PERSPECTIVES ON SCIENCE AND CHRISTIAN FAITH
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In this issue …

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

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Perspectives on Science and Christian Faith

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Randy Isaac

PSCF: A Retro- and Prospective

This is the sixtieth year of publication of the *Journal of the American Scientific Affiliation*, now known as *Perspectives on Science and Christian Faith*. Perusing the archives of the first decade of publication, one is struck by the diversity and breadth of topics as well as their familiarity.

The very first issue began, appropriately enough, with a discussion of the Christian view of the development of science. Subsequent issues delved into the presuppositions of the theory of evolution and into biblical interpretation. Radioactive dating of the earth was debated in 1952 as well as in 2008. Periodic articles traced the age of the universe from approximately 3 billion years in the early 50s to the 13.7 billion years that is accepted today. The second volume included articles on psychology, ensuring a focus on social sciences as well as natural sciences.

These sixty years have demonstrated the value of a peer-reviewed journal with emphasis on scholarship and balanced assessment of a wide range of topics relating to science and Christian faith. Simply being peer reviewed is not sufficient to guarantee quality. Of critical importance are the editors and the editorial board, the peer reviewers, and the book reviewers. The method of selecting anonymous reviewers who are knowledgeable and critical of the field in question is crucial to gaining credibility. The ASA has been blessed with a sequence of very talented scholars who have served as editors. There have been nine editors: Marion D. Barnes, D. N. Eggenberger, David O. Moberg, Russell L. Mixter, Richard H. Bube, Wilbur L. Bullock, J. W. Haas, Jr., Roman J. Miller, and most recently, Arie Leegwater. Their leadership and skill at handling the process for selecting papers and reviewers have been a vital part of achieving our reputation. The primary mission, as expressed by our founders, is "… the task of reviewing, preparing, and disseminating information …" related to science and Christian faith.

This journal has frequently been the first to publish new ideas that have grown to be important in the field. Deluge geology was first discussed in an article by Larry Kulp in the March 1950 issue. More than a decade later, the topic became widely known throughout the Christian community. Some of the earliest articles that were forerunners of Intelligent Design were published by Bradley, Thaxton, and others. Few in our society would fail to recognize this term today. Theistic evolution was defended by Richard Bube in the 70s as a viable option for Christians. Today the concept is gaining attention as understanding of the latest genetic data becomes widespread. All of these views, and many more, continue to be held within the ASA community, offering a unique environment for the exchange of ideas. Despite our differences in perspectives, we remain united in our statement of faith, and we worship together as the body of Christ.

Turning from the past to the future, what are the key topics that we might expect the ASA to address, with seminal articles in this journal? I would like to suggest a few broad questions on which we could reasonably expect a great deal of work in the coming decades.

How are scientific practice and Christian faith related? This is the enduring underlying question that continually demands our attention. Loud voices on all sides proclaim that a complementary relationship is an illusion or requires a radical change in either mainstream science or in our understanding of the Bible. Those who find inherent compatibility differ widely with one another in articulating that relationship. Through it all, we have a significant responsibility of apologetics in the face of pressure from secularists who claim a scientific basis for atheism. New scientific fields such as multiverses and string theory and new data from genetics and anthropology continue to challenge our understanding.

Guest Editorial

PSCF: A Retro- and Prospective

Where do we come from? The topic of origins will never die out. It is of vital importance and will continue to attract our attention. The dominant focus will shift, however, from the origin of the universe and the origin of species to the origin of life and the origin of consciousness. No viable scientific theories have yet emerged in these fields but any that do are bound to generate vigorous debate on the philosophical and theological implications. We especially need to understand the impact of worldview assumptions and their effect on the formulation and acceptance of scientific theories concerning these issues.

Why do we behave the way we do? In the past, Herbert Spencer and others, such as W. G. Sumner, eagerly applied evolutionary thought to social behavior, but these attempts led to dubious, often racist and elitist, conclusions. More recently, sociobiology has had its own checkered history. In the last 10–15 years, there has been a resurgence of another wave of research in seeking to understand our behavior based on an evolutionary perspective. It is too soon to tell whether the current wave will have more staying power than previous attempts. Armed with a new suite of tools to study genetics and brain function, researchers will have significant new data to interpret. The complex relationship of the influence of genetics, epigenetics, and spiritual factors in our behavior will come under great scrutiny. This work should be a strong focus for the ASA.

How should we then live? While science is properly descriptive and not prescriptive, these two modes are not entirely independent and there are implications of science on our moral and ethical behavior. We must continually address the ethics of how to carry out our scientific research and how to make decisions in an increasingly complex technological world. The ability to manipulate the fundamental code of life gives us a tremendous responsibility to use that power wisely. Increased knowledge leads to greater responsibility and accountability. Those of us living in both the scientific and the Christian communities have a deep responsibility to help shape the thinking of our society in the formulation of its ethic.

What can we do to help others? Today's students are energized by opportunities to help others in need. ASA members are galvanized by the ability to make contributions in areas such as alternative energy sources, creation care, and appropriate technologies for a sustainable future. In our era of global awareness, we recognize our opportunity and responsibility to work toward sustainability not just in our own lives but throughout the developing world. ASA can contribute effectively as a focus of communication of opportunities and experiences. We share a common motivation to serve our Lord and Savior by demonstrating his love to those in need.

There are many other areas that will be addressed in years to come, some new and some old. What will remain unchanged is our commitment to serve God by offering to Christians active in science and technology a network of communication and exchange of ideas at a high academic level. We will continue to demonstrate the unity of the body of Christ despite a great diversity of ideas and opinions. The quality of the scholarship in the pages of this journal is vital in helping us to achieve that goal. ⊙

Randy Isaac, *ASA Executive Director*

In This Issue

In contrast to the wide geographical distribution of the authors in the June issue, this issue stays closer to home. Articles by Timothy Larsen (Wheaton) on the so-called war between faith and science, Janel Curry (Calvin) on a social framework for understanding the diversity of Christian responses to climate change, Joel Duff (Akron) on Darwin's and flood geology's abominable mystery, and an interview of Ian Hutchinson (MIT) by Evan Peck (Gordon) and Karl Giberson (Eastern Nazarene) fill our pages. I would like to see interviews of leading scientists become a regular feature. Please contact me if you are considering initiating an interview.

Thirty-one book reviews authored by twenty-four different reviewers and four letters written in response to articles published in previous issues of *PSCF* also invite your perusal. Thank you to Randy Isaac for writing the guest editorial, a retrospective and prospective view of *PSCF*. ⊙

Written in Korean *kimchi*-deprived Grand Rapids,
Arie Leegwater, *Editor*

Timothy Larsen

"War Is Over, If You Want It": Beyond the Conflict between Faith and Science

Timothy Larsen

The purpose of this article is to help emerging scholars, especially in the sciences, to reframe the issue of the relationship between faith and learning in a productive way. While critiques of the warfare model exist in the specialized literature of the history of science, the presumption of conflict continues to dominate in the media and in popular conversations in both secular and religious contexts. As a result, young scholars have often imbibed this model themselves as an accurate portrait of the way things are, and they usually do not have a clear, up-to-date reflection on the relationship of faith and learning to put in its place. This critique is offered as such a resource.

In an earlier work that focused on the foremost secularists or atheists in nineteenth-century England who came to faith, I examined the pattern of the gaining or regaining of faith, of Christian conversion or reconversion.[1] This is an extraordinarily significant pattern. Many of these reconverts were once counted among the leading half dozen of the most respected and prominent national leaders of organized free thought. While a whole range of such figures could be highlighted here, I will present only George Sexton as he was indisputably considered the greatest authority on science in the secularist movement, and I want to make the relationship between faith and science the focus of this article.

George Sexton was the only atheist leader in nineteenth-century Britain with an earned doctorate—although he was English, his PhD was from the venerable University of Giessen in Germany. As a man of science, he was a Fellow of a whole range of elite, learned institutions including the Royal Anthropological Institute, the Zoological Society, and the Royal Geographical Society.[2] As an atheist, perhaps his most important scientific publication was a work drawing on Charles Darwin's thought entitled *The Antiquity of the Human Race* (1871).[3]

Sexton is but one of many such figures who abandoned secularism for Christian thought. By my calculations, at least 20% of the top leadership of organized atheism or secularism in nineteenth-century Britain eventually came to Christian faith and went on to defend Christian orthodoxy publicly,

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and a number as high as 35% is a realistic estimate from the evidence.[4] These were scholars who had not only read and understood the latest learned critiques of faith, but who had dedicated their lives to expounding and disseminating these skeptical views in lectures, debates, and publications. These views included philosophical challenges to faith such as Hume's critique of miracles, and scientific ones such as materialism, including a variety that incorporated Darwinism.

After their Christian conversions, these erstwhile secularist leaders spent the rest of their lives—usually a decade or more—lecturing, debating, and writing on how faith and learning could be integrated. They tackled head on, in an unflinching and erudite manner, all of the issues that they had raised as skeptics. Sexton, for example, lived for another twenty-five years after his conversion to Christian orthodoxy, and he wrote numerous works expounding on the intellectual credibility of Christian thought including *The Fallacies of Secularism* (1877).[5] His *Biblical Difficulties Dispelled* (1887) demonstrated that he was just as committed to the latest scientific thought as ever and that he believed that it was fully reconcilable with a belief in the divine inspiration and truthfulness of the Bible.[6]

This story has never been told before. Instead, the story of religion and the Victorians has usually been told as one of "the loss of faith."

This story has never been told before. Instead, the story of religion and the Victorians has usually been told as one of "the loss of faith." The Victorian crisis of faith or loss of faith has been a reigning theme for over fifty years now in the scholarship. Especially in the fields of intellectual history and literary studies, it is often the only thing that is said about faith in the nineteenth-century university courses and textbooks. A whole succession of books have been written recounting the lives of Victorians who lost their faith, from Basil Willey's *More Nineteenth Century Studies: A Group of Honest Doubters* (1956) to A. N. Wilson's *God's Funeral* (1999).[7] Despite this being presented as the main story, it does not, however, measure up against the reconversions of secularists. In these collections of deconverts by Willey, Wilson, and others, there is not a single prominent Christian leader who lost his or her faith—no celebrated preacher, no bishop, no key functionary in a Christian denomination or organization—whereas, as has been said, at least 20% of the prominent secularist leadership came to faith.

So how did the "loss of faith" become the overarching theme in certain streams of scholarship and in popular thought? A possible explanation is that deconversion narratives fit into another pattern: the war between faith and learning. In the nineteenth century, the human race learned enough to realize that "faith is not credible." If some daring and perceptive souls had discovered this earlier, it was not until this century that this realization became widespread. People who were intelligent and brave and keeping up with their reading, therefore, inevitably lost their faith. As my work on the conversion of secularist leaders reveals, this is simply a false picture of the relation between faith and learning in the nineteenth century: the intellectual claims of orthodoxy were actually quite compelling to many of the bravest, smartest, best-read people, even to those who had a deep bias against Christianity and a vested interest in opposing it.

The so-called "war" between faith and learning, specifically between orthodox Christian theology and science, was manufactured during the second half of the nineteenth century. It is a construct that was created for polemical purposes.[8] The main architects of the notion of a "war" between theology and science were scientists and advocates of secular education. An enormously influential book in this regard was John William Draper's *History of the Conflict between Religion and Science* (1874).[9] Draper, who was professor of chemistry at the University of New York, is an example of a scientist fueling the notion that the relationship between faith and learning should be viewed as a "conflict." His book was so successful that it went through fifty editions in the half century after its publication. A famous successor in the same vein was Andrew Dickson White's *A History of the Warfare of Science with Theology in Christendom* (1896).[10] White was the founding president of Cornell University, an upstart institution that used its secular stance as a way of setting it apart in the market from the old Ivy League schools that, for example, still had mandatory chapel attendance.

Draper and White were not simply describing an ongoing war between theology and science, but rather they were endeavoring to induce people into imagining that there was one. In order to do this, they repeatedly made false claims that the church had opposed various scientific breakthroughs and developments. For example, Draper and White encoded into popular thinking the erroneous notion that Christian orthodoxy had insisted for centuries that the earth was flat. A standard version of this urban legend includes a tale claiming that Columbus's expedition was opposed by church leaders on the grounds that it was based on the heretical notion that the earth was round. It has been so effectively disseminated that even Christians generally assume that it is true. In a recent book, David Kinnaman gives as an admirable example of contemporary Christian ignorance, a church that did a series in which it extended five apologies for the sinful behavior of the church in the past. The five most important things for which the church allegedly needs to repent included: "We're Sorry for Saying the Earth Is Flat."[11]

In fact, Christian theologians have always declared that the earth is round, from the early church through the medieval to the Reformation and beyond. Even the venerable Bede, a monk living in the eighth century, after the fall of the Roman Empire and before the reign of Charlemagne—a period which, in the old history books, was called "the Dark Ages" because it was seen as a low point in the state of human learning—asserted this unequivocally. I well remember reading up on Bede for a church history lecture I was preparing and, having myself grown up assuming that the flat-earth myth was true, being stunned to read Bede mentioning casually that the earth was in the shape of "a ball."[12] You can find the same view in the writings of Thomas Aquinas in the high medieval period or pretty much anywhere else you would care to look. Moreover, all the church leaders who discussed Columbus's possible expedition with him assumed that the earth was round. Their objection was that the earth was much bigger than he was assuming and therefore Columbus's calculations regarding how long it would take to reach India were inaccurate. These medieval clerics were, of course, right about this—their scientific theories were more accurate than those of Columbus. The eminent evolutionary biologist and nontheist, Stephen Jay Gould, in a full and candid exposure of this false claim that the church once taught a flat earth, has carefully explained that "the nineteenth-century invention of the flat earth … occurred to support another dubious and harmful separation … the supposed warfare between science and religion."[13]

The so-called "war" between faith and learning, specifically between orthodox Christian theology and science, was manufactured during the second half of the nineteenth century.

Another example is in the field of anesthetics. Draper and White also popularized the urban legend that the church opposed the use of anesthetics for women during childbirth on the grounds that it was a violation of the statement in Genesis that childbirth would be painful. Just recently, Deborah Blum, a Pulitzer-prize winning science writer and a professor at the University of Wisconsin-Madison, wrote in the *New York Times*: "When 19th-century doctors began using chloroform to alleviate the pain of childbirth, the Scottish Calvinist church declared it a 'Satanic invention' intended to frustrate the Lord's design."[14] This is simply wrong. No church has ever pronounced against anesthetics in childbirth. Moreover, there was no vocal group of ministers who opposed it. In fact, the inventor of chloroform received fan mail from ministers of the major denominations thanking him for helping to alleviate the suffering of women in labor. Rather, the opposition to anesthetics during childbirth came from medical professionals, not from ministers, and for scientific, not religious, reasons.[15]

A major figure in the construction of the notion of a war between theology and science was T. H. Huxley, the English biologist who was a principal champion of Darwinism and who coined the word "agnosticism" to describe his own viewpoint regarding religion.[16] James Moore has observed that warfare was Huxley's "favorite metaphor" for the relationship between science and religion.[17] Huxley even described himself as a "gladiator-general" in this alleged fight. Huxley saved his most savage attack for a Roman Catholic biologist, St. George Jackson Mivart. Mivart's infuriating crime was to accept scientific claims, not to reject them. He

claimed that Darwinism was perfectly compatible with historic Christian teaching. Huxley was furious with this Catholic thinker because Huxley was trying to generate the perception of a war between faith and learning. Huxley insisted that Mivart had to choose whether he wanted to be "a true son of the Church" or "a loyal soldier of science" (notice the military metaphor).[18] In short, Huxley was not witnessing a fight between faith and science; he was trying to provoke one.

So, one may well ask, why? Why did Huxley want a fight? Why did Draper and White manufacture evidence in order to lead people to imagine that there was one? Why was the notion of a war between faith and science constructed in the second half of the nineteenth century? Frank M. Turner, John Hay Whitney Professor of History at Yale University, has argued persuasively that the notion of a conflict between theology and science was generated as part of a campaign of professionalization by would-be scientists. In the mid-nineteenth century, there was no such profession. Charles Babbage, the brilliant mathematical thinker who first conceived the programmable computer, observed in 1851:

> Science in England is not a profession: its cultivators are scarcely recognized even as a class. Our language itself contains no *single* term by which their occupation can be expressed.[19]

In other words, this was before there were "scientists." Instead, there were only "men of science," a term, like its counterpart, "men of letters," that referred more to the pursuits of gentlemen of leisure than to what someone did for a living.

Until several decades into the nineteenth century, there were only two universities in England, Oxford and Cambridge. Both saw Classics, that is, the literature and philosophy of ancient Greece and Rome, as the rightful core of a university curriculum and therefore had few faculty positions in the natural sciences. Moreover, in order to hold a position at these universities, one would need to be ordained in the Church of England and thus also be a clergyman.[20] The same would have been true of schools for children and youths. There were no state schools until 1870, and therefore most schools, especially the elite ones such as Eton, Harrow, and Rugby, had an explicitly Anglican identity. Indeed, being a priest in the Church of England was widely seen as the most sensible way to make a living for someone who wished to pursue scholarly interests. It was a learned profession that allowed one considerable time to invest in intellectual pursuits of one's own choosing. For example, Connop Thirlwall (1797–1875) eventually rose to bishop in the Church of England. Nevertheless, his sympathetic biographer admits that Thirlwall's ordination "was determined, in cold-blooded fashion, simply by force of circumstances in order to obtain a decent leisure for his literary pursuits."[21] Thus, most scientific work in England was being done by clergymen. Moreover, much of it was remarkably good work. Not only were many of the nation's greatest men of science also clergymen, but numerous, more obscure clergymen up and down the country were also carefully, patiently, and accurately cataloguing the natural world and discovering its secrets.

Huxley and others who aspired to turn scientific pursuits into a profession … "needed" a war between science and religion.

One can see how this would be very annoying to Huxley who wanted to be a man of science himself but, not least because of his agnostic views, was unable to make a living either as an Oxbridge professor or as a clergyman. In fact, as celebrated as Huxley was, his career was not as a university professor or some other such position that we could assume to be a fitting one for a scientist of his reputation today. Rather, he was fortunate to make a living by lecturing at the Government School of Mines, and even this opportunity would not have been available earlier in the century.

Huxley and others who aspired to turn scientific pursuits into a profession, therefore, "needed" a war between science and religion. The purpose of the war was to discredit clergymen as suitable figures to undertake scientific work in order that the new breed of professionals would have an opportunity to fill in the gap for such work created by eliminating the current men of science. It was thus tendentiously asserted that the religious convictions of clergymen disqualified them from pursuing their scientific inquiries objectively.

More to the point, however, was the fact that clergymen were undertaking this work for the sheer love of science and thus hindering the expectation that it would be done for money by paid full-time scientists. Clergymen were branded amateurs in order to facilitate the creation of a new category of professionals. In addition to Draper and White, another book that illustrates this point is Francis Galton's *English Men of Science: Their Nature and Nurture* (1874).[22] Galton, like Huxley, also wanted a war. His research for the book included sending out questionnaires to scientists. To his disappointment, the overwhelming majority reported that religious beliefs were in no way a hindrance to scientific work. In an ironically unscientific way, he decided to ignore these results and simply to assert in his book that religious convictions were "uncongenial" to the pursuit of science, despite the fact that his own data did not support that conclusion.[23] The professional dimension of this story is reinforced by recalling that the other great enemy of the new breed of scientists was the animal rights advocate. What clergymen and animal rights advocates had in common was that the new would-be scientists perceived them as standing in the way of their ambitions for developing the profession.

Let me take a brief detour into the social sciences. While less scholarly work has been done on this, I think a similar professional dimension is a significant factor in the perception of a war between faith and anthropology. In a professional reading of the situation, missionaries "needed" to be labeled biased amateurs in order to make room for a new category of professionals, the anthropologists. Anthropologists have been so forceful in their attacks on missionaries precisely because missionaries are so good at doing excellent anthropological work. Indeed, anthropologists have a hard time competing with them. The heart of good anthropological research is field work, and missionaries are simply in the field, carefully observing and recording, much longer than almost any anthropologist can expect to be. A dirty secret of anthropologists is that they sometimes steal most of their data from the work of missionaries, often leaning on them heavily while they are in the field, and then disparaging them thereafter. Anthropologists "need" to say that the faith commitments of missionaries disqualify them from doing truly scholarly work, in order to open up a space for themselves as professionals.

This hostility is illustrated in the case study of the "missionary position." Numerous anthropologists have mentioned in their writings that missionaries once insisted on one sexual position as the only appropriate one, condemning other practices in the cultures where they were working as sinful. In the minds of these anthropologists, the "missionary position" is a classic example of the prudish, joyless, rule-obsessed, life-denying influence of missionaries. The notion of a sexual position dictated by missionaries has become such a common "fact" that it shows up in dictionaries, in works of reference, in magazines and newspapers, seemingly everywhere. Nevertheless, Robert J. Priest, in a 2001 issue of *Current Anthropology*, has demonstrated inconvertibly that this is an urban legend.[24] At no time and in no place did any missionary ever teach any such thing.

It turns out that the notion of a "missionary position" was coined by the famous social scientist, Alfred Kinsey, in his *Sexual Behavior in the Human Male* (1948).[25] Kinsey claimed to have learned of this from the anthropologist Bronislaw Malinowski's *The Sexual Life of Savages in North-Western Melanesia* (1929).[26] Kinsey had misremembered this, however, and in a way that reveals hostility to missionaries. What Malinowski actually wrote was an account of seeing an engaged couple leaning against one another and holding hands in public. This was condemned by traditionalists in their community as their behaving "'missionary fashion,' one of those novel immoralities introduced by missionaries."[27] In other words, "the missionary position" actually represents the influence of missionaries decreasing prudishness and restrictions in an affirmation of joy, life, love, and sexuality. Such an affirming story is not retold, however, but rather is replaced with a fictitious story that puts the missionaries in an unfavorable light. This is done, I am positing, because a conflict is "needed" in order to help the anthropologists establish themselves as the only professionals when it comes to gaining knowledge about people groups across the globe.[28]

To reframe my argument in another way, I am suspicious of the assumption that it was something intrinsic to the nature of modern discoveries that caused the perception that faith and learning were at odds. To continue with our case study, I am suspicious, specifically, of the assumption that the

advance of scientific knowledge in the last one hundred fifty to two hundred years has created an unprecedented problem for the reconciliation of faith and learning. The story of the nineteenth century is actually one in which orthodox Christian ministers, theologians, churches, and denominations accepted dramatic scientific developments with remarkably little fuss. Christians quickly accepted the new findings of geology, for example, and an earth that is millions of years old was the normative view among clergymen even well before Charles Darwin's *On the Origin of Species* (1859).

Likewise, the introduction of Darwinism into Victorian thought is not a story of denominations making official pronouncements against it or clergymen lining up to attack it, but rather of widespread acceptance and even championing of it by ministers and theologians.[29] Indeed, the main champion of Darwinism in America was himself a devout evangelical Christian, Asa Gray, professor of botany at Harvard University. Or, to take another example, a major popularizer of evolution for evangelicals was the nineteenth-century evangelist Henry Drummond, a colleague of the great Chicago revivalist D. L. Moody. Drummond wrote best-selling religious books in which he incorporated into evangelical theology his assumption that Darwinianism was sound science.[30] These names are only illustrative. It would take a long, long time to list all of the prominent orthodox Christian ministers, theologians, and thinkers who accepted Darwinism promptly as good science that did not conflict with Christian teaching.

The word "fundamentalist" comes from a series of pamphlets published in the early 1910s entitled *The Fundamentals: A Testimony to the Truth*.[31] Remarkably, in the light of subsequent history, several of the contributors to this series that literally served to launch the fundamentalist movement were ministers and theologians who believed in evolution. Princeton theologian B. B. Warfield, who is famous for championing biblical inerrancy, was one of them.[32] Another was James Orr, a professor of apologetics in Scotland, who wrote the very first tract in *The Fundamentals*. Another was George Frederick Wright, an American biblical archaeologist. Nevertheless, later in the series came a couple of anti-evolution tracts, most notably one by an obscure author entitled "Decadence of Darwinism."[33] This was a sign of where the nascent fundamentalist movement was heading. After a full biblical generation of certain polemical scientists promoting the notion that there was a war between faith and learning, conservative Christians came to believe it. At this crucial moment, the war metaphor would be adopted by the other side. Fundamentalists now published volumes with titles such as *The Great Conflict*, *The Battlefield of Faith*, and *War on Modernism*.[34]

Although certain strident scientists in the second half of the nineteenth century constructed the notion of a war between faith and learning, conservative Christians deserve their share of the blame for having adopted and perpetuated this model in the twentieth century and beyond.

The result has been a widespread suspicion of mainstream scholars by conservative Christians. The possibility of a vast, godless conspiracy by academics or scientists is a real one in many fundamentalist or conservative evangelical minds. The resulting anti-intellectualism, lamented and explored in Mark Noll's classic study, *The Scandal of the Evangelical Mind*, has taken a great toll.[35] In other words, although certain strident scientists in the second half of the nineteenth century constructed the notion of a war between faith and learning, conservative Christians deserve their share of the blame for having adopted and perpetuated this model in the twentieth century and beyond. The notion of a war between faith and science has been so successful that now some conservative Christians can cavalierly dismiss the evidence for global warming as a result of human behavior—not on the basis of countervailing scientific evidence (a perfectly legitimate effort), but on the grounds that it comes from scientists who are opponents not to be trusted. Huxley, I suspect, has got more than he bargained for.

To quote John Lennon, "War is over, if you want it." If the notion is actually fictitious—that it is getting harder, if not becoming impossible, to reconcile an orthodox Christian faith with the latest findings by scholars—then where do we go from here? After

the conflict between faith and learning comes the integration of faith and learning. This is what came before the warfare imagery as well. In other words, it has always been the task of learned, thinking Christians to take seriously both orthodoxy and the latest learning and to find a way to think about both of them in a coherent, faithful, noncompartmentalized way. Integration does not mean that historic Christian commitments are abandoned or contorted in the face of every wind of intellectual fashion. Neither does it mean that new scholarly findings leave our old ways of speaking about the faith completely untouched. Rather, it means that difficult intellectual work is needed, that of making the call on what is and is not a part of the faith which was once delivered unto the saints.

It has always been the task of learned, thinking Christians to take seriously both orthodoxy and the latest learning and to find a way to think about both of them in a coherent, faithful, noncompartmentalized way.

This has been done in every generation. Already in the second century, Justin Martyr was working on the integration of the Christian faith with classical learning, including the philosophy of Socrates and Plato.[36] In the Middle Ages, Thomas Aquinas pursued the integration of faith with the new dominant intellectual culture of a revived Aristotelianism.[37] One can see the Reformation, both in a Catholic form as articulated by Erasmus, and in a Protestant form as expounded by Calvin, as a theological appropriation of the new intellectual climate of Humanism.[38] These integrations involve both changing the way Christians think and speak about theological issues, and a willingness to hold to orthodoxy even when current intellectual fashions assail it. When my students sometimes argue that Justin Martyr was a compromiser who attempted to incorporate too much of Greek philosophy into Christianity, I remind them that when Justin was a schoolboy he did not give his last name as "Martyr" and thus he obviously tenaciously held onto key beliefs which could not be made compatible with the wider culture. Thomas Aquinas accepted many aspects of Aristotelian thought, but rejected its teaching on the eternity of matter because he discerned that it was incompatible with the orthodox Christian doctrine of creation *ex nihilo*.[39] This is what is meant by integration. Therefore, as I have used Darwinism as a case study for part of this article, I would like to point out that what I mean by integration is not that Christians should accept evolution uncritically *in toto*. In my own theological reflection on this subject, I would insist that any potential integration with Darwinism preserve the following elements: God as Creator; human beings as uniquely made in the image of God, yet fallen and sinful; and the Bible as a unique, truthful, and trustworthy communication of the inspired Word of God written.

I should also clarify that, of course, there were Christian ministers in the nineteenth century who were public and vocal opponents of Darwinism. The point is that this should not be viewed as part of a war in which "the Church" opposes "science" or "learning," but rather as an example of the kind of in-house conversations that Christians have always had—no different in kind from the church father Tertullian's rejection of the significant drawing upon Platonic thought being done by fellow believers following the pattern set by Justin Martyr or the way that thirteenth-century Franciscans were more resistant to the appropriation of Aristotelian thought than the Dominicans were.

Integration is not easy, and it is all the harder in a time when a climate of suspicion has been created by the now entrenched warfare model. I am well aware that as long as there are secular thinkers in our disciplines or Christians in our faith communities for whom the war is not over, then this legacy will continue to impinge on us in negative ways that we cannot control. Nevertheless, there is much that we can do to further integration for ourselves and our communities. For integration to be successful, it involves both a commitment to, and sympathetic and learned understanding of, the content of the Christian faith and the scholarly discipline under consideration. In other words, pastors who know the Bible and theology well but are ignorant of the actual contours of a secular body of knowledge cannot do integration. Likewise, scholars who know their discipline well but who only have a hazy understanding of the contours of the Scriptures and classic Christian orthodoxy cannot do integration

effectively either—even if they happen to be personally devout Christians.

In conclusion, the way forward must be a sympathetic collaboration between groups of people of goodwill from both of these areas of expertise—a collaboration that results in everyone becoming progressively more literate in both areas. This will mean making strategic friendships, projects, and consultations, and committing to spending a portion of our reading time studying material outside our own discipline. For example, to continue with the case study I have followed throughout, scientists reading theology, and theologians reading science.[40] War is over, if you want. Long live integration. ⊙

Notes

[1]Timothy Larsen, *Crisis of Doubt: Honest Faith in Nineteenth-Century England* (Oxford: Oxford University Press, 2006).

[2]In *Crisis of Doubt,* I expressed some skepticism as to whether the extant claims regarding Sexton's life story were reliable, speculating that he might have fabricated some of his own history and apparent qualifications (especially his ordination). Since publication, however, I have found a contemporary biographical sketch which solves the riddles that had concerned me and therefore I am now convinced that his life story is reliable: "George Sexton," *Human Nature* 8 (1874): 24–9.

[3]George Sexton, *The Antiquity of the Human Race*, 3d ed. (London: Austin and Co., 1871).

[4]I resisted giving an estimate of a percentage in *Crisis of Doubt* and only do so here due to the need for a brief substitute for the cumulative evidence and arguments I present at length there. I still maintain that calculating a percentage is not only problematic but also that it can be distracting rather than illuminating.

[5]George Sexton, *The Fallacies of Secularism* (London: G. S. Sexton, 1877).

[6]George Sexton, *Biblical Difficulties Dispelled: Being an Answer to Queries Respecting So-Called Discrepancies in Scripture, Misunderstood and Misinterpreted Texts, Etc., Etc.*, 2d ed. (Toronto: William Briggs, 1887).

[7]Basil Willey, *More Nineteenth Century Studies: A Group of Honest Doubters* (London: Chatto and Windus, 1956); A. N. Wilson, *God's Funeral* (New York: W. W. Norton, 1999).

[8]This claim is well substantiated by existing scholarship, some of which will be cited below. I would like to commend here an important survey of the relationship between faith and science. It is John Hedley Brooke's *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991).

[9]John William Draper, *History of the Conflict between Religion and Science* (New York: D. Appleton, 1874).

[10]Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom* (New York: D. Appleton, 1896).

[11]David Kinnaman and Gabe Lyons, *Unchristian: What a New Generation Really Thinks about Christianity* (Grand Rapids: Baker Books, 2007), 55–6.

[12]Benedicta Ward, *The Venerable Bede* (London: Continuum, 1990), 35.

[13]Stephen Jay Gould, *Dinosaur in the Haystack: Reflections in Natural History* (New York: Harmony Books, 1995), 41.

[14]Deborah Blum, "A Pox on Stem Cell Research," *New York Times*, 1 August 2006.

[15]An exposure of this urban legend is forthcoming by Rennie B. Schoepflin, a historian at California State University, Los Angeles, in a volume edited by Ronald L. Numbers, Hilldale Professor of the History of Science and Medicine, University of Wisconsin-Madison, which is scheduled to appear from Harvard University Press. I am grateful to Schoepflin for allowing me to see this work in advance. (This help includes pointing me to the Deborah Blum example.)

[16]A brilliant, critical biography is Adrian Desmond's *Huxley: From Devil's Disciple to Evolution's High Priest* (London: Penguin Books, 1998).

[17]James R. Moore, *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870–1900* (Cambridge: Cambridge University Press, 1979), 58.

[18]Frank M. Turner, *Contesting Cultural Authority: Essays in Victorian Intellectual Life* (Cambridge: Cambridge University Press, 1993), 190–2.

[19]As quoted in Turner, *Contesting Cultural Authority*, 177.

[20]For the passing of this model, see A. J. Engel, *From Clergyman to Don: The Rise of the Academic Profession in Nineteenth-Century Oxford* (Oxford: Clarendon Press, 1983).

[21]John Connop Thirlwall, Jr., *Connop Thirlwall: Historian and Theologian* (London: SPCK, 1936), 41.

[22]Francis Galton, *English Men of Science: Their Nature and Nurture* (London: Macmillan, 1874).

[23]As quoted in Turner, *Contesting Cultural Authority*, 185.

[24]Robert J. Priest, "Missionary Positions: Christian, Modernist, and Postmodernist," *Current Anthropology* 42, no. 1 (February 2001): 29–68.

[25]Alfred Kinsey, *Sexual Behavior in the Human Male* (Philadelphia: W. B. Saunders, 1948).

[26]Bronislaw Malinowski, *The Sexual Life of Savages in North-Western Melanesia: An Ethnographic Account of Courtship, Marriage and Family Life among the Natives of the Trobriand Islands, British New Guinea* (New York: Harcourt, Brace and World, 1929).

[27]As quoted in Priest, "Missionary Positions," 31.

[28]For a wide-ranging analysis of the issue of faith and the discipline of anthropology, see an article published in this journal by a colleague of mine that I had the privilege of commenting on when it was still developing. Dean E. Arnold, "Why Are There So Few Christian Anthropologists? Reflections on the Tensions between Christianity and Anthropology," *Perspectives on Science and Christian Faith* 58, no. 4 (2006): 266–82.

[29]See, for this, David N. Livingstone, *Darwin's Forgotten Defenders: The Encounter between Evangelical Theology and*

Evolutionary Thought (Edinburgh: Scottish Academic Press, 1987).

[30]For both Gray and Drummond, see their entries in Timothy Larsen, ed., *Biographical Dictionary of Evangelicals* (Leicester, England: InterVarsity Press, 2003).

[31]The classic study of the origins of fundamentalism is George Marsden's *Fundamentalism and American Culture: The Shaping of Twentieth-Century Evangelicalism, 1870–1925* (Oxford: Oxford University Press, 1980).

[32]Mark A. Noll, *The Princeton Theology, 1812–1921: Scripture, Science, and Theological Method from Archibald Alexander to Benjamin Breckinridge Warfield* (Grand Rapids: Baker Academic, 2001).

[33]Henry H. Beach, "Decadence of Darwinism," in *The Fundamentals: A Testimony to the Truth* 8 (Chicago: Testimony Publishing Company, n.d.), 36–48.

[34]Moore, *Post-Darwinian Controversies*, 75.

[35]Mark A. Noll, *The Scandal of the Evangelical Mind* (Grand Rapids: Eerdmans, 1994).

[36]For Justin Martyr and Middle Platonism, see Craig D. Allert, *Revelation, Truth, Canon and Interpretation: Studies in Justin Martyr's Dialogue with Trypho* (Leiden: Brill, 2002).

[37]For this, see Fernand van Steenberghen, *Thomas Aquinas and Radical Aristotelianism* (Washington, DC: Catholic University of America Press, 1980).

[38]For the Reformation and Humanism, see Alister E. McGrath, *The Intellectual Origins of the European Reformation* (Oxford: Blackwell, 1993).

[39]For this, see Jozef Wissink, ed., *The Eternity of the World in the Thought of Thomas Aquinas and His Contemporaries* (Leiden: Brill, 1990).

[40]I am grateful to Wheaton College for facilitating such collaborative reading and discussions through its Faith and Learning faculty development program. For example, I was allowed to serve as a reader for an excellent paper by my colleague in the chemistry department, Peter Walhout, and I am currently serving as a reader for a promising project by another colleague in the natural sciences. A germane, interdisciplinary volume arising from the Wheaton faculty is Dorothy F. Chappell and E. David Cook, eds., *Not Just Science: Questions Where Christian Faith and Natural Science Intersect* (Grand Rapids: Zondervan, 2005).

A Call for Book Reviewers

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Janel Curry

Article

Christians and Climate Change: A Social Framework of Analysis

Janel Curry

Scholars have studied the relationship between religion and environmental attitudes over the past forty years and have found a great deal of complexity. Presented here is a framework for understanding the range of Christian responses to the current debate over global climate change. The three major factors identified that influence attitudes toward nature and approaches to this environmental problem include (1) eschatology; (2) levels of integration in theological constructs of the relationship among humans, nature, and God; and (3) views on responsibility for social change. While this group of factors influences the relationship between Christian traditions and responses to climate change, no straightforward causal relationship between any one factor and attitude can be found. A more nuanced understanding of the range and source of Christian attitudes toward nature and climate change can aid in political and theological debate over this important issue.

Research has continued to find, generally speaking, weak relationships between Christianity and particular environmental beliefs/ behaviors and a great deal of complexity in these relationships.

The relationship between religion and environmental attitudes has been studied over the past forty years primarily in response to Lynn White's thesis that a Judeo-Christian belief system has a negative impact on attitudes and actions toward the environment.[1] Yet research has continued to find, generally speaking, weak relationships between Christianity and particular environmental beliefs/behaviors and a great deal of complexity in these relationships.

Let me share a few quotes from my own research to illustrate the complexity and range of attitudes.[2] These quotes, along with others in this article, come from my published empirical research which has involved the systematic collection of data on attitudes of different Christian groups toward nature. The choice of groups used to illustrate my points here is shaped by my previous research.

Baptist Seminarian

> … but the land for us is not as important … We are just so far away from the concept (living where our grandparents have lived), and I think it has just lost its importance. And it's right for it to be that way.[3]

Farmer (Community of Christ)

> Even though we have ownership of land … in the end it's God's … it bothers me sometimes to have all these lines of things put into the earth. You have water lines, you have electricity lines … I don't like them all up above you either, but in Des Moines … it's just paved over with concrete. And it'll never

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> again see the light of day. I groan. I feel the earth groan. I groan with it, for being covered so … and you know that it'll never be free again.[4]

How do we interpret this range of viewpoints? Scholars and the general public sense a link between religious perspectives and environmental attitudes, but the connection is not clearly understood. For example, environmentalists, scientists, and politicians recognize that religious communities need to be included in their attempts to meet the major environmental challenge of this century, global climate change.

My proposed framework encompasses three major factors: eschatology, integration, and responsibility.

I present here a framework for understanding the range of Christian responses to environmental problems, with special attention to how these responses play out in the current debate surrounding global climate change.[5] Thomas Ackerman presented a general categorization of Christian responses to climate change in a recent issue of *Perspectives on Science and Christian Faith*, but the major focus of his article was evidence of climate change.[6] My goal is to contribute to the scholarly discussions surrounding the variety of typologies proposed for understanding religious, and particularly Christian, views of nature and environmental problems. As Downs and Weigert, who developed one such typology from Papal and Episcopal documents, stated, future research included the "need for additional typologies as tools, especially religious environmental typologies."[7] Their typology was one largely influenced by ecological conceptual categories. In contrast, McCammack focused on evangelical Christians and used a typology based on political categories, an approach that lacked both nuance and theological complexity.[8] While both of these former typologies focus on a narrow segment of the Christian population, secular typologies also exist. Perhaps the best of these is the one developed by Dryzek in *The Politics of the Earth: Environmental Discourses*.[9] However, Dryzek's typology does not include theological understanding in its categorization.

My proposed framework is informed by more than twenty years of empirical research that has attempted to do justice to theological traditions across the Christian spectrum, while also interacting with the general literature on religion and environmental attitudes.[10] My approach is similar to the one Jared Diamond used in his book *Collapse*.[11] Like him, I present a group of factors that influence the relationship between Christian traditions and attitudes toward nature, but likewise argue that no straightforward causal relationship exists between any one factor and the attitudes we see. Rather, a varying combination of these factors within any one tradition influences both attitudes toward nature and attitudes toward policy proposals. The recent works of Shellenberger and Nordhaus criticize the contemporary environmental movement for its narrow special interest approach to environmental problems.[12] This same characteristic of the environmental movement makes the Christian community uncomfortable with the environmental movement, yet many Christians are sympathetic to environmental concerns. Such seeming contradictions call for a more complex framework to understand the Christian community. The hope is that this framework will illuminate the complexity of the relationship between religion and environmental attitudes and lay the groundwork for more dialogue among groups that often find themselves on opposite ends of the political spectrum, for the end purpose of addressing environmental and climate change.

My proposed framework encompasses three major factors. The first factor is eschatology, or beliefs about the future. Where is history going? The second factor is integration. How do traditions theologically construct the relationship among humans, nature, and God? The third factor is responsibility. Who or what is responsible for social change? And how is social change to be accomplished? This framework is not definitive or static. My empirical research and the literature give evidence of a great deal of complexity. However, this proposed framework reflects the key components of worldviews: (1) How do we conceptually understand our place in the world? (2) How is the future going to unfold? and (3) What are the appropriate tools or approaches for addressing and understanding social change in the journey?

Eschatology (Views of the Future)

Christian eschatologies, or views of the future, are one of the strongest factors that affect attitudes toward the environment.[13] Conservative Christian eschatologies are grounded in common theological commitments. These include belief (1) in the authority of the Hebrew and Christian Scriptures; (2) in God's creation of the universe; (3) that humans and nature fell from perfection with the sin of Adam and Eve; (4) that the restoration or redemption of humankind comes through the death and resurrection of Jesus Christ; and (5) that God's plan and promises will be fulfilled with the return of Christ.[14] This can be summarized with the sequential story: Creation, Fall, Redemption, Consummation. In contrast, liberal Christian traditions have a more evolutionary or progressive view of history. Society is moved forward through the portrayal of "what could be," held before society as a vision or possibility. Conservative and liberal Christians both have eschatologies, just different stories for how the future will unfold. An exploration of three different groups will illustrate a range of eschatologies, but also add complexity to the factor.

A Calvinist, Reformed eschatology sees continuity between this present material existence and some future perfected state that will be established when Christ returns. As one Dutch Calvinist farmer stated,

> We've begun our eternal life … the opening chapter … The whole thing of stewardship is certainly part of now and/or a part of eternity. The comparison between the seed and the full-grown tree and our body and our resurrection body—there's a connection, but still, you wouldn't believe that a huge oak tree could come from a little tiny acorn. And I don't think you can even begin to fathom what the life hereafter will be, if you think of our cells, now, as the seed.[15]

For this farmer, a presumed relationship exists between the present and future material existence of the earth. In this schema, Christ's death, resurrection, and future return are seen as the hope for both humans and the earth. Calvinism sees in the present era the seeds of the flourishing that will come when Christ returns. The present time involves living in an in-between state where humans can be persistent at bringing restoration where possible because of the ultimate hope of its being completed when Christ returns. Thus this present earth is not discardable, because a continuity exists between knowledge and the physicality of the present and future earth.

Quakers are what are called post-millennialists. Post-millennialists generally believe that the prophecies in the Bible were fulfilled during Roman times and that the trend of history is toward the gradual improvement of society. Quakers believe in an individual's experience of the Inner Light as an unerring guide for his or her speech and action.[16] This Inner Light has led Quakers to be activists against injustice.[17] They believe this Inner Light is present in all, thus reflecting a belief in the essential goodness of humans. And since humans are seen as basically good, Quakers believe that some level of perfection of society is possible. In addition, the universality of their concept of grace means that this perfection can be extended to society and the world as a whole, leading to an intense desire to try to improve society.[18]

The Quaker worldview is one of great optimism, activism, and belief in the forward march of progress of society.[19] Quakers perceive the here and now of the world as the main arena of God's redemptive activity, and humankind as the primary agent of establishing God's kingdom on earth.[20] Thus they have been very active in working for peace and justice through government agencies and international organizations.[21] They also put a tremendous amount of hope in education as a force in social change, as an instrument of continual societal improvement.

Dispensational theology and eschatology are often used to characterize Christianity as a whole. In fact, it is this eschatology that exhibits the strongest empirical connection to negative attitudes toward the environment.[22] Dispensationalists, often referred to as Christian fundamentalists, teach that believers will be removed from this physical earth at the time of the return of Christ. They look for signs, such as increasing violence and natural disasters, to mark the coming of Christ. Under dispensationalism, the earth is seen as a backdrop for the actions of God in saving humans, rather than as a central concern. Two quotes by dispensational seminarians show this perceived lack of continuity between the present earth and the future earth after

the return of Christ, and the placement of nature on the periphery of their worldviews:

> The other thing is that this world is not the end. I'm not saying that we shouldn't try to get too comfortable on this land, and I am not trying to sound like we can disregard our stewardship, but ultimately it is going to be God who is going to redeem, and we shouldn't look to make this world our end or eternal home.[23]
>
> (Our) relationship to God is what makes the land important. It's not the land that is important in and of itself.[24]

Is this dispensational eschatology the key to all understanding on the relationship between Christianity and environmental attitudes? As always, relationships are more complex than they appear on the surface. Dispensational denominations, like the General Association of Regular Baptists, are culturally very American. From its inception, this denomination has had a strong anti-communist/socialist ideology.[25] This tradition fits well into American individualistic ideology. It puts an emphasis on Christ as the personal savior of individual humans with the earth serving as a backdrop in this salvation story. Individuals— not communities—are the center of its religious story, and the earth is the stage on which these individual lives are played, rather than something of eternal, central concern.

Dispensationalism conforms generally to what Dunlap and Van Liere have defined as the Dominant Social Paradigm.[26] This American worldview includes being utilitarian in its views of nature, supporting individual property rights, being against government interference with individual rights, and emphasizing the market. So, does dispensationalism reflect a religious worldview or a more "purely" American cultural worldview? Let me give an example to illustrate the interplay between economics and eschatology among conservative American Christian groups.

First I will describe the position of two conservative Christian groups that have been active in countering concerns over global climate change, the Interfaith Stewardship Alliance (ISA) and the Acton Institute for the Study of Religion and Liberty. Both of these groups are supporters and signers of the Cornwall Declaration which is a statement on Judeo-Christian heritage and environmental stewardship. They fall into the category that Ackerman labels "denialists."[27] Next I will present critiques of these groups by two conservative evangelical Christians who are part of what is called the Creation-Care Community, Ron Sider of the Evangelical Environmental Network and Dean Ohlman, scriptwriter and TV producer for the Radio Bible Class Ministries' Day of Discovery broadcast.[28] Finally, I will describe the worldview position of the Creation-Care movement, in comparison to the ISA and the Acton Institute.[29]

The worldview of the ISA and the Acton Institute includes the belief that increased technological power and the miracle of the free market will lead the world toward increased health and wealth, toward perfection. They believe that larger homes, greater consumption, and general material prosperity are a reflection of this progress. In addition, those with this perspective believe that the earth cannot be hurt. God's design of creation has positive and negative feedback mechanisms that minimize or quickly repair environmental damage, so increased consumption does not hurt the earth. Finally, this progressive view of history holds that Christians with a biblical worldview will rise to power and compassionately use free-market capitalism to create an earth fit for Christ. Such progress will result in Christ's return.

Sider and Ohlman argue that the ISA and the Acton Institute are committed to a free-market eschatology, rather than a biblical eschatology. Therefore, their views are underlain by the assumption that the free-market system can solve all economic and social ills, and thus they show an undying faith in amoral capitalism and the unfettered market. Furthermore, they fail to see the prosperity that the ISA and the Acton Institute claim is present. Rather, Sider and Ohlman point to the suffering that exists in much of the world today. While they are critical of the ISA and the Acton Institute for their theological perspectives, Finn argues that they actually reflect a particular economic school of thought characterized by the methodological individualism of the Austrian school of economics. The emphasis is on the extension of economic analysis to the broad range of human choices, which results in the giving of methodological authority to economics over against theology.[30] Such an economic perspective resonates with American pragmatism and individualism.

The Creation-Care community identifies itself as in the mainstream of evangelicalism. Their perspective has a countercultural edge in that they believe that Christians should be "out of sync" with the predominant materialism of our culture. For example, the Evangelical Environmental Network's "What would Jesus drive?" campaign questioned both consumption and affluence. Claiming that theirs is the predominant mainstream evangelical view, the Creation-Care community sees Christ as the agent in establishing a theocracy, rather than any action that humans or the market may take. While waiting for Christ's return, they say that Christians are to be wise and compassionate stewards of God's creation, living out the Gospel before the watching world and preparing for their future roles in the coming Kingdom.

In these examples, Christian eschatologies, or views of the future, impact (1) whether groups think this world is worth saving, or whether its destruction is a sign of Christ's return and the removal of Christians; (2) whether groups believe that humans can destroy the earth—and if they can, what mechanism best achieves a better future; and (3) whether continuity exists between the present material world and some future existence.

The range of views described here, along with their debates with each other, illustrate how Christian eschatologies interact with and are shaped by American cultural assumptions and in particular by economic free-market eschatologies. Is eschatology the smoking gun when it comes to explaining the responses of different Christian traditions to the problem of global climate change? It is certainly a significant factor, but not the entire story.

Human/Nature/God Integration

The second factor affecting attitudes toward nature is integration. How do traditions theologically construct the relationship among humans, nature, and God? Let me illustrate this factor through two stories. While collecting ethnographic material among the Houma tribe of southern Louisiana, I encountered an elderly Houma woman who recalled that when she was young, "woodsmen"—dangerous mythological creatures—lived and ate in trees. She remembered one instance when the men had gone hunting and the "woodsmen" came, threatening the women. The women lit tobacco to keep the "woodsmen" away.[31] I asked the elderly Houma woman whether these "woodsmen" still existed. She gave me a puzzled look. She said simply that the forest had disappeared. The cypress forest has died through the process of building channels for the movement of oil rigs so the habitat for woodsmen had been destroyed. As the environment changed, mythology and spirituality changed as well.

Such highly integrative worldviews are not limited to traditional societies. While doing research on farming in Iowa, a farmer told me that he had noticed that the birds disappeared during the farm depression of the 1980s. He had shared this observation with his brother-in-law who had noticed the same pattern. I asked this farmer whether this was the result of land use pattern changes, and he quickly clarified that it was the result of the "state of humanity." The groaning of humanity had somehow affected the earth.[32]

Both these stories illustrate worldviews with high levels of integration in which the realities of God, nature, and humanity are closely intertwined. Highly integrative views, such as those held by those from the Reformed tradition, see God as continually sustaining both people and nature and view humans and nature together as part of God's plan for Shalom.[33] Some aspects of the Catholic tradition also express more integrative views of God, nature, and society. For example, Andrew Greeley has shown that more gracious images of God, identified with Catholic perspectives, lead to greater levels of environment care.[34] The National Catholic Rural Life Conference illustrates this high level of integration in its mission, which draws on a spiritual tradition that brings together the church, care of community, and care of creation. Thus the organization sees spirituality, community, ecology, and economy as all part of a larger whole and through this, sees issues of trade, poverty, integrity of creation, and democratic decision-making as connected.[35] Binde identified this perspective in Roman Catholicism as one where the route to human beings becoming closer to God is through the transgressing of the boundary between humans and nature.[36]

Theological traditions that do not have highly integrative views of God, humans, and nature conform more closely to the Western intellectual tradition, which tends to be very dualistic—humans apart from nature—and even the word "nature" implies something separate from humans.[37] West-

ern cultures struggle to find words that can express an integrative way of conceiving the world. This is intensified within theological traditions that reinforce a dualism between humans and nature.[38]

The Christian community needs the contributions of Christian traditions that have integrative theological language and visualization to meet the challenge of climate change, providing the language that is largely absent in Western intellectual traditions. The intractability of the problem of global climate change is due to its multi-faceted causes and solutions. How do we achieve global economic justice, while reducing greenhouse gases? How do we make transit systems socially acceptable and economically feasible, overcoming a culture and infrastructure that is dependent on the automobile? These challenges require highly integrated ways of looking at life, ways of seeing the world that perceive living within limits as not taking away freedom, but rather bringing out opportunities for life in new ways. This integrative worldview envisions reducing our carbon footprint through more densely packed settlement as creating the possibility for more mass transit which in turn creates the potential for more heterogeneous neighborhoods and more neighborliness. This view of the world encourages buying local food not just because it means less fuel expended in the transportation of the goods, but also because it leads to a richer sense of the region and the connection between farm and market. Integrative Christian traditions see all of these choices as having spiritual implications.

Responsibility: Routes to Social Change

The third and final factor in my framework of analysis is focused on perceived routes to social change, or the issue of responsibility. All policies addressing global climate change involve forms of constraint and restraint. But how do different Christian traditions envision routes to social change? Must change be accomplished through individual transformation and conversion, or through structural change? Is sin embedded in individuals or can it also be embedded in structures?

In general, those Christian traditions that are more individualistic in their conception of society are more strongly connected to American cultural emphasis on individual rights and actions—whether on the right or the left in terms of religious traditions. For example, many mainline Protestant denominations work out of a model of individual activism. On the conservative side, evangelicals and fundamentalists emphasize individual conversion.[39] Individualists see problems embedded in the lack of morality of individuals, while those that are more communal conceive of societal problems as at least partially embedded in societal structures. This initial assumption leads to different perceived routes to change, social change through individual transformation for the former and social change through the transformation of societal structures for the latter.

Individualistic conceptions of society are often tied to individual property rights and prominence of economic values. Climate change will require communal restraint, requiring that more individualistic religious traditions enlarge their imaginations to accept the value of community and community-wide or global constraints.

A growing dialogue within the Christian community holds some promise for overcoming the American individualism that paralyzes us in responding to the need for constraints and restraints. Traditional theological reflection on what it means to be made in the image of God has centered on traits that are possessed by individuals, traits such as "rational thought." This tradition is now in dialogue with a minority tradition that identifies being in the image of God with being created for relationship.[40] And in this relatedness, nature is not a neutral backdrop, but rather God, humanity, and nature are inextricably bound up with one another.

Theologian Colin Gunton, coming out of this theological tradition, goes so far as to say that it is wrong to abstract humans from their social context, but it is also wrong to abstract the environment from its inhabitants. He argues that such abstraction empties the world of its personal meaning because humans have a deep desire to be connected to each other and to the earth.[41] This theologizing may deepen the ability of American Christians to conceive of strengthening relationships rather than individual freedom as the route to addressing the challenge of climate change while at the same time following a spiritual path that recognizes a particular way that humans image God.

Church structure and history also impact views on social change. The sociology of church structure cannot be ignored. Evangelical culture is shaped by the independence of each congregation, and by mobility. This structural independence led historian Ron Wells, in the early 1980s, to state,

> So angered have I been lately with the Moral Majority and their kind that I wanted to make some public gesture of disassociation of myself with them. But to whom, or from whom, would I resign?[42]

This lack of an overarching structure, in comparison to other traditions, has meant that change within evangelical circles tends to be personality driven and shaped by Christian publishing and broadcasting. Mainline denominations and the Catholic church have more hierarchical or synodical governance structures, increasing the possibility of social change through direct denominational channels.

The National Religious Partnership for the Environment (NRPE) is an example of an organization that has been effective in working within the sociology of difference in addressing the issue of climate change.[43] The NRPE is an organization made up of the US Conference of Catholic Bishops, the Coalition on the Environment and Jewish Life, the National Council of Churches, and the Evangelical Environmental Network. The NRPE respects the cultures, beliefs, and structures of each of its partners and enables each partner to develop its own strategy for bringing its community along in their understanding of climate change.

The Evangelical Environmental Network, as part of the NRPE, established the Evangelical Climate Initiative (ECI) process.[44] Because of the sociology of the evangelical community, the strategy involved first gathering a well-respected group of evangelical leaders to meet with a similarly highly regarded group of scientists who were also evangelical Christians. The ECI grew out of discussions among this group and its statement was signed by over eighty evangelical leaders before it went public. Because of the nature of this social group, the next steps include continuing to recruit leaders, and targeting Christian radio and publications.

Christian traditions arise out of particular sociological contexts which influence the choices for effective strategies for incorporating these various traditions into movements to address climate change. But also the histories and stories of particular Christian traditions shape their theological development. Mennonites are an example of a group particularly impacted by its history. Surprisingly, Mennonites have expressed a utilitarian view of humans' relationship to nature.[45] Until recently, Mennonite theology made little reference to the preservation of the earth, though practice has tended in that direction. Most Mennonite theology has been concerned with church-state issues due to Mennonite pacifism, leaving the topic of nature in need of further exploration.[46] Thus, while Mennonites are known for their compassion for the underclass, such compassion has not been typically extended to nature.

But once again, groups are not easily classified. Because the Mennonite tradition puts a great emphasis on simplicity and communal life, Mennonites are suspicious of wealth, which tempers this utilitarian perspective. Thus, even though Mennonites may view the natural environment as basically for human use, they do not put the individual or economic growth above the good of the environment, and therefore are more open to constraints related to global climate change. Mennonites may be drawn into the concerns over climate change through the lens of simplicity in living, the vulnerability of the poor, and through concerns over justice.

Conclusion

I have looked at three major factors that influence attitudes toward nature and approaches to environmental problems, particularly climate change. The first factor was eschatology, or beliefs about the future. Where is history going? The second factor was integration. How do traditions theologically construct the relationship among humans, nature, and God? The third factor was responsibility. Who, or what, is responsible for social change? And how is social change to be accomplished?

As my analysis of these three factors makes clear, the issue of climate change and the Christian church is complex. However, understanding such complexity should not be seen as an impediment to moving forward, but rather should lay the groundwork for dialogue with the purpose of addressing climate change. To be effective in engaging the Christian community on the issue of climate change, we must

first understand the range of basic assumptions that the various groups bring to the discussions. We must also be able to discern the difference between religious beliefs and dominant cultural beliefs. For example, we must not mistake differences in approaches to social change with differences in whether individuals believe that global climate change is taking place.

To bring about effective social change, we must find those aspects of belief systems that resonate with concern over climate change, and then argue from those positions. For example, evangelicals are finding partners among mission groups that work in the developing world. These groups work together for policies that address global climate change because of concern for the poor. Framing concerns within the filter of justice and simple lifestyle draws Mennonites into the discussions.

Finally, we need to accept a diverse range of on-the-ground strategies, all needed to reach the diversity of groups. Evangelicals are best engaged in discussions through their leaders and mass media. The Catholic church is greatly influenced through its hierarchy and official statements by its leadership. Mainline Protestants are much more tied into information and discussions that come through secular organizations as well as from their denominational organizations, the National Council of Churches, and the World Council of Churches.

We cannot afford to work against each other. We need to work with the cultures of belief systems, to whatever extent possible. The model of the National Religious Partnership for the Environment is a good model because all communities are allowed to be themselves, and to frame their approach to be most effective. However, even this approach requires a conviction that global climate change is upon us and that a unified response is needed.

The challenge of constructing climate change policy is that it involves not only the range of religious worldviews, but also national and cultural worldviews. Environmental conflict resolution literature points out that worldviews are not so much a problem as the lack of worldview transparency in the negotiations of policies. Christians and non-Christians alike need each other and must find common ground. ⊙

Notes

[1]Lynn White, "The Historic Roots of Our Ecological Crisis," *Science* 155 (1967): 1203–7.

[2]Heather H. Boyd, "Christianity and the Environment in the American Public," *Journal for the Scientific Study of Religion* 38 (1999): 43; Conrad L. Kanagy and Hart M. Nelson, "Religion and Environmental Concern: Challenging the Dominant Assumptions," *Review of Religious Research* 37 (1995): 33–43.

[3]Janel M. Curry and Kathi Groenendyk, "Place and Nature Seen through the Eyes of Faith: Understandings among Male and Female Seminarians," *Worldviews: Environment, Culture, Religion* 10, no. 3 (2006): 350.

[4]Janel M. Curry, "Community Worldview and Rural Systems: A Study of Five Communities in Iowa," *Annals of the Association of American Geographers* 90, no. 4 (2000): 703.

[5]I assume the reality of human-induced climate change in this article.

[6]Thomas Ackerman, "Global Warming: Scientific Basis and Christian Responses," *Perspectives on Science and Christian Faith* 59, no. 4 (2007): 250–64.

[7]Andrew Downs and Andrew Weigert, "Scientific and Religious Convergence toward an Environmental Typology? A Search for Scientific Constructs in Papal and Episcopal Documents," *Journal for the Scientific Study of Religion* 38, no. 1 (1999): 55.

[8]Brian McCammack, "Hot Damned America: Evangelicalism and the Climate Change Policy Debate," *American Quarterly* 59, no. 3 (2007): 645–68.

[9]John S. Dryzek, *The Politics of the Earth: Environmental Discourses*, 2d ed. (New York: Oxford University Press, 2005).

[10]To see how my empirical research contributes to the range of scholarly work on religion and environmental attitudes, see the particular articles cited in this article that come out of that empirical research. They each include extensive references to the literature in the field, the methods of my research, and the results of the empirical research.

[11]Jared Diamond, *Collapse: How Societies Choose to Fail or Succeed* (New York: Penguin Books, 2005).

[12]Michael Shellenberger and Ted Nordhaus, "The Death of Environmentalism: Global Warming Politics in a Post-Environmental World," www.thebreakthrough.org/images/Death_of_Environmentalism.pdf (accessed March 14, 2008).

[13]Heather H. Boyd, "Christianity and the Environment in the American Public," *Journal for the Scientific Study of Religion* 38 (1999): 42; James L. Guth, John C. Green, Lyman A. Kellstedt, and Corwin E. Smidt, "Faith and the Environment: Religious Beliefs and Attitudes on Environmental Policy," *American Journal of Political Science* 39 (1995): 373–4; James L. Guth, Lyman A. Kellstedt, Corwin E. Smidt, and John C. Green, "Theological Perspectives and Environmentalism among Religious Activists," *Journal for the Scientific Study of Religion* 32 (1993): 375.

[14]Janel M. Curry-Roper, "Contemporary Christian Eschatologies and Their Relation to Environmental Stewardship," *The Professional Geographer* 42, no. 2 (1990): 158.

[15]Janel M. Curry, "Community Worldview and Rural Systems," 701.

[16]W. W. Comfort, "Four Essentials of Quakerism" in *Through a Quaker Archway*, ed. H. M. Lippincott (New York: Thomas Yoseloff, 1959), 52–3.

[17]B. Blanshard, "Inward Light and Outward Darkness" in *Through a Quaker Archway*, 36–7.
[18]W. W. Comfort, "Four Essentials of Quakerism" in *Through a Quaker Archway*, 55–8.
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[20]D. A. Roozen, W. McKinney, and J. W. Carroll, *Varieties of Religious Presence: Mission in Public Life* (New York: Pilgrim Press, 1984).
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[22]Guth et al., "Faith and the Environment," 377.
[23]Curry and Groenendyk, "Place and Nature Seen through the Eyes of Faith," 346.
[24]Ibid.
[25]Joel Carpenter, *Revive Us Again: The Reawakening of American Fundamentalism* (New York: Oxford University Press, 1997), 47.
[26]Riley E. Dunlap and Kent D. Van Liere, "Commitment to the Dominant Social Paradigm and Concern for Environmental Quality," *Social Science Quarterly* 65 (1984): 1015–28; Curry and Groenendyk, "Place and Nature Seen through the Eyes of Faith," 339.
[27]Ackerman, "Global Warming: Scientific Basis and Christian Responses," 260; Interfaith Alliance, www.interfaithstewardship.org; Cornwall Declaration.
[28]www.interfaithstewardship.org/pages/cornwall.php (accessed December 5, 2007); Dean Ohlman, "Responding to the Interfaith Stewardship Alliance Statement on Climate Change," manuscript (June 23, 2006); debate between Robert Sirico, President, Acton Institute and Ron Sider, Evangelicals for Social Action at Calvin Seminary (fall 2006). For another comparison between these two groups, see Brian McCammack, "Hot Damned America: Evangelicalism and the Climate Change Policy Debate," *American Quarterly* 59, no. 3 (2007): 645–68.
[29]Ackerman, "Global Warming: Scientific Basis and Christian Responses," 261. For transparency, let me state that I am chair of the board of the Evangelical Environmental Network and have signed the Evangelical Climate Initiative statement.
[30]Daniel Rush Finn, "The Foundations of Economic Personalism: Promise and Peril," *Journal of Markets and Morality* 6, no. 2 (2003): 599–615.
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[33]Curry and Groenendyk, "Place and Nature Seen through the Eyes of Faith," 343. The research reported in this article includes diagrams drawn by seminarians on the perceived relationship between God, humanity, and nature.
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[39]Janel Curry, "Social Capital and Societal Vision: A Study of Six Farm Communities in Iowa," in *Religion as Social Capital: Producing the Common Good*, ed. Corwin Smidt (Waco, TX: Baylor University Press, 2003), 146; Curry and Groenendyk, "Place and Nature Seen through the Eyes of Faith," 326–54.
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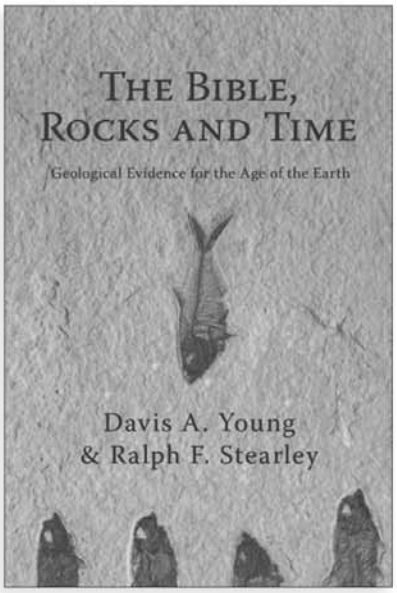

THE BIBLE, ROCKS AND TIME

Geological Evidence for the Age of the Earth

Davis A. Young and Ralph F. Stearley

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R. Joel Duff

Article

Flood Geology's Abominable Mystery

R. Joel Duff

Flowering plants represent the dominant part of Earth's plant life today. The origin of these plants was once referred to by Darwin as an "abominable mystery" because they appear so late and so abruptly in the fossil record. Flood geologists (creation scientists) seek to explain the origin of fossils and the majority of geomorphic features we see today as resulting from a global deluge. Thus, flood geologists must also be able to explain the observed appearance of flowering plants late in the fossil record.

This article examines the fossil record of plant pollen and spores in light of the predictions of flood and standard geology. Predictions may be made, based on flood geology models, of how pollen and spores would be expected to be distributed in the geological column as the result of a global flood. These predictions may be tested by observations from the fossil record. The fossil pollen and spore record is shown to exhibit features which would not be predicted by modern flood geology theory. Hence, the burden falls to the flood geologist to explain the pattern of pollen and spores in a manner that accounts for the "undeniable reality" of observed fossil succession.

Flowering plants represent the dominant part of Earth's plant life today. The origin of these plants was once referred to by Darwin as an "abominable mystery" …

The earth is covered by thick layers of primarily sedimentary rock sometimes referred to as the geological column. Conventional geological theory interprets these layers as representing events that took place over variable periods of time. In contrast, flood geologists, often referred to as creation scientists, hypothesize that a large fraction of all of these layers of rock resulted from a single universal flood, described in Genesis 6–8, "*by purely natural processes that are capable of being studied to a certain extent in hydraulics laboratories and local flood situations today*."[1] Both parties understand these rock layers to have been formed as part of a real historical sequence of events, albeit, for the latter, possibly augmented by periodic supernatural interventions.

Fossil Succession and the Geological Column

A conspicuous feature of the geological column is the presence of billions of fossils which represent the remains, or evidence of the presence, of formerly living organisms. Equally apparent is that these fossils are found in an ordered sequence and typically distributed only in a limited portion of the geological column. This ordered sequence or succession of fossils is observed as the same sequences of fossil species found throughout stacked layers of rocks around the world. Consequently, any theory claiming to provide an explanation for the origin of the geological

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record must be able to account for this obvious ordered sequence of fossils.

The implications of fossil succession are so staggering and so challenging that many creation scientists have either downplayed or attempted to deny the significance of this record. However, that position has become less common as observed in a published debate between flood geologists John Baumgardner and Michael Oard over competing creationist models of plate tectonics. In this debate, Baumgardner made one of the strongest statements in support of the reality of succession in the fossil record that has been made by any member of the scientific creationist community. While Oard attempted to cast doubt on many aspects of fossil succession, Baumgardner responded, in this extended quote, by summarizing the "facts" that must be accommodated by any flood geology model.

> As a final point, I would like to address Michael Oard's general rejection of the concept of fossil succession in the geological record. Fossil succession represents an undeniable reality of what creationists and evolutionists alike observe in the rock strata. For example, we find no archaeocyathids, a vase-shaped coral-like organism with a double-walled calcareous skeleton, above middle Cambrian strata. We find no pentamerus brachiopods or cystoid crinozoans or psilopsid plants above Devonian strata, no graptolites above Mississippian strata, and no trilobites or rugose corals above Permian strata. On the other hand, we find no birds or angiosperms in strata lower than Jurassic, no mammals in strata lower than upper Triassic, no reptiles in strata lower than Pennsylvanian, and no amphibians in strata lower than Devonian. A similar unmistakable sequence of types also exists in the case of the microfossils.
>
> One can personally examine the actual physical sequence of rock strata with their fossils, starting, for example, at the bottom of the Grand Canyon and continuing up onto the Colorado Plateau at Bryce Canyon. Independent of the names and geological periods that have been assigned to them, these rock units indeed have genuine identity, can readily be tracked laterally for hundreds of miles, and display an unambiguous vertical fossil sequence for anyone who cares to look. Creation tours actually provide this opportunity on a frequent basis. Oard cannot provide a rational defense for his denial of such observable reality. Creationists have long recognized this ordering in the fossil record and have related it to the progressive destruction of ecological habitat as the transgressing waters of the Genesis Flood reached higher and higher topographical regions of the planet. Oard in his mind seems to be equating fossil succession to evolution, not understanding that evolution is merely the interpretation evolutionists are imposing on the observed data. If we as creationists are to make genuine progress in reconstructing the actual history of the Earth in light of God's revelation, we simply cannot afford such denial and misrepresentation of crucially important information.[2]

For Baumgardner, there is no doubt that the fossil record exhibits succession and that many well-known extinct taxa such as dinosaurs and trilobites are found *only* in limited portions of the total geological column.[3] If, as Baumgardner bluntly states, "succession represents an undeniable reality," then this reality begs for an explanation.

Why Fossil Succession?

What are some of the potential explanations for this undeniable evidence of succession in the fossil record? Evolutionary and conventional geological theory was constructed, in part, to provide a framework for understanding the "reality" of the observed fossil succession. These theories state that organisms have changed through time, and during successive stages of organismal evolution, plants and animals became preserved in the rock record. Hence, each layer of rock represents a snapshot of the diversity of organisms that were alive during successive periods of time. In contrast, flood geologists reply that the fossil record represents neither an evolutionary record of organismal change nor a record of vast geological eras.

Regarding the latter view, flood geologists have frequently sought to explain the distribution, abundance, and succession in the fossil record of organisms that are highly familiar to the lay Christian, such as dinosaurs, fish, birds, and trilobites. An example of one of the most common explanations for the origin of these fossils is provided by Whitcomb and Morris in *The Genesis Flood*.[4] They

attribute these characteristics of the fossil record to organisms being drowned in a progressive fashion dictated primarily by their mobility and thus their ability to escape the encroaching waters of the Noachian Flood. Therefore, in their view, amphibians would be the first land animals swept away; followed by reptiles, including the dinosaurs; and then mammals, reflecting the order of fossils in the geological column. Furthermore, Whitcomb and Morris posit that "hydrodynamic sorting along with gravity selectivity of moving water for particles of similar sizes and shapes, together with the effect of the specific gravity of the respective organisms" could account for the pattern of small marine organisms in the fossil record. While roundly criticized by both secular and Christian geologists for being inconsistent with the fossil record, this simplistic model still garners much popular support in the creationist literature as evidenced by the prior quote by Baumgardner.

Any theory that proposes to explain the totality of the fossil record must be able to account for all of the evidence and not just a few of its most obvious features. Both Christian and secular scientists have pointed out serious problems with the Whitcomb and Morris flood geology model, most of which will not be repeated here.[5] Rather, a single challenge to this and all other flood geology models for explaining fossil succession is presented. While not a novel argument,[6] it poses a particular challenge that I refer to here as *flood geology's abominable mystery* for reasons provided below.

What makes one theory better than another? Stephen Hawking provides a response to this question by stating that "a theory is a good theory if it satisfies two requirements: it must accurately describe a large class of observations on the basis of a model which contains only a few arbitrary elements, and it must make definite predictions about the results of future observations."[7] Both conventional geological theory and flood geology claim to explain observations and both can make predictions about the distribution and order of fossils in the fossil record. But which theory best accounts for the data and makes predictions that are borne out by further testing? For flood geology, as envisioned by Morris and the majority of scientific creationist writers, the explanations for the observation of fossil succession involve the two mechanisms stated above: (1) progressive destruction of habitats as the waters rose, combined with animal migration and (2) hydrodynamic sorting based on size, shape, and specific gravity of organisms.

Given these mechanisms, flood geology should make predictions about what one expects to see if a majority of the earth's sedimentary rocks were deposited during a short-term universal flood event. The former mechanism, progressive inundation and migration, ignores the evidence that all of the major environments (e.g., marine, freshwater, and terrestrial), along with the animal and plant communities that inhabit them, change throughout the geological record. Thus, it does not even accurately describe the majority of observations. The latter mechanism, hydrodynamic sorting, is the primary focus of this article. Specifically, the two-part question is asked, what do flood geology models predict regarding where plant pollen and spores should be found in the fossil record, and does the evidence support these predictions?

Pollen and Spores

Plants produce a number of specialized reproductive structures. Of these, land plants produce either spores or pollen (Table 1), most of which are transported by wind, water, or insects. Spores are

Table 1. Major Groups of Land Plants and Their Dispersed Reproductive

Major Groups of Land Plants	Examples	Spores or Pollen?
Bryophytes—nonvascular and seedless	Mosses, liverworts, hornworts	Spores
Seedless vascular plants—vascular plants that do not produce seeds	Lycophytes (mostly extinct today) and ferns	Spores
Gymnosperms—vascular plants with seeds but no fruit	Pine, fir, redwood, spruce, Cyprus, etc.	Pollen
Angiosperms—vascular plants with seeds inside fruits	All flowering plants including grasses	Pollen

dispersive reproductive structures produced by plants such as mosses, lycophytes, and ferns (Fig. 1A–C). Spore sizes vary widely. Most are 30–50 mm in size, but some may be much smaller; others reach as large as 600 μm (more than ½ mm in size, see Fig. 1C) and are visible to the eye (e.g., the brown dust on the underside of some fern fronds). Pollen are reproductive structures and are produced by both gymnosperms such as conifers (e.g., pine, spruce, and fir) and flowering plants (Table 1, Fig. 1D–F). Gymnosperm pollen is easily distinguished from flowering plant pollen because of the different architecture of their pollen walls. Both pollen and spores vary greatly in wall thickness, shape, buoyancy, and specific weight. Pollen grains also range in size typically from 10–50 μm with the smallest being 6 μm (forget-me-not pollen grains). Among the flowering plants, there are many unique morphologies of pollen, some of which are highly characteristic of particular groups. For example, grass pollen grains, which are extremely abundant in modern soils, are distinctly rounded with a single pore. They are usually 20–40 μm in size.

Today there are over 300,000 pollen-bearing species of flowering plants. The nonflowering plants, including the bryophytes, ferns, and gymnosperms, account for about 40,000 living species. Spore and pollen production of many of these plants can be extraordinary. For example, a single male pine cone can produce 600,000 pollen grains with a full tree producing 350 million. A typical oak tree can produce over 100 million per year.[8] The production of pollen in a typical forest is several billion per hectare. Indeed, pollen and spore production is so great that they may be found dispersed everywhere on the surface of the earth, in sediments at the bottom of the ocean,[9] and trapped deep inside ice caps.[10] Because of their resistant outer walls, both spores and pollen are readily preserved in the fossil and recent sedimentary record. For example, a single sediment core from a modern or ancient lake

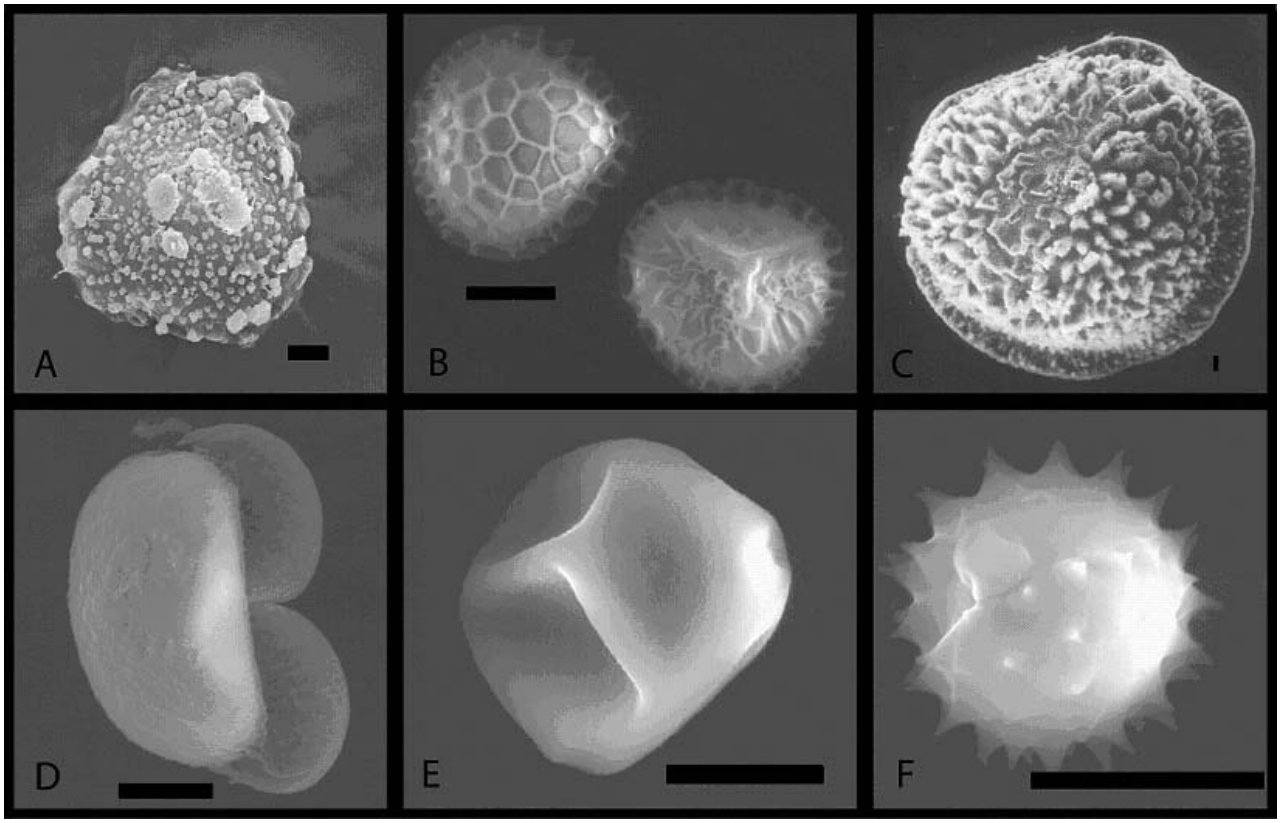

Figure 1. Scanning electron microscope images of representative spores and pollen. For each image the black bar represents 10μm. All images taken by Duff. (A) Spore of *Megaceros*, a hornwort which is a member of the bryophytes which are nonvascular spore-bearing plants. (B) Spores from *Lycopodium*, a seedless vascular plant similar to ferns. (C) Megaspore of *Isoetes*, a seedless vascular plant similar to ferns. These plants produce two types of spores which differ greatly in size. Megaspores are 200–600 μm in diameter whereas the microspores are similar to the *Lycopodium* pictured in B. (D) *Pinus* pollen grain; all pines produce pollen with similar features as pictured here. (E) *Betula* (beech tree) pollen grain. (F) *Solidago* pollen grain; all sunflower plants produce spiny pollen.

can yield hundreds of thousands of preserved pollen grains and spores, some of which originated far from the edge of the lake itself.[11] Likewise, pollen can survive even the harsh conditions of the digestive tract of mammals and become preserved in feces.[12]

Flood Geology Predictions

There is some dispute among flood geologists about what portion of the geological column should be considered the direct result of the Noahic Flood. At a minimum, it is assumed that all layers of rock, as recognized by conventional geology from at least the Cambrian (540 MYA—million years ago) to the end of the Cretaceous (65 MYA), were deposited by the catastrophic forces of the Noahic Flood over a short period of time.[13] Therefore it can be reasonably deduced that any plant or animal remains found in these layers of rock represent organisms that were part of the biota of the world either before or at the time of the initiation of the Flood event. Given this expectation of the geological record by flood geologists, three predictions about the distribution of pollen and spores may be made.

1. Pollen was present in the pre-flood world.

Pollen would have been present in the pre-flood world and can be expected to have been preserved in pre-flood soils and lake sediments during the traditionally defined 1,656 years between creation and the Flood. The Book of Genesis contains no specific references to pollen or spores and so we have no direct revelation that plants at that time produced such structures. However, it is not unreasonable to infer that pollen-bearing plants and thus pollen were present. For example, references to fruit in the Garden (Gen. 3:2), the coverings made of fig leaves (Gen. 3:7), the grain offering of Abel (Gen. 4:3), the "gopher wood" used to construct the ark (Gen. 6:14), the olive leaf plucked by the dove (Gen. 8:11), and the vineyard Noah planted immediately following the flood (Gen. 9:20), all appear to refer to plants that produce pollen. The manner in which these plants are referred to, as if they were part of the common experience of the original audience, gives no reason to invoke a pre-flood world in which plants displayed completely foreign means of reproduction, such that pollen was unnecessary. Furthermore, as will be shown, both the fossil record and their own models restrict the flood geologists' ability to speculate regarding the diversity of pre-flood vegetation.

2. Pollen and spores should be found throughout the geological column.

Flood geologists believe that the billions of tons of coal found in the geological column were the result of rapidly buried pre-flood vegetation.[14] The presence of vast amounts of vegetation prior to the Flood reasonably requires abundant spore and pollen production prior to the commencement of the Flood. For example, large numbers of pine and other conifer trees, all of which produce copious wind-dispersed pollen grains today, are found in the fossil record. Furthermore, since pollen grains and spores

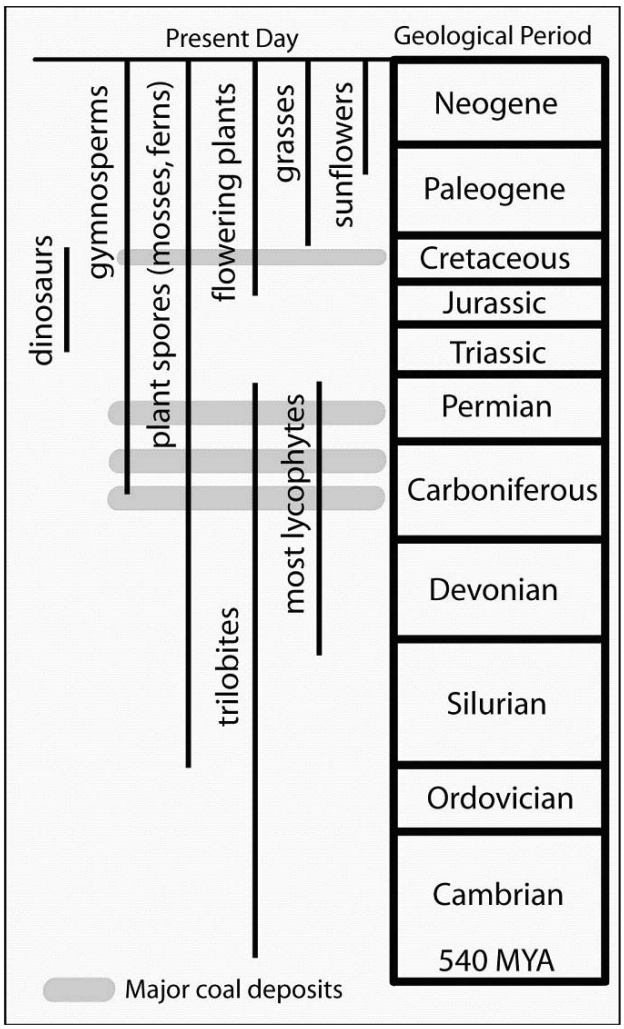

Figure 2. The distribution of some groups of fossils in the geological column. Geological periods are not to scale. Lines show extent of first appearance to last appearance of the fossils. However, densities of fossils during each geological period may vary greatly. The distribution of plant groups represents both pollen/spores and vegetative material, though pollen/spores may appear somewhat earlier than vegetative material.[18] Only the position of major coal seams are shown. Standard geological dates from the 2004 International Commission on Stratigraphy (www.stratigraphy.org/gssp.htm) for the end of the following geological periods are: Silurian, 418 MYA; Carboniferous, 306 MYA; Permian, 260 MYA; Cretaceous, 65 MYA; Paleogene, 33.9 MYA.

are readily preserved and have a wide range of sizes, shapes, and densities which overlap with one another, hydrological sorting mechanisms would not be expected to be able to distinguish between most spores and pollen or even between types of pollen, on a global scale. Thus, it can be inferred that flood geology theories would predict that pollen grains and spores, as a group, should not be found limited to specific portions of the record, but, rather, they should be found throughout the geological column. In other words, there is no known environmentally mediated mechanism by which spores and pollen can be completely separated from one another on a global scale.[15]

3. The location and abundance of pollen and spores should not be exclusively associated with the presence of related macroscopic plant material.

Granted that countless pollen grains and spores would already have been dispersed from the plants that produced them during the pre-flood period, flood geology models can be inferred to predict that a massive worldwide flood would be expected to distribute pollen and spores far, both laterally and vertically, from their progenitors. As a result, pollen and spores should be found frequently with unassociated macroscopic plant material throughout the geological column. For example, if it were claimed that flowering plant vegetation (e.g., oak trees) had greater buoyancy than nonflowering plant vegetation (e.g., pine trees), it could be argued that the former might be deposited in the upper portions of the rock record. However, even if such a hypothesis were warranted, there would be no reason to believe that the pollen (10–100 μm in size) associated with those plants should segregate in close association with the vegetative material (millimeters to meters in length) of the plants that produced them. Thus, flood geological models would predict that pollen and spores would not sort themselves out in the fossil record in direct relationship to macroscopic plant remains.

Pollen and Spores in the Fossil Record

Where have plant spore and pollen fossils definitively been observed in the geological column? Pollen and spores are found primarily in sedimentary rocks that also include land plants and animals. They are not found, or are very rare, in limestone formations and other marine sedimentary rock formations that include fossils such as brachiopods and crinoids. Like the well-known record of fossil succession in animals, plant fossils (which include both macroscopic plant material and microscopic spores and pollen) are also found in a distinctly successional pattern. For example, plants such as the lycophytes and ferns are first found in lower, though not the lowest, layers of the rock record with their first appearance in the Silurian (Fig. 2).[16] The first remains of members of the gymnosperms (conifers including pine trees) are found in early Carboniferous era rocks but do not become abundant until the Upper Carboniferous. It is only within those layers conventionally dated at 140 MYA and younger, beginning in the early Cretaceous era, that flowering plant fossils of any kind have been identified.[17] Hence, a majority of the geological column found worldwide from the Devonian through the beginning of the Cretaceous, has been found to contain only macroscopic (vegetative and reproductive parts) and microscopic (spores and pollen) fossils of ferns and gymnosperms to the exclusion of any evidence of flowering plants. This portion of the geological column can account for many thousands of feet of sedimentary rock on some continents (e.g., a large portion of the Grand Canyon). In addition, the spore and pollen record has been broadly observed to be associated with the macroscopic fossil record of plants with spores and pollen, sometimes being found in rocks just below the first vegetative remnants of plants.[19]

A few examples of data collected from specific locations around the world will serve to demonstrate the absence of flowering plant pollen in large portions of the geological column. A study of the pollen and spores found at Petrified Forest National Park in Arizona reveals spores identified from more than fifty different fossil fern and lycophyte species and pollen from more than eighty species of gymnosperms.[20] To date, no pollen grains of any flowering plants have been identified nor are any of the fossilized trees, which make the site famous, the remains of flowering plants. Rather, the majority of the fossilized trees are a type of extinct conifer. These petrified trees are found in a layer of rock called the Chinle Formation that is found spread across Arizona, Nevada, Utah, and western Colorado. The rocks from this formation are considered to be of Triassic age or older, as dated by a number of other methods not reliant on pollen or spore data.

To date, no flowering plant fossils have been found in any part of this formation. Thus these rocks are from the same part of the geological column which, in other locations around the world, consistently exhibits no flowering plant pollen.

Another example comes from Antarctica where a study of somewhat older Permian age rocks (250 MYA) revealed abundant spores of more than twenty distinguishable fern species, and pollen of about the same number of gymnosperms, but no evidence of any flowering plant pollen.[21] This study also compared pollen and spores from rocks of similar ages from South Africa and Australia and found that spores of the same species were present in those locations as well. In addition, the study showed a correlated pattern of extinction from the fossil record. Similarly, a study of sedimentary rocks at the Triassic-Jurassic boundary (about 215 MYA) in rock formations in Spain revealed more than forty-five species of ferns and gymnosperms but no flowering plant fossils.[22]

One last example involves the study of trapped plant material in amber. Many trees, especially conifers, ooze a sticky sap that can trap insects and catch pollen and spores. When this sap falls to the ground, it may become buried and preserved in a hardened "fossilized" state called amber. While rather abundant in the upper portions of the fossil record, amber (sometimes called fossil resin) is very rare throughout most of the fossil record and is unknown in rocks prior to the Devonian, which is notably when the first tree-like plants capable of producing resin are found in the fossil record. One famous rock formation, dated to the Triassic in southern Italy, is where some of the oldest known amber has been found. In a study of this amber, Roghi et al. were able to collect over 50,000 very small (1–10 mm in diameter) preserved drops of amber from crushed sandstone from specific strata of rocks in two locations more than 100 km apart at the base of the Southern Alps.[23] Microscopic examinations of preserved bits of plant vegetation, spores, and pollen found in these small amber drops revealed predominantly conifer pollen and plant parts with smaller numbers of fern and lycophyte spores. Once again, no pollen or vegetative parts of flowering plants could be identified from this material.

Many more examples of studies of pollen and spores collected from rock layers around the world could be presented with similar results: a conspicuous lack of flowering plant pollen from a large, and stratigraphically consistent, portion of the fossil record. Overall, the spore and pollen fossil record is demonstrated to be one of ordered succession. In addition, spores and pollen are often found preserved in rocks which may contain little or no macroscopic plant remains yet the types of spores and pollen found in these rocks are not unexpected given the macroscopic plants found in other rocks of the same age from other locations. This strongly supports a correlation between observed macroscopic plant succession and microscopic plant succession in the fossil record. This succession consists of only spores and spore-bearing plants found in the lower layers, followed by spores and gymnosperm pollen in rocks that have only fern-like plants and gymnosperms, and then, in the upper portions of the fossil record, spores and pollen from gymnosperm and flowering plants in association with vegetative material of the same plants.

The Pollen and Spore Record and Flood Geology

Given the record of observations of spore and pollen fossils throughout the geological column, are all the predictions based on the flood geology model borne out? Clearly, they are not! In fact, the pollen and spore record is the antithesis of what, a priori, flood geology models would predict. Even the first hypothesis that pollen was present in the pre-Flood world is only partially supported. Yes, there is undisputed evidence of the presence of gymnosperm and flowering plant pollen as well as preserved flowers and cones, in sediments of proposed flood origin. This logically compels the flood geologists to maintain that flowering plants and gymnosperms must have been part of the pre-Flood biota in order to have been preserved by the Flood. However, the presence of these plants and the evidence that they produced abundant pollen, combined with the observation that these plant remains are restricted to a small portion of the geological record, presents a conundrum to flood geologists. If pollen-producing plants were present prior to the Flood, why are those plants and their pollen not found in the lowest layers of the fossil record that represent the presumed earliest stages of the Flood?

Compounding this mystery is the observed order of other plants in the fossil record. While there is missing pollen in lower strata, many spore types associated with many extinct lycophytes and tree-ferns are found in those layers but then disappear in the upper layers of the fossil record.[24] These spores are identified by characteristic patterns on their surface but are very similar in size and shape to other spores found in other portions of the fossil record. No known hydrological sorting mechanism can be employed to tease these spores apart on such a global scale. Transport and depositions of spores have been shown to result in some sorting of pollen based on shape and size.[25] However, these studies find that such sorting occurs primarily on a local or regional scale. Furthermore, even in a local setting such as a stream or estuary, sorting is far from 100% efficient. Pollen are sorted only very roughly into size and shape classes but are still found intermixed. Even less efficient sorting would be expected in a global Flood with its much greater predicted turbulence.

If pollen-producing plants were present prior to the Flood, why are those plants and their pollen not found in the lowest layers of the fossil record that represent the presumed earliest stages of the Flood?

What about the flood geology expectation that spores and pollen grains should be found throughout the fossil record? The studies reviewed above demonstrate that neither pollen nor spores are randomly distributed in the fossil record, nor are they always found together. Spores are clearly found in the lower layers of rock, with pollen restricted to the upper portion of the geological column.[26] Flowering plant pollen also comes in many forms, some of which are distinctive of particular groups of plants.[27] For example, the grasses, which include all of the major grain crops such as wheat, corn, and rice, are nearly ubiquitous on the face of the earth today. These plants all produce spheroidal pollen with a single round pore that is very similar across all grass species and yet quite distinct from other flowering plants. These features allow these pollen to be easily identified in the fossil record. Grass pollen and evidence of grass vegetation are first found preserved in rocks of the late Cretaceous.[28] Flood geologists recognize these same sediments as either the last of the sediments to have been deposited during the Flood or as the result of post-Flood processes. Thus, the geological record of the Flood either suggests that grasses originated after the Flood or that their vegetative and reproductive parts escaped preservation in Flood sediments around the world until the very last sediments were laid down. How could Abel have brought a grain offering to the Lord (Gen. 4:3) and yet evidence of any form of grass (including all forms of cereals) be absent from the pre-Cretaceous portion of the fossil record?

While grass pollen are found in strata as far back as the Cretaceous, pollen from one of the largest families of flowering plants, the Asteraceae (sunflower family) with over 20,000 living species, are only first recorded in the late Paleocene epoch (60 MYA)[29] and do not become common until the Miocene epoch (23 MYA). Miocene sediments are attributed, by most flood geologists, to completely post-Flood events.[30] Either flood geologists must propose that (1) the members of this large family evolved rapidly after the Flood, either from some other plant group or that some member was present but very rare before the Flood and then evolved rapidly afterward; (2) some unknown mechanism (e.g., supernatural intervention) prevented these plants or their pollen to be trapped in the Flood sediments; or (3) evidence of their presence has somehow been overlooked despite studies of hundreds of well-preserved, spore-bearing sediments around the world.

Consider also the characteristics of coal formations as a testimony to the unique succession of plant material in the geological record. The majority of coal-bearing formations are found in geological strata identified to the Carboniferous Era (Fig. 2, p. 170). These coal formations, found worldwide, are always associated with ferns and lycopods and are surrounded by sedimentary rocks which contain evidence of spores of these and other spore-bearing plants.[31] In the Upper Carboniferous, spores for tree ferns and pollen of primitive gymnosperms first appear in coal seams. Absent from these locations is any evidence of flowering plant vegetation or pollen. However, there are coal formations, found higher up in the geological record from the late

Cretaceous (about 100 MYA), that do contain abundant flowering plant vegetation and spores.[32]

To account for the billions of tons of coal in the fossil record, flood geologists have suggested that nearly the entire surface of the pre-Flood earth was covered by dense forests and that much of the ocean surface was potentially covered by a floating forest. They propose successive burial of these forests to form individual coal seams.[33] However, these models do not account for, nor even acknowledge, the unique flora and successive order of fossil coals found worldwide including the lack of flowering plant wood or pollen in the lower coal layers.[34] The mount of coal-containing flowering plants and associated pollen suggests that the pre-Flood vegetative environment was populated by flowering plants. Yet, this only accentuates the mystery of the lack of any evidence of flowering plant material in billions of tons of coal found in the Carboniferous strata. It strains reason to advocate that whole communities of plants were completely devoid of flowering plants prior to the Flood. Nor would it seem likely that pollen from wind-pollinated plants such as oaks and birches would never have fallen into these communities or have mixed with them during a cataclysmic flood event. Without invoking supernatural intervention, how could waters of the Flood sort both macroscopic and microscopic parts of flowering plants from nonflowering plants?

Two Possible Objections

1. Might the pollen record be biased due to differential preservation?

There is no evidence to suggest that flowering plant pollen would be more susceptible to degradation than gymnosperm pollen or spores once trapped in the sedimentary column together. Interestingly, it can be inferred that flood geology models should predict that pollen and spores should be equally preserved in the fossil record simply because they propose that all of the fossils represented in the geological column are the result of rapid burial. Fossil preservation bias is not expected. Therefore, any bias in the fossil record requires explanation. For example, grass pollen appears to be exceptionally well preserved whenever found, which begs the question, "Why would they not be found throughout most of the geological column, if grasses were quickly buried in a global Flood?"

2. But are pollen and spores not used sometimes to date rocks? Maybe it only appears that older rocks lack pollen because the lack of pollen is being used to define the rocks as old?

While it is often claimed that the dating of the geological column involves circularity, this argument does nothing to assuage the pollen evidence. One only has to look at the fact that coal formations which lack flowering plant pollen are found in layers below those that do contain flowering plant remains.[35] Regardless of the names of the geological periods or dates determined by radiometric dating, the succession of fossils is still apparent in the fossil record and a serious challenge to flood geology.

The Abominable Mystery

Darwin once referred to the origin of the flowering plants as an "abominable mystery" because they appeared so late and so abruptly in the fossil record known to him. While no longer such a mystery, debate still exists over the details of the origins of the flowering plants, such as the evidence regarding the first definitive flowering plant vegetation and pollen in the fossil record.[36] However, while flood geologists continue to point to the persistent discussion of flowering plant origins as evidence of a problem for evolutionary theory, the observed, and widely recognized, lack of flowering plant fossils in the bottom two-thirds of the fossil record presents an ongoing and even greater abominable mystery for flood geology.

While the distribution of pollen and spores is seldom directly acknowledged as a problem for flood geology, there have been some attempts by flood geologists to demonstrate that there may be fossils, such as pollen, preserved in rocks near the bottom of the geological record. For example, a claim was made by Clifford Burdick in the late 1960s and early 1970s that fossil pollen from flowering plants had been found in Precambrian rocks deep in the Grand Canyon conventionally dated more than 500 MYA.[37] If true, these fossils would be found in sediments dated to more than 350 million years before flowering plants were thought to have evolved and thus present a serious challenge to evolutionary theory. However, this claim, roundly rejected by the scientific community, has even been disputed by some flood geologists who tested the claims and concluded that they were the result of contamination with modern pollen.[38] Nonetheless, some flood

geologists continue to claim that they have reaffirmed the original study.[39]

The reports of fossil pollen from these sites are interesting and unexpected. But what is even more surprising is that, considering that millions of fossils have been carefully catalogued with respect to location in the geological column during the past two hundred years, flood geologists can only point to a few possible examples of fossils that do not fit the well-established general patterns of distribution. Rather than the very rare exception, flood geologists should expect and would predict out-of-place fossils to be the rule rather than the exception. Consider the presence of multiple-sized droplets of amber within specific rock formations. A hydrological sorting hypothesis is unlikely to explain the presence of drops of amber of different shape, size, and weight all in a single, thin layer of rock to the exclusion of their presence in surrounding rock. An a priori expectation of flood geological models should be that these amber droplets would be found scattered throughout the geological column and would not necessarily be associated solely with a rock formation that also includes plants which are very likely the source of the amber. If sap formed and fell to the ground prior to the Flood, then these resin droplets would have become disassociated from their source in the catastrophic flood waters and been subjected to sedimentary processes that potentially would have left them far from their source trees. To complicate the matter, if amber were sorted by some sort of hydrological process, why would the spores and pollen found in them resemble the spores and pollen found separately preserved in the same strata of the geological column? This would seem to require that amber and spores/pollen would co-sort with one another. Again, this seems extremely unlikely and certainly not expected.

Standard geological and evolutionary theories provide a robust explanation for the succession of fossils in the geological column. As Baumgardner points out, these theories represent *"the interpretation evolutionists are imposing on the observed data."*[40] However, it must be recognized that those interpretations are quite capable of accommodating the observed data in the fossil record. In contrast, flood geology models do not predict the co-sorting of pollen and plants or the restriction of specific pollen or spore types to a single portion of the geological column. The consistency of the various independent lines of fossil and geological evidence in support of conventional geological and evolutionary explanations for the origins and distribution of pollen and spores through time and space is remarkable. As a result, the burden is placed on the flood geologist to explain the pattern of pollen and spores in a manner that accounts for the "undeniable reality" of observed fossil succession. ⊙

Notes

[1]J. C. Whitcomb, *The World that Perished,* rev. ed. (Grand Rapids, MI: Baker Book House, 1988), 68. Whitcomb explains that God normally does not do miraculously what he can do through ordinary providence. Thus, he argues that aside from some specific miracles that were necessary to begin and terminate the Flood, the events of the Flood should be viewed as natural outcomes of the massive flood. This minimization of the miraculous is a common theme in creation science literature.

[2]J. Baumgardner, "A Constructive Quest for Truth," *Journal of Creation* 16 (2002): 79–81.

[3]Flood geologists are not all convinced of Baumgardner's "undeniable reality" of fossil succession as witnessed in his debate with Oard. However, a large number do acknowledge the apparent succession of fossils in the geological record. Thus it represents at least a common viewpoint within the creation science community.

[4]J. C. Whitcomb and H. M. Morris, *The Genesis Flood: The Biblical Record and Its Scientific Implications* (Philadelphia, PA: Presbyterian and Reformed Publishing, 1961); also see Whitcomb, *The World that Perished,* 178; G. E. Parker and M. M. Parker, *Dry Bones and Other Fossils* (Colorado Springs, CO: Creation-Life Publishers, 1995). This last book is a children's book that explains the origin of fossils from a flood geology perspective. Chapter 4 explains very clearly how flood geologists perceive how fossils became sorted during the flood through hydrological processes and by successive flooding of ecological zones.

[5]D. Young, *Christianity and the Age of the Earth* (Grand Rapids, MI: Zondervan, 1982); D. Young, *The Biblical Flood: A Case Study of the Church's Response to Extrabiblical Evidence* (Grand Rapids, MI: Eerdmans, 1995); G. R. Morton, *Foundation, Fall and Flood: A Harmonization of Genesis and Science* (Dallas, TX: DMD Publishing, 1995).

[6]Morton, *Foundation, Fall and Flood*. See also M. Isaak, "Problems with a Global Flood," 2d ed. (1998) at www.talkorigins.org/faqs/faq-noahs-ark.html.

[7]S. Hawking, *A Brief History of Time* (New York: Bantam Books, 1988).

[8]R. H. Ho and J. H. Owens, "Microstrobili of Lodgepole Pine," *Canadian Journal of Forest Research* 3 (1973): 453–6.

[9]S. R. Ekman, "Pleistocene Pollen Stratigraphy from Borehole, Devil's Hole Area, Central North Sea," *Quaternary Science Reviews* 17 (1998): 855–69; S. Van der Kaars and P. De Deckker, "A Late Quaternary Pollen Record from Deep-Sea Core Fr10/95, GC17 Offshore Cape Range

Peninsula, Northwestern Western Australia," *Review of Palaeobotany and Palynology* 120 (2002): 17–39.

[10]Ice cores from ice caps such as those on Greenland, in Canada, and in Antarctica have been shown to contain numerous modern pollen grains. J. C. Bourgeois, R. M. Koerner, K. Gajewski, and D. A. Fisher, "A Holocene Ice-Core Pollen Record from Ellesmere Island, Nunavut, Canada," *Quaternary Research* 54 (2000): 275–83.

[11]Hundreds of studies have been conducted on cores of sediments from lakes to determine the pattern of spore and pollen trapped over time as a means of reconstructing past climates and vegetation patterns. An overview of the significance of these studies and the types of data that can be recovered are found in the following paper: B. Vad Odgaard, "Fossil Pollen as a Record of Past Biodiversity," *Journal of Biogeography* 26 (1999): 7–17.

[12]G. K. Kelso and A. M. Solomon, "Applying Modern Analogs to Understand the Pollen Content of Coprolites," *Palaeogeography, Palaeoclimatology, Palaeoecology* 237 (2006): 80–91.

[13]D. J. Tyler, "Flood Models and Trends in Creationist Thinking," *Creation Matters* 2 (1997); A. A. Snelling, "Special Symposium: Where Should We Place the Flood/Post-Flood Boundary in the Geological Record?" *Creation ex Nihilo* 10 (1996): 29–31.

[14]T. Walker, "Coal: Memorial to the Flood," *Creation ex Nihilo* 23 (2001): 22–7; A. Snelling, "Coal Beds and Noah's Flood," *Creation* 8 (1986): 20–1.

[15]P. T. Moss, A. P. Kershaw, and J. Grindrod, "Pollen Transport and Deposition in Riverine and Marine Environments within the Humid Tropics of Northeastern Australia," *Review of Palaeobotany and Palynology* 134 (2005): 55–69; R. G. Goodwin, "Pollen Taphonomy in Holocene Glaciolacustrine Sediments, Glacier Bay, Alaska: A Cautionary Note," *PALAIOS* 3 (1988): 606–11; G. L. Chmura and D. Eisma, "A Palynological Study of Surface and Suspended Sediments on a Tidal Flat: Implications for Pollen Transport and Deposition in Coastal Waters," *Marine Geology* 128 (1995): 183–200; G. S. Brush and L. M. Brush, "Transport of Pollen in a Sediment-Laden Channel: A Laboratory Study," *American Journal of Science* 272 (1972): 359–81.

[16]P. Steemans, "Silurian and Lower Emsian Spores in Saudi Arabia," *Review of Palaeobotany and Palynology* 89 (1995): 91–104. Steemans describes spores found preserved in well core sections more than 13,000 feet below the surface. These sections are dated to the Silurian and Lower Devonian (420–395 MYA). In these sections, spores are found to the exclusion of pollen, just as they are in rocks of the same age in other locations.

[17]G. Sun, J. Qiang, D. Dilcher, S. Zheng, K. Nixon, and X. Wang, "Archaefructaceae, a New Angiosperm Family," *Science* 296 (2002): 899–904. In the late 1990s, a number of fossil finds in the late Jurassic became the earliest evidence of flowering plants in the fossil record. As predicted by evolutionary theory, evidence of the first flowering plants consists of vegetation and pollen in the fossil record that is not diverse when it first appears, but in successive layers above the late Jurassic and lower Cretaceous, flowering plant fossils including types of pollen become increasingly abundant and diverse.

[18]Moss et al., "Pollen Transport and Deposition in Riverine and Marine Environments within the Humid Tropics of Northeastern Australia"; Goodwin, "Pollen Taphonomy in Holocene Glaciolacustrine Sediments, Glacier Bay, Alaska"; Chmura and Eisma, "A Palynological Study of Surface and Suspended Sediments on a Tidal Flat"; Brush and Brush, "Transport of Pollen in a Sediment-Laden Channel."

[19]The occurrence of fossil pollen and spores in somewhat older (i.e., lower) strata than their vegetative counterparts is not unexpected. Modern paleontological and evolutionary theory predicts that the more easily preserved parts of plants such as pollen and spores will be found first in the fossil record since it is assumed that the first plants that evolved these features would at first be scarce and their vegetative or floral parts rarely fossilized.

[20]R. J. Litwin, "The Palynostratigraphy and Age of the Chinle and Moenave Formations, Southwestern USA," (PhD diss., The Pennsylvania State University, 1986); R. J. Litwin, A Traverse, and S. R. Ash, "Preliminary Palynological Zonation of the Chinle Formation, Southwestern USA, and Its Correlation to the Newark Supergroup (Eastern USA)," *Review of Palaeobotany and Palynology* 68 (1991): 268–81.

[21]K. Larsson, S. Lindstrom, and D. Guy-Ohlson, "An Early Permian Palynoflora from Milorgfjella, Dronning Maud Land, Antarctica," *Antarctic Science* 2 (1990): 331–44.

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[24]B. Lugardon, L. Grauvogel-Stamm, and I. Dobruskina, "The Microspores of *Pleuromeia Rossica* Neuburg (Lycopsida; Triassic): Comparative Ultrastructure and Phylogenetic Implications," *Earth and Planetary Sciences* 329 (1999): 435–42; C. H. Wellman and J. Gray, "The Microfossil Record of Early Land Plants," *Philosophical Transactions of the Royal Society of London B* 355 (2000): 717–32. There are many groups of plants in the fossil record for which there are no living species today. Many of these fossils are found early in the plant fossil record and neither the plants nor their spores are found in any strata that contain flowering plants.

[25]Tyler, "Flood Models and Trends in Creationist Thinking"; Snelling, "Special Symposium: Where Should We Place the Flood/Post-Flood Boundary in the Geological Record?"

[26]Moss et al., "Pollen Transport and Deposition in Riverine and Marine Environments within the Humid Tropics of Northeastern Australia"; Goodwin, "Pollen Taphonomy in Holocene Glaciolacustrine Sediments, Glacier Bay, Alaska"; Chmura and Eisma, "A Palynological Study of Surface and Suspended Sediments on a Tidal Flat"; Brush and Brush, "Transport of Pollen in a Sediment-Laden Channel."

[27]M. E. Collinson, M. C. Boulter, and P. L. Holmes, "Magnoliophyta ('Angiospermae')" in M. J. Benton, ed., *The Fossil Record* 2 (London: Chapman and Hall, 1993): 809–49; S. M. Magallón-Puebla and J. Sanderson, "Relationships among Seed Plants Inferred from Highly Conserved Genes:

Sorting Conflicting Phylogenetic Signals among Ancient Lineages," *American Journal of Botany* 89 (2002): 1991–2006.

[28]W. L. Crepet and G. D. Feldman, "The Earliest Remains of Grasses in the Fossil Record," *American Journal of Botany* 78 (1991): 1010–4.

[29]M. Zavada and S. de Villiers, "Pollen of the Asteraceae from the Paleocene-Eocene of South Africa," *Grana* 39 (2000): 35–45. The sunflower family is the second-largest family of flowering plants, second only to the Orchid family. Common members include the asters, daisies, sunflowers, goldenrod, and lettuce. The first occurrence of Asteraceae in the fossil record appears after the Cretaceous, which places this entire family in sediments after the disappearance of the dinosaurs.

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[31]E. Cortland, F. Greb, F. Stephen, and D. A. Williams, "The Geology and Palynology of Lower and Middle Pennsylvanian Strata in the Western Kentucky Coal Field," *International Journal of Coal Geology* 47 (2001): 189–206; R. Peppers, "Palynology of the Lost Branch Formation of Kansas—New Insights on the Major Floral Transition at the Middle-Upper Pennsylvanian Boundary," *Review of Palaeobotany and Palynology* 98 (1997): 223–46. These are just two of many papers that document the palynological evidence of Carboniferous coal seams. Even the Carboniferous coal seams around the world show a transition from lycopod-dominated vegetation and spores in coal to coal that is composed of fern, seed-ferns, and some gymnosperms.

[32]D. J. Nichols, "The Role of Palynology in Paleoecological Analyses of Tertiary Coals," *International Journal of Coal Geology* 28 (1995): 139–59.

[33]C. Wieland, "Forests That Grew on Water," *Creation* 18 (1995): 2–24; A. Snelling, "Coal Beds and Noah's Flood," *Creation* 8 (1986): 20–1. The fundamental difficulty that the Flood geology model faces with coal is that even if every plant alive today were preserved as coal in a flood it would only account for a very small portion of the coal reserves on earth. Hence, it is argued that the pre-Flood world was globally tropical, had a larger land mass and potentially large floating forest on the pre-Flood seas.

[34]S. E. Nevins, "The Origin of Coal," *Impact* 41 (1976). Most creation science articles that discuss coal have similar elements as this newsletter article from the Institute for Creation Research. There is discussion about how the standard theories will not work and a trumpeting of flood geology to explain some odd features of coal seams. In this article, Nevins does acknowledge that certain lycopods and ferns are commonly found in Carboniferous age coal beds but neither Nevins nor other creationist authors tell their audience that these coal beds have no flowering plant component. Because they have chosen to ignore this obvious fact of the fossil record, they do not attempt to provide an explanation.

[35]This is not to say that some spores and pollen are not found in the "wrong" rock layers. At times pollen and spores may be found in rock layers younger than any known evidence of the plants. This can happen if ancient rocks with pollen and spores erode and pieces of those rocks get incorporated into new sedimentary layers. These layers are much younger themselves but may include very ancient fossils. This is expected to occur and is found in the geological record. What is not expected is to find pollen and spores in rocks that are much older then the first record of the plants themselves. For example, pollen found in Cambrian rocks would be an extremely challenging finding to modern paleontological theories.

[36]M. S. Zavada, "Angiosperm Origins and Evolution Based on Dispersed Fossil Pollen Ultrastructure," *Annals of the Missouri Botanical Garden* 71 (1984): 444–63; N. H. Hughes, *The Enigma of Angiosperm Origins* (Cambridge: Cambridge University Press, 1994); D. Dilcher, "Toward a New Synthesis: Major Evolutionary Trends in the Angiosperm Fossil Record," *Proceedings of the National Academy of Sciences* 97 (2000): 7030–6.

[37]C. L. Burdick, "Microflora of the Grand Canyon," *Creation Research Society Quarterly* 3 (1966): 38–50; C. L. Burdick, "More Precambrian Pollen," *Creation Research Society Quarterly* 11 (1974): 122–3.

[38]A. V. Chadwick, "Grand Canyon Palynology—A Reply," *Creation Research Society Quarterly* 9 (1973): 238; ——, "Precambrian Pollen in the Grand Canyon—A Re-examination," *Origins* 8 (1981): 7–12. Arthur Chadwick is a young-earth creationist who followed up on Burdick's research. He re-created Burdick's research and concluded that Burdick's findings were the result of contamination with modern pollen. Chadwick's conclusions were not well received by many in the creationist community, and additional follow-up tests were done by another group of creationists which were claimed to vindicate Burdick's original claims (see following note).

[39]G. F. Howe, "Creation Research Society Studies on Precambrian Pollen: Part I—A Review," *Creation Research Society Quarterly* 23 (1986): 99–104; W. E. Lammerts and G. F. Howe, "Creation Research Society Studies on Precambrian Pollen—Part II: Experiments on Atmospheric Pollen Contamination of Microscope Slides," *Creation Research Society Quarterly* 23 (1987): 151–3; G. F. Howe, E. L. Williams, G. T. Matzko, and W. E. Lammerts, "Creation Research Society Studies on Precambrian Pollen, Part III: A Pollen Analysis of Hakatai Shale and Other Grand Canyon Rocks," *Creation Research Society Quarterly* 24 (1988): 173–82.

[40]Baumgardner, "A Constructive Quest for Truth," 81.

Evan Peck

Interview

Faith in the Halls of Science

A Conversation with Ian Hutchinson

*Evan Peck and Karl Giberson**

Photo: Amanda Egolf

Karl Giberson

Cambridge, Massachusetts, home to Harvard, MIT, and other leading schools, is the educational epicenter of the United States and perhaps of the world (with apologies to Oxford). Like many leading educational centers, Cambridge is notoriously liberal and has historically led the charge in the cause of secularization.

I [Evan Peck] first visited Cambridge at the height of the 2004 election fever that returned George Bush to the White House. New to Boston, new to academia, and very new to politically charged communities, I wandered naively into a café near Harvard Square with my friend, Paul. My friend, seemingly oblivious to where he was, paraded an enormous George W. Bush pin on his chest.

Within minutes of our arrival, the manager approached our table. I thought he might want to advertise a new drink. Instead, he challenged Paul's sincerity in endorsing George Bush.

Evan Peck *graduated from Gordon College with a degree in computer science and a minor in creative writing. He is enrolled in a doctoral program at Tufts University, working with the Human-Computer Interaction group. Evan's past research has focused on combining human and distributed computing with casual online gaming. He plans to continue investigating the intersection of science and faith in the greater Boston area. In his spare time, Evan makes friends with coffee baristas, plays the electric violin, and obsesses over PowerPoint presentations.*

Karl Giberson *directs the Forum on Faith and Science at Gordon College in Wenham, MA, and is a professor at Eastern Nazarene College in Quincy, MA. He has published over a hundred articles, reviews, and essays and written or co-written four books:* Worlds Apart: The Unholy War Between Science and Religion; Species of Origins: America's Search for a Creation Story; The Oracles of Science: Celebrity Scientists Versus God and Religion; *and* Saving Darwin: How to Be a Christian and Believe in Evolution. *Giberson has lectured on science and religion at Oxford University and the Vatican as well as at many American universities and colleges.*

Welcome to Boston

I revisited Cambridge four years later to interview Ian Hutchinson, professor of physics at MIT and a deeply committed Christian. Hutchinson heads up the leading nuclear science program in the United States. But, while his interests lie in controlled fusion energy, he has accepted the role of a public intellectual believer, writing and lecturing about his faith, and orchestrating events like the Faith of Great Scientists forum at MIT.

I found myself thinking back to that night in Harvard Square. There is something peculiar about searching for religion in Cambridge—MIT of all places. I am a computer scientist and so MIT is my Athens. I felt strangely insecure and uncertain—fearful that the truth might not turn out the way I wanted.

I sat down with Hutchinson to chat about this improbable Cambridge intersection of science and faith—a conversation he cannot escape, as his office is located in one of the modern world's most powerful and symbolic centers of science.

As we carried on our improbable conversation, so different from those taking place in offices and classrooms up and down the hall, I grew increasingly impressed with Hutchinson's articulate, thoughtful, and never over-simplified insights into some of the most pressing and important issues of our time.

**The interview was conducted by Evan Peck, while he was doing a science writing project with Karl Giberson at Gordon College.*

Q You've been around intellectual communities in several different cultures. Has the tension between science and faith changed at all in the places you've been—whether that's England, Australia, or the United States?

A I've said on a number of occasions in the past, and I think it is still true (although maybe less true than it was a number of years ago), that the tensions between science and faith are worse in the US than almost any other culture I've been in.

Obviously, the cultures I've lived in have tended to be English language places—Australia, England, and so forth. But I would say that in Australia and England—and I would say that this is true in a number of other countries too—there isn't quite the same level of warfare mentality between science and faith as there is in the US. There are lots of reasons for that, which is a long story. But I think that's the case.

Q What was it that formed your interest in the intersection between science and faith?

A When I came to America, I didn't know if I was going to stay. I stayed for three years, and then I went back to England. I was working on fusion research. It was probably during that period that I first wrote down the way I felt science and faith came together for me.

A big part of that was the recognition that science asks rather specific types of questions about the world. Those questions give you only certain types of answers. And yet there are lots of far more interesting questions—or at least questions that are *as* interesting (not that I'm not interested in science. It's great. That's why I'm in science). But there are other questions which are just as important.

To a large measure, the world around us in the late twentieth, early twenty-first century, has reached a point of paying attention only to the questions that are scientific. The world is paying far less attention, or at least giving a lot less credence to answers to the questions that are about the bigger things of life—the things we associate with religious faith, as well as with some other related things, like history, the law, and so forth.

Q You mentioned that there are nonscientific questions. Where do you put people who are trying to understand spirituality from a scientific perspective, like evaluating which parts of the brain are triggered during spiritual encounters? Do questions like that blur the line between scientific and nonscientific questions?

A No, I don't think they do. The heart of my approach to those kinds of questions is to say that you *have to* give credence and value and significance to descriptions of the world at a whole range of different levels. You have to accept that those descriptions can be simultaneously true. The best example that I know is to think about a person,

On Stanley Jaki

I remember vividly when Stanley Jaki was invited by one of the Catholic groups to speak at MIT. He spoke about the idea that the Christian faith was a fertile soil in which the ideas of modern science, as we now know it, grew. I think that was a turning point for me.

Up until that point I had always thought, "Yes, there is a tension, but science and faith are addressing different questions. The questions that science addresses are important but limited questions. The questions that faith addresses have much more similarity to the kind of questions that arise in the humanities."

I didn't see a constructive level of mutual support between science and faith. Even though I felt that these were folks who could live together, I didn't really think that the two sides of the coin were closer together than that.

Jaki had a much more constructive view of the relationship between science and faith. It wasn't that "they are really different, and science has been tremendously successful in describing the physical world. But, it's okay because faith is able to address important spiritual questions which go alongside." That's a reasonably constructive view. But it's *not* one in which faith and science are supportive.

Jaki was trying to make the case that it's not *just* that they can get along together. In fact, if you look harder, you realize that Christianity was, as I phrase it, this fertile soil in which modern science grew. It was in large measure some of the theological, as well as philosophical, views that Christianity brought to society—the teachings about creation that both Christianity and Judaism share—that triggered the scientific revolution.

Faith in the Halls of Science: A Conversation with Ian Hutchinson

Photo: Shaylah Deviney

Ian Hutchinson

about yourself. I am an assembly of electrons and quarks, but I'm also a mixture of chemicals and carbon and calcium and hydrogen and oxygen and so forth. I am a set of cells guided by DNA and the biochemical factories that go on to make that. I am an animal with impulses and responses and senses and hair, and I am a person with desires and loves and fears, and I am an immortal spirit loved by God—a sinner saved by grace. I am *all of these things* at the same time.

And so, if we have a description of the way brain activity works when I am thinking a certain thought, that doesn't mean that the significance of that thought is somehow removed. No one would say about a computer program, "Because I happen to know how the computer works, the calculation it does is no longer significant."

The calculation is just as significant even though I know in principle exactly how the logic of a computer program works. The significance of the software is at a different level than the workings of the electronic gates that go on to make hardware. That is a poor analogy, but still an analogy people can go along with because it is so obvious that a computer is doing more than simply turning switches on and off when it runs.

And the creation that we see around us—the overall picture of the world that I see—is not just two levels, but multiple levels. So I would say that the idea of multiple levels of description all having validity is a key to helping understand the significance of, and the relationship of, physical or chemical or biological science—descriptions of people agents, and the fact that they are still people and agents.

Q What is the motivation behind some of the more aggressive atheist critiques by, say, a Richard Dawkins?

A The new phenomenon of this vituperative approach to criticism of religion—Christianity in particular—in the last five or ten years is fascinating. I think it betrays desperation on the part of those who have a scientistic and secularistic view of the world.

I think the ongoing story in the twenty-first century by people of that mentality is that science has explained religion away—or is in the process of explaining religion away. Therefore, science will gradually gain a hold in the religious beliefs that people have because they were brought up by their religious grandmother.

Dawkins is explicit about this. He says that people of faith believe because they were indoctrinated when they were kids. So as long as we get past that indoctrination, these religious beliefs will simply evanesce—decay away. We will have an enlightened scientific view of the world.

Q Do you buy into that?

A Well, I think that in the last five to ten years, it has become crystal clear to those people that it *simply isn't happening*. In fact, if anything, things are going the other way.

It's true that, particularly in Western Europe, there has been a tremendous process of secularization. But what the Dawkinses and the Dennetts of this world realize is that, worldwide, it is certainly *not* the case that religion—Christianity in particular—is decaying. In fact, if anything, it is growing.

So people who thought that these vestigial superstitions ought to evanesce (and they're not) are thinking, "Golly, we've got to do more about this, to really make sure this stuff goes down." And so they've started to write these strongly worded critiques. Dawkins is perhaps not the worst offender in this respect. Sam Harris, for example, is a person who has written even more immoderately than Dawkins about this.

Q As a whole, how do you view the integrity of these critical atheistic responses?

A Quite honestly, many of those critiques are laughable. They are simply not credible. People start to argue that religion is fundamentally bad, has been bad for humankind from day one, and then try to point out some of the admittedly bad things that have been done in the name of the Christian faith over the centuries—the inquisition, witch hunts, and so on. They start to talk as if that somehow proves that religion is the source of all evil.

It's just not credible. If you ask simple quantitative questions: how many people were killed by the inquisition over the two hundred years of its existence? The answer is probably no more than two thousand. If you compare that to Pol Pot, or Stalin, or Hitler, or any of those secularist dictatorships, it fades into *complete insignificance*. So it is completely ludicrous to start pointing at these admitted failures of Christianity to live up to its own ideals, and then somehow try to argue, "If only religion will go away, everything would be wonderful." It's just silly.

I think that there are two views you could take. One is you could say, "It's just silly and everyone will realize it's silly." Well actually, everyone does not necessarily realize it's silly. So there are a few people who have started to give direct answers. Nevertheless, sometimes polemics needs to be answered by polemics.

Q What about the Christian literature that responds to a Dawkins or Harris?

A The more direct answers to the critics come from someone like Alister McGrath, who has written a couple of books directly addressing Dawkins. McGrath is interesting because he has a PhD in biochemistry, so he is not ignorant of scientific arguments. He has degrees in theology, has spent a lot of time thinking about the faith/science intersection, and has written prolifically about it. He has written some relatively popular books that try to answer directly some of the critics—particularly the criticisms of Dawkins.

The problem I have, though, is that while this is great theater, it's not necessarily good, or profitable for study and future truth. So, that's the distinction between polemics and more serious thought about the foundations. I certainly try not to major on the controversies, even though that's what the media loves to do. As I say, it makes great theater. I suppose that's the reason I'm an academic and not an actor. I prefer the intellectual heart of the debate as opposed to the fluff.

Q So do you think these books are helpful, or just adding more fuel to the fire?

A I think there is an aspect of adding fuel to the fire, but the books I mentioned by and large don't do that. There is another strand of Christian response to the faith/science controversies of today and earlier days which, I think, does much more harm.

Dawkins, for example, in his latest book, talks about the fact—"Is there or is there not a God? This is a scientific question," he says. "And it must be answered by science."

I think Dawkins is *dead wrong*. I think that we are not going to answer questions of spiritual and religious commitment by treating them as if they can be answered by scientific questions—by doing experiments and so forth. I think that is just plain silly, and misunderstands what Christians have thought their faith is about for two thousand years.

But there are people in the Christian community who in effect say, "Yes! And here is our science

Photo: Shaylah Deviney

Ian Hutchinson being interviewed by Evan Peck.

and it proves we Christians are right!" That is an extremely mistaken and unhelpful response. I don't think that science answers the question one way or the other. But there are a lot of people in the Christian church who have missed the point on this, and think that there *are* scientific answers and scientific proofs of their faith.

Q Why are these Christians so insistent on finding proofs in the first place?

A They would love for there to be scientific answers and scientific proofs because they grow up in this society which is dominated by what I call scientism—the belief that science is all the knowledge there is, and if knowledge is not scientific, then it isn't really knowledge. And although those Christian respondents probably wouldn't admit it, they've been influenced by that model of thinking, which is rife within society as a whole—and certainly in the academy.

They therefore think, "Well, I know my Christianity is true, and I know that all truth is scientific. Therefore, there must be a scientific demonstration of my Christianity. It's simple logic."

But it's *so simply wrong*. One of the premises is incorrect. The premise that is incorrect is not that my Christianity is true. The premise that is incorrect is that all knowledge is scientific knowledge. But because they've accidentally, or unthinkingly, taken on that worldview that predominates in the academy, they want to fight back on those terms and think that by doing so, they will win the battle.

I see that as a big part of the motivation behind the intelligent design controversy. There are people who think there are scientific demonstrations that prove there is an intelligent designer.

Q Speaking of intelligent design, it is clearly a hot-button issue right now in the science and faith discussions. Have you been won over by either side of the argument?

A I'm slightly agnostic on that question. I am not persuaded by the arguments that I've seen and studied that surround the intelligent-design people who say they have found scientific demonstrations of design. I am not persuaded by those arguments. I am *completely* persuaded by the arguments that some of the key players in the design argument present, when they have difficulties with evolutionistic advocates such as Dawkins, who say that biological diversity came about in the blind action of chance—unguided.

I completely agree with the Christian critics who then say, "They are dead wrong about this! The evolutionistic arguments to dismiss spirituality and Christianity are empty, polemic rhetoric."

I agree with that! But that doesn't mean that the science of evolutionary description of the diversity of life on earth is wrong. It just means that the development of life doesn't follow from an evolutionary description of biodiversity that says Christianity is bunk in the way that Dawkins says it does.

Q Where do you have difficulties with the arguments of the ID advocates?

A I'm completely sympathetic to the ID advocates who say, "A lot of what Dawkins writes is non sequitur, rhetorical arguments." I agree with that. But then they go on and say, "And we'll show his science is wrong—and that, in fact, science proves that God exists."

That is the step which I do not go along with. In the first place, I'm not persuaded by the arguments. But secondly, it's a concession of the most important premise, which is *wrong*. It's the premise that all knowledge is scientific. Saying, "I'm going to try and take these scientists on their own ground and prove them wrong," is a concession that science owns the field. But science doesn't own the entire field of knowledge. So, to adopt that view is a bad strategy apologetically, as well as *completely* missing the boat from the point of view of epistemology.

So I have big struggles with the way a lot of Christians are taught to think about the science/faith debate—particularly in the US. Christians do themselves a great disservice when they think that the solution to the science/faith controversy is that intelligent design would somehow prove that God created the world by finding gaps in the ability of the natural processes to describe how things could be the way they are.

Q It seems that a lot of what Dawkins or Harris has to say comes as a reaction to some of that …

A You're right. There is a whole different thread of the debate where you could argue that the atheistic militancy of the day is a reaction to the militancy of the ID advocates. I think there is an element of truth in that.

Basically, the level of rhetoric has been ratcheted up. The ID advocates have attacked not just the unjustified extrapolation of the scientific worldview to cover everything, but they have also attacked the basic science—the notion that we actually do understand how biology and chemistry work.

A lot of scientists say, "You're just ignorant. You just don't understand biology. What's more, by saying that we've got to have ID in high school or in middle schools, you're going to undermine the already admittedly weak science teaching in the US public schools." So there is a sense of outrage on the part of those who think that science is important, and needs to be taught rigorously and in accordance with our best understanding of science in high schools.

I am personally slightly sympathetic to that. That is one of the reasons why I am willing to say to the ID advocates, "Hang on a minute! What you're doing is pouring fuel onto the fire of this debate, and you're doing so in such a way that you actually concede the most important point that we need to get to … which is that all knowledge is *not* science."

On ID in Public Schools

I believe that science is a sufficiently robust enterprise that it is not going to be blown off course by a minority of people. Scientists ought to have a more robust view of their whole discipline.

We should simply say, "Look, science is what it is." We should have confidence. We should argue strongly for what we believe to be a correct view of nature, and of the mechanisms that we see about us in the physical world. And we should argue strongly for the teaching of those. But we shouldn't get quite so bent out of shape over the adoption of ID in our schools by some school board.

I think that ID probably shouldn't be taught in schools. In so far that it is science, it is the ideas of a small group of people whose science is not particularly persuasive. It certainly isn't mainstream science.

I think the ID people are reacting to some of the arguments, the rhetoric, and the political activism of secularists in our society. One of the things which I believe drives the ID movement, and drives the controversy in the US, is a literalistic interpretation of the separation clause of the constitution in the US that has, in the past twenty or thirty years, been interpreted to say we can't teach religion, mention religion, or mention things that might have religious content in our public schools.

What happens is natural. People with Christian faith, whose kids might be going to public schools, want to see respect paid to their religious beliefs in the schools. They don't see why that should be, uniquely amongst all intellectual endeavors, banished from the schools. So they are looking for a way to bring back into the schools some respect and acknowledgment of their religious faith. They see ID as a way of doing it.

What they're obviously trying to do is to finesse the arguments of the secularists. The secularists say science isn't religion, so science can come in. So people say, "Fine! ID isn't religion either. It is science. So it can come in." It is a wedge issue.

But in all of this, what it really amounts to is tribalism. On the one hand, there are Christian people who are gathering together in their tribe, and then there are secularists, driven by this scientistic viewpoint, who are gathering together in their tribe. They are hammering at one another. It's not really an intellectual debate; it's a political power play.

Q On a bad day, scientists may see Christianity as undermining their work. But on a good day, the Christian faith can provide a "fertile soil" for first-class scientists. I can see atheistic scientists constructing a perspective in which they might say, "Well, we already have plenty of good scientists. Why even try to make peace in this conversation?"

A You know, we don't need to make peace. What we need to do is find truth. And certainly, that is what I would try to advocate. I don't feel obliged to sign up with either tribe in this particular debate. I make no bones about the fact that I have Christian commitments. I have joined that family by the grace of God, by adoption. But that doesn't mean that we should all have to band together on every single intellectual topic.

I think that the Christian church does itself a great disservice if it extends its standards of orthodoxy—in terms of theology and belief—to extremely transient popular ideas of movements like ID. I mean, the Christian history is littered with people who've adopted transients of the moment, instead of focusing on fundamentals. It's ironic to me that evangelicals (and I would certainly count myself an evangelical) who want to emphasize Christian orthodoxy and continuity with the historic apostolic faith, would adopt what I consider to be a blip on the historic horizon of Christian theology and doctrine as a kind of shibboleth of evangelicalism. In a certain sense, they are putting themselves in the same boat as the liberal revisionists. The liberal revisionists are throwing out orthodoxy because they are persuaded to adopt the thinking of the moment—often scientistic thinking of the moment.

Q How can Christians avoid this "thinking of the moment"?

A I think the answer is to return to the foundations of our faith. Ultimately, our faith is founded on the person of Jesus Christ; the foundations of our faith can actually begin to unpack some of this controversy.

It's certainly the case that if you look over history, at some of the great scientists, you realize that many of them were completely committed Christians—people of deep faith. They *weren't* all of the same brand, denomination, and persuasion. There were people whose orthodoxy was unquestionable. There were people whose faith was deep and much in the mainstream of a particular denominational tradition. And there were people whose faith we would recognize as comparable to the way we would express it today. But in all cases, they found a tremendous reality in that. And in many cases, their faith was really a terrific motivation for their scientific work. That sort of melding is what I want to try to advocate.

We can view a constructive relationship between science and faith as being the historic norm if we can back away from this scientistic emphasis that was brought into the fore by some of the rhetoric of the enlightenment. That is really what I would like most to get across to thinking Christian and non-Christian people. There is a different option.

Q Are you optimistic about the future?

A In the flesh, no. I'm not optimistic of being able to persuade either side of the argument in the near future—that this other path is the more profitable one to explore. I do see that there are people who "get it" in a certain sense. Or, perhaps more modestly, they are helped by thinking about the perspective the way I put it. But I don't see easy ways to finesse the fact that, as I alluded to earlier, the media loves an argument—a battle. So the people who promote the warfare metaphor have an immediate media advantage because it's just more fun. Maybe I need to work harder on making that other way seem more fun (laughs).

On the other hand, I am optimistic. I think that ultimately it's not in my hands. There is one in whose hands it is. And he has a plan. ⊙

ENVIRONMENT

IGNORING THE APOCALYPSE: Why Planning to Prevent Environmental Catastrophe Goes Astray by David Howard Davis. Westport, CT: Praeger Publishers, 2007. 228 pages, bibliography, index. Hardcover; $49.95. ISBN: 0275996638.

I would imagine that most environmental scientists marvel at the ability of human beings, and most especially American human beings, to be cavalier about their damage to the planet in the face of strong scientific evidence and worrisome trends. As D. H. Davis points out, scientific consensus was achieved on the basic facts of global warming by 1985, but in the ensuing twenty-three years, frustratingly little effective action has been taken to limit greenhouse gas emissions. Why not?

Setting out to answer questions such as this, Davis, a political scientist, dispassionately lays out the history of a handful of central ideas: the use of statistics and modeling to predict catastrophes and shortages, the tools of planning especially as they relate to energy supplies, efforts to limit population growth through controls on immigration and reproduction, the implications of nuclear war and disarmament treaties, and the long-delayed international efforts to address global warming. Each section begins with a timeline, which is followed by a detailed political history that focuses largely on post-war US administrations and their approaches to the issue at hand. This is all treated as data from which a few modest conclusions are mined in the last few pages of the book: grand problems tend to be dealt with when the solutions are not costly and the US takes a leading role (e.g., ozone depletion, nuclear disarmament). On the other hand, if solutions are expensive and the US intentionally obstructs progress due to perceived self-interest (global warming) or moral qualms (overpopulation), failure to make progress is almost guaranteed.

With careful research, Davis reveals a US government that seems unable to work consistently to prevent environmental catastrophes. Planning indeed goes astray. Why? Curiously, answers beyond those stated above are never spelled out, and the author attempts to stay strictly impartial. This bland neutrality is reflected in the closing sentences of the book:

> Looking back, it is easy to see that many environmental catastrophes have been ignored in spite of multiple warnings, and that the results have been bad. Planning to prevent them would have been good, but often does not occur.

Again we ask, why not? The strength of the author's neutral stance is that readers can draw their own answers from the history assembled. Davis ultimately paints a portrait of a government dominated by political expediency, short-term interests, and the military-industrial complex that Eisenhower warned us about. We see how attempts to confuse the public about issues on which scientists have reached consensus came first from industry but more recently from the government itself, which has become adept at distorting the scientific language of uncertainty to justify delays in taking action.

Davis opens the book with a comparison of biblical prophets with modern environmental predictions of environmental catastrophe. Like the prophets of old, these warnings are largely unheeded, and our governments seem inclined, like we are, to ignore bad news and calls for sacrifice. While *Ignoring the Apocalypse* is in no way a call to action, it does serve as a useful, if ultimately depressing, history of government inaction in response to the some of the most pressing issues of our time.

Reviewed by David O. De Haan, Associate Professor of Chemistry, University of San Diego, 5998 Alcala Park, San Diego, CA 92110.

ETHICS

IMITATING JESUS: An Inclusive Approach to New Testament Ethics by Richard A. Burridge. Grand Rapids, MI: Eerdmans, 2007. 490 pages. Hardcover; $35.00. ISBN: 9780802844583.

Imitating Jesus offers a comprehensive and methodologically careful review not only of New Testament ethics but also of contemporary New Testament research, in at least three areas: Jesus studies, Pauline studies, and gospel studies (Matthew, Mark, Luke, and John, each receiving separate and detailed treatment). This prodigiously researched book, with its thousands of footnotes and biblical references, and its massive overview of biblical research in multiple languages and cultures, will become one of the most important resources in New Testament studies, and certainly in New Testament ethics, of our generation. Moreover, as a kind of dessert added to this hearty main course, the book concludes with a provocative turn toward the near-contemporary scene by testing its thesis against the use and abuse of the scriptures in apartheid-era South Africa.

The thesis of the book is carried forward from beginning to end with metronomic efficiency. Burridge argues first that genre matters profoundly in the interpretation of the New Testament, and that the genre of the Gospels is biographical, at least as biography was done in the ancient Greco-Roman world. The figure whose story is being told is the historical Jesus, whose life left such a powerful imprint that all of these Gospel writers, and Paul, felt compelled to tell that story. They did so in various ways with various purposes specific to their particular contexts, but all combined the words and deeds of Jesus. The purpose of any biographical writing of this type was to encourage *mimesis*, or imitation, of the life of its central figure. Burridge argues then, that the New Testament writers each attempt to tell the story of Jesus in such a way that readers will imitate his life in response. New Testament ethics finds its unity in the effort of the writers to present the life and words of Jesus so that communities of his followers can be inspired and instructed toward his imitation.

In exploring the details of the actual "ethics" one finds in Jesus' life and teachings, Burridge finds a consistent pattern. Jesus offers extraordinarily rigorous moral teaching about important matters of everyday life, grounding all teachings in the love command; but he creates a mixed, inclusive community of quite flawed followers who

respond as best they are able to this man and his demanding teachings. A symbol of this creative tension between demand and grace is found in the way that parallel texts (Matt. 5:48, Lk. 6:36) summarize the disciples' obligations as "be[ing] perfect" over against "be[ing] merciful." This tension between the quest for moral perfection and the need for mercy toward ourselves and each other as we ever fall short of that goal is the place where New Testament ethics (and the church) lives and has always lived.

Burridge gently but firmly criticizes any New Testament ethics (including one of my own co-authored books, *Kingdom Ethics*) that attempts to find Jesus' ethical import only in his words, as in the Sermon on the Mount, as opposed to in the impact of his entire life. He thinks this is fundamentally a genre error—a misunderstanding of what kind of literature the New Testament contains (biography, not ethical treatise). I think Burridge misreads *Kingdom Ethics* here, because we do often discuss Jesus' entire life, using the rubric of his inauguration of the kingdom of God and the way Jesus incarnated that kingdom in his life as well as in his words. But I gained much from this sharpened emphasis on genre, and it rings true to say that what created the church and marked its ethos was the entire story of Jesus' life, not just his ethical teaching. The God-man came to earth, offered love and mercy to "sinners" in every moment of his life, gathered a motley crew of grateful friends around him, was then cruelly tortured and murdered for such sinners (us), and somehow by God's power gained victory over death itself. Christianity at its best has always been about responding to that life, in its entirety, and attempting, however inadequately, to "go and do likewise."

At the end of the book, when Burridge turns to the South African situation as a kind of case study of bad New Testament ethics, he shifts gears. He introduces a different literature, sometimes called the "use of the Bible in ethics" literature, which emerges mainly from the field of Christian ethics, and tries to offer guidance for the constructive application of scripture to contemporary contexts and problems. He shows how the primary options available for employing the Bible in ethics—moral rules, moral principles, moral examples, and an overall symbolic worldview—all proved susceptible to abuse by pro-apartheid South African scholars and church leaders. However, lest we fall into despair that the Bible is infinitely malleable and abusable, Burridge goes on to argue that one path remains: "reading together in an inclusive community." What matters is not just that we read scripture looking for clues for what it might mean to imitate Jesus, but that we do so in as inclusive a "reading community" as possible. It would have been impossible to sustain the tortured pro-apartheid readings of scripture if, for example, oppressed black South African Christians had been invited to participate in the community of those reading and interpreting the Bible. This is a hopeful move, though sadly no such strategy is foolproof. Even inclusive communities will find ways to mess up the reading of scripture.

Imitating Jesus is a hugely important book that belongs in the library of everyone who is serious about the Bible and about Christian ethics. It is like a cathedral in its massiveness and in the care taken in its construction over many years of research and writing. There was no haste in writing this book; neither can it be read hastily. But for both writer and reader, it is well worth the effort.

Reviewed by David P. Gushee, Distinguished University Professor of Christian Ethics, Mercer University.

General Sciences

THE AGE OF EVERYTHING: How Science Explores the Past by Matthew Hedman. Chicago: University of Chicago Press, 2007. 249 pages; index, glossary of terms. Hardcover; $25.00. ISBN: 9780226322926.

This book, based on a series of popular lectures, "explores how researchers in a wide variety of fields determine the ages of things" (p. 2). "It is not intended to provide an exhaustive catalog of every single dating technique." I found this book to be an enjoyable and informative read.

In addition to the introduction, the book is divided into eleven chapters. Some illustrate one primary method of assessing an age of an object or an event. Many, however, demonstrate how one dating procedure can be utilized to constrain another to provide acceptable estimates of age. Thus, for example, historic dates for Egyptian artifacts are utilized to correct radiocarbon ages while in general validating the radiocarbon technique (pp. 63–5).

The overall organization to the book is logical and draws the reader in. The author begins with Maya calendric glyphs, specifically examining the chronology of the ruler of the Mayan city of Calacmul, Yuknoom Ch'een (circa CE 600–686). Hedman then turns his attention to means for dating the Great Pyramids of Egypt (circa 2500 BCE), introducing radiocarbon dating in the process. The next few chapters extend the use of radiocarbon, corrected by tree rings (dendrochronology), back to the late Pleistocene (circa 15,000 BCE). Beyond that point, chapter by chapter, he leapfrogs his prehistoric report by orders of magnitude of years, tackling potassium-argon dating and the ages of fossil hominids, molecular dating and divergence times for mammalian lineages, meteorites and the age of the solar system, and the use of color-magnitude diagrams for assessing ages of collections of stars. Finally, he assesses our evidence for the age of the universe.

My one dissatisfaction with the volume was the general absence of text describing how most of the various dating techniques were originally discovered. The Mayan calendar glyphs, for example, are depicted, translated, and promptly utilized to interpret the life history of Yuknoom Ch'een without any reference to some of the lengthy history of their decipherment by Foerstemann and others. Willard Libby is mentioned in passing but his development of the radiocarbon technique is not narrated. I would have appreciated perhaps two extra pages per chapter, offering a reader the opportunity to understand some of the dynamics of discovery for many of these methods. Some readers more inclined to skepticism might thus suspiciously ask questions like, "how can we trust these translations of the Mayan characters?" To Hedman's credit, he includes avenues for further reading

at the end of each chapter, and these include sources for investigating the histories of the various techniques.

Based as it is on a series of lectures, the book is written in a straightforward, unpretentious, and friendly style. Sources of error in dates are plainly outlined, as well as means for assessing confidence in a technique or a particular chronology. Each particular case discussed is intriguing in its own right.

I think the book should appeal to many kinds of potential readers. Compiling cases from many different fields has yielded an overview that will retain the interest of most scientists and students. The writing style will permit the nonscientist to grasp the principles for many of these techniques. The book is recommended.

Reviewed by Ralph Stearley, Professor of Geology, Calvin College, Grand Rapids, MI 49546.

HEALTH & MEDICINE

FAITH AND HEALTH: Religion, Science, and Public Policy by Paul D. Simmons. Macon, GA: Mercer University Press, 2008. 293 pages, index. Paperback; $30.00. ISBN: 9780881460858.

Paul Simmons is a clinical professor in the department of family and geriatric medicine at the University of Louisville. He works through the division of medical humanism and ethics and has a history of publication and hospital consultant work in the field of medical ethics. This latest book looks at various aspects of medical care as well as current medical ethics controversies.

I found the book to be well rounded in regard to the subjects that are covered in eleven chapters. The first two chapters deal with human suffering and end-of-life decision making in the ICU. Both chapters are well written, and I would highly recommend them to medical students who are starting their clinical rotations and are beginning to have patient interactions. Chapter 3 evaluates United States healthcare and its potential for reform. The chapter is mostly a review for those who work in our country's healthcare system (i.e., expensive treatment for rare diseases, soaring pharmaceutical costs, abundance of subspecialists, etc.), and I found that it summarized well-known facts with minimal emphasis on solutions, which, to be honest, would probably require a book in itself.

Chapters 4 through 6 can be summarized as addressing end-of-life and aging issues, the patient right-to-die debate, and physician-assisted suicide. Again, I thought that chapter 4 ("Aging as an Assault on Human Dignity: Spirituality and End-of-Life Decision-Making") was particularly intriguing, and it should be required reading for pre-medical college students or medical students. The reader should be aware that Simmons does have strong opinions about right-to-die issues as well as physician-assisted suicide. These chapters are not objective but are extremely well researched. Any physician who has significant objections to physician-assisted suicide would disagree with some of the author's beliefs about how far suffering prevention should occur, as there will always be moral constraints placed by many health-care providers. Yes, physicians always should want to remove suffering, but not all would agree that helping end a patient's life should fit in the spectrum of treatment options.

Interestingly, chapters 7, 8, and 11 deal with artificial organs and the potential of cyborg creation, composite tissue allotransplants (for example, face and hand transplants), and demonic exorcism as a treatment option for psychiatrists. These chapters are extremely entertaining, informative, and a quick read.

Sections that deserve particular mention are chapter 9 dealing with stem cells and chapter 10 discussing abortion. The author makes many clear points about the validity of stem cell research and makes excellent arguments, in a manner similar to Francis Collins, regarding their therapeutic use. He poses intriguing thoughts about the difficulty of deciding when an embryo can realistically be called a human as he points out that "An acorn is not an oak tree, nor is an egg a chicken" (p. 203). I did find that I disagreed with his observations of the abortion debate. Many political experts will agree that the "Pro Choice" and "Pro Life" factions will most likely never come to an agreement on this issue. However, it is simplistic to state that the evangelical movement in the United States appears to protect the embryo or fetus under any situation, while ignoring maternal risks and the horrors faced by children born to mothers who do not want to care for them. Yes, fetal abortion is a medical necessity for some maternal conditions, but such events are rarer that Simmons would have the reader believe. Also, one can simply look through news or entertainment magazines as well as watch Christian church-sponsored or nondenominational television commercials to see that there is real Christian awareness regarding impoverished children in our country and worldwide.

In conclusion, this book is an excellent overview of current medical ethics issues that deal directly with Christianity. I would put it in a "must read" category for Christian physicians and health care workers although Simmons' opinions will not be congruent with all readers.

Reviewed by John F. Pohl, Associate Professor of Pediatrics, Scott and White Hospital, Texas A&M Health Sciences Center, Temple, TX 76508.

THE LIGHT: How Stress Poisons the Central Nervous System and Causes ADHD, Parkinson's Disease, Schizophrenia, Autoimmune Response and More by Ruth Whalen. www.lulu.com: Lulu Enterprises, 2007. 196 pages. Paperback. ISBN: 9781430329916.

This book is a unique opening into the world of patients who have suffered from central nervous system disease, including mental illness, written from the perspective of Ruth Whalen, a medical laboratory technician who has suffered from a variety of symptoms that she relates to caffeine toxicity. Her life story is interesting, and she is very open about her history of horrific child abuse and subsequent stress-related illnesses that she relates to caffeine ingestion.

Whalen's hypothesis is that she has an allergic reaction to caffeine. Interestingly, the foreword of her book is written by Abram Hoffer, MD, PhD, who is the president of the International Schizophrenia Foundation. He describes

her theory fairly clearly. Cathecholamines (the so-called "stress hormones") are methylated to reduce damage to the human body caused by oxidative stress; however, Whalen believes that a surplus of methylated compounds such as a continued presence of methylated catecholamines and methylated dopamine eventually cause diseases such as ADHD, schizophrenia, depression, autism, and other well-known mental health disorders as well as other diseases. The "methyl surplus," exacerbated by substances such as caffeine, hinges on the belief that excess methyl groups cause a variety of diseases, especially in individuals who are under constant stress. The author is not particularly even-handed in her theory. Yes, excess methylation may cause or signal certain cancers, but methylation also is necessary for early embryo function.

The book begins by describing the life history of Whalen and how she made the connection between her symptoms and a possible caffeine/methyl allergy. Several chapters then describe her theory and the research originally developed by Hoffer. There is a lengthy discussion of standard blood tests that are obtained when a patient is seen by a physician, various mental illnesses, and neurotransmitters. Some of these descriptions are quite good.

I do have some strong reservations about this book. I would agree with the author that many of the more complicated diseases that we have to deal with in medical practice and in life, including cancer, autoimmune disease, and mental illness, are multi-factorial and can be tragically dismissed as "I don't know, go see a specialist" by some primary-care physicians. However, I do have a hard time relating all of these diseases purely to excess methylation. There is essentially no mention by the author of genetic factors involved with certain mental illnesses (for example, the association of serotonin transporter genotypes in depression or cannabinoid receptor gene single nucleotide polymorphisms and ADHD). Thus, mental illness and cancer have genetic causes, perhaps influenced by methylation, but also perhaps not. A tragedy of this world is that dysfunctional family structure will cause many mental disorders, and this reality should be firmly recognized.

Some statements in the later chapters are questionable, and the overall format of the book becomes choppy in sentence structure and disjointed in paragraph sequencing. The statement that "Excess iron, copper, and zinc do not belong in the body either, and metals may not belong in the body at all" is misleading. Yes, too much of any substance is toxic, but we all need trace minerals for the cellular processes of replication, immune function, and nutrient absorption. The author states that after the body is detoxified, a person recovers more fully, including a return of the so-called sixth sense. To be honest, I have found that when patients remove themselves from stress, eat right, and exercise (and if they truly follow this advice), they often make remarkable advancements in health and lifestyle. Finally, the discussion in the book regarding the importance of future astrologic signs and how Peter and the early church "tricked people into believing that Catholicism is true Christianity, the word of God" is not necessary and is misleading to the reader.

In summary, I would recommend the book if one is a health care provider who is interested in learning about some of the alternative theories of disease being discussed by the lay community. The lack of objectiveness in the book otherwise prevents it from being helpful to clinicians or researchers.

Reviewed by John F. Pohl, Associate Professor of Pediatrics, Scott and White Hospital, Texas A&M Health Sciences Center, Temple, TX 76508.

HISTORY OF SCIENCE

THE DIALOGUE OF CIVILIZATIONS IN THE BIRTH OF MODERN SCIENCE by Arun Bala. New York: Palgrave Macmillan, 2006. 230 pages. Hardcover; $69.95. ISBN: 1403974686.

Arun Bala provides a history of science that stresses essential contributions from India. Over the course of twenty years, Bala's teaching in the history and philosophy of science at the National University of Singapore led him to revise his conception of the importance of science developed in India. He further refined his ideas through interactions with international Asian studies institutes and finally completed the book while at the University of Toronto as a visiting professor.

Disclaiming the centrality of European science in the development of modern science requires significant mental gymnastics. Bala's approach is to first argue that prior scholarship arbitrarily dismisses earlier scientific contributions from non-European cultures. Citing historian Colin Ronan, Bala claims, "His whole exercise of arbitrary dismissal without presenting any counter evidence to claims by dependable Greek writers seems solely designed to support his opinion" (p. 18). Although an amateur reader of science and religion, this reviewer believes that Bala overemphasizes other writers' glosses to unfairly support his opinion. Why, for example, does Bala not cite any of the writings of Stanley Jaki who was a major proponent of science *having* to emerge from a Christian, western cultural milieu?

In one of the more interesting chapters, chapter 5, Bala examines what evidence would adequately validate a transfer of intellectual ideas from India to Europe. He argues that a corridor of communication is established by Jesuit priests who arrive in India to spread the gospel and develop schools. Bala then shows a correlation between the opening of communication channels and the transmission of new ideas within Europe.

The remaining chapters sequentially show how European astronomy, optics, atomic structure, and cosmology required key ideas from intellectual Indian communities. "[W]e cannot ignore the possibility that the Kerala School of Indian mathematics influenced the Scientific Revolution in modern Europe" (p. 70). While this may well be true, Bala severely overstates his case. "Hence, far from what Kuhn presumes, optics did not achieve paradigmatic status with Newton but with Alhazen" (p. 89).

The Dialogue of Civilizations in the Birth of Modern Science is a scholarly book with a small target audience. Those specializing in Asian studies will find the thesis

interesting, although with the caution that Bala's enthusiasm leads to overstatements that need to be appropriately tempered.

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

NATURAL SCIENCES

RELICS OF EDEN: The Powerful Evidence of Evolution in Human DNA by Daniel Fairbanks. Amherst, NY: Prometheus Books, 2007. 281 pages. Hardcover; $24.95. ISBN: 9781591025648.

In *Relics of Eden: The Powerful Evidence of Evolution in Human DNA*, Daniel Fairbanks summarizes the molecular evidence for human evolution. As a distinguished professor at Brigham Young University, research geneticist, and author of a university-level genetics textbook, he is highly qualified to write on this subject. Moreover, his writing is full of wonderful vignettes and analogies. For example, in describing how transposable elements move around the genome, Fairbanks writes,

> McClintock focused on transposons, DNA elements that excise themselves and move to other places in the genome, much like the cut-and-paste function of a computer. Retroelements use a copy-and-paste process instead of the cut-and-paste process of transposons.

In chapter seven, Fairbanks tells the amazing story of the persecuted Russian biologist Nicolai Vasilov and his quest to found a seed bank in Leningrad in order to drive home the point that the most diversity in a species is found at its point of origin. He then develops the DNA evidence for an African origin of modern humans. These literary devices act to engage the reader in a close examination of complex subjects.

Fairbanks discusses a number of topics in molecular genetics that would be very interesting to a general audience, including the story of why humans cannot make their own Vitamin C, why chimpanzees have twenty-four distinct types of chromosomes but humans have only twenty-three, and why scientists can use DNA to trace patterns of human migration. Each topic is well presented in its own chapter along with the background information necessary to understand it. Chapter 1 begins with the story of how human chromosome 2 developed from a fusion of two other chromosomes. This chapter is replete with excellent explanations of the structure of DNA and clear diagrams that illustrate the major points. For example, telomeres are explained as buffers against the erosion of our DNA:

> Each time a chromosome replicates, a bit of telomere DNA erodes away, but a protein called telomerase restores the eroded ends to reconstitute the telomeres. Thus, telomeres function as buffer zones to protect the important DNA within the chromosome from erosion. If not for telomeres and telomerase, our chromosomes would progressively erode inward from the ends until they could no longer function.

It should be pointed out, however, that this book is not written for a completely scientifically naive audience. One probably does need a basic college biology course to fully understand the evidence that Fairbanks presents. A more sophisticated audience will greatly enjoy the historical touches, the rich comparisons of the human and chimpanzee genomes, and the detailed appendices.

In the final chapters, Fairbanks revisits the science/faith controversy, mostly from a historical perspective. The purpose of these chapters seems to be to acquaint the naive reader with a summary of how this controversy developed in America and why the dichotomy between science and faith should end. Overall, this book is an excellent and engaging summary of the recent molecular data that has resulted from the Human and Chimpanzee Genome Projects. The reader who is willing to closely examine the data is likely to agree with Fairbanks that there is indeed powerful evidence for human evolution.

Reviewed by Dawne Page, Professor of Biology, Point Loma Nazarene University, San Diego, CA 92106.

ORIGINS & COSMOLOGY

SCIENCE, EVOLUTION, AND CREATIONISM by the National Academy of Sciences and the Institute of Medicine. Washington, DC: The National Academies Press, 2008. 88 pages, bibliography, index. Paperback; $11.60. ISBN: 9780309105866.

The original edition of this book was published in 1984 by the National Academy of Sciences, an organization of outstanding scientists recognized by their peers in specific fields. Now in its third edition, the book affirms evolution as a widely accepted theory in the scientific community, and claims that the theory should be taught apart from religious studies. Additional examples and up-to-date information have been added to this new edition, enabling readers to understand the relation of evolution and religion in the school curriculum.

The book is divided into four chapters, with the last chapter serving as a brief conclusion. Following the chapters, the book offers answers to nine frequently asked questions concerning evolution and creationism. The book also includes several bibliographies and committee member biographies.

The first chapter briefly explains the process of evolution, the nature of science, and the differences between science and religion. The chapter briefly refers to several different religious leaders and prominent scientists (including Kenneth Miller and ASA member Francis Collins) who have successfully reconciled faith and science. The second chapter elucidates in detail the many different kinds of scientific evidence that support evolutionary theory. These include evidence from studies of astronomy, paleontology, comparative anatomy, molecular biology, genetics, and anthropology. The third chapter examines several creationists' viewpoints, including intelligent design, and discusses the scientific and legal reasons against teaching creationist ideas in public school science classes.

The conclusion reiterates the contributions of modern biology and science to biomedical advances and the understanding of the natural world. Today we are facing pressing concerns for protecting the earth's plants, animals, and the natural environment. How should we alter our use of fossil fuels and other natural resources to enhance the well-being of our descendants? How should we utilize our new understanding of biology on a molecular level to engineer the characteristics of living things? Answering the above questions depends on a sound scientific education, which includes knowing the implications of and role of evolution in scientific thought. Thus placing science and religion in opposition reduces the potential of each to contribute to a better future.

This book is an excellent handbook for explaining evolutionary theory to laypersons, offering evidence for evolution, detailing its contributions, and describing the relationship of the theory to various creationists' views. The book argues that evolution must be accepted as a scientific truth about the natural world, and that evolution continues to shape all living organisms, including humans. Consequently, the study of evolution in science classes must be autonomous, free from the influence of creationists.

This book admits that many questions concerning evolution remain unanswered. The most difficult questions, however, do not concern the "facts" of evolution, but the meaning and the purpose of natural selection. The exploration of evolution's meaning and purpose requires the complementary input of religious faith. Such input should properly be pursued in a religion class. There, students may learn that many religious denominations have accepted evolution as a natural phenomenon, and that the study of evolutionary theory can complement their religious belief.

The book's writing style is easy to read, and the illustrations are brilliant and attractive. The contributors are authoritative, and the additional readings are extensive and up-to-date. This book can well be enjoyed by student, professional, and any layperson. Further, it is worthwhile whatever one's faith commitments may be. While this book is inexpensive, it also can be downloaded for free from *www.nap.edu/catalog/11876.html*.

Reviewed by Wilkin W. Cheung, Adjunct Faculty, Science Department, Patten University, Oakland, CA 94601.

RANDOM DESIGNER: Created from Chaos to Connect with the Creator by Richard G. Colling. Bourbonnais, IL: Browning Press, 2004. 208 pages. Hardcover; $18.95. ISBN: 0975390406.

Editor's note: When Random Designer *was published several years ago, it initially appeared as a modest, self-published book. Since then, however, it has generated controversy within the Church of the Nazarene, raising issues of academic freedom at the denomination's various colleges and universities.*

Once upon a time, *creation* was a perfectly respectable term that credited matter, energy, and life to the Judeo-Christian deity. Lately, though, one can scarcely use this word without invoking narrowly prescribed views regarding the chronology and methodology of God's work. Similarly, *evolution* once meant a series of gradual changes, and it could be mentioned in polite company without being mistaken for a theological statement. No more. When several prominent thinkers insisted that evolution was aimless and blind, many agreed and thus rejected the theory.

In response, *theistic evolution* became a useful phrase that denoted divinely guided natural development. But even this term has become problematic as many persons of faith now see it as an oxymoron, the equivalent of *religious atheism*. We thus need new terminology to replace words that became casualties of the culture-war over origins. Richard G. Colling proposes the term *Random Designer*. This book's central thesis is that God uses random variation and natural selection (among other methods) to accomplish his purposes.

In Section I, Colling points out that randomness is integral to several natural processes that do not provoke religious controversy. According to the Gibbs' equation, many biochemical reactions are thermodynamically feasible only because entropy is increasing. In a widely accepted view of the immune system, B cells generate innumerable variations on an antibody protein sequence, some of which eventually prove useful against pathogens.

Colling presents random mutation/natural selection as a mechanism by which organisms adapt to changing conditions. He illustrates with the familiar example of bacterial antibiotic resistance. Few people dispute this process—commonly labeled *microevolution*, although Colling does not use that term—because science can document that it happens here and now. Colling presents a complete molecules-to-humans spectrum, and makes it clear that he regards *all* aspects of evolution (including speciation and prebiotic chemistry) as compatible with his faith.

In Section II (subtitled *Searching for Purpose and Meaning in a Randomness-Driven World*), Colling shares personal reflections as a biologist who seeks to integrate scientific knowledge with religious faith. Anecdotes involving his wife and their four sons provide insights to illustrate his walk with God. These chapters might not provide support for his views on origins; however, Colling seeks to present an integrated worldview. If nothing else, this section demonstrates the orthodoxy of his Christian beliefs.

Colling always capitalizes the phrase *Random Designer*, and he clearly uses it in reference to deity. For example, his discussion of all life forms having descended from one original progenitor cell concludes with "the Random Designer says that this grand drama was simply an early part of the magnificent plan designed to accomplish his purposes" (p. 63). This reflects Colling's conviction that God works through natural processes. Such a conviction does not sit well with many Christians, as they have been persuaded that any scientific explanation precludes divine action.

Random Designer generated some controversy at the Christian university where its author has taught for twenty-seven years. Last year, Colling was relieved of teaching nonmajors general biology, and his book was banned from being used in any class. For many, this

action appears to contradict the *Manual* of the school's sponsoring denomination, the Church of the Nazarene. The *Manual* states that the denomination

> opposes any godless interpretation of the origin of the universe and of humankind. However, the church accepts as valid all scientifically verifiable discoveries in geology and other natural phenomena, for we firmly believe that God is the Creator (Church of the Nazarene 2005 *Manual*, Articles I.1., V.5.1, VII).

We are embroiled in a cultural war in which many conservative Christians cling tenaciously to traditional values and cherished beliefs. They need to be persuaded gently and respectfully if they are to change their thinking about biblical interpretation, especially regarding origins. A writer who addresses that audience needs to be careful not to assault their religious sensibilities. I suspect that some readers were offended by the parody of Jesus' *Sermon on the Mount* on this book's dust jacket: "You have heard it said that God created the world 12,000 years ago. But I tell you God has revealed that five billion years is a closer approximation (etc.)."

The world needs more people like Richard Colling who are fully persuaded of the harmony between scientific truth and biblical belief. Those who read *Random Designer* to the end with an open mind will be helped by it.

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

PHILOSOPHY & THEOLOGY

A WORLD OF DIFFERENCE: Putting Christian Truth Claims to the Worldview Test by K. R. Samples. Grand Rapids, MI: Baker Books, 2007. 312 pages, index. Paperback; $17.99. ISBN: 0801068223.

Kenneth Samples is the senior research fellow at Reasons To Believe, a theological think-tank that seeks to communicate the uniquely factual basis for belief in the Bible as the error-free Word of God and for personal faith in Jesus Christ as Creator and Savior. Moreover, Samples is an adjunct instructor of apologetics at Biola University. He has written this volume with the explicit intention of helping modern-day Christians develop a worldview that is in conformity with Holy Writ. He advocates the notion that a Christian who correctly understands the worldview of Christianity can exhibit an overall lifestyle that corresponds to traditional Christianity. Samples notes that such a Christian worldview coupled with proper Christian logical reasoning would help expose fallacies present in contemporary worldviews.

In the first few chapters, Samples gives a laudable development of a worldview perspective that is in line with the biblical texts. Moreover, he delineates the importance of the Apostles' Creed for the foundation of a Christian worldview. This alone makes this volume worth its price. In another chapter, Samples expounds the basis of a Christian worldview by engaging its authority in all matters, i.e., Scripture. He goes on to give an excellent survey of the Christian view of God and its import in the derivation of a Christian worldview. Another chapter contains an enlightening discussion of the historic Christian view of humankind, correlating it to the development of a truly Christian worldview. In later chapters, Samples identifies and interacts with several opposing worldviews, including naturalism, postmodernism, pantheism, and Islamic views.

A notable strength of the volume is Samples' inclusion of discussion questions at the end of each chapter that more fully explore the implications of the material covered. Thus, this book could well be used in small-group studies within the local church. A second notable strength of this book is the concise, acute, and accurate coverage of the distinctive Christian doctrine, the Trinity. Samples presents a plethora of biblical support for the doctrine of the Trinity and its implications upon a Christian worldview. An added plus are the charts that Samples employs to summarize the arguments in each chapter.

Noting these strengths, however, I would urge that caution be exhibited by the readers of this book for the sole reason that Samples is unabashedly Reformed in his theology. Consistently, throughout the book, Samples equates Reformed doctrine with what is largely called either Protestant or evangelical. Consequently, if the reader is not careful in noticing Samples' confessional stance, he or she may interpret Samples to be supporting the notion that the sole theological disposition that is coherent is the Reformed position. This equating of evangelical/historic Christian doctrine with Reformed theology is disturbing to me, as one can be an evangelical in keeping with historic doctrine, while at the same time choosing to be Arminian or Wesleyan in theology. In fact, one finds little reference to scholars who write from a non-Reformed position, but nearly all of the cited material comes from other Calvinistic/Reformed scholars.

Another weakness is Samples' minimal use of primary source material, choosing instead to rely upon compendia, survey volumes, encyclopedias, and dictionaries for his argument(s). A complete bibliography for the sources that are cited is absent. Instead we encounter "select bibliographies" at the end of each chapter with endnotes including the material cited. Even with these reservations, however, I heartily advocate the purchase and perusal of this book by readers of this journal.

Reviewed by Bradford McCall, Divinity Department, Regent University, Virginia Beach, VA 23464.

DID MY NEURONS MAKE ME DO IT? Philosophical and Neurobiological Perspectives on Moral Responsibility and Free Will by Nancey Murphy and Warren S. Brown. New York: Oxford University Press, 2007. 236 pages. Hardcover; $77.95. ISBN: 9780199215393.

This is the first volume co-authored by these two scholars, professors at Fuller Theological Seminary: Murphy of philosophical theology and Brown of physiological psychology. They have previously co-authored articles and edited, with H. Newton Malony, *Whatever Happened to the Soul?* (2001, Fortress). The present volume is a *magnum opus* of their work together and is an extensive consideration of materialistic reductionism coupled with

an affirmation of top-down causation as it relates to consciousness and free will. Readers of *PSCF* will find that reading this volume leaves them much more appreciative of the *imago Dei* and much more confident in the possibilities of human beings to participate in emergent restoration of this world to the will of God.

Sections of the volume include (1) Avoiding Cartesian materialism, (2) From causal reductionism to self-directed systems, (3) From mindless to intelligent action, (4) How can neural nets mean? (5) How does reason get its grip on the brain? (6) Who's responsible? and (7) Neurobiological reductionism and free will.

Labeling themselves, in both this and their previous volume, as *nonreductive physicalists*, Murphy and Brown present a view that human mental functioning, while embedded in the brain, cannot be explained either by biological reductionism (bottom-up causation) or Cartesian dualism (physical body, nonphysical mind). Instead humans are best understood as agents in a social world whose functioning is best understood through a *top-down model* in which higher level capacities (e.g., language, consciousness) function systemically to constrain the physiology of the brain in an emergent manner that results in reason, freedom, moral responsibility, and self determination.

There is a sense in which this volume could be considered a penetrating survey of modern philosophy. One might have hoped that the views expressed here would have included an equal balance of current thinking in psycholinguistics, learning theory, and cognitive psychology. As it stands, the volume is weighted heavily toward philosophy. Only the Gifford lectures of Donald MacKay, the noted Scottish neuro-psychologist, are referenced in any consistent manner. Even here, MacKay's well-known counter to reductionist determination is curiously absent. MacKay is often referenced as noting that even if a behavior is predicted to occur (on the basis of physiology, environment, or past training), humans can always say "I don't think I'll do it."

This is not a book for the unsophisticated in either philosophical or neurological terminology. The questions the book addresses are, nevertheless, foundational, if not universal. Yet, the authors make little accommodation for the implied "average" reader in the fetching title of the book, i.e., *Did My Neurons Make Me Do It?* While the title indicates an intention, the writing style does not support it. Understanding the content would have been greatly enhanced by more human examples. The most memorable illustrations of their conceptualizations were from lower forms of life.

At the same time, this is a foundational volume—erudite and convincing in a way that does indeed affirm the unique capacities of the human being. While B. F. Skinner is often maligned as an advocate of social control through mindless behaviorism, it should not be forgotten that Skinner would agree that all organisms, especially humans, are active social agents whose actions are "emitted" rather than "elicited." While Murphy and Brown spend much less effort than Skinner in describing the social outcomes of their theorizing, they are, by implication, much more hopeful that the humans they describe can create a society where moral reasoning and free will have full sway. Their thinking goes far beyond either environmental or neurological determination. While they continue to malign Cartesian mentalism, they affirm the importance of social interactionism. As their postscript states, *"Go meta, regularly: remember the value of self-reflection."*

Reviewed by H. Newton Malony, Senior Professor, Graduate School of Psychology, Fuller Theological Seminary, Claremont, CA 91711.

EVOLUTION AND EMERGENCE: Systems, Organisms, Persons by Nancey Murphy and William R. Stoeger, eds. New York: Oxford University Press, 2007. 360 pages. Hardcover; $110.00. ISBN: 9780199204717.

One might wonder why emergence is drawing so much attention from scholars across a number of disciplines. Perhaps theologians, computer scientists, biologists, and sociologists are all intrigued by emergence because it depicts a common human experience. These experiences are typically routine, but can also provoke in us a sense of wonder and bewilderment. While chemical reactions, organism organization, and human social behaviors are clearly different, a common logic is inherent to each. That is, at a basic stage each exhibits a special relationship between parts and a whole. Examples that take these unique parts to whole relationships are all around us. Some would even argue that as you read this sentence an instance of emergence is occurring. Simply put, the parts in your brain (neurons) are interacting in a specific way giving rise to the whole (ideas) necessary to comprehend this sentence. In addition, the very sentence forms a complex of parts and wholes on several different levels. That common experience is the impetus for exploring emergentism. In Evolution and Emergence, the various essays seek to move emergentism beyond mere phenomenological alignment toward a legitimate explanatory option.

This book, edited by Nancey Murphy and William R. Stoeger, offers a collection of essays from philosophers, scientists, and theologians on the topic of emergent evolution. Fittingly, the book's three sections deal with "Philosophy," "Science," and "Theology."

The first section deals with philosophical notions of emergence. The article contributed by Nancey Murphy continues an argument she has made for years. In her view, emergence should be favored over reductionism due to the reality of downward causation exhibited by complex systems. Murphy's chapter is followed by two chapters from Robert Van Gulick. His first chapter is a summary of the primary reductionist, nonreductionist, and emergentist options available in the philosophy of mind. His second chapter addresses the difficult issue of mental causation and its possible reality.

In the final chapter of this section, Terrence Deacon notes that moving from mechanism to teleology requires a massive ontological jump. Instead of trying to reduce phenomenology to physics or to show them to be ultimately incommensurable, he focuses on the possibility that a mediating domain of causal dynamics can fill this gap. To serve this role, he looks to processes in which form generation and propagation are more prominent than either simple mechanistic/thermodynamic pro-

cesses or fully teleological processes. For Deacon, this means exploring the dynamics of emergence as a naturalistic or "bottom-up" process, much the way other scientific explanations are understood. From this perspective, Deacon strives to demonstrate how semiotic processes—which provide the framework for dealing with such human dilemmas as intention, desire, meaning, and even morality—are both physical processes in every sense of the word and yet can exhibit a causal character that appears to run counter to the most basic tendencies characteristic of other simpler physical processes. Deacon's central contribution is to precisely identify two fundamental inflection points where such fundamental symmetry breaking occurs in dynamic processes of increasing complexity and thus where the apparent "directionality" of causal dynamics diverge. The first inflection point leads to a dynamic dominated by formal rather than energetic relationships (morphodynamics), and the second leads to a dynamic dominated by represented ends and functions rather than mere forms (teleodynamics).

Scientific topics are covered in the second section. Working with the assumption that physics is not a complete explanatory schema, George Ellis adopts emergence as a way to assess causation and existence. Don Howard's chapter walks the reader through an assessment of the relationship between particle physics and condensed matter. He urges us to not be hasty in characterizing this relationship as emergent. Martinez Hewlett discusses the origin and complexity of life as a biological example of the need for "higher-order" explanatory models. The chapter from Alwyn Scott delves into the nature of nonlinear phenomena and their role in what he calls the "cognitive hierarchy."

Warren Brown's chapter describes a "bare bones" outline of a robust model for mental causation. The structure of this model includes a look at several challenging issues, including the nature of learning, the function of action loops, and symbolic representation, among others. His primary claim is that the best way to establish mental causation is to acknowledge that "mind is embodied and embedded in action in the world." By affirming embodied mind, Brown is a physicalist. With the mind embedded in action, he is a proponent of mental causation. Along these lines, Brown's use of emergence is not one of radical discontinuity between mental functions in humans and those in nonhuman animals; instead, he blurs this continuum. It is not that human mental causation is merely quantitatively different from other animals. The emergence of symbolic abilities and language allow for a qualitative difference as well—again, not in any discontinuous sense (human mental abilities find their precursors in our nonhuman relatives). Brown's efforts to establish downward/mental causation is laudable, but many questions remain: Does mental causation operate via efficient causes? If so, how? If not, what kind of cause is it? As an admittedly "bare bones" attempt, Brown's is an intriguing first step.

In section three, we move to theological chapters. William R. Stoeger has contributed an article that assesses the intricate relationship between emergence and reductionism. This interaction, he believes, offers a valuable resource for the wider interaction between theology and science, generally, and issues on divine and human action, specifically. Arthur Peacocke continues an argument he has made consistently for some time now. He believes that the picture of reality set forth through emergence is monistic and hierarchical—features that allow theologians purchase with regard to whole-part causation. Niels Henrik Gregersen explores artificial life as a possible resource for theologians with its emphasis on novelty, its attention to the actual and possible, and its awareness of the emergence of autopoietic systems—all of which have religious and theological repercussions. The final chapter is Philip Clayton's preliminary attempt to construct a Christian theology of emergence.

Catholic theologian John Haught's chapter describes and assesses the insufficiency of "scientific naturalism." For him, this position is exemplified by two commitments: first, there is nothing beyond nature, and second, the natural sciences are touted as the only accurate explanatory schema for dealing with this reality. Haught believes this "scientistic" view is fatally flawed because it ignores or dismisses the reality of subjective experiences which are clearly part of the natural world. Emergence provides Haught the means for affirming novelty, striving, and subjectivity as real and irreducible aspects of the world. Following the work of Alfred North Whitehead, Bernard Lonergan, Michael Polanyi, and Pierre Teilhard de Chardin, Haught argues for a "richer empiricism" that takes seriously "*the widest possible range of what we actually experience in the world*" (emphasis in original). There is certainly a type of naturalism that fits the model Haught has developed here, but naturalism is not the problem. Instead, it is the eliminative approach that some take—either reducing to "basic" particles or inflating to subjective ideals. Emergence is not a rigorous position because it eliminates reduction, but because it establishes a middle ground between the physicist and phenomenologist.

Overall, this is a helpful addition to the study of emergence. Several of the articles may be a bit challenging for the nonscientific reader, but the struggle is worth overcoming. Oddly, Oxford recently published another book that shares a very similar structure—and even several of the authors (see Philip Clayton and Paul Davies, eds., *The Re-Emergence of Emergence*, 2006). While there are differences between these texts, the exuberant price of each will likely prevent one from purchasing both. Either text will have a similar result: a thorough introduction to the topic of emergence from diverse perspectives.

Reviewed by James W. Haag, Postdoctoral Visiting Scholar, Center for Theology and the Natural Sciences, Berkeley, CA 94709.

RECONSTRUCTING A CHRISTIAN THEOLOGY OF NATURE: Down to Earth by Anna Case-Winters. Burlington, VT: Ashgate, 2007. 183 pages. Hardcover; $99.95. ISBN: 9780754654766.

Charges that Christianity has been responsible, in whole or in part, for our current environmental problems have been common since Lynn White's 1967 article "The Historical Roots of Our Ecological Crisis." Anna Case-Winters, professor of theology at McCormick Theological Seminary, takes this charge seriously and responds by developing a Christian theology of nature with guidance from the theology of John Calvin and process-panentheism.

The author begins with discussions of "the state of the world" and "the state of theology." She notes some of the problematic ways that traditional theology has treated nature and its relationship to God and humanity, and suggests critiques from the standpoints of feminist and process thought. The views of two theologians who will be mentioned frequently in a planned sequel, Sally McFague and Gordon Kaufman, are then set out and critiqued.

Case-Winters focuses next on the Reformed tradition, especially John Calvin. She argues that this provides a healthier approach to questions about the relationships of God and humanity to the natural world than critics have sometimes suggested. Then she discusses insights from ecofeminist sources, process thought, and religion-science dialogue. Chapters on "The Promise of Process-Panentheism" and ethical implications of the preceding discussions conclude the book.

There is a good deal that is helpful in this book and it may be especially useful for readers unfamiliar with ecofeminism, process theology, or panentheism. At the same time, there is some tension between the author's favorable view of these recent theological trends and the apparent desire to remain in contact with the traditional views of Reformed theology. Of course, it would be a terrible anachronism to ask about Calvin's position on ecofeminism or process theology, but it would have been helpful to explore this tension.

The treatment of dialogue between religion and science in chapter 6 concentrates on the relationship between humanity and the rest of nature and the meaning of the *imago Dei*. Philip Hefner's idea of the human as "the created co-creator" receives particular attention in connection with the latter topic. Preliminary steps in this chapter discuss methodological naturalism, Intelligent Design, and miracles. While these are helpful investigations, the topic of divine action deserved more detail.

The book contains some good content, but unfortunately readers are likely to be distracted continually by an appalling number of typographical errors and an apparent lack of proofreading.

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Religion & Biblical Studies

DO YOU BELIEVE? Conversations on God and Religion by Antonio Monda. Translated by Ann Goldstein. New York: Vintage Books, 2007. 178 pages. Paperback; $12.95. ISBN: 9780307280589.

This book is not what it first appears. Given the title and its description as a series of conversations about faith with noted cultural figures, one might expect something parallel to *Philosophers Who Believe* by Kelly James Clark, *Professors Who Believe* by Paul M. Anderson, or *Scientists Who Believe* by Warren W. Wiersbe. These books recount the testimonials of noted individuals representing relevant disciplines as a personal apologetic designed for the agnostic or skeptical reader.

Unlike these volumes, Monda's subjects are, for the most part, unabashedly nonbelievers or at least fairly unorthodox in their belief. They are drawn largely from the New York City literati, where Monda lives and conducted most of the interviews. Some of the names are likely familiar to the average educated reader, such as authors Saul Bellow, Jonathan Franzen, Toni Morrison, Salman Rushdie, Arthur Schlesinger, and Elie Wiesel; directors Spike Lee, David Lynch, and Martin Scorcese; architect Daniel Libeskind; and actress/activist Jane Fonda. Others were unfamiliar, at least to this reviewer. They include authors Paul Auster, Michael Cunningham, Nathan Englander, Richard Ford, Paula Fox, and Grace Paley, as well as playwright Derek Walcott.

For his part, Monda is a believer ("Catholic, Apostolic, Roman") but very much at home in the culture in which his subjects circulate. He is a filmmaker and film critic who teaches in the Kanbar Institute of Film and Television at New York University. He also writes for the Italian daily *La Repubblica*, in which these interviews were originally published. They were later collected and then translated into English by Ann Goldstein. His attitude in the interviews is forthright but respectful, challenging his subjects when they give shallow responses but never confronting or arguing with them.

Monda is best when he extracts from them what might be termed "confessions" regarding the subtle (or sometimes explicit) theological statements in their works, with which he is both aware and frequently enamored. The respectful tone was apparently helpful in eliciting some highly personal, even vulnerable, reflections from the subjects, along with some great one-liners, some of which made it into the table of contents as chapter headings. (See, for instance, the chapter on Saul Bellow, titled "I Believe in God but I Don't Bug Him," or on Paula Fox, "God Is the Name of Something I Don't Understand," or on Elie Wiesel, "I Have a Wounded Faith.") Yet it is obvious that some of the subjects struggle with deeply-held hostilities toward faith. When Grace Paley was asked, "What do you feel when you meet a believer?" she struck back, "I feel ambivalent: I respect his thinking and his belief, but at the same time I think he's deluded" (p. 126). One wonders what *disrespect* would look like for Ms. Paley.

Why would anyone care what this miscellaneous collection of cultural elites thinks about matters of faith? Despite an initial skepticism, this reviewer found at least two reasons to maintain a lively interest in the text. The first is that these individuals, randomly gathered though they may be, are, to use a trite phrase, "movers and shakers" in our society. We may or may not read them directly or watch their movies, but what they say matters to others whom we may read or who may otherwise paint colors on our cultural landscape. The other reason for reading is that most are deeply interesting. They are well read and their answers frequently reflect more than passing thought to the topic at hand. To take just one example, when Daniel Libeskind is asked if there are architects in whom a religious background or yearning is evident, he responds knowingly:

> The first name that comes to mind is obviously Antoni Gaudí. But in some ways it's too obvious. I've always been fascinated by the inescapable

> spirituality of a person considered a heretic, like Le Corbusier, or a mystic, like Mies van de Rohe, who read St. Thomas and St. Augustine and kept their books beside his bed. I would conclude by saying that there hasn't been a great architect who didn't have a strong element of spirituality (p. 103).

How can one find that anything but fascinating, except to complain that Monda did not follow up on that intriguing final comment?

A few appeal to science as part of their reflection on faith. Michael Cunningham notes that he suspects "there are profound and as yet undiscovered relationships between God and the principles of physics," adding "and I do believe in physics." He finds the search for order in the universe, as exemplified in the hunt for the GUT ("grand unifying theory") as a search for God, of sorts. And Saul Bellow hints at some sort of life beyond death: "I don't think everything is resolved with the destruction of the body. What science has to say seems to me insufficient and unsatisfying" (p. 33). Most, however, reflect a largely existentialist mindset.

Monda begins and ends with a fascinating quotation from Jorge Luis Borges:

> The idea of God as an omniscient, omnipotent being, who moreover loves us, is one of the most daring creations of fantastic literature. All the same, I would prefer that the idea of God belonged to realistic literature.

It is obvious that Monda believes that God resides in both literary forms and that most of his subjects who disagree with him echo Borges' sentiment. They may believe they have killed God but they miss him nonetheless.

Reviewed by Anthony L. Blair, Dean of Academic Affairs, Eastern University, St. Davids, PA 19087.

Religion & Science

THE BEGINNING OF ALL THINGS: Science and Religion by Hans Küng. Translated by John Bowden. Grand Rapids, MI: Eerdmans, 2007. 234 pages, footnotes, index. Hardcover; $22.00. ISBN: 9780802807632.

Hans Küng is president of the Global Ethic Foundation (Germany, Switzerland), having retired in 1996 as professor of ecumenical theology and director of the Institute for Ecumenical Research at the University of Tübingen. He is the author of more than fifty books, including his most well-known work, *On Being a Christian*. This book was written in German, and while the translation is excellent, the references are mostly in German and other European languages making them largely inaccessible to the North American reader. As I am learning, books on science and religion published by Eerdmans are quite technical and challenging. This book is no exception. The first two chapters alone covered 13.7 billion years of history, including the history of cosmology, physics, and mathematics up to the present. The five chapter titles are (1) A Unified Theory of Everything? (2) God as Beginning? (3) Creation of the World or Evolution? (4) Life in the Cosmos, and (5) The Beginning of Humankind.

Küng claims to believe in the common faith of Jews, Christians, and Muslims, but few of his positions would resonate with sincere believers of any of those faiths. The closest he comes to recognizing God as a personal God is that "he can be addressed." Passing reference is made to his trust in the "crucified Christ," but he clearly sees all religions as many paths to a common end. While he argues that faith is the only hope-filled alternative to reductionistic materialism, the terms and meaning of this faith are vague and almost meaningless to evangelical Christians. The theological reflection is limited to vague universalistic concepts, with virtually no reference to the Bible. Consideration for evangelical Christian faith is largely limited to a consistent critique of American fundamentalism and literalistic readings of Scripture. This book is not particularly novel, but the breadth and lucidity makes it a worthwhile book to have on hand as a clear presentation of an ecumenical position. The book takes a historical critical view and assumes the JEDP hypothesis as a given.

Having said that, Küng challenges both fundamentalist believers and rationalistic scientists, both of whom are guilty of holding to a confrontational approach to theology and science, which he considers out-of-date. This book moves through paleontology, human origins, psychology, and brain science. Küng writes:

> If god exists, then there is a fundamental answer to such questions: we can understand in depth why we are very finite, defective beings and yet have infinite expectations, hopes, and longings.

So, he holds to a theistic position even in the face of challenging scientific concepts and data. From this perspective, this book makes for persuasive reading. For example, criticizing biochemical reductionism, Küng denies that the mental is merely an epiphenomenon of the neural, or that our mental choices lack freedom because their biochemical or neural processes demand a given outcome. His arguments leave open the window of faith, even though the faith argued for lacks content. Regardless, these arguments toward the end of the book are powerful, and would carry weight with secular readers who do not have a theistic worldview. His style is winsome and his attitude humble. This book is very readable and addresses many disciplines and schools of thought. It could serve as an upper level college-level course in science and faith. Students would need to understand his premise, but it would lead them to references and paths of discussion that many simplistic faith and science discussions would not.

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

THE GOD OF NATURE: Incarnation and Contemporary Science by Christopher C. Knight. Theology and the Sciences series. Minneapolis: Fortress Press, 2007. xii + 164 pages. Paperback; $17.00. ISBN: 0800662210.

Knight is executive secretary of the International Society for Science and Religion and a research associate of the Faculty of Divinity at the University of Cambridge. In *The God of Nature*, he expands on the pansacramental naturalism that was sketched in his earlier book, *Wrestling with the Divine: Religion, Science, and Revelation*—also in Fortress

Press' Theology and the Sciences series (2001). This expansion takes two directions: one concerns the doctrine of the incarnation; the other involves a teleological view of creation.

By pansacramental naturalism, Knight attempts to get beyond both the deism characteristic of much of modern theology and the interventionist theism that marks much of contemporary reaction to deistic notions of science and its relationship to religion. The solution proposed reaches both forward and backward: forward to what many contemporary thinkers are calling a panentheistic view of the world as being "within" God and backward to classical Christian sources emphasizing a Neoplatonic understanding of time as the moving image of eternity, and the world as the unfolding of a once-for-all but yet perennially active God. In this framework, there are no interventionist acts that are needed to "fix" the world or keep it on course, but there also is no chasm between God and the world that needs to be bridged (even if God remains transcendent from the world as affirmed by classical theism). This allows Knight to affirm the evolution of the world through chance and natural law—the major means of divine "action"—as well as to view the entire scope of the material world as a "creation" that manifests the handiwork of God. Such a pansacramentalism emphasizes a naturalistic ontology but not epistemology: just as the evolutionary unfolding of creaturely species depends on their different ecological niche-systems, so also does the evolutionary development of the various world religious traditions and their explanatory worldviews depend on their different socio-historical-cultural systems.

The two developments Knight proposes in this volume unpack the incarnational or Logos christology of John's Gospel as that unfolded especially in the tradition of Eastern Christianity. A more or less recent convert to Orthodoxy, Knight draws particularly from the Logos-theology of Byzantine theologian and saint, Maximos the Confessor, focusing on the latter's notion of the Logos as constituting the inner essence or telos of all things, and connects that with the inclusivistic pluralism (or pluralistic inclusivism, depending on one's point of view) of the twentieth-century Orthodox spiritual writer, Philip Sherrard. This Sherrard connection is what distinguishes Knight's proposals from that of the Russian Orthodox scientist-theologian, Alexis Nesteruk, although it is unclear why Knight neither cites nor footnotes Nesteruk's *Light from the East: Theology, Science and the Eastern Orthodox Tradition* (Fortress Press, 2003). In any case, the result is a reinterpretation of Maximos' Logos-cosmology for the twenty-first century, consistent with modern scientific naturalism on the one hand, but yet also informed by ancient Orthodox apophaticism, spirituality, and teleology on the other. The incarnation is thus the fulfillment and completion of creation (rather than a special instance of God's interface with the world) that allows for a naturalistic and yet pansacramental view of the world to come into focus.

Is Knight successful in what he attempts here? When compared with Nesteruk's book, *The God of Nature* is less robust in terms of the science (Nesteruk is also a lab physicist) but perhaps more expansive in terms of theological vision (Knight is explicit about his being a fundamentally *theological* rather than scientific proposal, and his dialogue with Sherrard accentuates this aspect of the book). Attentive readers will also note, however, that as retrieved by Knight, the classical Christian tradition's view of God, especially when set against the Neoplatonic (and Boethian) understanding of the relationship between time and eternity, may not be far removed from early modern deism in terms of how both paradigms explicate the God-world relationship. Yet the effort to add an Orthodox perspective into the science-theology conversation is surely reason enough to read this book.

Reviewed by Amos Yong, Professor of Theology, Regent University, Virginia Beach, VA 23464.

RELIGION AND THE CHALLENGES OF SCIENCE by William Sweet and Richard Feist, eds. Burlington, VT: Ashgate Publishing Limited, 2007. 235 pages. Hardcover; $99.95. ISBN: 9780754657156.

This volume appears thanks to the support of the Social Sciences and Humanities Research Council of Canada and the work of two Canadian philosophers, William Sweet at St. Thomas University in New Brunswick and Richard Feist at Saint Paul University in Ottawa. The fifteen contributors hail from eight nations with about half of the authors being Canadian or from Canadian institutions of higher education. Most of the contributors are professional philosophers and the essays focus on underlying conceptual issues related to religion and the sciences. Two of the essays by Arthur Peacocke and by Denis Lamoureux are reprinted from, respectively, *Zygon* and *Perspectives on Science and Christian Faith*.

The first set of essays explores history and contexts in biology and evolutionary theory with attention to "The Declaration of Students of the Natural and Physical Sciences" from mid-Victorian Britain (Hannah Gay), Darwin's theological insights (Lamoureux), the work of Pierre Theilhard de Chardin (Lodovico Galleni and Marie-Claire Groessens-Van Dyck), and a theology of evolution (Arthur Peacocke). A second set of four essays takes up physics, philosophy, and fine-tuning arguments. A third section of four essays considers naturalism and the nonnatural, and a final section of two essays looks at whether science can provide evidence for metaphysics, and summarizes the various conceptual issues discussed in the volume.

The many new voices added into the discussion of religion and science that this volume alone contributes make it worth reading. The philosophical probing of the metaphysical foundations of much of the work in religion and science is long overdue and this book takes us forward in better realizing these underlying issues and their importance to contemporary discussions. There is reasonable diversity within the volume, although ID proponents will object to the absence of their point of view within the essays. The editors are to be congratulated on a finely produced and edited set of essays that help anchor discussions in deep and important philosophical issues in addition to the respective scientific theories, facts, and so forth usually involved in such discussions.

Reviewed by Dennis W. Cheek, Ewing Marion Kauffman Foundation, 4801 Rockhill Road, Kansas City, MO 64110.

GOD'S MECHANICS: How Scientists and Engineers Make Sense of Religion by Brother Guy Consolmogno. San Francisco, CA: Jossey-Bass, 2007. 233 pages. Paperback; $24.95. ISBN: 0787994669.

Guy Consolmagno has a BS from MIT in earth and planetary sciences and a PhD in planetary science from the University of Arizona. He has also done postdoctoral work at the Harvard University Observatory and MIT. He taught physics in Kenya as part of the Peace Corps, and at Lafayette College for five years. He has coauthored five astronomy books and published about fifty papers in various peer-reviewed astronomy journals. Consolmagno is also a Jesuit brother who currently works at the Vatican observatory both in Arizona and in Rome. He researches the connections between meteorites and asteroids and the evolution of small bodies in the solar system.

The book is written for a general audience. It is divided into five sections. The first two parts express Consolmagno's views on why it is reasonable for a technically minded person (a techie) to believe in God, and how a techie sees religious life. He makes some effort to show how techies differ in their way of approaching religious matters and in the types of questions they tend to ask, compared to the majority of parishioners in a typical church. Though he is discussing this in the context of fellow Catholics, the experience seems rather similar to my own and other technically minded people, whom he interviews in the third chapter. Some of the results of that survey are surprising and unexpected, both to him and to me. The fourth section provides a brief summary of historical theology and some of the questions that a typical engineer or scientist might be inclined to ask about religious matters. The final section explains why Consolmagno has chosen to be a Catholic and a Jesuit brother.

Early on, Consolmagno makes it clear that his treatise should not be seen as a kind of proof for God's existence; rather he wants to show that it is rational for a techie to believe in Jesus. This fairly concise summary is similar to arguments I have heard before. It is unlikely to change the minds of most atheists, but it does offer a rational basis for faith which can help grant courage to a techie who still feels a yearning for eternity but does not know how to explain it.

For evangelicals, the book should be understood as one way a technically minded Catholic individual views these matters. I saw much that we share in common and, despite issues in which we differ, I found more benefit in listening since similar problems occur in our churches. Being Catholic, Consolmagno does not understand how techies in the evangelical churches learn to cope with such difficult matters as creationism, which can inflict heart-sinking embarrassment for believing scientists. He is not well acquainted with average church-going creationists or their way of thinking.

Overall, I felt this book was worth reading since it helps us understand how a fellow Christian is struggling to serve God while working as a professional scientist in a complex world.

Reviewed by Wayne Dawson, Research Scientist, Structural Biology Laboratory, Chiba Institute of Technology, 2-17-1 Tsudanuma, Narashino, Chiba 275-0016 Japan.

GOD AND THE NEW ATHEISM: A Critical Response to Dawkins, Harris, and Hitchens by John F. Haught. Louisville, KY: Westminster John Knox Press, 2007. 156 pages. Paperback; $16.95. ISBN: 9780664233044.

THE DAWKINS DELUSION? Atheist Fundamentalism and the Denial of Divine by Alister E. McGrath and Joanna Collicutt McGrath. Downers Grove, IL: IVP Books, 2007. 118 pages. Hardcover; $16.00. ISBN: 9780380834464.

Roman Catholic John F. Haught and evangelical Anglican Alister McGrath (writing on this occasion with his wife Joanna) are among the best scientists/theologians to take on the issues being raised by the "new atheists." Every author here deplores the low level of the discussion and aims to expose the flaws evident in a new skirmish in the old warfare of religion and science. Sadly, just when it seems that we are getting to the place where theistic evolution is being taken seriously again as the way God creates the world (compare the work of Ken Miller, Francis Collins, John Polkinghorne, and Arthur Peacocke)—at just such a time when people have been finding evolutionary ideas compatible with Christian faith, we are confronted by a secular anti-religious fundamentalism which is contemptuous of theology and intolerant of faith.

Haught, who writes prolifically and impressively on the borders of theology and science, is plainly disappointed with the intellectually unchallenging character of the new atheism of Dawkins and company. He has been used to conversing with "old atheists" who maintain high standards and do not rely on invective. These fellows such as Nietzsche and Freud thought more in depth about what atheism entails and could understand what might interest thoughtful people in religion. The new atheism in contrast is disinterested in fairminded discussions about whether religion might actually have something to contribute to human knowledge. In the new atheism (and it is not really "new"), readers are not expected to understand religion or have any sympathy for it. Instead they are exhorted to detest faith. Thus Haught is disappointed that the new atheism does not explain things, even its own convictions, such as where it finds the basis for its strong morality or how its extra-strong confidence in reason is sustained.

As for the deity, they do not think of God as believers do, as the personal ground of meaning and love; they view deity as a scientific issue, very much parallel to the hypothesis of evolutionary biology itself which reduces the divine mystery to the standing of a finite scientific truth, forgetful of the many channels other than science through which we gain an understanding of the world. They are completely unwilling to see that faith can sometimes be positive, reminding us how limited scientific reason can be in its capacity to penetrate the richness, beauty, and depth of being. Science alone is a narrow slit through which to view reality as a whole. It requires other modes of interpretation to take it all in. In his critical response then, Haught is not impressed by the uninformed rhetoric and sweeping condemnations of every kind that he finds in this debate.

The McGraths, on the other hand, take a somewhat different tack, and go head to head with Dawkins in more of a no-holds-barred apologetic battle. Since Dawkins is clearly out to make atheists of us all, the McGraths are

out to convert him. Perhaps Dawkins, who succeeded Anthony Flew as the number one atheist in the world (Anthony Flew having recently become a theist himself) will himself bow the knee! The fact that Alister himself experienced conversion as a young man might even make this unlikelihood more possible. In his book, McGrath takes on four of the main issues. First, in regard to the existence of God, which Haught is reluctant to view as a scientific question, McGrath tells us that what ought to impress us are not the gaps in our knowledge of the world but the fact that the world itself is intelligible. He urges, following Richard Swinburne, another Oxford professor, that what needs explaining is the world's comprehensibility. Following that, he goes after the narrow-minded scientific rationalism which in the new atheism closes off every mode of understanding save its own. He insists that in order to understand the world, a little humility is required. The cosmos is after all a highly complex, multifaceted, and multilayered realty which makes it open to more explanations than one. The dogmatism of the new atheists is out of place.

Difficult too is the persistence of religion in a world thought to be utterly secular. Why is this? Dawkins is forced to see it as the by-product of one or another evolutionary mechanisms. More than that, it is that human beings know what it is to be "drawn to truth and mystery." It is the experience of being grasped by what Tillich calls an ultimate concern. Evil can be blamed for a lot of suffering which we find in the world. (So can atheism for that matter.) But there is no reason to think that the elimination of religion would yield a peaceful planet. And for every tragedy, there are many acts of human kindness. Religion is not unambiguously good or evil.

What can explain the bitterness of the new atheists toward religion? It may be anxiety concerning the trends as regards its persistence. Are we dealing here with a Dawkins delusion?

Reviewed by Clark H. Pinnock, Professor Emeritus of Theology, McMaster Divinity College, Hamilton, ON.

THE GOD THEORY: Universes, Zero-Point Fields, and What's Behind It All by Bernard Haisch. San Francisco, CA: Weiser Books, 2006. 157 pages. Hardcover; $21.95. ISBN: 1578633745.

Bernard Haisch has spent most of his career in astrophysics working at Lockheed-Martin in the Solar and Astrophysics Laboratory in Palo Alto, CA (formerly the Space Science Laboratory at Lockheed). He has written many manuscripts on subjects related to solar physics and a fundamental theory to explain inertia. For over ten years, he served as a science editor for *The Astrophysical Journal* which is one of the main working journals for practitioners in astronomy and space science related fields. He has served on a number of boards and committees in projects related to NASA. He earned his PhD in astronomy from the University of Wisconsin. He is currently president of a nonprofit organization called the Digital Universe. In addition to his scientific work, he has musical inclinations, speaks several European languages, and can read Latin.

PSCF readers who are expecting to gain a deep understanding of Christian theology (or even Buddhism for that matter) are certainly going to be disappointed by this book. Though he had a rather thorough grounding in a Catholic education and wanted to become a priest, he drifted away in his early 20s. Predictably, his comments about Christianity are little different from other popular writers. Most of the apologetics is rather old hat. However, if readers can view this as a work in progress, written by a scientist grappling with these matters from inside the scientific community, there are some valuable points worthy of appreciation.

Haisch disagrees with the currently fashionable trashing of all belief in God as something akin to a disease. He rails against those he calls fundamentalist reductionists: "someone who truly believes that there is nothing beyond the physical" (p. 24). Many Christians also share such objections. Although these are not new arguments, it is noteworthy that a serious scientist resists following the multitude and recognizes that something is seriously amiss in this model.

The issues of quantum field theory are also considered. Haisch does not accept the many worlds interpretation and considers it "absurd and morally repugnant" (p. 136). I disagree with Haisch on what constitutes a true vacuum, but do see merit in some of his insights as to how Christians might engage and understand the existence of multiple universes. The discussion of his scientific discoveries is rather exciting. He also has an interesting interpretation of Gen 1:3.

Unfortunately, the work seemed a bit rushed. I found the arguments on consciousness rather weak. Haisch appears to be a dualist, but Haisch fails to address some serious issues that dualists should acknowledge when presenting their views. In summary, I see an honest, and at times, quite daring work.

Reviewed by Wayne Dawson, Research Scientist, Structural Biology Laboratory, Chiba Institute of Technology, 2-17-1 Tsudanuma, Narashino, Chiba 275-0016 Japan.

LIBERAL PROTESTANTISM AND SCIENCE by Leslie A. Muray. Westport, CT: Greenwood Press, 2008. 184 pages. Hardcover; $65.00. ISBN: 9780313337017.

To be accurate, this book is *not* about liberal Protestantism and science. Were the volume to fulfill the promise of its title, it would doubtless be a delightful read … and a significantly larger book. That is to suggest that either the author or the editor (this volume is the seventh in the Greenwood Guides to Science and Religion, which have included surveys of how Judaism and Islam have approached science) neglected an imperative definitional task early on. And thus the text presents problems for the reader.

The first problem is defining "liberal Protestantism." The sources for this study are almost exclusively theologians. As one of that ilk, I do not necessarily conclude that this is a bad thing … except for the fact that individual theologians, typically ensconced in academic institutions, rarely represent the movements in which they do their work. Muray, professor of religion and philosophy at Curry College, is working with far too narrow a definition. There is nothing here regarding the actions of church

bodies or leaders regarding science, nothing regarding how laypersons within this tradition have approached science, nothing regarding how scientists who identify with liberal Protestantism have been influenced by that exposure, nothing regarding the scientific achievements of individuals, groups, or institutions associated with the mainline churches. And so much the pity, as there is a story there to be told.

The second problem is defining "science." While Muray re-tells the familiar story of how the old mainline was more ready to absorb Darwinism than the fundamentalist stream of Christianity his discussion of "science" would be more accurately described as a survey of epistemology (he has a particular attraction to radical empiricism) and cosmology (in this case, the interaction or relationship between God and the natural world). The one exception to this rule is his chapter on "ecotheology." But if one were to turn here to discover how the mainline understands the theological or moral implications of cloning, for instance, one would be disappointed. The same is true were the topic the ethical uses of technology or stem cell research or nuclear weapons.

Having complained about what the book does not provide, let us now turn our attention to the text as written. Truth be told, Muray does some things well. He provides the reader with a vivid contrast between liberal and conservative approaches to science. Unfortunately he falls into the familiar pattern of overstating the case, relying too heavily on the fundamentalist reaction to Darwinism as representative of evangelical attitudes. Yet his disavowal of "warfare" metaphors to describe the relationship between science and religion will resonate with readers of this journal. Instead, "often untold is the long history of the radical, enthusiastic, unequivocal embrace of modern science (and the secularity that usually comes with it) on the part of Liberal Protestant Church bodies and theologians" (p. 1). Those three adjectives—radical, enthusiastic, and unequivocal—show up repeatedly to describe and emphasize Muray's understanding of the stance of liberal Protestantism toward science.

Muray is also an excellent synthesizer of theological history. His historical survey begins with the Enlightenment, moves swiftly through the nineteenth century (he has little interest in the transcendentalists), stops briefly at William James, lingers for an affectionate embrace of Whitehead in the mid-twentieth century, and concludes with an introduction to a younger generation of contemporary scholar-theologians with whom the reader may be unfamiliar. Yes, the rhetoric is a bit conflated at times. (Try this from page 69: "I have to confess that I have a tendency to read James through my Whiteheadian lens, Whitehead through my Jamesian lens." Frasier Crane, where are you?) And while one may wish to quibble with him here and there on a particular point of interpretation, the quantity of individuals discussed and the manner in which they are juxtaposed with each other is impressive. Muray knows his stuff.

Were this volume subtitled "How theologians associated with mainline Protestantism have understood human knowledge of and divine interactions with the natural world," or something of that sort, this review would conclude with a recommendation that those so minded should by all means inform themselves with this brief, authoritative historical analysis of those ideas. Unfortunately, for those interested in how science has influenced or been influenced by mainline Protestantism, i.e., many readers of this journal, this volume yields little of value or interest. We hope for better from the remaining volumes in the Greenwood series.

Reviewed by Anthony L. Blair, Dean of Academic Affairs, Eastern University, St. Davids, PA 19087.

THE SPIRITUAL TECHNOLOGY OF ANCIENT EGYPT: Sacred Science and the Mystery of Consciousness by Edward F. Malkowski. Rochester, VT: Inner Traditions, 2007. 426 pages, notes, index. Paperback; $24.95. ISBN: 9781594771866.

The monuments of ancient Egypt, especially the pyramids of Giza, continue to fascinate the public in general and some scientists in particular. We have almost weekly reports of archaeological discoveries, such as the huge tomb of the sons of Ramesses II, and programs on the Discovery Channel featuring the catscans of ancient mummies. But we have rather bizarre unorthodox interpretations of these monuments as well.

This book by Malkowski, "a software developer and historical researcher," falls into the latter category. The foreword is contributed by Christopher Dunn, the author of numerous publications promoting "his ideas that the Giza pyramid was a gigantic machine" (p. xix), which transformed the earth's "vibrational energy into electrical power" (p. 332). This book is a tribute to the life and work of René A. Schwaller de Lubicz, a member of the French Theosophical Society, who resided in Egypt from 1936 until 1949, and who developed the hypothesis that the Egyptian monuments betrayed an unexpectedly sophisticated technical civilization. Schwaller believed that the apparent pantheon of animal gods "was really a way of expressing cosmic principles" (p. 188). Ra was not really the sun or sun god, but rather, solar energy.

Malkowski rejects the traditional ascription of the Sphinx to Mycerinus (Menkaure) of the Fourth Dynasty; rather, he accepts the views of Robert Schoch that the Sphinx was carved more than 7000 years ago (p. 319). Rather than the conventional explanation that grave goods were interred to serve the dead in the afterlife, he assumes that the Egyptians believed in reincarnation (pp. 357–9). He believes that an artifact from Abydos depicts "a helicopter and two airplanes" (p. 386).

In his pan-Egyptian explanation of the Bible, he holds that Moses learned not only Egyptian traditions from his upbringing in the Pharaoh's house, but also the "Akkadian (i.e., Babylonian) tradition from his father-in-law Jethro," who was a Midianite shepherd in northwest Arabia (p. 343). The Garden of Eden, despite its association with the Tigris and Euphrates Rivers, he places "between Lake Urmia and the Caspian Sea" in Iran (p. 209). The symbol of the cross was derived by the Christians from the Egyptian hieroglyphic sign, the Ankh "Life" (p. 270). The Christians used the symbol of the fish, ICHTHYS in Greek, because Christ was born on the eve of "the age of Pisces" (pp. 267–8).

The author alleges that the secret of Paul's success was perhaps his knowledge of the Hermetic tradition, a late

body of theosophical, alchemical, and astrological lore which Greeks in Alexandria, Egypt, associated with Hermes, whom they identified with Thoth, the Egyptian god of wisdom (p. 283). Malkowski, who believes that Gnosticism was a pre-Christian phenomenon, is confused as to the distinction between Hermeticism and Gnosticism.

To support his wide-ranging interpretations, Malkowski cites an array of dubious authorities such as George G. M. James, Cheikh Anta Diop, Martin Bernal, and Immanuel Velikovsky.

In summary, though this book may be read for amusement, I would not recommend spending any money to purchase it.

Reviewed by Edwin M. Yamauchi, Professor Emeritus of History, Miami University, Oxford, OH 45056.

A SCIENTIFIC SEARCH FOR RELIGIOUS TRUTH by Phil Mundt. Austin, TX: Bridgeway Books, 2007. 486 pages, index, bibliography. Hardcover; $21.95. ISBN: 1933538619.

Author Phil Mundt is a retired geologist who holds a PhD from Stanford University. This book is the result of a four-year quest in which the author had two main objectives: "The first was to try to resolve some of the main misunderstandings between science and religion. The second was to answer some life-long questions concerning religion, and search for religious truth; this was for the purpose of personal fulfillment and perhaps, salvation."

The book contains sixteen chapters and, while lacking footnotes, has an extensive index and bibliography. The first ten chapters comprise the main body of the book, while the last six chapters, collectively referred to as the "Science Annex," provide general science background (universe, solar system, earth, life forms/evolution, DNA/genetics, humankind). The book begins with Mundt's purposes for undertaking this project (chap. 1) and a general introduction into the field of science and religion (chap. 2). Next, the author presents background into scientific concepts that form the framework for any science and religion discussion (chap. 3). Mundt then transitions in chapter 4 into the beliefs that scientists have in general (i.e., deism, theism, agnosticism, atheism), and the particular beliefs of notable scientists in history (Newton, Einstein, etc.). The middle section of the book seeks to describe the belief systems and history of the major monotheistic religions: Judaism (chap. 5), Christianity (chap. 6), and Islam (chap. 7). Chapter 8 acknowledges and discusses, rightfully, the "difficult times" or atrocities committed by the Christian Church historically, while chapter 9 provides an in-depth description of the Christian denominations that resulted from the aftermath of the Protestant Reformation. In the final chapter of the main section of the book (chap. 10), the author concludes by presenting his own thoughts on areas ranging from the creation of the universe and evolution of life to religious mistakes and the culture war.

The book produces a potentially overwhelming wealth of information. At times, the book does not offer logical connections between different aspects of the material, and the flow can be confusing. Although the overall organization of the book and individual chapters could have been improved, this book still contains a large volume of information in a broad range of areas and is thus a useful resource for those beginning the foray into science and religion. In particular, this book serves as an introductory source on the history of the monotheistic religions (Judaism, Christianity, Islam), and for the development and evolution of the Christian theological tradition. In addition, the aforementioned "Science Annex" will serve as a valuable resource for those who do not have a scientific background.

Mundt's writing style tends toward conversational narrative, rather than dry academics. He takes the time to present material in such a way that all can be involved in the discussion. While most of the book is information presented objectively as "fact," Mundt occasionally includes his own opinions and conclusions in a frank and pointed manner. I thoroughly enjoyed it and wished that he would have included more of this in the sea of information and historical background that otherwise comprises the book.

In sum, the book is a welcome addition to the field of science and religion but must be considered in its proper place. Mundt is not seeking to join the academic ranks, but instead, to take the reader through the wealth of information that has guided his faith development. I found it to be a refreshing read and would encourage others in a similar place to read this book and enjoy Mundt's down-to-earth writing style.

Reviewed by Justin Topp, Postdoctoral Fellow, Department of Biochemistry, University of Texas-Southwestern Medical Center, Dallas, TX 75390-9038.

EVOLUTION FOR EVERYONE: How Darwin's Theory Can Change the Way We Think about Our Lives by David Sloan Wilson. New York: Delta Trade Paperbacks, 2008. 390 pages, index. Paperback; $15.00. ISBN: 9780383340922.

Matthew for Everyone, Mark for Everyone, etc., is a series of popular commentaries by N. T. Wright, and helpful little books they are. Now David Sloan Wilson has written *Evolution for Everyone,* which presents the gospel of evolution in a book that I found to be both fascinating and exasperating. Among evolutionary thinkers, Wilson is well known for his book, *Unto Others,* on group (or multi-level) selection and altruism, and for his theory on the evolution of religion in *Darwin's Cathedral*. The themes of these books return in *Evolution for Everyone*, a book that discusses the importance of groups in evolutionary biology and in human society. It illustrates evolutionary theory with examples from everyday life, and it goes on to suggest that societal phenomena, such as cooperation, arts, language, and religion, can all be explained by evolutionary theory. In *Evolution for Everyone*, Wilson presents evolution not only as a biological process, but also as an all-encompassing worldview.

I found the book fascinating, especially the first half. Describing some wonderful examples from the natural history of animals, Wilson describes how reproductive strategies and behavioral patterns favor individuals and groups because they can be acted on by natural selection. Although this may be a more gene-centered view than

S. J. Gould would have been comfortable with, Wilson backs his theories up with observations and data. In the early chapters, he builds on the ideas of W. D. Hamilton, E. O. Wilson, R. Dawkins, and the branch of ethology known as behavioral ecology. But David Sloan Wilson has a legitimate voice of his own, and he has earned the right to be heard. While his gene-centered view has a touch of reductionism, his idea of group selection counters that tendency.

In the second half of the book, there is an exasperating and different train of thought. From natural selection and group selection, the argument moves to group phenomena, group dynamics, and human culture. Yes, there are many things in nature and in human life that have a connection to groups: cancer is caused by groups of cells, hunting in primitive human societies often takes place in groups, and religions are practiced by groups. But this interesting train of thought does not make religion a product of biological evolution any more than a group of automobiles in a parking lot are a product of such evolution.

Human beings have a biological past, in my view, but Christians and many non-Christians believe that humans have a unique task and place in this world. This is reflected in the fact that several levels of complexity are involved in what it means to be human. Complexity is not adequately dealt with by Wilson, for he reduces all phenomena to the biological level of functioning, and that is the only level that he considers in his book.

The physical level of functioning, i.e., the world of chemistry and nonliving things, and its role in originating living things, is mentioned only in passing in *Evolution* (pp. 137–8). Yes, Wilson mentions RNA as a possible first step in the development of living entities and cells, and Darwin speaks of "some warm little pool" as the source of life's origin in a letter to his friend, Joseph Hooker; both authors accept the biological level of functioning without dealing with its origin. I cannot help thinking of a line in Exodus 32, "Then they gave me the gold, and I threw it into the fire, and out came this golden calf!" We are reminded that there are topics that evolutionary theory still needs to solve, in spite of the confident title of Wilson's book.

More pertinent to the topics covered in Wilson's book is what I would call its biological imperialism. Cultural phenomena, such as language, logic, art, marching, and music, all are group phenomena, and hence, in Wilson's way of thinking, can be explained through evolutionary theory. There is no need, therefore, of a theory of emergence, for all things are biological. And, indeed, if I have read closely enough, the idea of emergence only appears once in the book, and that in relation to the idea of self-organization (chap. 31).

Religion is a major theme in the book, which is understandable since Wilson received a Templeton grant to study the evolution of religions and to write *Darwin's Cathedral*. It is clear that for Wilson, religions are moral phenomena so there is no need to consider, in the Christian context, incarnation, divinity, revelation, and other things transcendent. Then, in the context of group phenomena, Wilson describes religions as useful in that they lead to beneficial group dynamics—there is the altruism topic again—but, strangely, religion is described as "outlandish beliefs for which there is no basis whatsoever" (p. 256). With friends like that, who needs enemies?

Interestingly, Wilson also describes what he calls "stealth religions" or "pseudo religions" and illustrates them by using the thought of Ayn Rand. Science is being used, he says, "as a substitute for God" (p. 277). Wilson does not seem to recognize that this describes his own pattern of thinking, and that in his own theories the biological level of functioning is elevated, taking on the role of creator of all of created reality.

Read this book for the lovely descriptions of behavioral ecology, and as an illustration of an evolutionary thinker who decides that he can include religion in the class of phenomena that have evolved. Do not take the book for gospel truth, for its gospel is a poor substitute for the real thing.

Reviewed by Harry Cook, The King's University College, Edmonton, ON.

UNEXPECTED GRACE: Stories of Faith, Science, and Altruism by Bill Kramer. Philadelphia, PA: Templeton Foundation Press, 2007. 243 pages, notes. Paperback; $22.95. ISBN: 9781599471129.

Kramer is a freelance writer who has written for magazines, nonprofit organizations, corporations, theater, and film. Several of his plays have been produced and two of his screenplays have won independent film festival awards. For nearly thirty years, he has practiced meditation and, as a result, is deeply interested in the way individuals attempt to integrate spiritual beliefs with the challenging circumstances of real-world social agendas. *Unexpected Grace*, which is his first book, brings storytelling to science with compelling narratives about the investigators and participants in four studies, all of which have social and spiritual significance.

The idea for this book took hold over meals on the campus of Villanova University during the Works of Love Conference in 2003. The actual theme of the conference was Scientific and Religious Perspectives on Altruism. Listening to the professors, clergy, and scientists around him, Kramer realized that behind their studies and research were important stories that needed to be told. He later visited the Institute for Research on Unlimited Love (IRUL) in Cleveland which had co-hosted the Villanova conference along with the Metanexus Institute. He was eventually granted permission to interview and profile the participants of four different studies, all of which are chronicled in *Unexpected Grace*. The result is what Kramer calls a collection of love's short stories, each of which is also a true story.

The first of the four studies is an account of what took place at St. Paul's Chapel in New York after the twin towers of the World Trade Center were destroyed on September 11, 2001. For nine months, St. Paul's closed itself to the public while it threw open its doors on a round-the-clock basis to every worker at Ground Zero, every uniformed officer and every conceivable service provider. The chapel became a place of radical hospitality where services for the mind, body, and spirit were rendered for free by a host of volunteers. The guiding

assumption of these volunteers was that the high-intensity altruism of the recovery workers, battered daily by their grueling labor and the remains of the dead, could not be sustained without the ongoing labors of love that these volunteers provided. As a result of their dedication and sacrifice, St. Paul's Chapel became a holy place where the love of God flowed freely through the hearts and hands of those who served inside her walls.

The other three studies were university based and more quantitative in nature. The first of these was carried out at the University of California Santa Cruz. It involved exposing students from different ethnic background to a series of "Fast Friendship Interventions" in order to test the hypothesis that establishing cross-group friendships would improve inter-group attitudes. The second study, centered at Case Western Reserve University in Cleveland, examined various aspects of spirituality as predictors of giving. Results from the study indicated that the best predictor of giving was a humility measure—the more humble people were, the more money they were willing to donate to others. The last of these quantitative studies took place at the University of Iowa Hospital. In this "Physiology of Love" study, researchers attempted to correlate MRI brain scans with feelings of empathy. Brain scans were taken as participants viewed a series of video clips which included interviews with patients who were either chronically or terminally ill. Initial findings were that the degree of empathy expressed by the participants depended upon the degree of similarity to and familiarity with the conditions of the patients.

The overriding focus of psychology for the past century has been the study of human darkness and evil. Only in the last few decades has psychology begun to explore human virtues such as compassion, forgiveness, friendship, empathy, and altruism. The four studies included in this book are excellent examples of this more positive approach to human psychology. Hopefully, these studies will encourage even more scientists and theologians to pursue research into humanity's higher nature. The lessons learned from studies like these can then be applied to some of the more pressing social problems that we face as a nation.

Reviewed by J. David Holland, Biology Instructor, Benedictine University at Springfield College, 1500 N. Fifth Street, Springfield, IL 62702.

EVOLUTION AND RELIGIOUS CREATION MYTHS: How Scientists Respond by Paul F. Lurquin and Linda Stone. New York: Oxford University Press, 2007. 240 pages, index. Hardcover; $29.95. ISBN: 9780195315387.

Authors Paul Lurquin (School of Molecular Biosciences) and Linda Stone (Department of Anthropology) are professors at Washington State University, and have written this book to help laypersons argue for the validity of evolution. They describe the differences between myth and science, then use this distinction to claim that evolution is the scientific explanation for the origin of life, while creationism and intelligent design are unscientific "religious creation myths".

The book has a preface, seven chapters, two appendices, a glossary, and index. There are no footnotes, but instead a list of books and websites recommended for further study. The book begins with a description of creationism and intelligent design (ID) in which ID is presented as a newer, but quite similar, version of creationism. Next, the authors provide the reader with a historical overview of evolutionary theory and its development as it incorporates evidence from biology, molecular genetics, population genetics, archaeology, and anthropology. This overview is followed by a rebuttal of "creationist purpose" and irreducible complexity. The next three chapters focus on the evolution of *Homo sapiens*, the origin of life and the cosmos, and the evolution of the DNA world. The last chapter is a polemic on the "dangers of creationism."

The authors present evolution clearly and concisely, and are fair to the evidence, rightfully admitting that we do notknow everything there is to know about evolution. As expected, while earlier chapters are laced with strong arguments for the validity of evolution, the chapters on the origins of life and the evolution of the DNA world are quite speculative and optimistic. The authors are clearly in their element when describing evolution. Their argument suffers, however, when they move to attacking creationism and intelligent design (virtually the same in their eyes) as myth and unscientific. The authors reduce ID to a defense of "perfect design" or teleological "purpose," then use that caricature to attack ID. Intelligent Design as a movement is much broader, with science, philosophy, and theology components (see Haarsma, *PSCF* 59, no.1 [2007]: 55). Reducing, if not misrepresenting, ID in such a manner makes it easier for the authors to argue against ID, but it clearly does a disservice to the movement and diminishes the integrity of the book for ASAers.

One highlight of the book was a section in Chapter 1 describing the responses of other (non-Christian) religions to evolution. The authors observe that other religions also have creationist movements similar to Christianity. Although the book's title suggested that this observation would more thoroughly examine this topic, this section was a mere ten pages, and left me wanting more.

The authors claim not to be against religion, but instead against those who feel they must interject their religious beliefs into the scientific realm. For the most part, the authors do remain neutral, or "non-religious," but there are several shots taken at scientists who argue that faith is supported—if not enhanced—by science. The idea that findings from science suggest there is a purpose for our existence or the acknowledgement of the anthropic principle particularly riles the authors, as they feel that science and religion occupy separate, if not warring, domains. Their negativity toward matters of science and faith seem to have fueled the concluding chapter of the book "The Dangers of Creationism," which is really an irrational rant about how creationism and intelligent design will ruin the technological and scientific supremacy of the United States. As the authors claim, "We must maintain the technological prominence of our country alive and well, and we can do so by preventing the introduction of theology and miracles into science courses. If we fail to discard this ideology, the world will watch, ponder, … and suddenly burst out laughing."

While the treatment of evolution is well written and the section on other world religions' responses to evolution is worthwhile, the issues noted and the other capable offerings available make it difficult to recommend this book. For those interested in "evolutionary evangelism," read the better offering by ASAer Darrel Falk: *Coming to Peace with Science* (2004).

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CREATIVE TENSION: Essays on Religion and Science by Michael Heller. Philadelphia, PA: Templeton Foundation Press, 2003. 171 pages, index, appendix. Paperback; $22.95. ISBN: 1932031340.

Michael Heller is the 2008 winner of the Templeton prize in science and religion and these essays demonstrate that the prize was well deserved. *Creative Tension* was published in 2003; however, because Heller is from Poland and has written largely in Polish, his work was virtually unknown to Western audiences until he received the Templeton prize. Heller is both a Roman Catholic priest and a cosmologist. He is actively engaged in research on noncommutative geometry and its application to relativity and quantum mechanics. Thus he brings the perspectives both of a practicing scientist and of a trained theologian to these essays. The result is a unique and stimulating integration.

Although each of the fourteen chapters could be treated as a stand-alone essay, they possess a natural flow from one to another. Part I consists of four essays grouped around the theme of methodological issues; Part II (also four essays) offers a historical perspective. Part III, titled "The Work of Creation," is the heart of the book; the three essays deal successively with relativity, quantum mechanics, and probability theory, frequently using Heller's own research to illustrate ideas. Part IV (also three essays) focuses directly on science and faith issues.

While it is well known that religious people often employ a "God-of-the-gaps" theology, Heller points out that people on the science side of the dispute often employ it as well, in the form of a "no gaps, no God" argument. The first essay discusses examples of both forms drawn from "big bang" theory. The second essay tackles the theological interpretation of physical creation theories. Teller analyzes the nature of physical theories and argues that it is not possible for a philosophical or theological interpretation to be in strict agreement with a physical theory—common language and the mathematical language of theory are too different. Thus at best such interpretations are metaphors. He also introduces a key theme—the most important questions for theology that arise from science are not associated with particular theories but rather are, "Why is there anything and why is the world comprehensible?" The third essay defines the "scientific image of the world" as a global picture of the physical world, obligatory for scientists in a given epoch and highly influential on nonscientists. He carefully describes the medieval, enlightenment, and contemporary images and persuasively argues for the importance of theologians understanding the image within which their culture operates. The last essay briefly discusses a possible program for a theology of science. It discusses two aspects of the world inaccessible to both philosophy and science—the contingency of the world and the values present in it—and offers some reflections on the rationality of the world. It then suggests that the principal role of revelatory data in consideration of science is not analysis of specific scientific theories (e.g., biological evolution or big bang cosmology) but rather consideration of the significance of the scientific endeavor.

Part II addresses the historical context of the religion-science conflict. Chapter 5 discusses the nature of the Copernican revolution. In the popular perspective, the pre-Copernican view placed humanity at the center of the universe and Copernicus displaced it. Heller argues that the medieval image was only vaguely geometric; it was more like a city with God (not humanity) in the center. Thus the Copernican revolution can be seen as moving humanity from "the privileged margin to the average center." He also discusses the processes that gave the Copernican revolution momentum and the "strangeness" the revolution introduced between science and theology—that science aims for intersubjective transferrable information whereas religion, at its root, involves an intimate nexus between an individual and God. Chapter 6 is critical to Heller's thought. He argues that Christianity was not simply a vehicle to carry Greek thought to the modern era. Rather, it introduced the notion that the world is contingent upon God's will, could have been made differently, and thus its nature cannot be discovered by speculation. This opened the door to empirical investigation of nature. Heller also points out that a deep tenet of science is that nothing should be accepted without sufficient proof or argument. But there is no a priori justification for this tenet; thus rationality becomes a moral choice—its successes can be viewed as revealing the correctness of that choice. For Christianity, "that Christ is the logos implies that God's immanence in the world is his rationality." There is thus a profound affinity between Christian belief and science; nevertheless, the age succeeding Copernicus was characterized by conflict between belief and science rather than by symbiosis, and Heller analyzes the basis for this. Chapter 7 is a brief analysis of the work of Teilhard de Chardin. In the mid-twentieth century, Chardin's work demonstrated a possible synthesis of evolution and Christian belief. But subsequent scientific advances have rendered Chardin's views out of date. Heller discusses three ways in which this has occurred. Chapter 8 examines the work of Georges Lemaitre, like Heller, a scientist and a priest. Lemaitre lived in the early twentieth century when logical positivism was ascendant. He was extremely careful not to mix his scientifc and his religious convictions. But today, even secular scientists speculate freely on religious and philosophical matters. Thus Lemaitre illustrates how much the climate surrounding these issues has changed.

"Although science and theology use different languages and employ different methods, they often speak on the same subject. Therefore confrontations—not necessarily conflicts—are unavoidable." These words introduce Part III, the most challenging and the most substantive section of *Creative Tension*. Chapter 9 examines the mathe-

matical definition of the initial singularity (also known as "the big bang") and conditions for its existence, and then suggests some philosophical and theological implications. It points out several dangers in identifying the initial singularity with God's creation of the universe. Most importantly, general relativity is a classical model—one that does not involve quantum mechanics. The initial singularity arises from solutions to the equations for general relativity. At quantum levels, this theory breaks down. Heller contrasts this with noncommutative geometric models; these generalize relativity, apply at the quantum level, but yield solutions that are totally nonlocal. Thus space, time, and individuality do not exist in their usual meanings. One noteworthy implication is process theology's view that an atemporal God would be static. In fact, noncommutative models yield solutions which are global states that are dynamic—that is, change can occur apart from space and time. Thus this claim of process theologians is falsified. Chapter 10 extends the discussion of noncommutative geometry and quantum mechanics and explores some fascinating implications for generalized notions of causality without time and probability and without individual events. Heller also suggests that these notions will necessitate some rethinking of God as primary cause. Chapter 11 addresses the views that conclude that reality, at its most fundamental level, is random; often such views are presumed atheistic. But such a presumption neglects two principal questions: Why do the laws of probability apply to the world? And, why should the world be "frequency stable"—i.e., why does the law of large numbers hold? Heller concludes this section by arguing that any natural theology is sentenced to a "God-of-the-gaps" strategy; therefore we need to distinguish between essential and nonessential gaps. He argues that all gaps are spurious except two and perhaps a third: Why is there something rather than nothing? Why is the world comprehensible? How do we account for meaning and values?

Part IV focuses on the limits of science, acknowledging that "limits" may be a poor metaphor as there are no sharply defined boundaries. Chapter 12 is titled "Illicit jumps—the logic of creation" and focuses on the interplay between syntaxis and semantics in language. The leap from syntaxis to semantics is often a source of paradox—for example, "This sentence is false." But it works in three important examples: in the genetic code, syntax generates semantics; in the human neuronal system, signals give rise to consciousness; and showing that mathematical laws could make it possible for something to arise out of nothing (as some have argued) does not account for the origin of the laws. But he cautions against God-of-the-gaps inferences here. Chapter 13 addresses the concept of rationality. It's tempting for empiricists to identify rationality with the mathematical-empirical method. But there exist other ways of knowing that seem rational. Consider the statement "The mathematical-empirical method is rational." This cannot be verified by the mathematical-empirical method. Heller suggests some thoughts on what such a broadened concept of rationality might look like. Chapter 14 concludes the book with some thoughts on science and transcendence, noting that contemporary science teaches us as never before a sense of mystery; it ends with a collection of thoughtful questions that foster this sense. The book includes an appendix describing the work of the Center for Interdisciplinary Studies in Cracow (to which Heller belongs) and its work in science and religion.

Creative Tension is well written and stimulating reading. Anyone trained in physical science or mathematics should have sufficient background to understand all of the technical concepts; someone in the social or life sciences may need to skip some technical explanations; a person trained in the humanities can still find much here but will need to read selectively. I highly recommend it for anyone interested in the science-religion conflict.

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EXPLORATIONS IN NEUROSCIENCE, PSYCHOLOGY, AND RELIGION by Kevin S. Seybold. Burlington, VT: Ashgate, 2007. 163 pages, bibliography, index. Hardcover; $89.95. ISBN: 0754655636.

In this volume, Seybold, Professor of Psychology at Grove City College in Pennsylvania, attempts to address current questions about how the brain is related to mental and physical actions as well as to religious behavior. This is his first single-authored volume although he has co-authored several previously published articles relating psychology and religion.

For the uninitiated, this volume could well serve as an introduction to neurology as well as a survey of current philosophical and psychological reasoning about higher mental processes. Chapters include Neuroscience, Psychology, Religion, Philosophy of Science, Integration Issues, Brain and Religion, The Self, Evolutionary Psychology, Religion/Spirituality and Health, and The Future.

The writing is succinct and the chapters are well organized. Seybold reflects an involvement in the Templeton Foundation seminars on science and religion. He has probably received some foundation support for course preparation as well as encouragement to prepare the present volume. The content of the book seems grounded in a number of their concerns about the relation between religion and the physical sciences. As a compendium of the philosophical and theological implications of developments in neuroscience, the volume certainly seems to have accomplished its intent.

Seybold argues that while human life is embedded in physical and social reality, selfhood, religious faith, and morality are more than the products of biological evolution. He follows Nancey Murphy in identifying himself as a "non-reductive realist." He includes a comprehensive survey of "evolutionary psychology" in general and Edmund Wilson in particular. For Seybold, religion and ethics are more than superficial solutions to the human needs for security and selfishness. He counters Wilson's assertion that these are culturally regressive accretions that are falsely based on transcendental foundations.

Nevertheless, Seybold considers how a physicalist, such as himself, can avoid a dualist's understanding of the human soul and what are the ramifications of his position for the Christian belief in the resurrection of

the dead. He offers no rational solution to this dilemma and simply notes the importance of embodied selfhood implicit in the church's resurrection faith. He discounts any presumption that belief in the human spirit means eternal life will involve non-embodied souls floating around on clouds.

I found Seybold's treatment of a basic philosophical issue of neuroscience, "consciousness," somewhat undeveloped. Although the index refers to this concept fourteen times, he does not deal with the issue in more than a cursory manner. Particularly in the discussion of evolutionary psychology, the unique feature of self-awareness among humans would have seemed to be of central concern. Of course, it should be noted that the issue of the emergence of consciousness coupled with an empathy for self-awareness in other people remains somewhat of a mystery in almost all fields.

The section on philosophy of science was especially informative. The discussion considers the positivism of B. F. Skinner and others in the light of "post-positivism"—the view that all science is "theory laden." Following Kuhn, science is best seen, not as a continuing straight line of discoveries built, but as theories that are tested until they are questioned and other paradigms are presented. Seybold suggests that science has a "social nature" in that scientists come together in groups to assess facets of the theories that guide them.

However, the hierarchical model of the sciences that he presents, wherein physics is pictured at the bottom and theology is pictured at the top, would not seem to fit into Seybold's basic system. On the one hand, only a few theologians would label theology as a science and, on the other hand, the model implies reductionism—an implication I do not believe Seybold would espouse.

In sum, readers of *PSCF* will find this volume well worth reading—both for the surveys it supplies and for the paradigm that it affirms. Seybold can assume he has a place as a seminal Christian psychologist.

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Social Science

EX-GAYS? A Longitudinal Study of Religiously Mediated Change in Sexual Orientation by Stanton L. Jones and Mark A. Yarhouse. Downers Grove, IL: InterVarsity Press, 2007. 420 pages. Paperback; $24.00. ISBN: 978083082846X.

Society at large and the professional psychological and psychiatric communities as represented by their leading professional associations consider male homosexuality to be not a choice, but a predetermined way of life. Attempts to change male homosexuals' orientation are considered harmful and impossible to sustain. This remarkable study presents scientific evidence that such claims have to be modified in light of contradictory findings. On the other hand, the study also suggests that glib evangelical claims that homosexuality can be easily changed and is merely a moral choice are also overstated.

The senior author is provost and professor of psychology at Wheaton College (IL). His junior author is a graduate of Wheaton's doctorate of psychology program and is professor of psychology and director of the Institute for the Study of Sexual Identity at Regent University, VA. Using funds provided by evangelical ministries, the authors set out to study, in a rigorous longitudinal manner, ninety-eight subjects who were thought to be representative of males seeking change through Exodus, a Christian ministry to the gay community. The main hypothesis was the standard professional view, that change of sexual orientation is impossible and that the attempt to change is highly likely to produce harm for those who make such an attempt. Their two main findings were that it is possible for some to embrace chastity and reduce the prominence of their homosexual desire, and that in some cases homosexual attraction can diminish and heterosexual attraction can increase with a resultant satisfactory heterosexual adjustment.

The authors are to be commended not only for the rigor with which they designed and prosecuted this study, but also for the various clever means they used to obtain methodological reviews and other necessary feedback from experts who were opposed to the very idea of the study. Their description about their attempts to publish the book with a secular publishing house demonstrates the manner in which ideology can rule the academy and those who publish on its behalf. Fortunately, InterVarsity Press agreed to publish this book that is written at a level of methodological rigor and detail that is rare for a general Christian publishing house. The authors are cautious in their narrative descriptions about all aspects of the study, especially its conclusions. It can only be hoped that others will now seek to replicate this study and demonstrate, with larger samples or samples drawn from different organizations, that what was observed in this sample of persons within the Exodus ministry is a real artifact that transcends one particular group within one particular Christian ministry at one particular point in time.

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Technology

THE RECEPTION OF JACQUES ELLUL'S CRITIQUE OF TECHNOLOGY: An Annotated Bibliography of Writings on His Life and Thought by Joyce Main Hanks. Lewiston, NY: The Edwin Mellen Press, 2007. 546 pages, indices. Hardcover; $139.95. ISBN: 9780773453739.

Jacques Ellul (1912–1994) would certainly make a short list as one of the most influential Christian thinkers of the twentieth century. His prolific writings have evoked admiration and controversy in many different arenas of academic and public life including the environmental movement, biblical and theological circles, social criticism, political theory, ethics, philosophy, and finally, law, the area in which he was formerly trained and worked as a university professor at Bordeaux. (He also was a lay preacher in the French Reformed Church.) The far-ranging nature of his writings and the provocations they encapsu-

lated are still invoked by an extraordinarily diverse group of people across the sociopolitical spectrum.

Hanks, a professor of French language and literature at the University of Scranton, has been a long-time member of the International Jacques Ellul Association and very active in scholarship related to this seminal thinker. She is widely known as the premier bibliographer of Ellul, who left behind a huge volume of material—much of it totally disorganized and scattered. Her most recent effort along these lines before this volume was *Jacques Ellul: An Annotated Bibliography of Primary Works* that was published as *Research in Philosophy and Technology, Supplement 5* in 2000 by JAI Press. This volume is the result of a multi-year effort to collect in one volume significant writings in English and French about Ellul's work and life from the 1930s to the present, based largely but not exclusively on collections at Regent College Library in Vancouver, BC, and Wheaton College, IL. Entries are grouped into three main categories (chapters): (1) books, articles, and interviews; (2) dissertations; and (3) reviews of Ellul's books. Notes for each entry range from a few words to a few paragraphs. A very comprehensive set of indices covers authors and subjects. This resource is invaluable for anyone who wants to explore the impact and ideas of Jacques Ellul as viewed through the eyes of others.

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TECHNOLOGY AND SPIRITUALITY: How the Information Revolution Affects Our Spiritual Lives by Stephen K. Spyker. Woodstock, VT: SkyLight Paths, 2007. 158 pages. Hardcover; $19.95. ISBN: 9781594732188

"Most of us are not terribly reflective about the technologies we use." So asserts Stephen K. Spyker in the first line of the book. Spyker is an engineer and technologist by disposition with thirty-five years of experience at the intersection of technology and spirituality. He currently serves as the director of information technology at Earlham School of Religion and Bethany Theological Seminary.

Spyker pays particular attention to how technologies shape our spirituality. He employs the device or concept of "matrix" to describe the rather complex relationship between one's spirituality and technology. He borrows this concept from the fields of mathematics and computer science and uses it in two different, yet related ways. First, a matrix represents a place of origination. In order for us to understand something as multifaceted as technology, we need a matrix to represent the varied imagery associated with a complete definition of a given technological concept or the emergence of a given technology. A matrix implies that technology is much more subtle and less well defined than most people realize. Technology, in fact, operates at a much deeper level than is usually considered.

Secondly, the matrix represents the interconnectedness of technology and one's spirituality. In other words, there are many levels or planes of relationships on which technology and spirituality exist and many "lenses" through which to view these relationships. The book employs eight of these lenses to observe the influence that technology has on our spirituality. The lenses are simplicity, transparency, community, identity, relationship, velocity, connectivity, and liberty. Spyker devotes one chapter to each of these lenses, demonstrating how they allow readers to evaluate the impact of emerging technologies on their life.

For the first of these lenses, simplicity, he reminds us that the promise of technology was a simpler life. He goes on to ask if certain technologies have had the opposite effect. Other discussions include how technology has increased the "speed" or pace of our lives, how it has tailored some of our goals and ambitions, the way in which it shapes or influences one's own identity, and the ways that it filters our view of the Divine. Spyker extends this dialogue quite successfully to the areas of daily life that technology affects and insightfully demonstrates how entrenched technology has become in our lives.

Part of the appeal of this book is its accessibility to those who would not consider themselves very savvy in the sphere of technological innovations. In fact, in some regards, people in this camp are the intended audience. Yet, the discussions probe deeply enough that even those of us who consider ourselves technologically literate would do well to reflect upon them. Spyker strikes the right balance between popular appeal and sophisticated dialogue to engage a broad readership. This book gives the reader an opportunity to reflect on the myriad of ways everyday life is influenced by the vast technological developments that are a part of the modern world.

Reviewed by Kyle Hilton, Vestal, NY 13850. ⊙

Letters

First Man versus Adam in Genesis

In a letter to *PSCF*, P.G. Nelson[1] comments on an apparent problem with my article[2] in which I am suggesting that Adam and Eve in Genesis 2–4 came later than the first humans in Genesis 1.

He claims that the first human in Gen. 1:27 is the same as Adam in Gen. 2:7, because the same expression (*ha'adam*, "the man") is used in both cases, the article (*ha*) being retained in what follows, and Adam (*'adam*) without the article is used later only, beginning with Gen. 4:25. But 1:26 has "Let us make man" (*'adam*), immediately followed in 1:27 by "So God created man" (*ha'adam*). Both refer to the same collective of humans, as explained by the specification, "male and female he created them," which implies that here "man" is not Adam, but humanity.

Then, Gen. 2:7–4:1a uses *ha'adam* including the article (2:23b and 4:1b have *'ysh* rather than *'adam* for "man"—for obvious reasons). Nelson apparently takes "there was no man to work the ground" in 2:5 (*'adam* without the article) to refer to mankind as a whole, believing that what follows is a creation story amplifying 1:27. But he

does not explain why in 4:1a, when Adam fathered Cain, the article is used with his name, but not in 4:25, when the same Adam fathered Seth. Nor does he say why 5:1–5 omits the article consistently (5 times) for the same Adam with whom Genesis 2–4 is dealing. From Genesis 6 onward, "man" cannot denote Adam any more, yet in virtually every case in the rest of Genesis we read *ha'adam*, the same form used for Adam in Genesis 2–4.

Nelson claims that the transition from singular to plural in Gen. 1:27, "in the image of God he created him; male and female he created them," is explained by the story of the creation of Eve in 2:21–23, implying that therefore in 1:27, "him" refers to Adam and "them" to Adam and Eve. This is not compelling. It looks like circular reasoning. Starting with a belief that Adam was the first man, he concludes that 1:26–27 must refer to Adam, and from this, he concludes that "male and female he created them" in 1:27 must refer to Adam and Eve. Similarly, some translations of 1:27 incorrectly talk of a man and a woman, whereas "male and female" are generic terms. So "them" can be the same collective entity as "him," which is plural in essence.

A given form of an expression is no guarantee that it always designates the same entity. The context has to be considered within the sentence, the paragraph, the book, the whole Bible, ancient culture, and language flexibility.

One crucial case of context sensitivity is the question of the extent of the geographical frame. Gen. 1:1–2:4a is a creation story, referring to the entire universe, the Earth, and life as a whole. On the other hand, 2:4b–4:16 deals with the history of God's personal dealing with Adam and his family.[3] This second section of Genesis is clearly centered in southern Mesopotamia, the land of Sumer of the fifth millennium BC, as evidenced by the four rivers of 2:10–14.[4]

Between Gen. 2:4b and 12:3, there is no obvious break in the narrative, the geographical context gradually widening toward the northwest, before Abraham goes to Canaan. Nothing in this long story deals with the whole Earth. In particular, this applies to Noah's flood, its farthest northwestern reach being near Cizre on the upper Tigris, at the edge of the low hill country part of Urartu (Ararat).[5]

Notes

[1]P.G. Nelson, "Adam and Eve," *Perspectives on Science and Christian Faith* [*PSCF*] 60, no. 1 (2008): 71.

[2]P. Rüst, "Early Humans, Adam, and Inspiration," *PSCF* 59, no. 2 (2007): 182–93.

[3]Gen. 2:4 constitutes a symmetric bridge linking the two parts in a manner indicating a temporal succession, rather than an expansion; cf. A. Held and P. Rüst, "Genesis Reconsidered," *PSCF* 51, no. 4 (1999): 231–43.

[4]C.A. Hill, "The Garden of Eden: A Modern Landscape," *PSCF* 52, no. 1 (2000): 31–46.

[5]C.A. Hill, "The Noachian Flood: Universal or Local?" *PSCF* 54, no. 3 (2002): 170–83.

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Does the Bible Really "Declare" the Earth Young?

In the recent response (*PSCF* 60, no. 1 [2008]: 35) to the essay review of Randy Isaac on Radioisotopes and the Age of the Earth, Larry Vardiman, a physicist at the Institute for Creation Research and a member of the RATE group, said, "... the apparent conflict between the billions of years of earth history commonly espoused by conventional science and the thousands of years declared by Scripture seems to be resolvable." This sentence raises a question: Does the Bible really declare the earth young?

Unfortunately, I did not find any biblical sentence that declares the earth young or the earth old. The Bibles that the RATE Group used would be the same as others. I believe, therefore, that the RATE Group should correct the phrase "declared by Scripture" with "declared by young-earth creationists" in the sentence. There can be many interpretations for a single declaration of the Bible. Of course, the young-earth argument is just an interpretation. An interpretation should not be confused with the biblical declaration.

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Can Science Make the "Breath" of God Part of Its Subject Matter?

Graeme Finlay (*PSCF* 60, no. 2 [2008]: 103–14) reflects on how the randomness of natural processes achieves God's creative purpose. Finlay indicates:

> To the Christian it is axiomatic that each one of us is a created being (Ps. 139). Scientifically, we are the product of random genetic process. Theologically, we are the outcome of loving divine purpose. Molecular randomness (in scientific terms) and createdness (in theological terms) inevitably go hand-in-hand.

A human being is a physical/nonphysical/supernatural entity, which is quite consistent with the Christian notion of humans as body/mind/spirit (Matt. 6:22, Rom. 12:2, 1 Cor. 2:11). Scientific study of the human genome cannot access the nonphysical in humans. The notions of life, consciousness, and rationality lie at the foundation of the humanity of humankind, but cannot be reduced to the purely physical. The latter somewhat contradicts the assertion that "Genetic mechanism in all its happenstance has produced the genetic basis of humanness."

Consciousness is a moment-by-moment awareness of our temporal existence and surroundings. Human knowledge has access only to snapshots and flashbacks of reality. God is the being forever conscious and thus eternal that does not exist in time. God has no history and so he experiences the whole of reality as an eternal "Now."[1] God is the supernatural or divine being that is omniscient and sustains His creation (Heb. 1:3). It is not

clear, however, how God's action in spacetime can form part of a strictly evolutionary description of humans.

The Apostle Peter needed the Father in order to know the true nature of Jesus (Matt. 16:16–17). Perhaps the supernatural in humans actually mediates between the nonphysical mind (knowledge of who Jesus is) and the physical body (flesh and blood) and exercises the free will we possess. Science does not deal with the nonphysical and less so with the supernatural aspects of humans. Thus no development in evolutionary theory, *qua* scientific theory, can ever shed light on the true nature of humans, which can only be understood by knowing Jesus the Christ.

Verbs usually connote an action with temporal duration, which is not applicable to God. Certainly, God does not acquire knowledge as we do. He just knows. His knowledge is not temporal. However, for us, embedded in spacetime, our description of nature in terms of deterministic or probabilistic laws will give us only the physical aspect of the whole of reality. A complete understanding will include the supernatural, which is inaccessible to scientific inquiry no matter how science is defined. Therefore, if evolutionary theory is unadulterated science, then it cannot account for the true nature of a human being.

Of the different kinds of knowledge needed to study the whole of reality, only metaphysics and theology address the ontological question of existence while science deals only with the physical aspect of nature.[2] These issues are paramount when attempting to forge a solid integration of evolution with the Christian faith. Ascribing the genomic structure and temporal development in nature to "God's faithful dealings with his creation" may be satisfying to a Christian, but contrived to an unbeliever.

"Then the Lord God formed man of dust from the ground, and breathed into his nostrils the breath of life; and man became a living being" (Gen. 2:7). Physical science has successfully developed paradigms to study nonliving "dust." However, can science make the "breath" of God part of its subject matter? Is the concept of life so elusive that it becomes scientifically indefinable? Perhaps the inability of nonliving matter to detect and identify life as well as consciousness indicates that only life itself can "detect" and know life. Similarly, only self can "detect" and know self. Consciousness presupposes rationality, rationality presupposes life, and life presupposes God. Human rationality and consciousness are used to know nature and God, yet paradoxically humans may be unable to formulate a scientific theory either of life or of self.

Notes

[1]C. S. Lewis, *Mere Christianity* (New York: Macmillan Paperback edition, 1978), 145.

[2]Moorad Alexanian, "Teaching, Propaganda, and the Middle Ground" (Letter), *Physics Today* 11 (2000): 80.

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AI, Scripture, and Hardware

I found two problems in Russell C. Bjork, "Artificial Intelligence and the Soul" (*PSCF* 60, no. 2 [2008]: 95–102). He cited a usual translation of Psalm 8:4–5. This is the only time among the 2606 occurrences of *élohim* that the King James version translates it as "angels." This follows the LXX *[Septuagint*] and is commonly adopted by other translations. A proper translation should indicate that human beings are a little below God, a thought that better fits 1 Peter 1:12. Why should the greater yearn to look into the state of the lesser?

From this it follows that strong AI expects the production of an image of the fallen image and likeness of God. Would this produce a mortal apparatus? An immortal one? Or would the possibility of exchanging parts and updating programs give it improved and unending existence? There is also a vital difference between a device that can perform a range of specific tasks more rapidly and accurately than humans can, and one that can self-consciously make moral decisions well or poorly. Can the machine comprehensively improve on the imitated person?

As a bonus, one may ask whether digital hardware, the current option, can ever adequately emulate analog wetware, even if this is all there is to consciousness.

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American Scientific Affiliation

The American Scientific Affiliation (ASA) is a fellowship of Christians in science and related disciplines, who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. Founded in 1941, the purpose of the ASA is to explore any and every area relating Christian faith and science. *Perspectives on Science and Christian Faith* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community. The ASA Statement of Faith is at www.asa3.org/ASA/faithASA.html

Canadian Scientific & Christian Affiliation

A closely affiliated organization, the Canadian Scientific and Christian Affiliation, was formed in 1973 with a distinctively Canadian orientation. The CSCA and the ASA share publications (*Perspectives on Science and Christian Faith* and the *ASA/CSCA Newsletter*). The CSCA subscribes to the same statement of faith as the ASA, and has the same general structure; however, it has its own governing body with a separate annual meeting in Canada. Contact CSCA by writing to: Canadian Scientific and Christian Affiliation, PO Box 63082, University Plaza, Dundas, ON L9H 4H0 or visit their website at: www.csca.ca

How Do I Join the ASA?

Anyone interested in the objectives of the Affiliation may have a part in the ASA. Membership and subscription applications are available at www.asa3.org/ASA/joinASA.html

Full membership is open to all persons with at least a bachelor's degree in science who can give assent to our statement of faith. Science is interpreted broadly to include anthropology, archeology, economics, engineering, history, mathematics, medicine, political science, psychology, and sociology as well as the generally recognized science disciplines. Philosophers and theologians who are interested in science are very welcome. Full members have voting privileges and can hold office.

Associate membership is available to interested nonscientists who can give assent to our statement of faith. Associates receive all member benefits and publications and take part in all the affairs of the ASA except voting and holding office.

Full-time students may join as **Student Members** (science majors) with voting privileges or as **Student Associates** (nonscience majors) with no voting privileges.

Spouses and **retirees** may qualify for a reduced rate. **Full-time overseas missionaries** are entitled to a complimentary membership.

An individual wishing to participate in the ASA without joining as a member or giving assent to our statement of faith may become a **Friend** of the ASA. Friends receive all member benefits and publications and take part in all the affairs of the ASA except voting and holding office.

Subscriptions to *Perspectives on Science & Christian Faith (PSCF),* are available at $40/year (individuals), $65/year (institutions) and $20/year (students).

How Do I Find Published *PSCF* Articles?

Articles appearing in *Perspectives on Science and Christian Faith* are abstracted and indexed in the *Christian Periodical Index; Religion Index One: Periodicals; Religious & Theological Abstracts*, and *Guide to Social Science and Religion in Periodical Literature*. Book Reviews are indexed in *Index to Book Reviews in Religion*. Present and past issues of *PSCF* are available in microfilm form at a nominal cost. For information write: University Microfilm Inc., 300 North Zeeb Rd., Ann Arbor, MI 48106.

Contents of past issues of *PSCF* are available at www.asa3.org/ASA/PSCF.html

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