beetle’s defense mechanism as an indication of design. However, this defense mechanism makes sense in a world of *predation*. And did the Fall completely transform the digestive system of animals that “turned carnivorous,” which would require dramatic anatomical and biochemical (i.e., total systemic) changes?

Part IV (“Suffering, Death, and the Fall”) discusses the YEC assumptions that “very good” could only mean perfection and thus no pain, animal death, or extinction before the Fall. Yet Scripture speaks of *human* death coming with sin (Rom. 5:12), not *all* death. (Do we want to count *plants* here?) No, the garden in Eden *was not* the best of all possible worlds, but a *means* to it. Pre-Fall animal immortality should not be a litmus test for orthodoxy, as YECs often suggest.

Whorton sees the curse as limited not to all animals, but to “the evil one embodied in the serpent” (p. 159); eating dust is a picture of humiliation. The woman’s pain would *increase* in childbearing. Toil would be added to human labor, making it far less productive outside the garden.

Significantly, the curse in Genesis 3 does not mention animal death at all. Romans 8 suggests an in-built perishability to creation, vulnerable to suffering and futility.

Whorton’s irenic, balanced book, though making some minor assumptions and claims with which I disagree, deftly addresses crucial issues and helpfully corrects a number of problems and faulty assumptions in the YEC paradigm.

Reviewed by Paul Copan, Palm Beach Atlantic University, West Palm Beach, FL 33401.

SCIENCE AND NONBELIEF by Taner Edis. Westport, CT: Greenwood Press, 2006. xxii + 287 pages, bibliography, index. Hardcover; \$65.00. ISBN: 9780313330780.

Nonbelief, the belief that there is no God, is under attack from believers in God; they use arguments that include some based on science. To defend nonbelief, this book has been written by theoretical physicist Taner Edis, associate professor of physics at Truman State University (Kirksville, MO), whose extensive prior publications on the secularist tradition in science contrast it especially with ideas from Islam and Christianity.

This book, in the series Greenwood Guides to Science and Religion, opens with the series editor, Richard Olson, stating a goal: to explore interactions between the scientific and the religious across space, time and culture, in volumes, each with three supplements. The first supplement is a chronology of events, which includes the names or writings of prominent scholars, but not those of Jesus and Mohammed. The second is a set of primary documents, for which Edis has chosen six, which generally argue that in the light of modern science, belief in religion or the paranormal is mistaken or harmful. The third is an extensive annotated bibliography, which includes 236 works, each with one or two sometimes critical sentences summing up their content. Many of the works support nonbelief or liberal theology; others by Christians or Muslims oppose evolution or advocate creationism or intelligent design. However, a formidable challenge to nonbelief is ignored, by the exclusion of writers such as Darrell R. Falk, George L. Murphy, or Richard T. Wright, who integrate sound science and Christian faith.

The seven chapters, illustrated by eleven photographs, ten diagrams, and four cartoons, begin with the history of “Science, philosophy and religious doubt,” from antiquity through medieval times to today. Edis asserts that the top-down view of nature being controlled by a deity has been replaced by a bottom-up description in which physical processes determine biological ones, which in turn are a sufficient cause for human thoughts, emotions, and behavior. Three chapters follow, focusing on physics, biology, and science of the human mind. The Big Bang is not regarded as the moment when the universe began but as a point in continuous spacetime. Law and randomness interact to make apparent anthropic coincidences not remarkable. In biological evolution, order forms spontaneously in the universe, a system far from equilibrium; its maximum possible entropy grows, an idea in conflict with a fixed maximum in entropy for an isolated system attaining equilibrium. Likewise, to explain thought and activity of the human mind without invoking anything spiritual like a soul, an analogy with a computer is useful, but in it,

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the distinction between hardware and software blurs for a mainframe compared to a microcomputer, and algorithms for artificial neural networks differ greatly from people learning.

Three final chapters relate broadly to the social sciences. "The fringes of science" criticizes beliefs in scriptural miracles, parapsychology, and unidentified flying objects. Next, materialistic explanations of religion are offered, but none is satisfactory for why "humans seem to be predisposed to believe in powerful supernatural agents." To close, Edis shows how nonbelievers' understanding of science should influence their actions, both individually in morality, and collectively in politics; neither science nor religion leads to a definite set of moral principles, moral rules of the religions being different. "Separate spheres" for science and religion (non-overlapping magisteria) is indefensible intellectually, but useful politically to ally secularists and liberal believers against the undermining of integrity of science education or freedom in research, by religious conservatives.

This book, which defends nonbelief effectively from some attacks based on science (particularly those using intelligent design, anthropic principles or paranormal phenomena), could influence an inquirer to think that the claims of Christianity are false. Edis seeks to protect the scientific community's ability to benefit society, both against restrictions coming from religious conservatives, and against recognition of pseudoscientific ideas. The committed Christian reader could be helped to identify arguments to avoid in apologetics, and unresolved conflicts between science and faith.

Reviewed by Charles E. Chaffey, Adjunct Professor of Natural Science, Tyndale University College, Toronto, ON, Canada M2M 4B3.

IS BELIEF IN GOD GOOD, BAD OR IRRELEVANT? by Preston Jones, ed. Downers Grove, IL: InterVarsity Press, 2006. 158 pages. Paperback; \$13.00. ISBN: 0830833773.

Here is an e-mail exchange like few others. A lead singer/songwriter for a punk band, "Bad Religion," exchanges honest and deep reflections with a history professor in a Christian college (who is a fan of "Bad Religion"). They talk about religion and science and naturalism and Christianity. Added to their inviting dialogue are sidebars that give further insights and illuminate the material being discussed plus an occasional "inquiry box" which raises questions addressed to the reader. Finally the endnotes lead to further exploration and reflection. The chapter headings in this book are simply indicators of the main subject of the dialogue exchange in the e-mails. For instance, the chapter titles include "Getting Acquainted," "Inquisitions," "Hating God," "Theism Versus Naturalism," "Freedom and Environment," and "Christianity and Violence."

Preston Jones, the John Brown University Professor of History, started the exchange of e-mails with a fan letter. To his surprise, Greg Graffin, the songwriter, wrote back, and they found many things in common. But, of course, the deepest thing found them on opposite ends of the spectrum. I wrote in the margins after the conversations, "Good format. Fascinating exchange. Fair to the positions taken." It opens my mind to another world and gives new insight to part of the world of those under 40 years of age.

Preston Jones seems a bit more sour on the world than I am. The punk songwriter, a recent Ph.D. in zoology under Will Provine at Cornell University, struck me as having been damaged by contacts he has had in the past with the Christian faith. I found him to be amazingly dependent on a rather naive faith in natural science. It is the only road to truth and the only hope for humankind, as he sees it. He seems to have read little in contemporary philosophy of science and not broadly in the history of science. I hope he stumbles across someone in his future who can expand his horizon. A summary of the book would be: "An honest exchange of a believer and an unbeliever chiefly focusing on science and Christianity with attempts to convert each other to their perspective positions." It ends before any changes are noted in either.

This book would make excellent reading for any college student in the sciences, for anyone studying for the pastorate, and for almost anyone who deals with young people in today's world. Those who are interested in apologetics would also find it stimulating. In fact, I would recommend it for anyone interested in how a Christian and an anti-Christian can intelligently and peacefully interact. Because it is an honest record of exchanged e-mails with very little editorial addition by Preston Jones, there really are no weaknesses to note. It is simply a factual account and a stimulating one. Reading this from a scientist's perspective, I had the itch to jump in and be part of the dialogue, because Preston does not use references to the nature of science, the history of science, and other disciplines which I think would have been appropriate responses to some of Greg's remarks. As, for instance, in the quote below:

God is an answer for people who have no idea how the physical world works. Now, if you combine knowledge of how the world works with fear induced through theological "education" during youth, you have religious scientists who can accurately identify the gaps in scientific knowledge and are compelled to fill them with God's wisdom or plan or whatever.

Perhaps some readers could start up a correspondence with Greg on the basis of the book.

Reviewed by Terry Morrison, Director Emeritus, IVCF Faculty Ministry, Madison, WI 53711.

SCIENCE & RELIGION: A Critical Survey by Holmes Rolston III. Philadelphia, PA: Templeton Foundation Press, 2006. xlv + 357 pages. Paperback; \$24.95. ISBN: 1599470993.

Holmes Rolston III is the University Distinguished Professor of Philosophy at Colorado State University. He is associate editor of the journal *Environmental Ethics*, author of six books (primarily in the area of environmental ethics), and winner of the Templeton Prize in 2003 and the Mendel Medal in 2005.

This is a re-publication of the original 1987 edition of the same title, with a new 35-page introduction. The book has numerous notes and a comprehensive index, but it has no bibliography other than a list of references at the end of the introduction.

The Introduction focuses on the rising importance of information in the past twenty years and on the unique-

ness of humans. Chapter 1 (Methods in Scientific and Religious Inquiry) focuses on the thesis that

in generic logical form science and religion, when well done, are more alike than is often supposed, especially at their cores ... Science operates with the presumption that there are causes to things, religion with the presumption that there are meanings to things.

Chapter 2 (Matter: Religion and the Physical Sciences) is a survey of explanations, from Aristotle's four causes to Newtonian mechanics to quantum mechanics and indeterminacy to relativity. Chapter 3 (Life: Religion and the Biological Sciences) draws an analogy between the creaturely suffering of evolution and the suffering of Christ, both of which were for the greater good. Chapter 4 (Mind: Religion and the Psychological Sciences) describes and critiques four schools of thought: Freudian psychoanalysis, behaviorist psychology, humanistic psychology and cognitive psychology. Chapter 5 (Culture: Religion and the Social Sciences) focuses on various sociological predictions of the end of religion and why each has gone wrong.

Chapter 6 (Nature and History) discusses and distinguishes between "hard naturalism" and "soft naturalism." Chapter 7 (Nature, History and God) describes and discusses three options within theism for overarching or accommodating the place of the natural: scientific-existential theism, process theism, and transscientific theism. The author also discusses what room the sciences leave for religion.

In summary, Rolston takes representative issues from the leading sciences and integrates them in a survey that begins with matter and moves through life, mind, culture, history, and spirit. Rolston's *Science & Religion* differs from similar books in its attention to the human sciences of psychology, sociology, and history. One point made in the Introduction and in the final chapter is that science cannot teach us what we most need to know and care about: "Science is a good servant but a bad master." It can leave us "with our material needs better provided for, but lost in meaninglessness and alienation, divisiveness and angst."

Rolston has accomplished a balanced survey of a very wide range of sciences and the room for religious belief after science in each area. Rolston's book is not an easy read. It assumes a broad knowledge of philosophy, theology, and the sciences. Philosophical terms and names are mentioned without definition or identification, so it is best suited for readers who already have some familiarity with the field of science and religion.

Reviewed by Paul R. Bruggink, 143 Hummingbird Lane, Clarrington, PA 15828.



GENERAL SCIENCES

BEYOND PARADISE: Technology and the Kingdom of God by Jack Clayton Swearingen. Eugene, OR: Wipf and Stock Publishers, 2007. 312 pages, bibliography, index. Paperback; \$40.00. ISBN: 1597528420.

Jack Clayton Swearingen is an ASA Fellow and Secretary-Treasurer of the Christian Engineers and Scientists in Technology, an affiliation of ASA. His career has included

equipment design, research in materials science, and the application of science and technology to arms control and weapons dismantlement. He worked at Sandia National Laboratory (where I had the privilege and pleasure to work with him for eight years). Jack also spent time at the Pentagon and subsequently became Professor and Founding Director of Engineering Programs at Washington State University.

The book *Beyond Paradise* is the culmination of many years of research, dialogue and public discourse, through the 40-year career of Swearingen as a design engineer and materials scientist. The book is divided into eleven chapters followed by an extensive bibliography. Chapters 1-3 present a time-scale portrayal of technological civilization where technologies' origins and development are reviewed and its effects examined on civilization, other species and planet Earth itself. The title of chapter 4, *The Myth of Morally Neutral Technology*, presents the main thesis of the book and actually characterizes the content of chapters 4-9. Swearingen constructs three arguments for why technology cannot be viewed as morally neutral. In chapters 5 and 6 he shows that the course of technology is putting humankind on a collision course with physical, social, aesthetic and spiritual limits. In chapter 7 he shows how personal and group values enter the engineering design process. In chapter 8 Swearingen explores the roots of technological worldviews and in chapter 9 addresses the mixed blessing brought by personal mobility, graphically exemplified in the use of the private automobile. Chapters 10 and 11 then present a biblical foundation for technology as the "platform from which technological civilization may be redirected toward four-fold sustainability" (spiritual, social, ecological, and aesthetic).

"Swearingen deftly combines science, social analysis, theology, and old-fashioned common sense into a thought-provoking Christian treatise on the challenges facing our troubled planet. This is an essential book for navigating the ethical minefields of technological civilization."

—EDWARD WOODHOUSE
Rensselaer Polytechnic Institute

BEYOND PARADISE TECHNOLOGY AND THE KINGDOM OF GOD

"He conveys a sense of urgency in a book that abounds in detail and is both intellectually and spiritually challenging."

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JACK CLAYTON SWEARENGEN is an ASA fellow. He has worked on nuclear weapons, energy systems, arms control, and green design.



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Book Reviews

Swearengen deals with a very timely topic, mostly overlooked by the Christian community: the fact that technology is shaping our culture and controlling our lives—for better or for worse. We are all becoming aware of critical issues generated by human activity, such as increased energy demand, dwindling supplies, need for clean fresh water, congestion, environmental overload, surveillance and loss of privacy, etc. The inevitable question that emerges is whether technology can provide solutions for all these problems when *technology itself* is the cause of these problems. After doing extensive reading, dialoguing and thinking, Swearengen makes a credible case that it is secular values that are driving innovation and thus creating an idolatrous worship of science and technology. He challenges Christians to counteract this trend by helping shape technology (or even limiting it, when warranted) by using biblical guidelines.

In his prologue, Swearengen states the purpose of his book as follows: (1) to convince Christians that technology assessment is worthy of inclusion in discipleship; (2) to explain how the Church can use biblical values to confront the scientific-technical worldview and influence contemporary technological “culture.” In my opinion, Swearengen achieves the purpose for which the book was written. He does all this with deep conviction and a contagious passion, while recognizing with characteristic modesty, that this is only the beginning of an emerging process in the “theology of technology.” It will take a significant change in the Christian community’s outlook before it can take the lead in helping to manage the consequences of technology and/or acknowledging its limits.

Every ASA member would benefit immensely from reading this book. It is an extremely valuable resource and could even serve as a reference volume. I recommend the book without reservation. (See advertisement on page 151 for ordering information, discounts available.)

Reviewed by Kenell J. Touryan, National Renewable Energy Laboratory (retired), Indian Hills, CO 80454.

THE GOD EFFECT: Quantum Entanglement, Science’s Strangest Phenomenon by Brian Clegg. New York: St. Martin’s Press, 2006. 245 pages, notes, index. Hardcover; \$24.95. ISBN: 0312343418.

The quantum entanglement phenomena, now firmly established, clearly demonstrates that our common sense perception of reality is—simply stated—wrong. Specifically, the property of “locality,” which holds that all events are necessarily the result of “particles hitting particles” has been disproved. Clegg takes us on a historical journey through the arguments and experiments which have established this, taking time to point out the strange implications of this counter-intuitive view of reality. He does this in the form of an entertaining, readable, and exciting story.

Albert Einstein once (many times, actually) said, “God does not play dice with the universe.” Disbelieving quantum mechanics, Einstein was responsible for a short (four pages) paper in the May 1935 *Physical Review* (a copy of the paper is at www.burghy.50megs.com/epr.htm). In the thought experiment described in that paper, he showed that, if quantum mechanics was “true,” then the principle of locality must be false. This he considered absurd. Alain Aspect, in the early 80s, showed that locality was, indeed, false.

It is a marvelous story, and Clegg tells it well. Other books of a similar nature include *The Ghost in the Atom* by Paul Davies, 1986, where eight physicists argue eight different QM models; *Schrödinger’s Kittens* by John Gribbin, 1995; *Time’s Arrow* by Huw Price, 1996, on the nature of time; and *The Fabric of Reality* by David Deutsch, 1995, which argues for the multiple universes model. The world we inhabit is created both strange and wonderful, stranger than we can possibly imagine and so wonderful we can only stand in awe of its Creator. Highly recommended to all my ASA colleagues, particularly those who are not physicists.

Reviewed by John W. Burgeson, 36633 Road P.8, Mancos, CO 81328.

BEAUTY IN SCIENCE AND SPIRIT by Paul H. Carr. Center Ossipee, NH: Beech River Books, 2006. 194 pages. 37 illustrations including 16 color plates, index. Foreword by Philip Hefner. Paperback; \$18.00. ISBN: 0977651479.

In this age of conversation and conflict between science and religion, between reason and faith, it is seldom that we hear about the aesthetic dimensions of life and thought. And yet, ultimately, as Keats reminded us, “Truth is beauty and beauty truth.” Beauty, whether visual or conceptual, touches us deeply and moves us to elevated levels of experience. There is much in the world around us to admire, appreciate, and marvel for their sheer symmetry and grandeur, from colorful flowers and patterned butterflies that nature has wrought to magnificent cathedrals and meaningful mandalas that humans’ spiritual yearnings have created. Those who have tasted science and are sensitive to humanity’s religious heritage will see in all this an unfathomable mystery that no amount of rational analysis can deconstruct.

In this delightful little volume, ASA member Paul Carr has brought together for the reader a variety of examples of such beauty. With photographs and reflections he gives us a guided glimpse of so much of aesthetic value in the world, reminding us that there is much to be grateful for in life, beyond palatal pleasures and creature comforts. The work is clearly the result of considerable reading and reflection as revealed in the numerous quotes and extensive bibliography that are part of the book. Any reader is bound to be enriched by its pages and pictures.

Reviewed by V. V. Raman, Professor of Physics and Humanities Emeritus, Rochester Institute of Technology, Rochester, NY 14623.



HEALTH & MEDICINE

HEALTH AND HUMAN FLOURISHING: Religion, Medicine, and Moral Anthropology by Carol R. Taylor and Roberto Dell’oro, eds. Washington, DC: Georgetown University Press, 2006. 284 pages. Paperback; \$29.95. ISBN: 1589010795.

Taylor is director of the Center for Clinical Bioethics, a senior research scholar at the Kennedy Institute of Ethics, and an assistant professor of nursing at Georgetown University. Dell’oro is assistant professor in the Bioethics Institute and the graduate director of the Master of Arts Program in Bioethics at Loyola Marymount University in

Los Angeles. The fifteen contributors come mainly from secular and Roman Catholic universities. Each chapter has endnotes and the book concludes with a detailed index.

The book's five sections define theological anthropology, bioethics, and the human person; address human dignity and integrity; speak about human vulnerability, especially with respect to health issues; deal with gender and relationality; and discuss the practice of theological anthropology in health care, health policy, and science.

Part 3 was the most helpful, as it moved from theory and addressed the real experience of people living with disease and chronic illness. Chapter 7 by S. Kay Toombs described her experience with multiple sclerosis and the value of living in a Christian community. She spoke of the robust spiritual community shared by these quite physically disabled people.

Part 3 also contained a chapter on the practice of anointing the sick with oil. It was a beautiful synthesis of the theological (the power of God to heal) and the anthropological (the symbolic value of rituals like anointing with oil). Toombs described the role anointing plays in reminding the entire body of Christ that a believer is sick and needs help from the Christian community. One of the ways to extend this help is by placing our hands on the sick person's body.

The editors took on a very large task, hoping to explain what humanity is, and then to use this definition to guide bioethics. The book is innovative and covers material that is new to me. Some of the chapters are effective on their own. However, the complexity of the book results in the chapters not always leading to a unified and coherent argument.

Evangelical Christians take sin seriously, in both its general and specific effects to bring about disease, pain, and suffering. James 5:13–16 indicates the value of prayer in healing the body and forgiving sin. Sin was not presented as substantive to the issue. Therefore, it was given short shift and only mentioned four times in passing.

This book would be of interest to chaplains, ethicists, medical anthropologists and Roman Catholic philosophers. As an evangelical Protestant trained in biochemistry and public health, I found many of the chapters difficult reading. In the Conclusion, the author made an appeal for universities to train up "gray zone" people who are practicing scientists but theologically trained so they can speak competently in both fields. This is a goal affirmed by the ASA. This book is such an attempt, but the theological content is not as robust or evangelical as what I am accustomed to find in ASA publications and discussions.

Reviewed by Mark A. Strand, Shanxi Evergreen Service, Yuci, Shanxi, China 030600.



HISTORY OF SCIENCE

SCIENCE AND RELIGION, 1450–1900 by Richard Olson. Baltimore, MD: The Johns Hopkins University Press, 2006. 292 pages. Paperback; \$19.95. ISBN: 0801884004.

Science and Religion is a historical survey of the rise of modern science. Richard Olson stresses the cultural influences

occurring during the period 1450–1900, reflecting the author's interest in the interaction of culture with science. Olson is currently a professor of history at Harvey Mudd College and has published *Science Deified and Science Defied* (1990) and *The Emergence of the Social Sciences* (1993). His undergraduate degree is in physics and his Ph.D. is in the history of science.

Science and Religion, 1450–1900: From Copernicus to Darwin is a companion volume to *Science and Religion, 400 BC to AD 1550: From Aristotle to Copernicus* by Edward Grant. Collectively these provide a historical survey from the fourth century BC to the twentieth century. The second volume is as thorough in addressing topics as the companion volume but written in a more academic tone and covering several less general topics.

The first chapter bridges the two books by using Galileo's interaction with the clerical authorities as a case study for the interaction of science and religion. The historical analysis then begins, showing the transition from natural magic to experimental science:

With rare exceptions, medieval science was not intended to be applied — except to the understanding and appreciation of God's creation and as a background to medical training (p. 25).

The following two chapters address quite specific topics: "Science and Catholicism in the Scientific Revolution, 1550–1770" (chap. 3), and "Science and Religion in England, 1590–1740" (chap. 4), particularly Anglicanism. These chapters show the personal side of science but will probably appeal mainly to adherents of these Christian traditions. A chapter on Newton's influence in the seventeenth century (chap. 5) and Kant in the eighteenth century (chap. 6) is followed by a survey of geology and Lamarckian biology. The final chapter, "What to do about Darwin?" (chap. 8), concludes the historical survey with religious responses to Darwin from Anglo-American Protestant, Catholic, and Jewish perspectives.

The book should appeal to aficionados of science and religion interested in the interaction of culture with the development of science. The book is impressively researched with an extensive list of primary sources and annotated biography making this a valuable resource for experts and a potential library acquisition.

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

MY EINSTEIN: Essays by Twenty-Four of the World's Leading Thinkers on the Man, His Work, and His Legacy by John Brockman, ed. New York: Pantheon Books, 2006. 259 pages. Hardcover; \$25.00. ISBN: 0375423451.

It has been over one hundred years since Albert Einstein changed the world's understanding of reality. As both a scientist and a humanist, he dominated the first half of the twentieth century and, as these essays reveal, continues to influence physics and philosophy well after his death in 1955. John Brockman, a writer and publisher of the "third culture" website, www.edge.org, has done an outstanding job of creating a word picture of Einstein, as two dozen modern thinkers perceive him.

When I was a young physics student in the early 1950s, Einstein was both my hero and an unattainable target.

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My professors and fellow students likewise held him in awe. The essayists in this fine book unanimously tell this same story. It is to the author's credit that he orchestrated the book as well as he did. Like the classic "Five blind people describing an elephant," the writers each describe Einstein from a different perspective; the result is a composite and ultimately satisfying portrait of the man. Readers who know him only as an icon (possibly on a T-shirt) will gain an appreciation for both his genius and his humanity. Every writer "sees" a different person behind the ironic smile and the shock of unruly hair that has come to be the world's picture. More importantly, most of the essayists write in detail how his example has led them into fruitful careers in physics.

One of the book's failings, if it can be called that, is that only one of the writers, John Archibald Wheeler, actually knew Einstein personally. It would have been good to have included comments from those who knew him, particularly Niels Bohr, Heisenberg, Rosen and Podolsky. But Brockman has chosen, rather, to illustrate Einstein's influence on the researchers that have come after him. In this, he has succeeded. It instantly reminded me of another classic, Alan Lightman's 1993 novel, *Einstein's Dreams*. I found reading these two books together greatly enhanced my appreciation of the man.

This is a great book—particularly for the physicist-Christian. It is a "keeper," and I heartily recommend it to all my ASA colleagues, of whatever profession. For non-physicists, some of the mysteries of relativity and quantum mechanics are unfolded, and the power of a scientific legacy is skillfully described.

Reviewed by John W. Burgeson, 36633 Road P.8, Mancos, CO 81328.

THE INTELLIGIBILITY OF NATURE: How Science Makes Sense of the World by Peter Dear. Chicago, IL: The University of Chicago Press, 2006. 242 pages, bibliographical essay, notes, index. Hardcover; \$27.50. ISBN: 0226139484.

Peter Dear, President Andrew White Professor of the History of Science at Cornell University, offers a work describing the struggle that participants in the scientific enterprise have had in understanding their task. As far back as the fourth century BC, Aristotle distinguished between *epistēmē* and *technē*—the knowledge of truth and practical know-how—or, more concisely, knowing and doing. This distinction has endured in various forms and combinations through the years to current debates over science in the Christian community. Can we clearly separate the practical and the theoretical? How deep is the truth we are so quick to publish? Will we ever know the First Cause?

Dear sets the stage for his discussion in "Introduction: Science as Natural Philosophy, Science as Instrumentality," wielding a broad brush through the achievements of modern science. Natural philosophy was originally understood in early-modern Europe as entirely separate from practical knowledge. This is illustrated by the two ways that people looked at the heavens. Natural philosophers were interested in the composition of the heavens, the source of the motions of the objects in the sky, the limits (if any) in the universe—the nature of the universe. Astronomy was interested in the positions and motions

of these objects and the application of mathematics in predicting future positions in order to construct calendars, dates of religious observations, and astrological predictions. Later, Isaac Newton was severely criticized as a natural philosopher, because he was unable to explain gravitational attraction, yet praised as a mathematician.

The distinction began to blur in the sixteenth century as Francis Bacon championed the goal of natural philosophy in practical matters of Christian charity and, more broadly, to legitimize the goals of the gentry to make money through improvements in agriculture, navigation, manufacturing, war, etc., ending in what Dear dubs "techno-science" which fuses science and technology as a "single enterprise" and produces a new kind of person—the twenty-first century scientist.

Six chapters follow offering lucid case studies of the interweaving of theory and practice from the sixteenth century to the present.

1. The Mechanical Universe from Galileo to Newton
2. A Place for Everything: The Classification of the World
3. The Chemical Revolution Thwarted by Atoms
4. Design and Disorder: The Origin of Species
5. Dynamical Explanation: The Aether and Victorian Machines
6. How to Understand Nature? Einstein, Bohr, and the Quantum Universe

Dear's stories cover well-worn paths. Happily, his apt quotes bring dry topics to life. The material is accessible for undergraduates who have a basic knowledge in science. Chemists will appreciate the struggle to find unity in their field. Taxonomy becomes interesting in the debate over the question of classification—whether according to similarities or differences, or how they might appear in God's mind. The quantum discussion has the greatest inherent difficulty and will need help from an instructor or a physics book.

It would have been interesting to see how Dear would have cast the "genetic revolution." Perhaps this is a topic for student papers.

Dear is following paths that others have considered—with sometimes conflicting opinions. He might have noted science was earlier seen as having moral value in producing a certain kind of person. The diverse ways in which these categories have been cast and multiplying disciplinary sub-cultures create barriers that prevent today's scientist from defining his or her discipline in concise terms. Perhaps the suggestion that "science is what scientists do" has some merit. He concludes with the rather unsatisfactory comment:

The natural-philosophical assertions made by science are not based simply on scientists' "proofs" about the way the world is. They are judged from the start on whether they make sense, and the controversies over the very issue, revealed again and again, in the history of science, show how that "making sense" depends on who is doing the judging, and in what cultural circumstances. The world pictures that we believe in owe much more to what we find plausible than to the way that the world "really" is: their acceptance, rather than being determined by the natural world itself, depends on the ways in which we choose to live in the world (p. 194).

The Intelligibility of Nature is a good read for anyone interested in science and as a component of an undergraduate course in the history and philosophy of science.

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

THE PERSON OF THE MILLENNIUM by Manfred Weidhorn. New York: iUniverse, 2005. 161 pages. Paperback; \$15.95. ISBN: 0595368778.

Is Galileo the most influential individual of the last thousand years, on science and on society? However controversial, Manfred Weidhorn's supporting thesis dovetails with a fruitful trend of extending the controversy on science and religion, centered on Galileo, in a direction accounting for its impact on civilization, not just for Galileo's troubles with theologians and philosophers. *The Person of the Millennium* insightfully identifies a paradigm shift of history with the Galilean revolution.

This generally meritorious work is marred in places by a tendency to oversimplify. It portrays Galileo as insistent that philosophy "has nothing to do with measurement." Galileo called himself a philosopher; his experiments on inclined planes had everything to do with measurement. Weidhorn charges that when Galileo refuted Ptolemy, he "incorrectly concluded that Copernicus had been vindicated." Galileo never asserted that he had achieved a Copernican demonstration.

Weidhorn writes that Galileo "did not definitively prove the validity of the Copernican theory (Foucault in the nineteenth century did)." Bradley's and Bessel's Copernican demonstrations predated Foucault's, the latter being an experiment which Galileo conceived but lacked the equipment to measure tiny angles in the sky. Galileo's own observations of the cycle of phases and angular diameters of Venus and Mars conformed to the Copernican hypothesis, not to the Ptolemaic. Because a series of demonstrations constituted "definitive proof," it is simplistic to isolate and remove any one of these scientists' achievements, and say that it did or did not constitute a proof.

Did the Church vindicate Galileo's science? Weidhorn writes that "on the central issue, he [Galileo] was right and the Church was wrong, as it finally admitted 350 years too late." That admission in 1992, however, was a theological "rehabilitation." On that occasion, Cardinal Poupard and Pope John Paul II, who admitted mistakes by their seventeenth century predecessors, also alleged that Galileo had not proved his case scientifically. They even attempted to obscure the issue by presenting the Copernican and Ptolemaic alternatives as if equivalent in a wider context of modern physics.

Weidhorn writes that "[s]cience and religion, as separate disciplines, are hermetically sealed off from each other," as if the mutually beneficial relation of science and the noncoercive study of theology were not part of religion. He writes that "[i]n trying to silence him [Galileo], the Church was, therefore, correctly assessing the long-term danger presented by his innovations." If the church had assessed the long-term danger correctly, it would never have silenced him; Cardinal Bellarmine's inability to imagine that the Copernican planetary arrangement might be proved true, as Galileo had warned, initiated the silencing.

Weidhorn asserts the existence of "a straight line from Galileo's freeing of reason from ... religion to the turning of reason against religion by rationalists like Voltaire, Marx, Nietzsche, Shaw" and multiplies examples of such "straight lines," thus creating for his readers the impression that Galileo is somehow responsible for later anti-religious developments. The argument rests on a fallacy. There is a straight line, taken by a ray of sunlight, from Sun to Earth. If a bombardment of rays protects you from cold or kills you from heatstroke, it is not the Sun's doing.

This author's attempt to ground modern democratic institutions in Galilean science comes uncomfortably close to blaming Galileo for the false principle of majority rule. He writes: "[D]emocracy takes no metaphysical position but lets a headcount settle things." A headcount may settle things, but not without coercion of the minority by the majority. Athenian democracy spearheaded by Pericles predated Galilean science. Weidhorn misses the connection of Galileo's advocacy of free intellectual exchange to the free market economy when he tries instead to connect Galileo to democracy.

Weidhorn has hit upon a historical failure of organizational dynamics where he writes: "... if history teaches anything, it is that an idea is like a dropped ball ... Anyone may pick it up and run with it in any direction ... once you put an idea into currency, you lose all control over it." Here is a worthy challenge for social scientists.

One of my favorite math books is error-ridden; I learned from it by correcting its errors. Similarly, though *The Person of the Millennium* is a mine field of unhistorical interpretations through which the reader must step gingerly, it is also thought-provoking and worthwhile reading.

Reviewed by Albert DiCanzio, Adjunct Professor, School of Business and Technology, Webster University, Webster Groves, MO 63119.

FRANCIS CRICK: The Discoverer of the Genetic Code by Matt Ridley. New York: Atlas Books, HarperCollins, 2006. 213 pages, no index. Hardcover; \$19.95. ISBN: 006082333X.

Matt Ridley, a science writer (*Genome* is his best known work) deliberately emphasized the code, not the helix. Crick did important theoretical and experimental work on solving the genetic code.

James Watson's *The Double Helix* began with this sentence: "I have never seen Francis Crick in a modest mood." Ridley is not modest about Crick either: "the greatest biologist of the twentieth century" (p. 5). The publisher also admires Crick—the book is in a series about "Eminent Lives," which includes Washington, Jefferson, Beethoven, and Shakespeare.

This book is a good biography, in spite of brevity and lack of scholarly apparatus. It should be in all academic libraries, and it is accessible to intelligent nonscholars. The book tells of Crick's early education and his marriage. It describes how Crick worked with Watson, interacted with Rosalind Franklin (the two were on very good terms at the end of her life), and other aspects of Crick's career.

Crick worked on the study of consciousness during his last years. There were no great breakthroughs. Ridley says that what really motivated Crick, in his work on DNA and on consciousness, was a desire to discredit vitalism,

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the idea that living things cannot be explained and understood completely in terms of physics and chemistry. Depending on what is meant by explanation, I question vitalism, too. Crick did not live to see the achievement of his goal of being able to understand consciousness in terms of neuron activity. We are a long way from that yet, and may never get there.

What is meant by explanation? If, by explanation, we mean that we can, at least in principle, describe how a cell works, in chemical and physical terms, most biologists of today would agree. This has not yet been done, at least not completely, but, within my lifetime, enormous strides have been made. I would not be surprised if a working living cell, capable of metabolism and reproduction, was produced *de novo* from laboratory chemicals in the first half of this century. Any aspect of cell function can, in principle, be explained and understood in terms of the chemistry of the cell. Does this rule out divine action? Certainly not. In principle, it is possible to understand, say, all the parts, and the functioning, of a Ford Explorer. If I did so understand it, that would not mean that it was not a wonderful piece of equipment, designed and planned. In the same way, even if we did understand all of the cellular activity of organisms, including how consciousness works, it would not make their existence any less wonderful, nor would it rule out supernatural design and planning.

If, by explanation, we require ourselves to answer some other questions like "How did life begin?" "Why do atoms and other chemical entities have the properties that make life possible?" "Why are humans interested in this sort of question?" we cannot explain life. (More and more plausible naturalistic answers for the first question may be produced, but they will never give us a certain description of what actually did happen.) Ridley says that Crick once put forward panspermia (Earth was seeded with life by aliens) as an explanation for the origin of life on Earth. Why would an intelligent person consider that living things may have been placed here by extraterrestrials and reject that they were placed here by a supernatural being?

It is unfortunate that Crick, who was noted for discussing serious issues for extended periods with intelligent people, even when they did not agree with him on all points, did not really come to grips with the issues of the meaning of life, the origin of living things, and the origin of the universe. Perhaps he did not really want to come to grips with these questions. Perhaps he could not find an intelligent believer to discuss them with. Perhaps he was turned off by interpretations of the Bible that claim to rule out some of the important findings of science. I do not know. But it is unfortunate.

Reviewed by Martin LaBar, Professor of Science Emeritus, Southern Wesleyan University, Central, SC 29630.



NATURAL SCIENCES

THE COSMIC MYSTIQUE by Henry A. Garon. Maryknoll, NY: Orbis Books, 2006. 235 pages, index. Paperback; \$20.00. ISBN: 9781570756320.

The only formal divisions of this book are the 35 chapters, which can be read either sequentially or, a wonderful fea-

ture of this book, independently. This is not to say this work is without a theme but simply that either way of reading the book will be productive. Each chapter is concluded and summarized with questions for reflection.

Garon takes his readers on a journey of wonder throughout "the beyonds" (p. ix) of physics undertaking a "pursuit of meaning" (p. 3). Each chapter, though distinct in topic, does bear a similar structure to the next. Garon is masterful at communicating his child-like wonder for the world around him. A point of commonality with the reader is established immediately as Garon unfolds his simple observations of the world.

In what is a fairly typical chapter in the book, Garon begins by describing his childhood scientific investigations into the eating patterns of honeybees and sleeping patterns of crawfish. He goes on to develop this thought to bring in the teachings of Karl Rahner on the relationship between humans and the world ("the *objective other*" p. 39).

From the story of Robinson Crusoe to the growth of snowflakes, it is this pattern that makes the book so accessible and readable. Garon tries to "consider ways in which the worlds of science and religion blend" (p. 3) and in using this pattern does so masterfully. A formidable challenge to those who believe that the teachings of Scripture imply that all exchanges (particularly scientific) with the physical universe should be considered secular is raised by Garon.

This book is an attractive read on two levels. First, it can serve as a primer to the works of ones such as Karl Rahner, Pierre Teilhard de Chardin and others of a similar vein. They undoubtedly have influenced this work and the worldview of Garon heavily. He also concludes the book with reference to some of their well-known/trademark works. This book is the work of a scientist who is a theologian. He is able to blend what has in contemporary times been considered antithetical (i.e., God and Science). Garon admirably maintains his integrity both as a scientist and as one with a theistic worldview. This book represents a contemporary manifesto on how both can be held. Naturally one may wish to read material in which these thoughts have been expressed previously; Garon's bibliography provides this opportunity.

Secondly, though I do not know if this was the intent, Garon really lays out a new pedagogical strategy for teaching science. At a minimum, he serves to reinforce the power of wonder in beginning the discussion about God. It bears a restatement that there is an effectiveness that still remains, though often neglected, in starting a conversation about theological truths in an examination of intricacies of the physical universe. Like Garon, I avoid the terms "gap" and "design" lest the impression be given that this work is a "God-of-the-gaps" or ID reiteration. As a sincere and devout scientist, Garon progresses from simple observations to profound biblical truth, leaving us with a well-developed exposition of natural revelation. A point of potential controversy is Garon's Christ-centered approach.

There can still be wonder even in that which science explains; it still remains a testament to the glory of the Creator. It is incorrect to assume that wonder and knowledge are mutually exclusive. Yet, at the same time Garon is careful to guard against materialism which he defines as "... mindless surrender ... to things with little consideration of higher values" (p. 159). He posits a "correct mate-

rialism" (p. 160) as has been put forth in the thoughts and writings of Rahner. This approach (from wonder) may in fact be influential enough to encourage those of faith to re-engage themselves in the sciences.

This book was a joy to read. It should be read by those so entrenched in their scientific discipline that they no longer look heavenward. This work serves to remind us that the universe is God's creation and that he has revealed himself through it.

Henry A. Garon is a professor of physics recently retired from Loyola University in New Orleans.

Reviewed by Kyle Hilton, South Hamilton, MA 01982.

ORIGINS & COSMOLOGY

THE COSMIC LANDSCAPE: String Theory and the Illusion of Intelligent Design by Leonard Susskind. New York: Little Brown, 2006. 1380 pages, glossary, index. Hardcover; \$24.95. ISBN: 0316155799.

Susskind, a professor of physics at Stanford University, was instrumental in formulating string theory. This is his first popular book. It has thirteen chapters covering such topics as an introduction to particle physics, the Anthropic Principle, the origin of string theory, the myth of uniqueness and elegance, and why he believes that the universe is a Rube Goldberg affair.

One of the unique things about this book is that Susskind actually respects those who believe in intelligent design, saying they have a point, which is an oddity among science books. The Anthropic Principle, he says, is easy to explain away, save one thing, the tiny value of the cosmological constant. This constant is a repulsion force which Einstein called his biggest blunder but which discoveries in the late 1990s may show to be one of his greatest discoveries. Susskind says the cosmological constant should be 120 orders of magnitude larger than it is. Thus, it appears to be fine-tuned to an incredible degree. It is this which Susskind is trying to explain.

He believes that the mathematics of string theory, with its 10^{500} possible solutions is telling us that there really are 10^{500} universes out there, each represented by one of the solutions. In such a cosmic landscape of universes, a few of them would have the properties of our universe, with our tiny cosmological constant. This is, he says, how we came to exist. We are a giant crapshoot on the cosmic landscape; design is an illusion arising from this.

Contrary to most books on physics, this one presents an alternative to the general view that the universe is elegant. Susskind ridicules this elegance saying that modern particle physics theories require thirty constants of nature, for none of which do we know why they have the values they have. This kind of adjustable clockwork is not elegant. No one can explain why the particles have the masses they do, the charge they do. We have not even observed the Higgs boson, which is supposed to give matter mass. Like angels and demons, some particles are believed in, but they are never seen.

At the end of the book is an all too brief discussion of the inability to verify the cosmic landscape. Susskind

acknowledges that some think it appears as a religion. Like God, the cosmic landscape refuses to enter our laboratories and subject itself to observational verification. He looks to mathematical inconsistency to be the test for the string theory. The problem is that mathematical consistency does not ensure ontological status and neither does the existence of an equation. The thrust of the book seems to be: To explain our existence requires the existence of a cosmic landscape, a megaverse. Therefore, the cosmic landscape exists. This is quite similar, in my opinion, to the ontological proof of God, which purports: The definition of a perfect God must include existence. Therefore, God exists. But when applied to the string theory, does it have the same force? Is it even science rather than religion?

One truly fascinating revelation about string theory as an explanation for our existence is not the unverifiable megaverse. That has long been known. It is that string theory, the thing that creates the cosmic landscape upon which Susskind depends for his existential explanation, depends upon supersymmetry, a theory that predicts that each and every subatomic particle has a twin. The problem is that this entire concept has been experimentally falsified because the present day particle accelerators are quite capable of detecting these twins but they have *never* been observed — none of them. This means that string theory as an explanation for our existence is not only *not* an explanation; it is just flat out observationally false. To use a falsified theory as a way to create a multiverse in order to avoid fine-tuning seems a wee bit ironic given the claim above that mathematical consistency will be the standard upon which to judge the theory. If observationally false predictions do not falsify it, what will? This too fits the definition of a religion more than that of a science.

The book was an interesting read, although tedious at times early on. The last half was much better. I recommend it to the readers of this journal.

Reviewed by Glenn R. Morton, 10131 Caim Meadows Dr., Spring, TX 77379.

INTELLIGENT THOUGHT: Science vs. The Intelligent Design Movement by John Brockman, ed. New York: Vintage Books, 2006. 231 pages, appendix. Paperback; \$14.00. ISBN: 0307277224.

You *can* judge this book by its cover. If its "science vs. intelligent design" (ID) subtitle does not make the authors' central premise clear enough (that ID is *not* science), the photo of a human skull facing an orangutan skull reinforces the point. A barely-legible nameplate underneath the orangutan fossil reads *Darwin*. Whether this was meant to satirize past creationist attacks against the theory of evolution, I cannot say. The skulls were apparently part of the exhibit *Fierce Friends: Artists & Animals in the Industrial Era, 1750–1900* hosted by the Van Gogh Museum in Amsterdam and subsequently by the Carnegie Museum of Art in Pittsburgh.

Brockman is an editor at Edge Foundation, a private nonprofit whose goal is "to promote inquiry into and discussion of intellectual, philosophical, artistic, and literary issues, as well as to work for the intellectual and social achievement of society" according to www.edge.org, for which he is publisher. All sixteen essayists in *Intelligent Thought* are regular contributors to *Edge*. They include

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evolutionary biologists (Jerry Coyne, Richard Dawkins, Neil Shubin); a historian of science (Frank Sulloway); paleontologists (Scott Sampson, Tim White); psychologists (Scott Atran, Marc Hauser); cognitive scientists (Daniel Dennett, Nicholas Humphrey, Steven Pinker); physicists (Seth Lloyd, Lisa Randall, Lee Smolin, Leonard Susskind) and a theoretical biologist (Stuart Kauffman).

Intelligent Thought is a polemic whose unrelenting theme is that ID (like other forms of creationism that preceded it) threatens science education and American society. Although some contributors critique ID as science, others make little effort to conceal their indignation over ID's secret religious agenda. Brockman's own rhetoric clearly illustrates his warfare mentality. In the following quote, he equates IDers with the Visigoths:

Our children are literally the future of our nation, which will increasingly need competent scientists and engineers to guide us through the coming technological revolutions ... There are examples in history of the collapse of great civilizations. There is no particular reason that the United States should be exempt from historical forces. The Visigoths are at the gates. Will we let them in?

On its publication date, copies of *Intelligent Thought* were mailed to all 535 members of United States Congress. A cover letter signed by the authors stated in part:

The recent federal court decision in Dover, Pennsylvania found that ID was not a scientific theory, but a form of religion in disguise. Judge John Jones III, a churchgoing Republican appointed by President Bush, concluded that teaching this doctrine in the public schools represents both bad education and an unconstitutional violation of the First Amendment ... Reason and law triumphed in Dover.

The controversy over ID vs. evolution is not a scientific controversy ... The "controversy" is about whether sectarian religious views should be taught in the science classroom. Most theologians readily accept evolution, finding it compatible with their faith ...

Science education that incorporates unscientific issues like ID is a sure path to America's failure against competing countries.

Stuart Kauffman is one of the few contributors who entertain the possibility that ID *might* be science. He discusses *pre-adaptation*, the view that a biological structure may have been selected for one job, but also had the potential to do something else. Kauffman offers ID the opportunity to make a testable prediction. ID, he says, must predict that no multifunctional intermediates will be found. If ID adherents are unwilling to predict this, they cannot claim to practice science. If IDers *do* make this prediction, Kauffman argues that it has already been refuted by the fish swim bladder, which developed into lungs with a radically different function.

Richard Dawkins, author of *The Blind Watchmaker* (1986), discusses whether our judgment of *intelligent* is a legitimate scientific question. At least in the case of SETI, he admits that it is. What should messages from extraterrestrials sound like? Rhythmic radio pulses detected by Jocelyn Burnell (1967) came from pulsars, not E.T. Once we understood their physical origin, they ceased to be compelling evidence for intelligent aliens. A string of

prime numbers (as in Asimov's *Contact*) might constitute a more convincing message, but Dawkins claims that too could have a natural explanation.

Regardless of what you think of its evolutionary views, *Intelligent Thought* demonstrates that Christianity has a public-relations problem. Misrepresenting religious views as scientific views has not won the trust of our secular neighbors.

Reviewed by Joseph H. Lechner, Professor of Chemistry, Mount Vernon Nazarene University, Mount Vernon, OH 43050.

DARWIN STRIKES BACK: Defending the Science of Intelligent Design by Thomas Woodward. Grand Rapids, MI: Baker Books, 2006. 223 pages, index. Paperback; \$14.99. ISBN: 0801065631.

ASA member Thomas Woodward teaches the history of science, communications, and systematic theology at Trinity College of Florida. His specialty is rhetorical argumentation. This book is a sequel to his book *Doubts about Darwin* (2003), a history of the Intelligent Design (ID) movement by an insider. The present book has a foreword by Dembski and the blurbs on the back cover are by Johnson, Behe, Wells, and Colson.

Woodward chronicles the debate over ID in the last decade, which he presents using the language of warfare (appropriately, he has a military background). The book has four introductory chapters followed by chapters on Behe and cellular complexity, Wells and *Icons of Revolution*, the Cambrian explosion, the origin of life (two chapters), Dembski and complex specified information—unexpected allies of the ID movement—and an assessment of the present situation.

Woodward is an impassioned advocate for the ID movement. He uses his rhetorical skills accordingly. ID proponents are presented in a favorable light. The arguments of ID critics are presented in some detail but are then immediately discounted—they are characterized as disappointing or unconvincing. Woodward writes in a lively style suitable for the general public. His comments about the personalities involved in the debate are very interesting.

The major books of the ID critics engaged by Woodward are *The Tower of Babel* by Robert Pennock, *Finding Darwin's God* by Kenneth Miller, *The Triumph of Evolution and the Failure of Creationism* by Niles Eldridge, *Creationism's Trojan Horse* by Barbara Forrest and Paul Gross, *Unintelligent Design* by Mark Perakh, *Why Intelligent Design Fails* edited by Matt Young and Taner Edis, and *God, The Devil, and Darwin* by Niall Shanks. An edited version of Del Ratzsch's review of *God, The Devil, and Darwin* appears in this book as an Appendix.

Woodward, who is neither a professional scientist nor a professional theologian, relies on the assumptions that the two foundation books of the ID movement, namely *Evolution: A Theory in Crisis* by Michael Denton and *Darwin on Trial* by Phillip Johnson, are based on solid ground. He assumes that the proper battlefield is that chosen by Richard Dawkins in his book, *The Blind Watchmaker*. He also assumes that the rhetorical firepower provided by Behe and Dembski is effective. In my assessment, each of these assumptions is invalid.

Denton now regrets the choice of title of his 1987 book, and he has dissociated himself from the Discovery Institute and the views of Johnson. Rather than a mechanistic (a superwatch analogy) view of macromolecular structures, he now sees self-organizing lawful forms (a crystal analogy). British scientist-theologians such as Roger Forster and Paul Marston regard Johnson's insertion of metaphysics into science as misguided and misinformed. Johnson has made the same mistake as Dawkins, and thereby has set up a perceived conflict between science and religion at a point where no conflict need exist in this particular respect. Dembski's design filter based on specified complexity (ID in its pure form) fails in practice because he can never know the probabilities that he needs to apply it to a biological situation, because of the unknown processes involved. Thus, his argument is ultimately one of the "God of the gaps" type.

The ID argument is not science because it fails to provide an alternative explanation of the "how and when" type. It is poor theology because it confines the creative action of God to just a subset of universe.

Woodward sees the Dover trial decision as an aberration, and he foresees a rosy future for Intelligent Design. However, from my perspective that decision was a logical outcome of events in the US, and my expectation, based on the fundamental weakness of ID, is that in the future, ID proponents will be engaged in trench warfare rather than conducting a blitzkrieg.

People interested in the evolution-religion debate should read Woodward's book for its lucid exposition of the ID argument. But in order to see why the argument is ultimately unsatisfactory and in fact unnecessary, they should then read the recent books by Francis Collins, Simon Conway Morris, John Haught, Denis Alexander, Ted Peters and Martinez Hewlett, and Alistair McGrath that present a theistic evolutionist view and directly demolish the scientism of Dawkins.

Reviewed by Donald Nield, Associate Professor of Engineering Science, University of Auckland, Auckland, New Zealand.

THEISTIC EVOLUTION: Did God Create through Evolution? by Mark W. Swarbrick. West Conshohocken, PA: Infinity Publishing, 2006. 254 pages. Paperback; \$15.95. ISBN: 0741424142.

Swarbrick is a former pastor in Arizona with the Assemblies of God, holding a diploma in Ministerial Studies from Global University's Berean School of the Bible. A former theistic evolutionist, he writes out of pastoral concern for those Christians who continue to believe that "God created the world through the process of evolution" (p. 2). The book aims to demonstrate the incompatibility of Christianity with evolution.

To make his case, Swarbrick begins with an expansive (and, in my opinion, question-begging) definition of "evolution":

Evolution is the universe spontaneously expanding and organizing itself into galaxies and solar systems from the disorganization of the explosion. On earth, chemicals leached from rocks by water form a 'pre-biotic' soup. From this goo, living cells spontaneously form and begin changing into more complex

living creatures. These creatures in turn continue to advance to higher life forms until finally man has evolved. All of this activity is undirected and unsupervised by any divine being (God) (p. 10).

He then provides a sketch of Christianity as principally a plan of sovereign redemption, immediately followed by an attempt to catalog the opinions of theistic evolutionists and how these differ from Christianity. While he ably and fairly demonstrates the diversity of exegetical views among that group (creation timelines, the reality of Adam and Eve, local vs. global flood, whether miracles occur, etc.), Swarbrick does not attempt to interface with their theology. There is no reference to Polkinghorne, Teilhard de Chardin, or Ken Miller—nor, indeed, any other prominent author on the subject—in the entirety of the book.

Rather, Swarbrick focuses on common objections to theistic evolution, while declining to showcase any attempts to rebut them. In Chapter 3, titled "Conflict 1: Deism vs Theism," he maintains that

[T]he theistic evolutionist cannot believe that God somehow "guided" evolution in any real sense, for the very definition of evolution as it is being taught in school today denies this ... The theistic evolutionist finds himself in the cock-eyed position of trying to imagine God creating accidentally on purpose (p. 22).

Ergo, as the chapter title implies, theistic evolution is deism, not theism. Chapter 4, "Conflict 2: The Fall and the Curse," explores the question of suffering and its traditional Christian explanation rooted in the Fall and Restoration through Jesus. This is an area with compelling, though not necessarily insuperable, difficulties for theistic evolution. Of special note is how "survival of the fittest" can be considered a "good" process as Christians understand goodness. Swarbrick surveys these problems well and with thorough reference to the Scriptures, though disappointingly without any discussion of other readings of redemptive history that might not have these problems.

Chapters 5 through 8 focus on difficulties with theistic evolution in issues of incarnation, judgment, salvation, and redemption. All of these objections, in Swarbrick's view, flow from denying the literal history of, respectively: Adam, a global flood, miracles (including the Resurrection), and the Second Coming. While he admits that not all theistic evolutionists hold to a low view of Scripture, he nevertheless believes that a fully consistent application of evolution requires such a view. In chapter 7, he devotes almost half the book (105 pages) to an impressive historical study of inerrancy and its pre-eminent position in Christian thought, from Paul to Augustine to Martin Luther to the present day. This part of the book is quite scholarly; indeed, I could see purchasing the book for this material by itself. Yet its application to the stated goal of the book is tenuous and not relevant to the many theistic evolutionists who hold fast to God's Word.

The final chapters present evolution as a negative social force and as an unscientific social construct. Swarbrick writes authoritatively on evolutionary influences in the eugenics, racism, and Nazism of the late nineteenth and early twentieth century (his survey of Hitler's *Mein Kampf* is particularly strong). His treatment of the science is, sadly, not nearly as impressive and rather scanty for a book on this topic. Just over forty pages of conflated young-earth creationist and intelligent design arguments, which are considered by his stated audience to be thor-

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oughly discredited and false, are not likely to have much traction. The volume closes with a sharing of the gospel message for non-Christian readers.

All told, this is a puzzling book. Swarbrick's transformation from theistic evolutionist to young-earth creationist has left him with a binary view of the subject. Despite claims to the contrary, he does seem to believe that science and religion are in irreconcilable conflict. He is, however, to be commended for writing in Christian love and avoiding polemic.

Reviewed by Christopher J. Barden, Dalhousie University, Halifax, NS, Canada, B3H 4J3.

A BIBLICAL CASE FOR AN OLD EARTH by David Snoke. Grand Rapids, MI: Baker Books, 2006. 195 pages plus appendix, references, and index. Paperback; \$14.99. ISBN: 0801066190.

In this book, ASA Fellow David Snoke, a professor of physics at the University of Pittsburgh, presents a case for a "day-age" view of Genesis 1. Snoke's twin goals are to establish that the "day-age" view is a valid alternative for Christians who hold to biblical inerrancy and to argue for a concordist understanding of the Genesis texts and modern science. He succeeds admirably at the first goal, but is less persuasive concerning the second.

The book is organized into nine chapters and includes an appendix with a "literal" translation of Genesis 1-12. The first two chapters identify Snoke's underlying assumptions and recite the scientific evidence for an old earth. Snoke does an excellent job of explaining why and when extra-biblical evidence can be used to interpret the Bible, and provides a calm, concise summary of the physical evidence against the young earth view. These chapters are particularly useful and admirable because they avoid the argumentative tone that so often creeps into this sort of discussion.

After laying this groundwork, Snoke responds to two key objections against the old earth view: the problem of death before the Fall and the relationship between the creation week and the Sabbath. His insights concerning animal death before the Fall are particularly helpful. He suggests that the wild, untamed aspects of creation, including things such as carnivorous animals, may have served before the Fall as a reminder to Adam and Eve of God's power, and as a sort of warning about life outside the protected confines of Eden. Just as Aslan in C. S. Lewis' *Narnia* books is not a "tame Lion," he notes, these aspects of creation that do not seem "nice" to us remind us that God is also a "dangerous" God.

After presenting his biblical case for an old earth, Snoke turns to the case for a concordist view of science and Scripture. He defines "science" as "nothing but a way to organize and analyze the things of the world around us," and concludes that since the Bible also makes observations about the physical world, there should be areas of overlap where "things in the Bible are open to scientific investigation."

Many readers will take issue with this definition of "science." Some also may question Snoke's hermeneutical presupposition that biblical texts concerning creation are presented in a form that can be correlated with modern

scientific propositions. Many readers also will question why Snoke discounts Darwinian evolution based on an *a priori* reading of the creation story concerning Adam and Eve, while remaining willing to consider alternative interpretations of related texts that superficially seem to suggest a recent creation. Nevertheless, on the question of the age of the earth, this is a fair and well-balanced book that deserves a wide reading, particularly in the evangelical community.

Reviewed by David W. Opderbeck, Assistant Professor, Law Department, Baruch College, City University of New York, New York, NY 10010.



RELIGION & BIBLICAL STUDIES

A LITTLE PRIMER ON HUMBLE APOLOGETICS by James W. Sire. Downers Grove, IL: InterVarsity Press, 2006. 112 pages. Paperback; \$12.00. ISBN: 083083382X.

ASA associate member James Sire, formerly InterVarsity Press editorial director, with a Ph.D. from the University of Missouri, is the author of *The Universe Next Door*, *Scripture Twisting*, *Why Good Arguments Often Fail*, and many other books. This book is a "primer, a very first book exploring the nature of Christian apologetics, which, simply defined, is a defense of the Christian faith," according to the author. This short book, dedicated to the famous apologist, Francis Schaeffer, contains endnotes, a short bibliography in chapter five, scripture index, and subject index.

Its six chapters can be stated in the form of questions with Sire giving the answers.

Q: What is apologetics?

A: It is the simple presentation of a case for biblical truth, most notably the central truth of Jesus Christ as the Son of God and Savior.

Q: What is the value of apologetics?

A: Apologetics is good for the soul and character of the apologists and the character of the Christian community.

Q: What are the limits of apologetics?

A: Apologetics can offer reasonable evidence for the truths of the Christian faith, but it cannot offer knock-down proof.

Q: What are the contexts of apologetics?

A: Apologetics can be offered in formal or informal situations, to hostile or friendly audiences, and under time constraints or open-ended.

Q: What are the arguments of apologetics?

A: Apologetics offers the case for Jesus, the case for the historical reliability of the Gospels, the case for the coherence of the Christian worldview, the arguments for individual aspects of the Christian faith, and the case for a personal experience of God.

Q: What is the call to apologetics?

A: The call to be an apologist is from God, to God, and for God; it involves a focus on Bible study, prayer, and reading on issues relating to real life.

Sire writes in an engaging and insightful manner, with personal experiences included which make the reading relevant and interesting. He does not hold himself up as a highly successful apologist, but recounts occasions when he has witnessed to large groups and to individuals. Sire writes: "I must confess, though, that though I have accumulated thousands of frequent flyer miles, I have not been very successful in generating significant spiritual conversations" (p. 69).

Sire concludes his book with traits helpful to a Christian apologist. These include passions for truth, holiness, people, communication, positive judgment of Christian friends, success in academic work, and enjoying apologetic endeavors.

This is a welcome addition to books on apologetics. The word "humble" in its title calls attention to the words of Paul to Timothy: "The Lord's servant must not quarrel; instead, he must be kind to everyone, able to teach, not resentful" (2 Tim. 2:24). Any Christian seeking to carry out the Great Commission would profit from reading Sire's thoughts.

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

THE REASON DRIVEN LIFE by Robert M. Price. Amherst, NY: Prometheus Books, 2006. 364 pages. Hardcover; \$24.00. ISBN: 1591024765.

Rick Warren wrote *The Purpose-Driven Life*, which one pundit claims is, after the Bible, the best-selling nonfiction book ever written. Robert Price, the author of *The Reason Driven Life*, considers Warren's book "merely recycled standard, one might even say *stale*, fundamentalist teaching" (p. 21). He thinks Warren is "a dogmatic preacher or writer who offers a magic alternative" to an individual taking control of his own life (p. 24) and offers "miserable human speculation" (p. 29).

Price has several problems with Warren's approach which assumes that one size fits all, in terms of a single, uniform purpose for life, and that the Bible is inspired ("An inspired and infallible passage whose meaning you cannot be sure of is not much more useful than an *uninspired, fallible* passage," p. 28; "... fundamentalists cannot seem to maintain their faith without a thousand self-deceptions ... endless implausible excuses and dodges," p. 32). Price aims to respond to the points made in the forty chapters of Warren's book which he describes as the "fundamentalism-driven life."

Price's evangelical/fundamentalist background enables him to write as an outsider who was once an insider. He received Christ in 1965, had a daily devotional time, became a soul winner, attended church weekly, enthusiastically studied the Bible, received Campus Crusade for Christ training, became chapter president of InterVarsity Christian Fellowship, and attended Gordon-Conwell Theological Seminary. He eventually abandoned evangelical Christianity, explored liberal Protestant theology, and during his pastorate of a liberal Baptist church, rejected theism altogether.

Price prefers not to describe himself as an atheist, because it describes what he does not believe rather than what he does. He considers himself a humanist, a would-be philosopher, and a church attendee "for the rich pageantry and

the moral challenge" (p. 18). Price thinks Christianity prolongs moral, intellectual, and personal immaturity. Freud was right, claims Price, when he said maturity only comes to those who realize there is no Creator, no divine lawgiver, no author of destiny and meaning, and no giver of eternal life (p. 17). To Price, the morally neutral universe is not rooting for events to come out a certain way.

Evangelicals may find points with which they agree. For example, Price believes that the much proclaimed statement "Christ changed my life" is sometimes more a statement of faith than an accurate description of experience. Price is not antagonistic to Christians, but states he likes them. Price seeks to be logical rather than combative and argumentative. He states, "I'm not trying to get you to agree with me. That wouldn't be rational. I merely aim to provide food for thought that you might not otherwise have considered" (p. 21).

For those who want to explore alternative views to Price's, *A Little Primer on Humble Apologetics* by James Sire offers brief guidance and directs the reader to many other apologetic and theodicy resources. For an intriguing book by an evangelical on the will of God, read Garry Friesen's classic *Decision Making and the Will of God: A Biblical Alternative to the Traditional View*.

Price is professor of theology and scriptural studies at the Johnnie Coleman Theological Seminary, professor of biblical criticism at the Center for Inquiry Institute, and a fellow of the Committee for the Scientific Examination of Religion and the Jesus Seminar. His books include *Beyond Born Again*, *The DaVinci Fraud*, and *The Incredible Shrinking Son of Man*.

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

IN THE BEGINNING: Bibles Before the Year 1000 by Michelle Brown, ed. New York: HarperCollins Publishers, 2006. 360 pages. Hardcover; \$45.00. ISBN: 9781588342409.

The Bible is the best-known book of all times. It is a compilation of writings stretching over a period of 1500 years. Beginning with the Pentateuch and extending to the Johannine manuscripts, none of the biblical autographs remain. However, many ancient manuscripts of the Hebrew and Christian Bibles are extant. For the first time, the Smithsonian Institution has collected many of these writings and made them available for public viewing. They were on view at the Smithsonian Institution Arthur M. Sackler Gallery from October 21, 2006 to January 21, 2007, the first time some of the biblical manuscripts have ever been put on public display.

In the Beginning is produced as an accompaniment to the Smithsonian Institution exhibition of biblical codices and scrolls. Some of the treasures included in the exhibition and this book are manuscripts from the Monastery of St. Catherine's at Mount Sinai in Egypt, early English and Irish manuscripts from the Bodleian Library at Oxford University, a Dead Sea Scroll from the first century CE, and the Niketas Bible of the tenth century CE, a great example of Byzantine illumination. Although many copies of the Bible are fragments in poor condition, this collection presents some of them in captivating color. Many are in black and white. All of them are numbered for easy identification and accompanied by informative text.

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Included for those readers interested in details about the book and its inclusions, are an index, list of photo credits, list of contributors, a bibliography, notes, a glossary, a who's who, a chronology, a list of manuscripts and lenders, and a reference catalogue.

This is a wonderful volume for Bible lovers, historians, theologians, teachers, photographers, librarians, and anyone else interested in the development of biblical manuscripts from antiquity. And best of all, it is a reasonably priced, big book (10 by 11 inches) with high quality paper and plenty of white space. It is a volume which should find a home in every public and academic library, and the Smithsonian Institution and HarperCollins have rendered a service to the world of erudite and lay knowledge.

Michelle P. Brown, the volume's editor, is well qualified. She is professor of medieval manuscript studies at the University of London, former curator of illuminated manuscripts at the British Library, and the author of *Anglo-Saxon Manuscripts*, *Understanding Manuscripts*, and *The Lindisfarne Gospels*.

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

INTRODUCTION TO NEW AND ALTERNATIVE RELIGIONS IN AMERICA (five volumes) by Eugene V. Gallagher and W. Michael Ashcraft, eds. Westport, CT: Greenwood Press, 2006. 1504 pages, notes, selected bibliography, indices. Hardcover; \$399.95. ISBN: 0275987124.

New religious movements (NRMs) have come under increasing scholarly scrutiny in recent years. One academic journal devoted entirely to the subject, *Nova Religio: The Journal of Alternative and Emergent Religions*, is in its tenth year as of this writing, and there is a regular slew of books from both academic and popular presses on the subject. Now, the field can be said to have something of an authoritative encyclopedia in Greenwood Press's five-volume *Introduction to New and Alternative Religions in America*. The set is an impressive achievement that will aid both scholar and layman in navigating the often nebulous territory of nonmainstream religion in the US.

The first volume of the work, *History and Controversies*, begins with a lengthy article by Timothy Miller, covering religious innovation from colonial times to the present, and includes a whole host of entries that look at issues of leadership, law, gender, age, sexuality, violence, and globalization as they relate to NRMs, as well as to the history of Christian and secular countercult movements. The next four volumes cover specific organizations or practices, grouped together by basis of what might be considered their philosophical root: *Jewish and Christian Traditions* (covering Shakers, Jehovah's Witnesses, Christian Science, etc.), *Metaphysical, New Age, and Neopagan Movements* (Spiritualism, Eckankar, Wicca, etc.), *Asian Traditions* (Vedanta Society, Soka Gakkai, Unification Church, etc.), and *African Diaspora Traditions and Other American Innovations* (Nation of Islam, Santería, etc.).

Each entry is amply endnoted and features a list of works for further reading. The result is probably the largest survey of new and alternative religions yet published (even if it is strangely missing specific entries on Scientology and various UFO religions). Previous surveys have

tended to be limited to specific groupings of movements, such as Sarah M. Pike's *New Age and Neopagan Religions in America* (Columbia University Press, 2004), which has made it difficult to see the religious forest for all the trees out there. This reference set essentially creates a map that helps locate these movements in the world at large.

Of course, there still remain a number of problems underlying the study and categorization of NRMs, the predominant one being that such descriptors as "new" and "alternative" are entirely contextual, as the editors admit. Indeed, there are entries in Volume 4 on Buddhism in general and Tibetan Buddhism specifically, neither of which are new in the slightest, save in the American experience. (And why are not Hinduism or Islam included?) Too, classifying NRMs according to their source material is a risky proposition at best, as religious innovation at the fringe may cover a wide array of inspirations; for example, some neopagans borrow freely from both ancient Norse sagas and Native American traditions. Co-editor W. Michael Ashcraft's previous book, *New Religious Movements: A Documentary Reader* (New York University Press, 2005), categorized NRMs on the basis of what the various movements offered the adherent: new understandings, new selves, new families, new societies, and/or new worlds. It was a very insightful typology, and I think it a shame that it was not applied in some respect here, perhaps in an article on the many ways in which NRMs have been studied.

Despite these few problems, editors Ashcraft and Eugene V. Gallagher have managed to compile what will be the standard reference on the subject for years to come. Readers of this journal may be particularly interested in the set, given the many ways in which some new and alternative religions appropriate science, be it the racially charged pseudoscience of the Christian Identity movement or the scientific rationalism that underlies portions of Swedenborgian doctrine. Popular understandings (or misunderstandings) of science have had just as much influence upon the religious milieu of the US as have the introduction of other religious traditions—groups such as Christian Science or the Church of Jesus Christ of Latter-Day Saints cannot be fully understood without contextualizing their history in the dominant scientific theories of the times in which they were formed. *Introduction to New and Alternative Religions in America* is a great set, though its exorbitant price, roughly eighty dollars per volume (each approximately 300 pages), means that libraries or other institutions will likely be the only ones able to afford it.

Reviewed by Guy Lancaster, Assistant Editor, Encyclopedia of Arkansas History & Culture, Little Rock, AR 72201.

FABRICATING JESUS: How Modern Scholars Distort the Gospels by Craig Evans. Downers Grove, IL: InterVarsity Press, 2006. 290 pages. Paperback; \$19.00. ISBN: 0830833188.

Craig Evans, a New Testament scholar and teacher at Acadia Divinity College in Nova Scotia, has written a helpful text addressing popular concerns about the origins of Christianity from a conservative evangelical perspective. Evans is well qualified, having learned textual criticism, ancient languages, and early Christian history at Claremont Graduate University under the tutelage of such

scholars as James Robinson, chair of the Nag Hammadi seminar; William Brownlee, one of the first scholars to study the Dead Sea Scrolls in 1948; and James Sanders, the leading proponent of the "New Perspective on Paul." Evans is one of the few conservative scholars sought after by the secular media for expertise in Christian origins. Evans recently served as an advisor to the National Geographic Society's 2006 report on *The Gospel of Judas*.

Fabricating Jesus is written for a popular audience familiar with the writings of John Dominic Crossan and other Jesus Seminar-type authors. While not a point by point critique of various revisionist portrayals of early Christianity, Evans addresses the major methodological flaws behind both scholarly and popular attempts to rewrite the history of Jesus and the early church.

Evans argues that some scholars are motivated by misplaced faith and misguided suspicion. In the case of Bart Ehrman, the popular author of *Misquoting Jesus*, Evans notes that Ehrman had unfortunately built his faith on a rather strict notion of inerrancy instead of simply trusting in the accomplished work of Jesus Christ.

Evans expands his argument by noting where some scholars miss the mark: (1) having cramped starting points and overly strict critical methods; (2) reliance on questionable texts, such as dating *The Gospel of Thomas* as a first century document over and against the general consensus that it was actually mid to late second century; (3) putting Jesus into alien contexts, such as making Jesus into a Cynic; (4) taking the sayings of Jesus out of their New Testament narrative contexts; (5) diminishing the miraculous deeds of Jesus; (6) preferring Josephus over the New Testament writers; and (7) making claims for multiple "Christianities" during the first century.

To cap off the main thesis, Evans reveals the hokum history and bogus findings of such popular works as Michael Baigent's and Richard Leigh's *Holy Blood, Holy Grail*, the conspiracy theory in the guise of historical scholarship that inspired Dan Brown's *DaVinci Code*. *Fabricating Jesus* includes several appendices, including a fascinating discussion of the free-floating sayings of Jesus and some comments about *The Gospel of Judas*.

Two of the best features of *Fabricating Jesus* is its excellent annotated notes section and list of recommended readings consistent with Evans' perspective (James Dunn, Robert Stein, Ben Witherington, N. T. Wright). It is hoped that an extended set of annotated notes for the book will be available at the InterVarsity Press website at: www.ivpress.com/cgi-ivpress/book.pl/code=3318.

Fabricating Jesus succeeds as a popular text, but it leaves you wanting more. For instance, Evans does not really address the most troubling concerns behind Bart Herman's *Orthodox Corruption of Scripture*, which is Herman's scholarly rendition of *Misquoting Jesus*. Herman's "lost Christianities" is not so much the problem as his claim that orthodox Christian copyists altered the biblical text for apologetic purposes. It would be helpful if a conservative evangelical scholar of Craig Evans caliber would issue an in-depth critique of Herman and other more serious non-evangelical scholars.

In the genre of conservative evangelical responses to *The DaVinci Code* and the Jesus Seminar, *Fabricating Jesus* stands out as a generously civil yet firm critique of the way some scholars distort Jesus. Evans has very little rea-

son to fear the loss of faith in light of historical criticism. Evans is frankly embarrassed at how some members of his guild mishandle the evidence in order to advance certain arguments. Nevertheless, Evans is optimistic in that most scholars do follow sound scientific principles in doing historical research. Unfortunately, it is generally the more controversial fringe writers that grab the media headlines. Readers who are interested in how difficult it is to keep misguided suspicion and misplaced faith from impacting the discipline of historical criticism would benefit from reading *Fabricating Jesus*.

Reviewed by Clarke Morledge, Network Engineer, College of William and Mary, Williamsburg, VA 23185.



SCIENCE EDUCATION

FOSSILS AND FAITH: Finding Our Way through the Creation Controversy (4 lessons) by Thea Nyhoff Leunk. Boca Raton, FL: CRC Press, 2005. Leader's Guide, 67 pages. ISBN: 1592551998. Paperback; \$12.95. Student newspaper for each session; \$4.95. Useful for high school students grades 11 and 12 or young adults/adults in either a day school or church school setting.

DISCOVER CREATION AND SCIENCE (Walk With Me Grades 6-8, Year 3, Unit 5, 4 lessons). Grand Rapids MI: Faith Alive Christian Resources, 2006. Leader's Guide, 44 pages. ISBN: 1529551637. Paperback; \$5.95. Student materials for each session; \$3.15. A study for grades 6-8 or youth groups on creation and science.

When and how should we begin to address the issues that arise when science touches Christian faith? Surely as early as science is taught in school. Offering kids the chance to relate the Genesis stories they learned in Sunday School to the science they are taught at school can be daunting yet it can provide a foundation upon which they can build as their knowledge of Scripture and science matures with the years. Setting the stage for how one should approach these topics can avoid much pain in the future.

Session 1 of *Discover Creation and Science* provides a bridge between school and church by beginning with a science trivia game to get the kids focused. Then a transition occurs to an "I wonder" time where students write down science questions that they might ask God to answer that God *alone* knows. These generally focus on the Creation account. They then share the questions, and the teacher helps them to clarify their thoughts with follow-up questions. Using Heb. 11:3, the teacher brings in the dimension of faith and wonder. Emphasis is placed on the diversity and complexity of God's creation. A short time spent outside the classroom can provide examples.

Session 2 "Looking for Answers" contrasts the ways that the Bible and science describe nature. Emphasis is placed on a careful examination of both science and the Bible in tackling questions.

Session 3, "Respecting Different Opinions," looks at some of the classical questions of age, geology, biology, and design and argues the necessity of a careful examination that respects the ideas of others.

Session 4, "The Bottom Line," seeks to focus on the things that Christians hold in common (from six-day liter-

Book Reviews

alists to theistic evolutionists) and suggests that Christians need to present a common front against those who would use science to eliminate God.

This is a rich study. It has good material, creative teaching methodology, openness to new ideas and an approach toward science and faith issues that reflects that of the broad ASA community. It deserves a wide audience.

Fossils and Faith is aimed at the late high school and young adult level in covering the gamut of issues around the theme of origins. A student newspaper frames the questions to be considered in each of the four sessions. Dressed in colorful graphics and written in imaginative fashion, the newspaper has something for all, in setting up the discussion for the day. "In the Beginning, God" offers the Babylonian and biblical creation accounts as describing the Creator as both *immanent shaper* and *distant king*. The class then exegetes the meaning of the biblical account using a helpful hermeneutical approach. Poetry and humor add different interest-gathering dimensions as the class considers the Bible's view of creation.

Session 2, "The Heavens Declare," focuses on the scientific picture: the how of origin of the universe, life on earth, the animals, people. Heady stuff! A bit of science provides a change of pace. "God Has Made Everything Beautiful in Its Time" considers the hard questions—separating fact and belief—in framing a view of creation that takes Scripture and science into account. The final session, "When I Consider," pulls the earlier sessions together in asking what our role in the world should be. Earth keeping, celebration, and worship of the Creator are in order.

In moving from reviewer to enthusiast I encourage the reader to acquire a copy of the teacher's guide and student newspaper, read them carefully, and consider how these courses might be taught in your church or Christian school. Then bring your case to the CE director/pastor/headmaster and prepare for an enriching experience.

Reviewed by J. W. Haas, Jr., Emeritus Professor of Chemistry, Gordon College, Wenham, MA 01982.



SOCIAL SCIENCE

FAILED STATES: The Abuse of Power and the Assault on Democracy by Noam Chomsky. New York: Metropolitan Books, 2006. 263 pages, notes, index. Hardcover; \$24.00. ISBN: 0805079122.

Failed States is a frightening book. Chomsky, an MIT professor, a speaker on National Public Radio, and a prolific writer of political books, makes the claim that our beloved United States is close to being a "failed state." By asserting our right to intervene militarily against other countries, we have claimed for ourselves a world hegemony which we will not allow for any other country, not even an ally such as Great Britain. We create "client states," countries which, regardless of political system, are favored in trade relations and even supported against democratic change. In doing this, we pose an increasing danger to the world and to ourselves, likely nuclear war, at the cost of subduing our citizenry.

This is *not* a partisan book; both political parties come in for criticism. Examples date back fifty years and more, exacerbated since the events of 9/11. By regarding the

country as beyond the reach of international law and exempt from world norms, including the Geneva Conventions and the UN Charter, the United States has become a "rogue state." Even worse, Chomsky asserts, because these postures are creations of both major political parties, the system works to stifle political alternatives and genuine democracy is effectively reduced to popularity contests between Tweedledee and Tweedledum.

Early on, the author discusses breaches of the international norm of war as codified in the Geneva Conventions—first enacted in 1864 to protect both wounded soldiers and civilian populations. In 2002, then White House counsel Alberto Gonzales advised the president on what might constitute torture, advising him to ignore the "quaint and obsolete" provisions of that agreement, once solemnly attested to by our country. Chomsky quotes law professor Jordan Paust:

Not since the Nazi era have so many lawyers been so clearly involved in international crimes concerning the ... interrogation of persons detained during war.

His assessment of Bush's 2002 memo authorizing what most people would deem "torture" is quoted as follows:

... evidence of an unprincipled plan to evade the reach of law ... while seeking to avoid criminal sanctions ... [it] authorized and ordered violations ... which are war crimes.

Other actions, by previous administrations, are also dissected:

- Reagan's invasion of the sovereign state of Granada, with no congressional approval or even public discussion;
- Carter's training and support of the Somoza troops in Nicaragua as they murdered an estimated 40,000 people;
- Eisenhower's policy on Cuba, sanctions (which mostly hurt poor people) that remain in place to this day;
- George H. W. Bush's pardon of Elliot Abrams, convicted of lying to Congress about the United States' terrorist war in South America;
- Reagan's destruction of the elected democratic Guatemala, leading to the death of an estimated 200,000 persons;
- Wilson's invasion of Haiti—because the government there refused to allow U.S. corporations to buy up the land, thousands died;
- Clinton's authorization of the U.S. company, Texaco, to supply the Haitian military junta, one which had overthrown the fragile Haitian democracy, founded in 1990;
- Clinton's military interventions in Bosnia, now generally recognized to have been done, not on humanitarian motives, but to demonstrate NATO's power and establish American domination in Europe.

More could be added; read the book. The Bush invasion of Iraq, taken nearly unilaterally, comes in for particular attention.

This is a tough book to read. Chomsky writes for the highly educated and well-informed reader; I thought I was possibly one or the other but found some parts of his manuscript too complex to fully understand. If you can stand a book which is 50% comprehensible, it is worth picking up. It may disturb you (it did me) to learn more about our country's history and current political actions.

Reviewed by John W. Burgeson, 36633 Road P.8, Mancos, CO 81328.

THE REPUBLICAN WAR ON SCIENCE by Chris Mooney. New York: Basic Books, 2006. 342 pages, index. Paperback; \$14.95. ISBN: 0465046762.

The author is a young journalist who has written for publications like *Mother Jones* and *Slate* and now is the Washington correspondent for *Seed* magazine. This book is in four parts: the first being his view of how the Republican Party has been taken over by "industry" and the "Religious Right" interests in the last 30–40 years. In the second part, he focuses on four issues that he alleges that "industry" has fought in a way that is tantamount to a war on "science." These are global warming, the Data Quality Act (DQA), dietary issues relating to consumption of sugar and fats and the obesity problem, and the endangered species act (ESA) and related irrigation issues. The third part deals with issues relating to the Religious Right; viz: "creation science," stem-cell research, and programs of sex education for children. The book closes with a blistering attack on President Bush, entitled: "The Anti-Science President: Bush League Science." Then follows seventy pages of detailed notes.

The theme is crystal clear. In today's Republican party, the two dominant cultural forces of "industry" and the "Religious Right" are either evil, misinformed, ignorant or maybe all three. Their actions on the selected issues, Mooney claims, are antithetical to "science"—the latter being the "consensus view." He admits Democrats have misused science also but the sins of Republicans are far worse in his judgment. His recommendations for the future are to restore the Office of Technology Assessment (OTA), preserve the ESA, remove the DQA and above all educate the public on the misuse of science, which will help hasten the political demise of these Republican forces.

The tone of this book, even according to friendly reviewers (do a Google search), is "snide and polemical" and "shamelessly partisan." He not very subtly contrasts his "reality-based community" with "faith-based communities." He denigrates scientists on the opposite side of his views, e.g., by dubbing those skeptical of global warming as "contrarians" and even bothers to note that some of these scientists are "smokers." For me, he crosses the line by attacking two scientists with whom I have had personal interactions and whom I admire: Dr. John Graham, who recently resigned from the Office of Management and Budget (OMB), and Dr. Vernon Ehlers, congressman and ASA member.

This book has a focus more narrow than the title implies—i.e., dealing with a few issues of political importance and including technology issues like the ABM, when useful. Despite the detailed research, the level of understanding is that of a young journalist and not that of an experienced scientist. To cite an example on which I am knowledgeable, Mooney claims the DQA is a political ruse to hinder science in regulatory agencies. In fact, the DQA, which specifies peer review for documents on the scientific basis of regulations, was enacted in response to several events where an agency document had deficiencies. Instead, Mooney argues that where there is "scientific uncertainty," agency personnel should be allowed to exercise their "professional judgment," keeping in mind the Precautionary Principle (PP). But we in industry correctly have assessed such proposals as the "abandonment of science." Heretofore, scientific proof of a hazard must precede costly regulation. Some, including Mooney, propose that regulations should be as tight as economically

possible even without scientific proof of hazard, if there is the "possibility," as professionally judged by agency personnel, that a hazard "might" be found in the future.

This book is a source of "talking points" for a Democrat engaged in the rough and tumble world of politics as a book entitled *The Democrat War on Religion* would be for Republicans. As for the question of substance, without sensing its immediate applicability, Mooney, in his preface, makes the statement: "It's much easier to sow confusion and misinformation than it is to generate new and reliable knowledge."

Reviewed by John M. Osepchuk, Full Spectrum Consulting, 248 Deacon Haynes Road, Concord, MA 01742.

THIS SIDE OF HEAVEN: Race, Ethnicity, and Christian Faith by Robert J. Priest and Alvaro L. Nieves, eds. Oxford, England: Oxford University Press, 2006. 356 pages, index. Paperback; \$35.00. ISBN: 0195310578.

The issue of race underlies the great American experiment like nothing else, and because the US is still self-reportedly a majority Christian nation, race is manifest in our expressions of faith. During the civil rights era, American Christianity essentially split on the issue, with the prophetic voice of Martin Luther King Jr. lining up on one side and the various White Citizens' Councils (with their own verses from Scripture at the ready) lining up on the other, as those ever-present lukewarm Laodiceans lingered in the middle, just wishing it would all go away. Even in the twenty-first century, when most of us would like to pretend that racial inequality is a thing of the past, American Christians are still trying to work out their thinking on what is no longer just a black-white cultural divide.

This Side of Heaven, the product of a long-term study on race and religion funded by the Wabash Center for Teaching and Learning in Theology and Religion, is an attempt to address this big American question from within a Christian context and from a multidisciplinary perspective. The book was designed to fill a particular need—many Christian colleges and seminaries have added courses related to race and ethnicity, but most of the reading material on these two subjects is either at the more popular level or is written from a secular viewpoint often exhibiting an antireligious bias. The editors and authors have worked to create a book that is prescriptive in nature; it explores the latest scholarly thought on race and ethnicity and then details how the problems underlying the ecclesia, particularly in America, might be addressed from a Christian faith perspective.

This Side of Heaven is divided into four parts. The first contains essays examining how race affects our thinking as well as detailing the anthropological reasoning behind seeing race as a cultural construct rather than a biological one; in keeping with the prescriptive nature of the book is a chapter on developing a multicultural competency, in which the authors call for "a theology of identification, one that allows individuals to see the interconnectedness of their identity, clan, and nation with the identity, clan, and tribe of the other" (p. 88). Part II looks at how we encounter the "other" in our racialized worlds. It covers interracial relations in evangelical American Christianity as well as a few smaller case studies, such as the historical debate over integration at Columbia Bible College. The

third part looks at how the Bible has been particularly abused with regard to a racist theology. This includes chapters on the Christian Identity movement as well as some corrective pieces addressing Scripture directly, including one that examines the Samaritans as not a separate race but rather a separate religious group. The last section contains an array of case studies of interracial contact in a variety of church settings.

The editors fulfill their goal, for the end result is a book that is perfect for those being educated in a Christian environment—it is true to both modern scholarship and a religious vision that sees the church as potentially limitless in scope. Not only are our problems with race explicated in detail, but the correctives offered for our catastrophically racialized society call to mind the equalizing worldview that was the foundation of most of these evangelical churches—the radical vision of equality that sought to offer a godly alternative to a society riven by race, class, and gender. Readers of this journal should find the book particularly valuable as an alternative to the discourse on race that is the norm in many Christian and scientific circles. Every now and then, something like Richard J. Herrnstein and Charles Murray's *The Bell Curve* (1994) lures many with its assertions that the group they belong to constitutes an elite, as ordained by, biology (and, by extension, God). The temptation to seek validation for the superiority of a particular racial or ethnic group is not just scientifically misguided but is also incompatible with the Christian vision, given that the church, fundamentally, "is defined by faith in Christ rather than by genealogy, ethnicity, or race" (p. 328).

Reviewed by Guy Lancaster, Encyclopedia of Arkansas History & Culture, Butler Center for Arkansas Studies, Little Rock, AR 72201.

DAILY LIFE OF CHRISTIANS IN ANCIENT ROME by James W. Ermatinger. Westport, CT: Greenwood Press, 2007. Hardcover; \$49.95. ISBN: 0313335648.

Why this book? To explore the differences and similarities in daily life between Christians and pagans, to examine how Christianity developed and identified itself in an unfriendly world, and to place Christianity within the structure of Roman society. In the author's words: "The central aspect of this book examines Christians' daily life during the Roman world, especially in the city of Rome and before the legalization of Christianity" (p. ix). The author's information comes from literary and archaeological sources.

This ten chapter book includes a glossary, bibliography, chronology, photographs, drawings, images, and an index. The book's three main sections describe, in the Roman world, the uniqueness of Christianity, the uniqueness of Christians, and what it meant to be a Christian. Ermatinger presents a brief biography of two saviors of the world: Augustus was seen as political savior of the Roman world; Jesus would be seen as the religious savior of the whole world (p. 6). "These two individuals, Augustus and Jesus, living nearly contemporaneously with each other in the same political system, influenced the future of Christianity and the Roman world" (p. 7).

Christianity took root and developed because of the *Pax Romana*, established by Augustus (p. 19). Constantine established Christianity as the official state religion which led to its rapid spread because "Individuals quickly learned that by converting to this new religion there were more opportunities for advancement and wealth" (p. 21). Even so Christians were sometimes persecuted because they were part of a group, and "The Romans had a sort of national paranoia; they distrusted any gathering of people," even a volunteer fire department (p. 39).

There were many contemporary Roman religions, but they offered little hope for life after death. This was one reason why Christianity and the mystery religions were so popular, with Christianity winning out eventually (pp. 43–4). This topic is explored in the chapter entitled "Afterlife."

The last chapter, "Impact of Christianity," explains how Christianity shaped and influenced its buildings, organizations, papacy, pilgrimages, and tourist economy. The author concludes that some practices and attitudes of Christianity evolved (divorce, dietary laws, vernacular services), but others continue to be a vital contemporary part of Christian experience (fasting, prayer, and communion).

James W. Ermatinger, professor and chair of the Department of History at Southeast Missouri State University in Cape Girardeau, MO, is the author of *Economic Reforms of Diocletian* and *The Decline and Fall of the Roman Empire*.

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

 Letters

Dialogues Appreciated

I love the dialogue approach, as exemplified by the Seely-Ross and Haarsma-Behe dialogues in the March 2007 issue of *PSCF*. For my money, this issue was the best yet of *PSCF*. Being able to read the article, the responses, and the responses to the responses all at once made it so much easier for me to understand the issues and make up my own mind. I hope *PSCF* is able to feature similar dialogs in the future, e.g., Dick Fischer & Glenn Morton, Carol Hill and ???, Howard Van Till and ???, and anyone else whose previous articles have stirred up letter responses in the past.

Perhaps some of the "debates" on the ASA List Serve could be turned into future dialogues by giving the principal debaters an opportunity to present their positions and comments on others' positions.

Incidentally, I also appreciated the insightful book reviews in the "Origins & Cosmology" section (my personal area of interest).

Keep up the good work. I give my compliments to the anonymous donor who made the 88-page issue possible.

Paul Bruggink
ASA Member
143 Hummingbird Lane
Clarrington, PA
hrc54@alltel.net

Intelligent Design Is Not Natural Science

The Intelligent Design (ID) movement has insisted that intelligent design is scientific. William Dembski, a prominent spokesperson for ID, wrote that intelligent design is "a fruitful scientific concept,"¹ "a full-fledged scientific theory,"² and "a scientific research program."³

In his article, "Is Intelligent Design 'Scientific'?" (*PSCF* 59, no. 1 [March 2007]: 55-62), Loren Haarsma twice points out that most people equate science with natural causes. Even so, he concludes his article by stating that ID is "partly science."

The intelligent manipulation of known characteristics of the physical universe is the hallmark of engineering and technology. The intelligent design (Lower case 'i' and lower case 'd') and the intelligent assembly of the components of biological origins are synonymous with supernatural genetic engineering and supernatural biotechnology. Whether they are the result of a supernatural design placed within the singularity, the result of supernatural intermittent activity within the physical universe or the result of a creative act cannot be determined scientifically.⁴

The intelligent design and the intelligent assembly of biological entities reside totally outside *natural science*. They are antithetical to natural events having natural causes. However, once existent, the components of biological origins function naturalistically and do not require ongoing supernatural intervention. Scientists can do their experiments and obtain results consistent with methodological naturalism.

The ID movement would be better served by dropping or ignoring all associations with "science" and, instead, assimilate the language of engineering and technology where intelligent activity is normative. The relationship between evolution and intelligent design is not one of science vs. religion but, rather, one of natural science vs. technology.

How should one respond to the question: "Is intelligent design scientific?" A reasonable response would be: "The classification of intelligent design within science is irrelevant. Let me explain why intelligent design belongs within engineering and technology."

The formal concept of Intelligent Design (Upper case 'I' and upper case 'D') is a totally different matter. ID is a process, which differentiates intelligent causation from naturalistic causation. Therefore, it lies wholly outside the natural sciences, outside technology and outside engineering. ID is based in the field of logic.

Proponents of ID use a logical algorithm to determine the probable causative agency, which gave rise to individual biological components. This algorithm, the Explanatory Filter, has three junction points where consecutive decisions are made concerning contingency, complexity

and specificity. This Filter is used to differentiate intelligent causation from natural causation. An activity or structure that is contingent, complex and specified is most likely due to intelligent design and activity. The origin of a specific biological component, which is contingent, complex and specified, lies within biotechnology and/or genetic engineering rather than within natural science.

Lastly, a scientific research program unique to Intelligent Design is a myth. Promoting such a program is counter productive. Intelligent design is advanced through quality scientific research, through the scientific method and through sound reasoning. Neither Michael Behe, author of *Darwin's Black Box*, nor Jonathan Wells, author of *Icons of Evolution*, based their books on an Intelligent Design scientific research program. Rather, both relied on quality research within natural science. A scientific research program from an alien culture should be able to determine that the Pioneer Space Craft is the result of intelligent causation rather than naturalistic causation. No special research program need be set up. The same can be said for the investigation of causative agency concerning biological origins.

Notes

¹W. Dembski, *The Design Revolution* (Downers Grove, IL: InterVarsity Press, 2004), 34.

²*Ibid.*, 37.

³*Ibid.*

⁴F. Nelson, "Letters: RFE and ID Universe Are Both Supernatural," (*PSCF* 57, no. 1 [March 2005]: 76-7).

Fredric P. Nelson, MD
ASA Member
22 Pennock Terrace
Lansdowne, PA 19050
fpn@evolutiondissected.com

Kudos for the March 2007 Issue

I have just read through the March 2007 issue of *PSCF*. It was the best edition yet. The article-response-author reply pattern added greatly to the clarity and quality of the discussions. I hope that pattern will be continued as much as possible.

Thanks.

James C. Peterson
ASA Fellow
R. A. Hope Professor of Theology, Ethics, and Worldview
McMaster University Divinity College
Faculty of Theology and Faculty of Health Sciences
1280 Main Street West
Hamilton, ON L8S 4K1 Canada
petersonj@cogeco.ca



Change in Manuscript Submission

Beginning **July 1, 2007**, submit all manuscripts (except book reviews) to:

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Subscriptions to *Perspectives on Science & Christian Faith (PSCF)*, are available at \$35/year (individuals), \$55/year (institutions) and \$20/year (students).



American Scientific Affiliation
55 Market Street, Suite 202
PO Box 668
Ipswich, MA 01938-0668

Phone: (978) 356-5656
FAX: (978) 356-4375
E-mail: asa@asa3.org
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Editors, ASA/CSCA Newsletter:

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A closely affiliated organization, the Canadian Scientific and Christian Affiliation, was formed in 1973 with a distinctively Canadian orientation. The CSCA and the ASA share publications (*Perspectives on Science and Christian Faith* and the *ASA/CSCA Newsletter*). The CSCA subscribes to the same statement of faith as the ASA, and has the same general structure; however, it has its own governing body with a separate annual meeting in Canada. Contact CSCA by writing to: Canadian Scientific and Christian Affiliation, PO Box 40086, 75 King St. S., Waterloo, ON N2J 4V1 or visit their web site at: www.csc.ca.

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