PERSPECTIVES on Science and Christian Faith

JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

In this issue . . .

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

VOLUME 49, NUMBER 4 DECEMBER 1997

Perspectives on Science and Christian Faith

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MANUSCRIPT GUIDELINES

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

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2. Authors of *Papers* and *Communications* must submit **3 copies** of their paper for review purposes (an original and two copies).
3. Regular Papers should be accompanied by an *Abstract* of not more than 100 words.
4. All manuscripts should be typed double-space on good quality 8 1/2 x 11 paper (computer copies should be printed letter-quality).
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6. Figures or diagrams should be clear, black and white, line ink drawings or glossy photographs *suitable for direct reproduction.* Captions should be provided separately.

REGULAR PAPERS are major treatments of a particular subject relating science and the Christian position. Such papers should be at least 10 manuscript pages in length, **but not more than 6000 words**. Publication for such papers should normally take 18 to 24 months from the time of acceptance.

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New Features For *PSCF*

Old traditions often become deeply embedded. Except for minor tweaking, *PSCF* has maintained its present form for two decades. However, recent discussions with ASA commissions, the Young Scientists Task Force, and the Executive Council have led to new categories of articles in an effort to attract a wider readership and serve our membership more effectively.

News & Views examines recent developments in science which have significance for the ASA mission. We will offer short informed statements on the science involved, include references to the wider literature, then provide context for the implications that might be drawn for a Christian understanding of nature or the scientific enterprise. Will you contribute to this section?

The ***Young Scientists' Corner*** provides features of interest to students and those in the early stages of their scientific career. To begin, we offer a biographical essay from a married scientist-engineer duo which describes what drew them to science (and each other) and how this has played out in their relationships with the Christian community. There are other themes that could be explored. We look to our readers for suggestions and written contributions.

Another idea, ***Rapid Communications*** category for *PSCF*, has been simmering in the minds of the editor and the Communications Commission. For several years there has been a running debate as to the validity of placing everything from *PSCF* on our web site. Proponents say that our outreach will be maximized if that were the case; others ask who will pay for this service. One step in the direction of electronic publication would be to offer web-site publication of papers that speak to current issues, whether breaking stories in the scientific literature or hot-button items on the science-religion listserves. As a quarterly with an eighteen month backlog of papers, *PSCF* occasionally offers articles that are "out of date." There are several papers in the review process on Intelligent Design-Theistic Science issues which fit this category.

Electronic papers would go through the same peer review/revision process and be abstracted in *PSCF*. The full paper would appear *only* on our web page. We would aim for publication within three months of receipt. Authors of papers in this category would have their choice of electronic or regular publication. Please let me know what you think of this proposal.

Jack Haas, editor
haas@gordonc.edu

In This Issue

In our first paper, Jay Richards takes a hard look at the blurring of lines between "hard science" and "metaphysics" in the context of Many Worlds Hypotheses (MWH). MWH have emerged from the increasing recognition that the universe appears contingent and seems fine tuned for supporting the existence of life. Christians and atheists each appeal to these phenomena. Richards, however, suggests that the weight of the argument falls in the direction of the theists.

F. LeRon Shults then examines the tension between absolutism and relativism—the "postmodern dilemma"—as an issue in the way that we seek to relate science and Christian faith. One result has been a fragmentation of knowledge which keeps us from achieving this goal. He proposes a solution based on based on the psychology of Robert Kegan, the complementarian logic of W. Jim Neidhardt, and the critical realism of Wentzel Van Huyssteen.

Our final two papers offer concordistic studies of the "flood" and the "fall." Glen Morton provides biblical, geological, and anthropological evidences to support a local flood model of Noah's flood based on the desiccation of the Mediterranean Sea basin. Gavin McGrath then carefully examines the implications of the fall of Adam on human culture and nature. Keith Miller's Communication provides a much needed corrective to misconception about the nature and interpretation of the fossil record. We close this issue with book reviews and the always popular Letters to the Editor.

Young Scientists' Corner

Taking the Road Less Traveled: Reflections on Entering Careers in Science

by Keith B.* and Ruth Douglas Miller*, Kansas State University, Manhattan, KS 66506

In today's cultural and religious climate, the pursuit of a professional career in science as a Christian calling and ministry is certainly becoming a road less traveled. The evangelical Christian community at best views science as an apologetic tool, if not with skepticism or outright hostility. Rarely do evangelicals see science as a God-affirmed pursuit of truth or a quest toward a deeper understanding of God's creation. Nor do they recognize the vital importance of science for a proper Christian stewardship of the creation. We here recount some of the important lessons that we have learned in our personal entry into our scientific and engineering careers.

Children have an innate curiosity about their natural environment, and that interest was cultivated in both our lives. As we grew up our parents strongly affirmed our interests in nature and science. They encouraged us to see the value and enjoyment of observing nature. A love of nature and a desire to understand it grew from our childhood fascination with the insects, birds, plants and rocks we encountered around us. Keith's parents also affirmed for him the reality of God's presence and involvement in creation. Furthermore, the living witness of his parents made clear that God has a claim on all aspects of our lives. His parents' lives evidenced no sacred/secular dichotomy, but did demonstrate that sacrificial giving was the expected outcome of Christian faith.

In contrast Ruth was not raised in awareness of God, and formed her ideas of religion on her own, based on what she read. Her parents' scientific training and outlook perhaps had something to do with her empirical, experiential view of spiritual things—she chose not to believe in a God she could not see, hear, or feel. It took the body of Christ living his love toward her to convince her of the reality of God—this in a non-denominational high school fellowship group. Unfortunately the same group placed little emphasis on the life of the mind, so that Ruth went to college assuming her eventual career would have little to do with her faith except as a place to share Christ with others.

Non-denominational fellowships strongly influenced Keith during high school as well. The Jesus movement of the 1970s greatly strengthened his relationship with God. Inspired by the experience of Christian community during an outdoor charismatic Christian festival in 1973, a fellowship of high school students began meeting in his home, and like Ruth he experienced the love of God as shown through fellow believers.

Keith became increasingly aware of the central importance of the body of Christ, and the value of its diversity, during his college years. Through his involvement in InterVarsity Christian Fellowship he learned the value of divergent viewpoints in understanding and applying Scripture.

**ASA Fellow*

Understanding the meaning of Scripture simply could not be done in isolation from the body of Christ. College provided important opportunities to experience differences in worship, theology, and culture. Keith values the opportunity he had to participate in a wide range of denominational worship styles, experiences which have proved very helpful in broadening his understanding of the Church universal.

At college Ruth experienced a new thing: a faculty mentor in her own field who was openly a Christian. This dedicated researcher and engineer was the advisor to the InterVarsity chapter on campus. He displayed over his desk a sign listing Maxwell's equations (describing all electromagnetic phenomena) as the words spoken by God to bring light into being. That may have been the first Ruth knew of "work" being an expression of service and worship of God, and those magical equations still proclaim his glory to her daily.

With the beginning of the serious study of our disciplines in graduate school, we first came to understand what was involved in advancing our understanding of the natural world. It was very enlightening to realize the degree of disagreement and debate within the scientific community, and it was exciting to become a part of that debate. It also was apparent that scientific researchers, although affected by a variety of personal biases and pressures, are driven by a passionate desire to pursue truth. Scientists vigorously defend a particular hypothesis or interpretation because they believe it to more truly reflect the reality of the natural world than a competing interpretation. The often intense debates occurring at scientific meetings and in the scientific literature are expressions of this commitment to truth, and provide continual critical tests of our present understanding of nature.

With the beginning of the serious study of our disciplines in graduate school, we first came to understand what was involved in advancing our understanding of the natural world.

While the parallels between the search for truth in nature and the understanding of Scripture seem obvious now, it was not until our participation in a graduate Bible study group at the University of Rochester that we really began to think in terms of integrating our faith and learning. Finding the graduate fellowship at Rochester (and Keith!) and the ASA was "coming home" for Ruth—here was a group of Christians of like faith who valued the life of the mind! This group of graduate students, diverse in both denominational backgrounds and chosen academic disciplines, provided a fertile environment for the stimulating discussion of our common Christian faith. This group spelled out clearly the idea that what we do, in the lab, in industry, or in the classroom is all service to God. We pursued truth in a holistic sense. We brought our particular understandings of nature, history, and philosophy, obtained from our academic work, to bear on our scriptural interpretation and application, and we brought scriptural principles to bear on issues we faced in our academic pursuits. Because we were willing (or became willing!) to question our own theological positions and consider diverse perspectives, we all grew in our understanding of God. This would not have occurred in an environment in which we were isolated from other theological traditions and from the perspectives of different academic disciplines. We fear this is precisely the situation for much of the evangelical Church, which has isolated itself not only from the academy but also from other believers. One expression of this is the lack of appreciation for the history of ideas—even the history of our own theological traditions.

It was not until our participation in a graduate Bible study group at the University of Rochester that we really began to think in terms of integrating our faith and learning.

In more recent years, we have continued to grow in our understanding of God's claim on all reality, and on all aspects of our lives. Stewardship includes much more than our money and time. It should be a lifestyle that includes the life of the mind and what we do in our chosen professions.

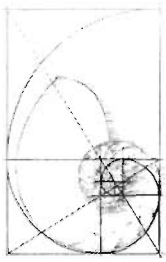
There is indeed no sacred/secular distinction. This was made very clear to us during our visit to Cambridge, England in 1994 for the C.S. Lewis Summer Institute. Lining the walls and floors of the cathedrals and village churches in England are memorials to the lives of Christians recognized for their service, not as missionaries or pastors, but as honored contributors to the sciences and arts. The buildings themselves are testimonies to the highest attainments in art and engineering. In these places Christians recognize lives lived in devoted pursuit of science, literature or art as fulfilling a divine calling. It is unfortunate for both the Church and our culture that this understanding has been largely lost in the United States.

Stewardship includes much more than our money and time. It should be a lifestyle that includes the life of the mind and what we do in our chosen professions.

From our own experiences entering the scientific and engineering professions, we would place several challenges before the evangelical church in the United States. (1) Encourage young people in the pursuit of their God-given talents and affirm their spiritual callings to serve God in their professions. (2) Recognize the value of divergent viewpoints in issues not central to the Christian faith. We need to openly discuss the different perspectives on issues held by committed believers. When we are unwilling to consider the positions of others, or to question our own strongly held beliefs, we restrain the Holy Spirit from guiding us to a fuller understanding of Scripture and its application in a very technological and scientific world. How can we deal redemptively with the complex issues we face in our society if we do not value the professional and academic training required to understand them? (3) Encourage young people to think deeply about their faith and the world. Discuss the contributions of the great Christian thinkers of the past and present. Honor those who have made seminal contributions to the advancement of human knowledge.

Each of us is called to full-time service to Christ and the Church. Be assured that the pursuit of knowledge and truth honors God, and empowers the body of Christ to be a transforming power in society.

For those who may be just beginning their path toward a career in science or engineering, we offer the following words of encouragement. In studying the processes of the natural world, you are watching the hand of God at work. By striving to understand the workings of creation, you are equipping yourself to fulfill the stewardship mandate given to us by God. Never think of your calling as a scientist or engineer to be of less value than a calling to "full-time ministry" as a pastor, teacher, or missionary. Each of us is called to full-time service to Christ and the Church. Be assured that the pursuit of knowledge and truth honors God, and empowers the body of Christ to be a transforming power in society. While in school seek out Christian faculty as mentors—and don't think that secular colleges employ no Christian faculty. The faculty ministry of InterVarsity (smorrison@ivcf.org), for example, is working to develop a mentoring program in colleges and universities throughout the U.S. Finally, the academy, and professions, can be engaged by Christians who demonstrate a mastery of their disciplines, and who take seriously the views of others. It is the passionate pursuit of truth, not a defensive response to criticism or a reactionary denouncement of others, that will make the Christian worldview a respected voice. Above all, a life lived with integrity and in sacrificial service will reveal the reality of a God who demands our entire lives. ★



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Workshop registration is limited to 75 spaces. A registration fee of U.S. $100 or Eurocheck in U.S. dollars is required to reserve your place. Room and board for the workshops are underwritten by the John Templeton Foundation. ***Registration deadline for the winter workshops is December 17, 1997. Registration for the summer workshops is April 15, 1998. Registration after this deadline is based on availability.***

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News & Views

Nature Survey Shows American Scientists' Religious Beliefs Essentially Unchanged Over Eight Decades

by Editorial Staff

Various surveys of American religious attitudes have shown that more than 90% of the general public believe in a personal "God"; perhaps 70% define God in the theistic sense.[1] Predictably, a majority of those in academic life come down on the side of non-belief.[2] A recent *Nature* survey attempted to see if there was any change in the attitudes of a random sample of 1,000 names drawn from the 1910 edition of *American Men of Science* and the 1995 edition of American Men and Women of Science.[3] In each sample about half were biologists and a quarter each in mathematics and physics/astronomy (chemists were not included).

James Leuba's 1916 survey found that 60% of scientists did not believe in God; he felt that the number would increase with time. Instead, 8 decades later, the number is about the same. One of the interesting features of the 1916 survey was that 20% of those who disbelieved in God did believe in personal immortality; the 1996 survey found the more logical paring of belief in God and immortality. One further distinction found today's mathematicians the most inclined of the disciplinary groups to believe in God (45%) while disbelief was most prevalent among biologists in 1916 (69.5%); that ranking is now held by physics/astronomy (78%).

While it is encouraging to see that *some* "scientists are still keeping the faith," Christian students in non-religious institutions should expect to have their faith tested just as those who went before them. The ASA was founded in part to support such young people. ★

Notes

[1]Jeffrey L. Sheler and Joannie M. Schrof, "The Creation," *U. S. News and World Report* (Dec. 23, 1991): 59.

[2]R. Stark and L. Iannaccone, *American Economic Review: Papers and Proceedings* (1966): 433–437.

[3]Edward J. Larson and Larry Witham, "Scientists are still keeping the faith," *Nature* 386 (1997): 435–436.

Insect Mouths

by Alan McCarrick, The Christian Academy, Media, PA

The fossil record of complex insect mouthparts seem to show that they adapted to nectar producing plants long before flowers appeared. Piattelli-Palmarini states that this flies in the face of conventional evolutionary principles that predict a series of small steps between flowers and insects adapting to each other.[1] He refers to an earlier article on insect fossils, "Insect Diversity in the Fossil Record" by C. Labababdeira and J. Sepkoski. They state:

> The more startling interpretation that can be drawn from the data is that the appearance and expansion of angiosperms had no influence on insect families ... The fact remains that the post-Paleozoic radiation of insect families commenced more than 100 million years before angiosperms appeared in the fossil record.[2] ... we have examined a few synoptic aspects of the fossil record of insects, and the results contradict several notions about what macroevolutionary patterns can be seen among fossil insects ...[3]

Another step in this awkward direction is found in a *Science* review entitled "Mutual Satisfaction." These authors studied the obligate mutualism of the yucca moth by looking at the DNA of the yucca and several related moths. They concluded, based on the hypothetical ancestry, that "chance and pro-existing conditions may be more important than a long history of togetherness ... [and] that co-opting existing functions is the key to the evolution of novelty."[4]

Even if over-designed, those insects had to feed efficiently on something. Another review in *Science* entitled, "Permian Pollen Eaters,"describes fossilized pollen in the gut of a Permian insect found in the Ural Mountains.[5] The pollen is assumed to have been eaten as food. This insect died well before the appearance of flowers in the early Cretaceous. The authors identified the pollen as an *air dispersal* type suggesting that the insects were exploiting pollen as food before the plants exploited the insects for dispersal.

For the Christian, this evidence raises a couple of questions. Could God have used pro-existing adaptation of insects as evidence of his creative agency, or even as an evidence of a young earth and short creation days? Possibly (I prefer the former). Does

the fossil evidence unquestionably demonstrate that coevolution doesn't happen (in this case) and that evolutionists must conclude again that useful trait suddenly "just fits" another function? Possibly. The jury is still out, and we must not rush to make too much of this yet.[6] ★

Notes

[1]Massimo Piattelli-Palmarini, *Inevitable Illusions; How Mistakes of Reason Rule Our Minds* (New York: John Wiley & Sons, 1994), 195.
[2]C. Lababdeira, J. Sepkoski, "Insect Diversity in the Fossil Record," *Science* 261 (July 1993): 313.
[3]Ibid., 314.
[4]E. Culotta,"Mutual Satisfaction," *Science* 269 (25 Aug 95): 1046.
[5]C. Holden, Ed.,"Permian Pollen Eaters," *Science* 276 (16 May 97): 1035.
[6]I am indebted to the writers on the Evolution listserve (evolution@calvin.edu) who discussed the fossil record of insects and angiosperms.

Scientific Fraud

by D. Gareth Jones, University of Otago, Dunedin, NZ

Science lives by trust, and if that trust evaporates, what is left? Such is the predicament in which the world of science currently finds itself. Of the many examples of scientific fraud, a major one at present emanates from Germany.[1] Gene therapists, Friedhelm Herrmann and Marion Brach, have been accused of fabricating data in more than 30 papers in molecular medicine. While Brach has admitted forging data, Herrmann is contesting the decisions made by various jurisdictions on the ground that he was only the senior author or translator. He claims he had no motive since he had already reached the top of his profession.

This case is riddled with intrigue, including the breakup of a personal relationship which led to the exposure of plagiarism. The claims include misuse of a position as an anonymous referee, by taking other people's unpublished results and constructing imaginary experiments around them. Equally dubious practices as a referee of grant applications have also been suggested.

The unethical nature of practices such as these is self-evident. The fact that science appears to be riddled with them is an indictment of the pressure under which scientists are having to function. Nevertheless, they are also reminders that truth and scrupulous honesty are prerequisites for scientific activity, as they are for all healthy human interactions. But, on occasion, these can prove barriers to career advancement, and the question of ethical priority then becomes paramount.

What also emerges from this tragic series of incidents is that science is frequently not the impersonal, objective activity many like to think. Important as objectivity is, science is undertaken by fallible (and sometimes unscrupulous) people, and the interaction between the two can be a delicate one. The integrity of science is under scrutiny, because if science cannot be trusted what can? Surely Christians, of all people, should be campaigning vigorously for impeccable standards of truth, rigorous accountability, and as much openness as possible in science. And yet, these attributes lead inevitably to a willingness to go wherever the evidence takes us, and this can sometimes be a tricky business. ★

Notes

[1]Allison Abbott, "Fraud Claims Shake German Complacency," *Nature* 387 (1997): 750; and Quirin Schlermeker, "Gene Therapist Accused of Fraud to Ask Redress in German Court," *Nature* 389 (1997): 105.

Books Received and Available for Review

(Please contact the book review editor if you would like to review one of these books. Please choose alternate selections.) Richard Ruble, Book Review Editor, *Perspectives on Science and Christian Faith*, 212 Western Hills Drive, Siloam Springs, AR 72761 or rruble@acc.jbu.edu

Piero & Alberto Angela, *The Extraordinary Story of Life on Earth*, Prometheus, 1996
C. L. Blomberg, *Jesus and the Gospels*, Broadman and Holman, 1997
Leonard Brand, *Faith, Reason, and Earth History*, Andrews University Press, 1997
Jay Earley, *Transforming Human Culture: Social Evolution and the Planetary Crisis*, SUNY Press, 1997
Paul Edwards, *Reincarnation: A Critical Examination*, Prometheus Books, 1996
M. H. Ellis, *Unholy Alliance: Religion and Atrocity in Our Time*, Fortress Press, 1997
Michael Hawkins, *Hunting Down the Universe: The Missing Mass, Primordial Black Holes, and Other Dark Matters*, Addison-Wesley, 1997
Dorothy Howell, *Environmental Studies: Images from Popular Culture*, Greenwood Publishing Group, 1997
S. R. Kellert, *Kinship to Mastery: Biophilia in Human Evolution and Development*, Island Press, 1997
Bernard Lightman, *Victorian Science in Context*, Chicago University Press, 1997
Mary Matossian, *Shaping World History: Breakthroughs in Ecology, Technology, Science, and Politics*, Sharpe, Inc., 1997
D. C. Matt, *God and the Big Bang: Discovering Harmony Between Science and Spirituality*, Jewish Lights, 1996
Vinoth Ramachandra, *Gods That Fail: Modern Idolatry and Christian Mission*, IVP, 1996

Many Worlds Hypotheses: A Naturalistic Alternative to Design

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Princeton, NJ 08542-0803

In this paper, I consider the so-called World Ensemble theories or Many Worlds Hypotheses. As I see it, Many Worlds Hypotheses (MWH) arise primarily (but not exclusively) from the realization of the apparent contingency of the visible universe and the way in which it seems "fine-tuned" for the existence of complex forms of intelligent life. I am interested in their common function as a metaphysical explanation, *and the way MWH function as a sort of "Designer substitute." However, MWH cannot exclude the possibility of theism or design, except as bare assumption, and, much to the chagrin of certain theorists,* some might even entail theism.

While Many Worlds Hypotheses (MWH hereafter) occur in various, sometimes contradictory forms, they arise primarily (but not exclusively) from the increasing realization of the apparent contingency of the visible universe and the ways in which it seems "fine-tuned" for the existence of complex forms of intelligent life. The fundamental constants observed in matter, and those thought to obtain in the initial conditions at the origin of the physical universe, look curiously attuned to the development and existence of intelligent life.

I am not interested here so much in the relative merits of the numerous MWH currently proposed, but in their common *function as a metaphysical explanation, in which they explain the apparent fine-tuned contingency of the visible universe,* and the way MWH function as a sort of "Designer substitute." Where the theist might infer the existence of God from the fine-tuned contingency of the universe or take observations of fine-tuning as confirmation of belief in God, others infer the existence of many, even infinitely many, worlds from these observations. I argue that if the latter is a valid inductive inference, then so is the former. And if MWH function on the same level as theistic belief, and the latter belief is metaphysical, then so is the former. Specifically, many versions of MWH (but perhaps not all) look like *deductions from naturalism* proposed to accommodate this apparent fine-tunedness. Moreover, MWH cannot exclude theism or design, except as a bare assumption. And in light of a contemporary version of the ontological argument for the existence of God, some might even entail theism (much to the chagrin of MWH theorists). At most, they may function as solace for the naturalist faced with evidence for fine-tuning.

Metaphysical Commitments in Science

In contrast to positivism earlier in this century, a growing body of work in the philosophy and history of science has uncovered the degree to which theories, paradigms, and even metaphysical beliefs and assumptions play a crucial role in scientific research. Without belief in the observability, reality, and general orderliness of nature, science probably would never have developed, and a complete loss in these beliefs would probably presage the demise of science. Moreover, as is now commonly said, scientific data are theory-laden and scientific theories are under determined by the data. To put it contentiously, high-level beliefs *infect* low-level observations. Many potential theories may be consistent with any finite amount of observational data, and such data will themselves be couched in terms of some specific theory. Even the very relevance of that body of data may be shaped by the broader context in which the observers are working.

While I do not wish to enter this debate here, it does seem clear that MWH theorists take advantage of a blurring of lines between "hard science" on the one hand and "metaphysics" on the other. However,

I will not criticize MWH because they are metaphysical. Rather, I wish to show only that they do have a metaphysical function, and, more strongly, seem to stem from metaphysical naturalism. This claim does not entail that there are no other motivations for proposing MWH. My argument is only that metaphysical commitment is a primary motivation. Whether such metaphysical convictions have a place in legitimate science is a question for another time.

Attempts to Avoid the Question

Since at least the time of Hume and Kant, many have insisted that properties such as probability and contingency could not be applied to such a thing as the entire universe. The cosmological and teleological arguments have commonly been thought flawed because they assumed that the universe as a whole needed explaining. While few people would deny that *something* must have necessary existence in order for *anything* to exist contingently, the nontheist could always insist that the universe itself was the necessarily existing thing. Its existence, as Aristotle assumed, was infinite in duration. To appeal to a god who would himself be more complex than the universe, in order to account for the existence of the universe, is to violate Ockham's Razor. We should more simply stop the regress of explanation with the universe itself, as *the* fundamental, necessary brute fact. The teleological argument, on the other hand, was thought destroyed by the awareness that, since we have nothing to compare it with, we cannot rightly say the universe is designed, as we could say, for example, with a watch. Any apparent design in nature, so it has been claimed, is more sufficiently explained by Darwin's natural selection working on random genetic mutation than by recourse to creation by a supernatural being.

Ironically, in the time since many theologians have given up all appeals to such arguments, scientists have been amassing an enormous amount of evidence for the radical contingency and (apparent) fine-tuning of the visible universe. Big Bang cosmology, which implies that the observable universe has a past of finite duration, can be very troubling to those who wish to assign necessary existence to the universe. For while both theist and atheist deny the maxim that *everything that exists has a cause for its existence*, since both suppose something (either God or the universe) to have necessary and uncaused existence, the intuitive plausibility of another option seems almost irresistible; that is, *everything that begins to exist has a cause for its existence.*[1] A necessarily existing thing by definition does not pop into existence. Of course, one could just deny this new option in the case of the universe, but then one would retain little credibility in appealing to a much more tenuous principle such as Ockham's Razor in denying, say, theism.

Coupled with Big Bang cosmology has been the abundance of mind-boggling, highly sensitive conditions which appear to obtain in our universe, conditions necessary for the existence of beings such as *Homo sapiens*. Even granting the most generous assessment of Darwinian explanation, the conditions necessary for either Darwinian evolution, or our continued existence, fall within nearly infinitesimally small parameters. The four fundamental constants observed in physics—the gravitational, electromagnetic, strong, and weak nuclear forces—maintain conditions which, if variant in some instances by even one part in trillions of trillions, would make life of our type physically impossible. Examples of this are myriad and well-documented.[2] Here is one example. According to Paul Davies, if the nuclear strong force or electromagnetic force had been different by one part in ten quadrillion, no stars like our own could have formed.[3] The slightest variation in the initial conditions at the Big Bang would have resulted either in a nearly instant recollapse, or an expansion so strong that no gravitation would have been able to bring hydrogen atoms together for the formation of stars, and thus heavy elements necessary for the life present on our planet.

There is potential trouble in these findings for the materialist who bestows upon the physical universe

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ultimate reverence: the *contingency* and even *design* of nature. During the nineteenth century, the eternity of matter was held by many as a basic pillar on which all of science rested, and the doctrine's crucial role in Marxist materialism was prominent. So we should suspect belief in the eternity and necessity of nature to die hard (necessity and eternity travel together). MWH are able to preserve these materialist commitments while accepting and even insisting on the contingency and radical improbability of the visible universe when considered by itself. Before considering the more interesting option of MWH, however, we should note a few attempts to sidestep the crucial issue of contingency and fine-tuning.

MWH are able to preserve [the eternity of matter] while accepting and even insisting on the contingency and radical improbability of the visible universe when considered by itself.

Some, such as Stephen Hawking, still hope somehow to assert the necessity of our visible universe (we might call it our *world* to avoid begging any questions about what *universe* implies). Once a so-called Theory of Everything (TOE) is attained, unifying the four fundamental constants, we will have a core set of equations which will be necessary, and no explanation beyond them will be needed.[4] This has such a strong ring of implausibility that it may be a mistake to note its problems. But an *ex post facto* attribution of necessity to a scientific theory, no matter how powerful or correct, is simply confused. If an internally coherent alternative is conceivable, or if the absence of any TOE is even *possible*, then its truth or existence cannot be necessary. It would also seem to falter before Gödel's incompleteness theorem.[5] That a TOE or Grand Unified Theory would contain particular numbers in specific equations should be enough to raise suspicion about attributing necessity to it. Beyond this, one may note that making the universal constants necessary would have "the devastating consequence" for science of making experiment unnecessary.[6] Armed with a Theory of Everything, we could simply deduce how things will go, making experimentation unnecessary (although a committed Platonist might not shrink from this conclusion).[7]

Two other strategies often recur where theorists discuss the so-called *anthropic principle*. Most simply, the anthropic principle notes that human beings will necessarily (in the physical sense) observe a universe consistent with their existence. Barrow and Tipler define it thus:

> The basic features of the Universe, including such properties as its shape, size, age and laws of change, must be *observed* to be of a type that allows the evolution of observers, for if intelligent life did not evolve in an otherwise possible universe, it is obvious that no one would be asking the reason for the observed shape, size, age and so forth of the universe.[8]

I am not concerned here with the question of whether the anthropic principle is insightful or trivial, or with the way it often makes the broad evolutionary picture true by definition. I mention this "self-selection" aspect of the anthropic principle below, and consider it an important component in MWH. Here I note only its failure as an attempt to avoid the question of the radical contingency of our existence and a universe consistent with it.

For a reason not wholly clear, some partisans of the anthropic principle assume that since only a universe consistent with observers will be observed, we should not be surprised to find ourselves observing such a universe. So Barrow and Tipler state:

> We should not be surprised to observe that the Universe is so large. No astronomer could exist in one that was significantly smaller. The Universe needs to be as big as it is in order to evolve just a single carbon-based life-form.
>
> We should emphasize once again that the enormous improbability of the evolution of intelligent life in general and *Homo sapiens* in particular does *not* mean we should be amazed we exist at all.[9]

While these statements underscore the fact that very specific conditions must be met for beings of our sort to exist, they clearly are not explanations. The issue of surprise is not that we observe a universe consistent with our presence, but that *that* universe is the one which *exists*.

John Leslie's story of the Firing Squad illustrates the strangeness of this explanation.[10] Imagine a man standing before a 50-man firing squad, remaining alive and unscathed after his execution. Would he reasonably reflect, "I shouldn't be surprised that all 50 sharpshooters missed, because if they hadn't, I wouldn't be here to observe it"? Surely not. Similarly, our presence as observers does not dispel amazement at the apparent fine-tuned nature of the visible universe.

More radical arguments occur in works by some such as John Wheeler, who seems to assert that our observation of the universe is itself the cause of the universe's existence, since only that which is observed really exists. Such radical idealism raises a whole host of problems and questions beyond the scope of this essay. Wheeler' proposal is (at least partly) an attempt to account for quantum phenomena; but it has this idealist edge which will probably not endear it to most scientists. So I will not tarry long on it here. However, my avoidance of it should not be taken to imply it is not worth considering.

A final attempt to circumvent the apparent fine-tuning of the universe in such a way as to be consistent with earthly life is an appeal to the *Copernican* principle. That is, we are charged with anthropocentrism in assuming our form of life and consciousness are the only meaningful forms of life taken. Perhaps life and consciousness can evolve in interstellar dust or in the core of a neutron star. After all, we know so little about even our type of life.

Of course, no one need argue that human life is the *only* meaningful type of life.[11] Ironically, from the same quarters, which insist that human type of life is only conceivable as the result of billions of years of trial-and-error evolution, emerge defenses of the possibility of life existing inside a neutron star or during the milliseconds between the expansion and contraction persisting in other universes. The burden of proof should be on those who propose such implausible life forms; we need only argue that the existence of any plausible life forms will occur in very fine-tuned universes such as the one we observe. M. H. Hart has estimated that "even on an ideally habitable planet the chance that living things would develop would probably be lower than 1 in $10^{3,000}$."[12] The motivation to undercut claims such as this may be understandable, but the creation *ex nihilo* of hypothetical alternate life forms to explain away our apparent uniqueness does not provide a very strong argument against amazement at this uniqueness.

Many Worlds Hypotheses

Having noted these explanations, or evasive maneuvers, concerning the apparent fine-tuned contingent nature of the visible universe, we can now ponder what I think are more interesting and compelling proposals: Many Worlds Hypotheses. Unlike some other proposals, MWH accommodate the troubling observation of a contingent, visible universe and may even bask in the fact. Whereas earlier the contingent objects of the universe were considered part of a necessary, infinite, and eternal universe, developments in Big Bang cosmology and relativity have made attributions of eternity and necessity more difficult to make to the observable universe. On the other hand, MWH postulate that the observable universe, while itself contingent, is a mere part of a vast ensemble of different universes or worlds. We can only observe *this* world. The Many Worlds theorists and traditional theists both agree that an explanation for a contingent world should be sought outside that particular world, but their strategy is quite different. For the Many Worlds theorists, "the question 'Why this universe?' is no longer relevant, because all possible universes exist. The set of universes taken together is not contingent."[13]

The Many Worlds theorists and traditional theists both agree that an explanation for a contingent world should be sought outside that particular world, but their strategy is quite different.

While theorists have proposed numerous mechanisms for producing multiple worlds, they have several features in common:

(1) Absence of (or very limited) causal contact.

(2) Characteristics between worlds are often very different, for example, different laws.

(3) Worlds are very large, or are becoming very large (not an essential feature).

(4) Worlds or universes apart from our own cannot be known by us in any direct ways.[14]

So, however we construe them, alternate worlds are generally unobservable by definition. This fact alone is enough to cause some scientists to dismiss all MWH as unscientific speculations. And if science by definition is concerned exclusively with the "directly" observable, this criticism would obviously be correct. But, a great deal of quantum and theoretical physics, as well as cosmology, focuses on subject matter not directly observable. So tagging these theories with the disrepute of being unobservable does not suffice to consign them to the realm of the "unscientific." This is not to say that any of the MWH are correct or even plausible, but only to say that the *need for explanation* with which a unique and contingent universe confronts us is reflected in the various MWH.

The theoretical mechanisms popular at present for hypothesizing a World Ensemble fall into five categories: (1) An oscillating cosmos which goes through an infinite number of cycles, in which there is a Big Bang, an expansion, a contraction, a Big Crunch, and then the process repeats itself; (2) The Everett Interpretation of quantum theory, by which individual, noninteracting worlds "split off" from one another as a result of the individual "choices" of quantum events; (3) Noninteracting quantum fluctuations in a Superspace, each a separate world or small universe, or perhaps even without a common background Superspace; (4) An infinitely large "open" universe in which separate regions are so distant from each other that no contact exists between them; and (5) An Inflationary Cosmos which, although "closed," has an immense collection of different domains, unobservable by any of the others.[15] Although all these proposals have their advocates and detractors, they rely on factors which militate against the earlier desire to make *our* world necessary. Most assume or try to account for (as in the Everett Interpretation of quantum theory) the probabilistic nature of physics at very basic levels. They often use theories of symmetry breaking by which fundamental constants—the very nature of matter as we know it—would vary from world to world. They propose many worlds which are real but very different and unobservable from our own. Our world is merely one among vastly many. The Everett Interpretation of quantum theory reminds us that naturalism and fine-tunedness are not the only motivations for MWH, since the Everett Interpretation was devised at least partly to overcome the "collapse of the wave function" in the measuring process.[16]

[Many World theorists] propose many worlds which are real but very different and unobservable from our own.

Although there is diversity among MWH, I am interested here only in their function as an interpretive and metaphysical explanation for the surprisingly fine-tuned nature of our universe. The appeal of a multiple worlds theory should be fairly obvious. If there are infinitely many universes, the fact that this particular one exists is hardly surprising. This one had to exist somewhere, since it is a member of the set of all possible universes. What would originally make this universe seem awe-inspiring, since "we can conceive of so many alternatives to it,"[17] becomes less troubling if all those alternatives exist as well. When dealing with infinite sets, counter-intuitively, the near infinitesimally improbable, if at least possible, is not only actual but common, even infinitely common. It is here that the "self selection" effect of observation comes in. For only those universes (however improbable) which are consistent with the evolution and existence of observers will be observed. Just like an immense lottery, someone has to win. The winner may be surprised to be the one, but there is clearly nothing surprising that *someone* won. In the case of universes, observers will exist only in those universes intricately arranged to permit their existence. That which might initially be thought highly improbable is on the strongest MWH, inevitable. Most crudely, an infinite ensemble of all possible worlds entails the actuality of every possibility.

Theorists sometimes qualify this extreme affirmation by insisting that multiple worlds is an ensemble of many or all *physically* possible worlds, with the laws of physics being the same in all worlds. So Paul Davies says:

> The selection of universes on offer is restricted to those that are *physically* possible. There will be many more universes that are logically possible but contradict the laws of physics ... So, although such many-universe theories might provide a selection of alternative *states* of the world they cannot provide a selection of laws.[18]

However, such a qualification does not accommodate the words of many multiple worlds theorists. Barrow and Tipler, for example, are unwavering in their interpretation of Everett's Many-Worlds Interpretation of quantum physics: "... the Universe, which is defined as everything that actually exists, is equal to all logically consistent possibilities."[19] If Many Worlds theorists accepted Davies' qualification about the inviolability of physical laws, they would be strapped with the continuing trouble of why *those* laws exist. In order to preserve the notion that these laws occurred randomly, they must be conceived as only one set among many, all arising through some chance mechanism such as symmetry breaking. With Davies' qualification, we still have the presence of contingent physical laws which need explaining. The Many Worlds theorist wants to circumvent that need. Most Many Worlds partisans are willing to give up even the inviolability of physical laws to accommodate the apparent intricate fine-tuning of physical laws (in our world) for life. What these theorists need is a theory which preserves randomness and chance, and yet accounts for the apparent "design" of our universe. Infinite worlds are thought to provide this:

> If cosmological initial conditions are exhaustively random and infinite then anything that can occur with non-vanishing probability will occur somewhere, in fact, it will occur infinitely often.[20]

Of course, an infinite number of worlds need not be actual in order to make the existence of ours untroubling. If the likelihood of our universe existing, is, say, 1 in $10^{10^{10}}$, then only $10^{10^{10}}$ worlds need exist to serve this purpose:

> For when might our existence be made unpuzzling through a multiplicity of universes and an observational selection affect? Answer: Just as soon as the multiplicity and the variety of those universes *were great enough to give a fair chance that at least one universe would contain intelligent observers.*[21]

Interestingly, this point is often missed by many of our theorists, who prefer talk of necessity, logical possibility, and infinite sets. "A whole bunch of worlds" just doesn't pack the punch for dispelling troubling questions of design and contingency that a claim about "an infinite variety of worlds" does. "The question of why does this universe rather than that universe is answered by saying that *all* logically possible universes do exist. What else could there be?"[22] While such a reply may satisfy those disposed toward naturalism and away from questions about a Designer, I will argue that it can explain nothing more than is explained by theistic belief, is probably inferior to that belief as an explanation for the apparent fine-tuning of the observable universe, and that such explanations raise additional questions which make them less the ally of the naturalist than might be thought; and, in any event, insofar as MWH act as substitutes for considering the possibility of design and the existence of a Designer, they are metaphysical. This is not to say science should not be involved in metaphysics, but rather that the traditional boundaries between science and metaphysics are becoming increasingly blurred.[23] Whether this is a good or bad thing I leave to the reader to decide.

Many Worlds Hypotheses and Design

While the motivation for the popularity of MWH cannot answer the question of the *truth* of any of them, MWH do serve to answer the question of the observable universe's contingency and apparent fine-tuning. Moreover, theorists often assume that if some version of a many worlds theory is correct, no consideration of an actual Designer need arise, since such a question would be superfluous. MWH and the need for a Creator are often presented as mutually exclusive alternatives, and discussions of them are usually framed in such terms. Nevertheless, they are clearly not logical complements. They do not reside in wholly incompatible conceptual territories. The truth of one does not entail the falsity of the other. They are really only alternatives in that they can explain the same phenomena. They may both be compatible with the data; they may be equally adequate empirically.

While MWH and creation by design are not logically contradictory, they are usually alternatives.

On the other hand, MWH and design by a Creator (these are usually the live options) are *alternatives*. If we had reason to believe one were true, we would not need recourse to the other, since the phenomena calling for explanation would be sufficiently explained. And they are certainly perceived as alternatives by much of the relevant scientific constituency. In fact, fear about a resurgence of questions about design and teleology in nature has inspired much unnecessary suspicion toward findings which indicate the incredible intricacy and improbability of the existence of complex systems such as DNA or life in general. MWH may be a way to *concede* these observations without re-entering putatively won battles over teleology. John Leslie is explicit about this:

> Nowadays, when the God hypothesis is so unpopular, many scientists would initially be very reluctant to accept that Life balanced on such a razor's edge. Hawking's estimate [that an expansion speed decrease at early times by one part in a million million would have meant life's absence] would thus suggest to them that Hawking is wrong. But these scientists could well change their minds when they saw that a varied ensemble of universes and an observational selection effect could do much the same work as God might do.[24]

So, while MWH and creation by design are not logically contradictory, they are usually alternatives.

Second, MWH do not enjoy greater empirical support or verification than belief in design. Every datum which might reasonably be thought to support the former could equally well support or confirm the latter. The popularity of MWH among scientists may obscure this point. Any calculations on Baye's theorem for the improbability of the intricate equilibrium obtaining in physical constants, necessary for the formation of stars and biological forms, will be sup-

port for design at least as much as for many worlds. As *explanations* for intricacy, apparent fine-tuning, and our presence in this world, MWH and design occupy very similar conceptual territory. (I am *not* saying here that Christian or theistic belief is merely an explanation or a hypothesis. I am referring here only to the function of such belief as an explanation for contingency, uniqueness, et al. in the physical universe.) The privilege which science and naturalism enjoy in our intellectual context may blind us to the fact that MWH are no more "empirically verified" than is theistic design.

MWH do not enjoy greater empirical support or verification than belief in design.

Of course, they may *both* be empirically adequate, but that is another matter. Because it is scientists on the whole who are at present the most common advocates of MWH, we may be hoodwinked into bestowing upon these theories the status of "Science," while continuing to dismiss questions of design and creation as theological, metaphysical, or speculative. As John Leslie notes:

> Science, remember, does not support the multiple-universes hypothesis *rather than* the God hypothesis. We do not have, independently of the delicate adjustments which—so science seems to say—were crucial to Life's possibility in this universe of ours, any strong evidence of a World Ensemble.[25]

Third, and like unto the second, MWH do not enjoy an *a priori* status of preference over intentional design by a Creator. This *presumption of naturalism*, we might call it, is presupposed by some advocates of MWH: If any hypothesis—no matter how implausible, unlikely, or unverifiable—can be proposed to explain the apparent fine-tuning of our universe, then we should prefer it to recourse to divine intention. I can think of no good argument to justify such a presumption, other than a desire to support naturalism *contra* theism. On this level, we may see most clearly that some advocacy of MWH is metaphysically motivated. This is not, of course, a judgment about the truth or falsity of any such hypothesis. A commitment to materialism or naturalism, like more mundane presuppositions about the orderliness or existence of an external world, can influence research and theory choice in science as in other fields. Which physicist would be more likely to spend more time considering various theoretical models for producing multiple worlds—a Christian or other theist, or a naturalist? I doubt any honest respondent would deny that the latter would be more likely.

Of course, few people would decide so ultimate a question about whether the universe were created as a question of probabilities, or as a mere inference to the best explanation. Moreover, probably few individuals dwell in an epistemic locus from which such a question could be disinterestedly assessed. Nevertheless, I do think there are some good arguments for the theistic belief and against the atheistic belief which motivates, if only implicitly, much multiple world hypothesizing. Of course, I am only concerned with belief in a Creator *versus* belief in multiple or infinite worlds as an explanation for apparent fine-tuning. If both theism *and* the existence of many worlds are true, then there is little controversy. But since I judge the bulk of motivation for MWH to be a recognition of apparent fine-tuning *plus* a commitment to naturalism, I suspect there are few *reasons* to hold both these ultimate beliefs as true. There seem to be few other reasons—empirical, philosophical, or otherwise—for the postulation of so many countless and unobservable regions. That a proliferation of MWH would follow on the heels of a mass of evidence in science that the observable universe fits into the very narrow parameters necessary for life of a sort even remotely similar to the type of life we know, is a sequence which is surely not coincidental.

While naturalism does not explain every motivation for MWH proposals, *MWH are naturalistic answers to these observations*. If naturalism is true, some version of MWH is a live option, given the alternatives. As a Christian and theist, I can think of no good reason to think any of the currently popular MWH are true (except perhaps for some principle of plenitude). Most currently proposed, relevant theories—even if true—probably would not produce all logically possible worlds.[26] Many seem already to have been disproven, such as dissipative processes making a cyclic universe impossible.[27] And the *actual* existence of an infinite set of entities like worlds may not even be possible.[28]

Many Worlds Hypotheses and the Ontological Argument

Since some good arguments against MWH and for theism already exist in the literature, I will not recount them here.[29] Most of these arguments could be classified as either *teleological* or *cosmological* versions. Swinburne's point that Ockham's Razor alone should lead us to prefer theism to multiple worlds[30] seems reasonable and correct to me, but of course this opinion does not aspire to a knock-down-drag-

out argument for God's existence. In the remainder of this paper, I will call attention to some facets of MWH which come to light when we consider a form of the *ontological* argument for the existence of God, namely, the modal version formulated by Alvin Plantinga. The intersection of the ontological argument and MWH generate some questions which the infinite worlds enthusiast might wish to consider.

As noted above, the most popular MWH tend to employ the language of necessity, possibility, and infinity. Rather than argue for a large number of different worlds, Many Worlds theorists are fond of insisting on an infinite variety of worlds, of *every logically possible world existing* at some point. We also noted the motivation for such ontological multiplication: the set of all possible worlds enjoys a necessity which our contingent (visible) universe lacks. Arguments for the mere physically possible, where the same physical constraints and boundary conditions obtain in all universes, cannot answer the question, "Why these laws?"

Not surprisingly, some philosophers such as John Leslie cringe at how scientists offering MWH use the concepts like *necessity* and *possibility*.[31] The (apparent) explanatory power of infinite worlds will always exceed any finite World Ensemble, and such an infinite set can accommodate any calculations for our world's improbability, no matter how immense. Leslie himself notes this value of explanatory power: "A chief reason for thinking that something stands in special need of explanation is that we actually glimpse some tidy way in which it might be explained."[32] An infinite set has a certain pleasing "tidiness" that, say, 703 trillion lacks. Thus arguments for infinite worlds proliferate.[33]

We should note that the *actual* existence of all possible worlds plus the observational selection effect is crucial. All worlds are as actual as is ours, but those not conducive to the existence of observers will not be observed.[34] The logically possible is the actual. If such were the case, it would certainly make our observation of this world less astounding. Of course, by definition we have no access to these other worlds, and the popularity of an *infinite* variety should serve as still more evidence for viewing MWH as metaphysically driven. Ironically, the use of *all possible worlds* by theorists may unintentionally raise some unwelcome questions such as the following: "Just what do 'all logical possibilities' include?"

To consider that question adequately, a brief excursus is necessary concerning the ontological argument for the existence of God. The original version of this argument from St. Anselm states that God is that Being than which there can be no greater, the greatest possible being. As such, it should be clear that such a being must exist in reality, and not merely in our understanding alone. For if he existed merely in our understanding, then any existing being would be greater than he (since any existing being is greater than any mere theoretical but non-existent being). If that were the case, then there would be a being greater than the greatest possible Being, which is impossible. Therefore, God must exist in reality.[35]

Alvin Plantinga's modal version of [the ontological] argument [states]: ... That which exists in some possible worlds but not others is logically possible, but its existence is contingent or accidental.

This frustratingly intriguing argument has usually been dismissed since Kant, who charged that Anselm erroneously made existence a predicate or a property.[36] However, the truth of this "refutation" is far from obvious, and even if it were, it is not clear that Anselm's argument does treat existence as a predicate.[37] Be that as it may, such criticism is irrelevant to Alvin Plantinga's modal version of this argument. Most simply, he restates it in terms of possible worlds. That which exists in some possible worlds but not others is logically possible, but its existence is contingent or accidental. It might not have existed. So the fact expressed by *Bill Clinton is the President of the United States* is contingent. It could possibly have been otherwise. That which exists in no possible world is impossible. It is necessarily non-existent. So a married bachelor or a square circle exists in no possible world. That which exists in every possible world, such as the truth that 2 + 2 = 4, is said to exist necessarily. There is no possible world in which it could not have existed.

Now imagine a being in whom maximal greatness is exemplified, who possesses whatever properties are great-making, such as power, knowledge, goodness, and so on. Such a being most traditional theists would identify as God (though this obviously would not exhaust God's properties or existence, especially for the Christian). Now clearly a being who possesses maximal greatness, if such greatness were to be maximal, would have to exist in every possible world, that is, he would exist necessarily.

Note this does not make existence a property, since a non-existent being has no properties. Rather, existence is a *condition* for having properties: "So existence and necessary existence are not themselves perfections, but necessary conditions of perfection."[38] Note also, that unlike most MWH, possible worlds here are not actual worlds, but are merely possible "states of affairs—possible with respect to the actual world."[39]

MWH begin to look like little more than sophisticated ways to* assert *naturalism-at-any-cost ...

Since maximal greatness by definition will entail existence in every possible world, any being which possesses maximal greatness will be necessarily existent. Now consider the proposition: (1) *Maximal greatness is possibly exemplified*, i.e., there is a world W in which maximal greatness is exemplified. But, since maximal greatness entails necessary existence, if it is even possibly exemplified (in one or more worlds), then it is exemplified in every possible world; and this world being one among the set of all possible worlds, maximal greatness is instantiated in this world. Since we would designate God as the being possessing maximal greatness, if he exists as such in any possible world, he exists in every possible world, including this one. In short, (2) *Maximal greatness is instantiated in some possible world* entails the truth of (3) *Maximal greatness is instantiated in this world.*[40]

This argument is clearly valid, but is it sound? Since I believe God exists, I think it is. But how about the atheist? Is he compelled to believe in God on the basis of this argument? Probably not, because the atheist is free to deny the truth of (1) *Maximal greatness is possibly exemplified*. Of course, this is tantamount to arguing that the existence of God is *impossible*, that he is necessarily non-existent. Even the most rock-ribbed atheist will probably not want to make such a strong claim.

Having briefly considered this modal ontological argument, we can see its relevance for discussions about MWH. It leads us to ask: Just what is logically possible? In considering (1), there appear no obvious logical flaws in it. It is not self-contradictory. It does not violate any logical principles, excluded middle or otherwise. It surely appears to be a logically possible state of affairs. It is not even dependent on the far stronger claim of some Many Worlds theorists that every possible world is actual. Ironically, *if (1) is true, then the strong MWH which make the possible actual—reifying the possible—may even strengthen this argument for God's existence*, since no one could claim that it merely "defines God into existence"[41] (a complaint I think is incorrect anyway for this version of the argument). This would obviously frustrate the aspirations of most Many Worlds theorists; but such can be the penalty for toying with notions such as possibility, necessity, and infinite sets. MWH, that strained appeal for naturalism-at-all-costs, may actually be complicit in hiding an argument for God's existence!

However, all this talk about all possible worlds being actual does not settle the most burning issue raised by the alternatives of MWH versus design by a Creator: "What is logically possible?" We still have the problem of *compossibility*. Some states of affairs which, taken on their own, may appear to be internally coherent and logically possible are incompatible with other such states of affairs when they are considered together. For instance, (4) *A maximally perfect being exists on whom everything depends* appears logically possible. But even its *possible* truth is incompatible with (5) *A universe exists which is dependent on nothing outside it*, even though (5) also appears to be logically possible when considered in isolation. However, the conjunction of (4) and (5) together is not a possible state of affairs.

So we are still left with the troubling question of whether (4) or (5) is the *actually logically possible state of affairs*. How one judges that will undoubtedly depend on how one judges the truth of some version of either theism or naturalism (if these are the two main options in this context). But such a judgment, while it may include evidence of apparent fine-tuning, cannot be deduced necessarily from such evidence, since both theism and MWH seem compatible with it. This is *not* to say that this evidence in conjunction with other "evidence"—whether historical, philosophical, empirical, experiential, revelatory, or otherwise—may not suggest the truth of some version of theism over naturalism (or vice versa), but only to say that the judgment concerning the possible truth of either (4) or (5) cannot be deduced (so that every reasonable person would have to agree) from the evidence of apparent fine-tuning. In this light, MWH begin to look like little more than sophisticated ways to *assert* naturalism-at-any-cost, since their defenders clearly do not include a designed universe in the supposedly infinite set of worlds. Why such discrimation? While MWH clearly attempt to work out the implications of naturalistic doctrine, their partisans fail if they aspire to assert an argument against another belief such as theism.

Conclusion

Thus, I conclude that while MWH may be a source of some solace for the atheist and naturalist, they present no compelling arguments for their truth over against theism in general or Christian belief in particular. Moreover, if MWH aspire to make theistic belief irrelevant or superfluous, they fail. *At most,* they are alternatives to such belief, when one is presented with the overwhelming evidence for apparent fine-tuning in the observable universe.

At the very least, we can conclude that the many popular MWH should be classified as much as metaphysics as physics, as their ability to serve as a substitute for theistic belief indicates. The Christian and theist who see such hypotheses simply as scientific theories which will be discarded at the first sight of falsifying evidence will fail to recognize their metaphysical character.

Perhaps most suspiciously, MWH create a condition whereby *no amount of evidence,* no matter how intricate, could ever serve as evidence of a Creator, since in a set of all possible worlds, every possible state of affairs will be actualized somewhere, no matter how improbable, intricate or complex. Even a world like our own, but which abruptly emerged in, say, *six days* enjoys membership in the club of possible worlds; so even *that* world would be no evidence for a Creator. The explanatory mischief of MWH begins to appear a little strong. The naturalist committed to a MWH must maintain that (1) the existence of God (a maximally perfect being) is logically *impossible,* and that (2) *no amount* of evidence for apparent design could count as evidence for actual design. Under these restrictions, an omnipotent Creator would be incapable—short of vetoing human cognitive freedom—of leaving traces of his existence in the physical world which could be recognized as such. This seems a little stubborn.[42] ★

Notes

[1]See William Lane Craig and Quentin Smith, *Theism, Atheism, and Big Bang Cosmology* (Oxford: Clarendon Press, 1993), 3–76, for more on this point.

[2]For an extensive description of many of these, see John D. Barrow and Frank J. Tipler, *The Anthropic Cosmoloical Principle* (New York: Oxford Univeristy Press, 1966), 219–556.

[3]In William Lane Craig, "The Teleological Argument and the Anthropic Principle," *The Logic of Rational Theism,* ed. Craig and MacLeod (Lewiston: Edwin Mellen Press, 1990), 129.

[4]Stephen W. Hawking, *A Brief History of Time* (New York: Bantam Books, 1988).

[5]Roger Trigg, *Rationality and Science* (Oxford: Blackwell, 1993), 184–9.

[6]Stanley Jaki, *God and the Cosmologists* (Washington, DC: Regnery Gateway, 1989), 96.

[7]I owe this point to an anonymous referee of this journal.

[8]Barrow and Tipler, 1–2.

[9]Ibid., 3, 565.

[10]John Leslie, *Universes* (London: Routledge, 1989), 13–14.

[11]For more discussion of extraterrestrial and alternate life forms, see Barrow and Tipler, 576–677, and Leslie, 11ff.

[12]Leslie, 131–2.

[13]Paul Davies, *The Mind of God* (New York: Simon and Schuster, Touchstone, 1992), 190.

[14]Leslie, 69–70.

[15]Ibid., 6–8.

[16]I owe this point to a referee for this journal.

[17]C. Pantin, quoted in Barrow and Tipler, 83.

[18]Davies, 219.

[19]Barrow and Tipler, 105.

[20]Ibid., 7.

[21]Leslie, 140.

[22]Barrow and Tipler, 496.

[23]Craig, 146.

[24]Leslie, 192.

[25]Ibid., 102.

[26]See Quentin Smith, "World Ensemble Explanations," *Pacific Philosophical Quarterly* 67 (January 1986): 73–86.

[27]Again I owe this detail to a referee for this journal.

[28]For an excellent argument on the impossibility of the existence of an actual infinite set, see William Lane Craig, *The Kalam Cosmological Argument* (Barnes & Noble, 1979).

[29]See, for example, W. L. Craig in Craig, McLeod, 127–53; Craig and Smith, 3–76, 92–107; 141–60, 218–31, 279–300; Robert Prevost, *Probability and Theistic Explanation* (Oxford: Clarendon Press, 1990); and Richard Swinburne, "Argument from the Fine-Tuning of the Universe," in *Physical Cosmology and Philosophy,* ed. John Leslie (New York: Macmillan Pub. Co., 1990), 154–73.

[30]Swinburne, 166–72.

[31]Leslie, 129.

[32]Ibid., 129.

[33]Examples are common and blatant: "[I]t is argued that all logically possible universes exist in an ensemble of disjoint universes." In D. W. Sciama, "The Anthropic Principle and the Non-Uniqueness of the Universe," in *The Anthropic Principle,* ed. F. Bertola and U. Curi (Cambridge: University Press, 1993), 107.

[34]Leslie, 14, 94, 123–4, and Sciama, 107.

[35]See the reprint of Anselm's argument in Louis P. Pojman, ed., "The Ontological Argument," *Philosophy of Religion: An Anthology* (Belmont: Wadsworth Pub. Co., 1987), 51–3.

[36]See Kant's charge in "A Critique of the Ontological Argument," Ibid., 53–7.

[37]Alvin Plantinga, *The Nature of Necessity* (Oxford: Clarendon Press, 1974), 196–7; ———, *God and Other Minds* (Ithaca: Cornell University Press, 1967; reprint 1990), ch. 2.

[38]Plantinga, *The Nature of Necessity,* 214.

[39]Ibid., 54.

[40]Ibid., 213–7.

[41]Davies, 188.

[42]Such intransigence might even be irrational, since we clearly infer design in mundane circumstances. But MWH logic could be used to rule out all inferences that will end with the intentions of an intelligent agent, even in the human sphere. For the structural properties of inferring design, see William A. Dembski, *The Design Inference: Eliminating Chance through Small Probabilities.* Doctoral Dissertation, University of Illinois at Chicago, 1996.

Structures of Rationality in Science and Theology: Overcoming the Postmodern Dilemma

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This paper examines the structures of rationality that underlie the way we as individuals think and act, whether in science or in theology. It attempts to show how our knowledge is shaped by a tension between absolutism and relativism, or what this author calls the "postmodern dilemma" (although it is an old dilemma in a new form). A taxonomy of "structures of rationality" is proposed, and correlated to three developmental stages. The fecundity of the final "relationalist" structure is illustrated in the critical realism of W. Van Huyssteen and the use of complementarity logic by W. Jim Neidhardt.*

Those of us who are interested in relating scientific thinking and Christian faith, whether as scientists or theologians, find ourselves caught on the horns of a dilemma. On the one hand, it seems that recent work in the philosophy of science has demonstrated the provisional, contextual, and *subjective* nature of all knowledge, even in the "hard" sciences. This aspect of the "postmodern" critique suggests that it is impossible for us to know what is "real." On the other hand, as Christians who affirm the reality of God and the contingent reality of nature, we want to argue for a real *objective* world "out there" about which we can make truth-claims in science and theology. We are caught in a tension between relativism and absolutism.

Most of us carry on our professional lives without considering this dilemma; perhaps we even think the whole issue is somewhat superfluous. Nevertheless, whether we are aware of it or not, we all resolve the dilemma; but the resolution is at such a deep level that we are able to "know" without "thinking" about it. In fact, the way we think and act in our disciplines is powerfully shaped by the way we resolve this deep tension between viewing knowledge as absolute or as relative. Unfortunately, I believe Christians are too easily pulled, often unconsciously, toward resolving the tension by giving in to the relativism of our "postmodern" age, without recognizing the impact this will have on the way we do science and theology.

This paper suggests that the way a person resolves the dilemma of absolutism vs. relativism is shaped by his or her "order of consciousness," a phrase borrowed from Robert Kegan.[1] By correlating this psychological description of stages with a description of what I will call "structures of rationality," we may gain a better understanding of one factor influencing our everyday thinking. One of the most important discoveries of this correlation will be that relativism is not necessarily the last word.

Our first task, however, must be to clarify briefly what we mean by "rationality." The classical model of rationality, which sought certain and self-evident foundations for knowledge, and clear rules to follow based on those foundations, has collapsed under the clamoring throng of the postmodern crowd. Harold Brown has shown that we will always need

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a reason for why we select the foundations we do (or how we know they are self-evident).[2] The classical model of rule-following, foundationalist rationality always results in an infinite regress: searching for foundations for foundations. Brown proposes a new model that features "judgement" within a community. The details of his proposal[3] are less important for our purposes than the fact that he takes "the notion of a *rational agent* as fundamental, and such notions as 'rational belief' as derivative in the sense that a rational belief will be one that is arrived at by a rational agent."[4] The move from making "rational" a predicate of a proposition or a community to applying it to individual agents is critically important for understanding the proposal of this article. It sets the stage for understanding how an individual's ability to think rationally is shaped by his or her underlying "order of consciousness."

Robert Kegan's "Orders of Consciousness"

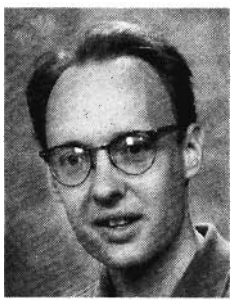
My goal in this first section is to show how Robert Kegan's "subject-object" theory outlined in his 1994 book, *In Over Our Heads*, provides a developmental scheme that can help us explain the structures that underlie and shape rationality in both science and theology.[5] In an earlier work, *The Evolving Self*, Kegan described the evolution of the self as it develops through a set of stages called "evolutionary truces." These are temporary solutions "to the lifelong tension between the yearnings for inclusion and distinctness."[6] In his 1994 book, he expands his theory to clarify the central importance of the underlying structure of the relationship between subject and object within each stage.

Kegan speaks of five "orders of consciousness," each evolving as a more complex way of relating the subject (or the knower) to the object (or the known). This theory grew out of his desire to elucidate the core structural commonalties underlying the cognitive and interpersonal characteristics of the developmental stages. For our purposes, the critical orders of consciousness are the third, fourth, and fifth, which Kegan refers to as "traditionalism," "modernism" and "postmodernism," respectively. (In the next section, we will propose a taxonomy of "structures of rationality" that correspond to these three orders of consciousness). Let us review each briefly, with reference to Chart 1 on page 230.

The first thing to notice about the chart is that the contents of the "subject" box are moved into the "object" box with each new order of consciousness. So, for example, whereas in the second order, one constructs knowledge *out of* one's point of view (childhood), a person in the third order "backs up," so to say, and objectifies his or her own point of view, as one among others (typically in adolescence). The *qualitative* nature of this transformation obtains for each new underlying structure, including the move to "postmodernism."

Kegan illustrates the difference between the third and fourth orders of consciousness by describing a couple who are struggling with the issue of interpersonal intimacy in their marriage. He notes that if each spouse constructs the self at a different order of consciousness, each will have a different idea of what it means to be intimate, or to be near another "self." In the fourth order, the self becomes *subject* to its third order constructions "so that it no longer *is* its third order constructions but *has* them ... [now] the sharing of values and ideals and beliefs will not by itself be experienced as the ultimate intimacy of the sharing of selves, of who we *are*."[7]

The move to the fourth order is a *qualitative* difference, involving more than just the inclusion of more complex content within the same mental frame. It requires a transformation of the third order, with its underlying cross-categorical structures, from whole to part, i.e., from *subject* to *object*. The move to a "systemic" (fourth) order is not something that can be taught like a new skill. It normally takes a long time for an individual to "negotiate"



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such a complete transformative change. Introducing new complex ideas to a person who still constructs the subject-object relationship in the third order will not by itself accomplish a transformation. Rather, the person will tend to fit the newer concepts into the old order and "make the best use it can of the new ideas *on behalf of the old consciousness*!"[8] As we will see below, the same phenomenon occurs when a scientist or theologian attempts to accomodate new ideas; the underlying structure of knowing shapes the way the new concepts fit into his or her frame of reference.

Although Kegan focuses most of his case material on helping to understand movement up to the fourth order (which his research indicates most educated adults have not reached), he points out that culture is quickly moving to a point of demanding the fifth order. This is his interpretation of the emergence of "postmodernism" in various disciplines and cultural spheres. These new demands in so many arenas of life "all require an order of consciousness that is able to subordinate or relativize *systemic knowing* (the fourth order); they all require that we move systemic knowing from *subject* to *object*."[9] This final "order" is important to understand, for I will argue that at this level a person gains a new capacity to overcome the postmodern dilemma, without collapsing into relativism or absolutism.

To understand the fifth order more clearly, it will be helpful to take an example that is particularly relevant to our topic: Kegan's discussion of "knowledge creation" from a fifth order of consciousness, and its relationship to "postmodernism." The move out of the fourth order means a relativizing of the "system" from its throne as *subject*, recognizing that all of its constructions are grounded in subjectivity. It is a process of "differentiating" the self from the fourth order of knowing. But then, asks Kegan, is *post*-modernism (being "beyond" the fourth order) also about a new kind of "integration" after the "differentiation," or is the creation of knowledge hopelessly ungrounded? Here he distinguishes between two kinds of postmodernism: *deconstructive* and *reconstructive*. Both point to the limits of knowledge, to the "unacknowledged ideological partiality" of every discipline and theory. For the deconstructivist this leads to the unacceptability of any position and the devaluation of commitment. The reconstructive

Chart 1: Summary of Kegan's Five "Orders of Consciousness"

	Subject	Object	Underlying Structure
1st Order	Perceptions Impulses	Movement Sensation	**"Single Point / Immediate / Atomistic"**
2nd Order	Concrete Point of View Enduring Dispositions	Perceptions Impulses	**"Durable Category"**
3rd Order	**Traditionalism** Abstractions Interpersonalism Inner States	 Concrete Point of View Enduring Dispositions	**"Cross-Categorical, Trans-Categorical"** Stepping outside of one's "point of view," to see it as *object* among other possible "points of view."
4th Order	**Modernism** Abstract Systems Ideology Self-Formation	 Abstractions Interpersonalism Inner States	**"System / Complex"** Creating a mental structure that "subtends, subordinates, acts upon, directs, and actually generates the meaning of relationships."
5th Order	**Post-Modernism** Trans-Ideological Inter-Institutional Self-Transformation	 Abstract Systems Ideology Self-Formation	**"Trans-System, Trans-Complex"** Systemic knowing itself is relativized, made *object* instead of *subject*. The relationship is seen (hermeneutically, not ontically) as prior to elements in relation.

*Adapted from Robert Kegan, *In Over Our Heads: the Mental Demands of Modern Life* (Cambridge, MA: Harvard Univeristy Press, 1994), 314.

approach, on the other hand, makes an "object" of the limits of our disciplines and theories:

> for the purpose of nourishing the very process of reconstructing the disciplines and theories ... When we teach the disciplines or their theories in this fashion, they become more than procedures for authorizing and validating knowledge. They become procedures about the reconstruction of their procedures. The disciplines become generative. They become truer to life.[10]

As a theory about theory-making and a *stand-taking* about the *way* we take *stands*, a reconstructive approach to postmodernism will necessarily make judgments concerning theories and stands that are not aware of the relativized mental structures that uphold them. The more complex order of consciousness is "privileged" only because it is "closer to a position that in fact protects us from dominating, ideological absolutes."[11]

In essence, the move to the fifth order of consciousness requires that one take the relationship itself as prior to its parts: "Do we take as prior the *elements of* a relationship (which then enter into relationship) or *the relationship itself* (which creates its elements)?"[12] This primacy of relationality in the "fifth" order of consciousness will be a key to overcoming the postmodern dilemma through what I will call a "relationalist" structure of rationality.

Before moving on to a description of my taxonomy, it is important to emphasize that my appropriation of Kegan's "orders of consciousness" is qualified in at least three ways. First, the use of this model is not meant to suggest that psychology "explains" the experience of human knowing. It describes only one factor among many (historical, physiological, spiritual, etc.). Second, the model is not intended, even by Kegan, to be elitist. Having a numerically "higher" order does not make a "better" person, either morally or intellectually. The taxonomy merely describes increasing levels of complexity, which may lead to more competence in some areas. Third, my use of Kegan's model is not an attempt to "prove" a theological point by appealing to the authority of psychology. Rather, it is an attempt to outline a proposed correlation between two structural aspects of human knowing.

Structures of Rationality

By a "structure of rationality" I mean the underlying tendency, within an individual, to lean toward one side or the other (absolutism and relativism) in resolving the tension between the objective and subjective aspects of knowing. In a sense, this "structure" plays a mediating role between a person's "order of consciousness" and the actual outworking of his or her theology or science. The model I propose (see Chart 2 below) suggests that a transformation of one's structure of rationality, analogous to that of a move from a fourth to a fifth order of consciousness, strengthens one's capacity for "upholding" the kind of resolution required to overcome the postmodern dilemma.

It is important to recognize that while there is a *shaping* relationship between orders of consciousness and an individual's structure of rationality, it is not a *causal* relationship. This schema of three structures is a measure of the way the self *holds onto* its constructions, and not a critique of the constructions themselves. The point is that individuals with absolutist or relativist structures may talk about potential resolutions of the dilemma like "critical realism" or

Chart 2: Structures of Rationality

Structure	Resolution of the Postmodern Dilemma
"Absolutist" Structure of Rationality (parallel to Kegan's "third order of consciousness")	Tendency to resolve the tension by collapsing into the "absolute" side of the dilemma. The *objective* aspect of knowledge is emphasized.
"Relativist" Structure of Rationality (parallel to Kegan's "fourth order of consciousness")	Tendency to resolve the tension by collapsing into the "relative" side of the dilemma. The *subjective* aspect of knowledge is emphasized.
"Relationalist" Structure of Rationality (parallel to Kegan's "fifth order of consciousness")	Tendency to resolve the dilemma by recognizing and maintaining the relationality that holds together both *subject* and *object* in tensional unity. This can avoid a collapse into either absolutism or relativism.

"complementarity logic" (which we will examine later), but these concepts are put to use in the service of constructing a less complex order of consciousness, which weakens their ability to avoid a one-sided collapse of rationality. That is, their underlying *frame of reference* has not developed to match the explanatory constructs which are *referents in the frame*.

***The "relationalist" structure offers the possibility of* turning the postmodern dilemma "inside out ..."**

An individual with an "absolutist" structure of rationality will be more likely to try to resolve the dilemma on the side of absolutism. That is, he or she will continue to search for foundations in order to have a ground of certainty. The possibility that others have different foundations emerges with the third order of consciousness because one's "point of view" becomes object rather than subject in the knowing process. The "relativist" pull of the dilemma is generally repelled or ignored, although this rejection may be based on a variety of different foundations or absolutes, as we will see.

A person with a "relativist" structure of rationality, on the other hand, will resolve the tension by leaning toward the "relative" side of the dilemma. Here the *relationship* between various foundations, sets of rules, and communities of discourse (rather than one tradition or another) becomes the *object* of knowledge, but the *relationality* itself is not yet primary. Although Kegan's research indicates that less than half of all educated adults have achieved this "fourth" order of consciousness, it would seem that most theologians and scientists who are struggling with issues of rationality, epistemology, and interdisciplinary method, are at least at this level. We can see, for example, in Ian Barbour's description of "integration" and "dialogue" models for relating science and religion that these *begin* with the disciplines as separate, and then try to work out the relationship between them *a posteriori*, indicating a fourth order of consciousness.[13] In the "modern" Cartesian era, when the task was one of being a detached observer of the "outside" world,[14] such an approach may have seemed sufficient. In our "postmodern" era, however, attempts to resolve the dilemma of absolutism vs. relativism from a fourth order of consciousness will almost inevitably lean toward the side of relativism.

A "relationalist" structure of rationality, on the other hand, takes the tensional reality of subject and object in knowing as a relational unity that precedes the description of either side. We may think, for example, of Martin Buber's comment that it is in the "between" that spans subjectivity and objectivity that truth is found.[15] By framing the situation in this way, this structure of rationality can recognize the contextual, provisional nature of the "subjective" side of knowledge, but simultaneously affirm the real (or true) existence of the "objective" side of knowledge. It is *out of* the relationality itself, out of the tensional unity of subject and object in the knowing event, that rational judgments are constructed.

By proposing a "relationalist" structure of rationality, I am not attempting to end discussion by sliding into a solipsism of subjective knowing (as the "traditionalist" might think), nor am I surreptitiously smuggling a new kind of absolutism into knowledge (as the "modernist" might think). Instead, the "relationalist" structure offers the possibility of *turning the postmodern dilemma "inside out,"* i.e., of allowing the inherent relationality-in-tensional-unity of subject and object in the act of knowing to "order" our rational constructions. However, the fact that individuals may share a "relationalist" structure does not mean that all their theories will have the same content. On the contrary, individuals will attempt to resolve the dilemma in very different ways. There are a multitude of attempts to find a middle way, as Bill Placher puts it, between the extremes of universalism and radical relativism.[16] However, the possibility of actually overcoming the dilemma, and not merely resolving the tension by leaning to one side or the other, is increased when a person reaches a fifth order of consciousness and achieves a "relationalist" structure of rationality.

Let us now examine each of these three structures of rationality in more detail by exploring some examples. All of the examples will be of scholars who have attempted interdisciplinary dialogue between theology and science, because it is in the context of such attempts that a person's underlying order of consciousness is most clearly revealed.

The "Absolutist" Structure of Rationality

We will spend the least amount of time on this structure because most scholars interested in the shaping of rationality as a common resource in theology and science have moved beyond it. Perhaps the clearest examples of constructions that appear to be formed by "absolutist" structures of rationality

are found in the works of those who adhere to extreme forms of *scientific materialism* and *biblical literalism*. Although completely opposed in the *content* of their theories, these paradigms seem to be *constructed* out of remarkably similar orders of consciousness. As van Huyssteen points out, both are based on a foundationalist epistemology and share the following characteristics:

> Both believe that there are serious conflicts between contemporary science and religious beliefs; both seek knowledge with a secure and incontrovertible foundation, and find this in either logic and sense data (science), or in an infallible scripture or self-authenticating revelation (theology); both claim that science and theology make rival claims about the same domain and one has to choose between them.[17]

In the terminology I have been developing, we would say that scientific materialists and biblical literalists are likely to have an "absolutist" structure of rationality that is shaped by a third order of consciousness. Underlying the constructions of individuals from either camp is a rationality shaped by the collapse of the postmodern dilemma toward the side of absolutism. Both commitments lead to an interdisciplinary approach limited to *ex parte* pronouncements, chipping away at the foundational pillars that support the opponent's epistemic temple. Even if an individual's rationality does not exhibit these extremes, a person with a third order of consciousness will at least lean toward the absolute or "objectivist" side of the dilemma. Clearly this structure of rationality is not up to overcoming the postmodern critique; it merely tends to ignore the contextual, fallible, non-exhaustive nature of human knowledge.

The "Relativist" Structure of Rationality

A fourth order of consciousness upholds and shapes rational constructions in a qualitatively different way. The cross-categorical structures of the third order of consciousness ("traditionalism") become *object* instead of *subject* of the knowing event (see Chart 1). This level of development is adequate for most scientific and theological work. It is only when the relational constructs introduced into our experience demand new modes of thinking that its limitations are revealed. Because this is the structure out of which most of us construct our knowledge, it will be critical to understand how it can shape our response to the postmodern dilemma. In this section, we will look at two concepts that are often found in attempts to explain the role of rationality in science and theology: *critical realism* and *complementarity*. I hope to show that a "relativist" structure of rationality may not be sufficient for successfully constructing these concepts as resolutions of the absolutism vs. relativism dilemma. In the next section, we will look at these two concepts as case studies again, but ask how a "relationalist" structure of rationality may be better suited to the task of upholding them.

Critical Realism. A well-known proponent of this approach in the science and theology dialogue is Arthur Peacocke. He notes that "critical realism" is a broad term with nuances of meaning, used differently by various authors. In his book, *Theology for a Scientific Age*, Peacocke explains: "critical realism recognizes that it is still only the *aim* of science to depict reality and that this allows for gradations in acceptance of the 'truth' of scientific theories."[18] He describes his epistemic approach as *critical* (not naive) because it acknowledges that our constructs are in the form of metaphoric language that cannot be taken literally. It is *realist* because it affirms that even our provisional language does actually refer to a reality beyond the knower.

Clearly Peacocke's use of critical realism is an explicit attempt to respond to the postmodern dilemma. How well does it work? The first clue that Peacocke may be operating with a "relativist" structure of rationality is found in the way he begins with the two poles or sides of knowing, the *critical* (representing subjectivity) and the *realist* (representing objectivity), and then tries to work out a possible resolution. This way of "ordering" the subject-object relationship shapes his rationality so that he tends toward relativism whenever a conflict emerges. When treating scientific issues, his view of knowledge seems *more realist than critical*; but on theological topics his approach is *more critical than realist*. This waffling between two separate epistemic convictions is symptomatic of an underlying structure of rationality that starts by holding the sides of the postmodern dilemma apart.

Statements about God are relativized, and judged in accordance with the reigning scientific paradigm (which, Peacocke admits, is itself relative). For example, only *after* explaining in scientific terms "*how* God might interact with the world," argues Peacocke, can we "with integrity assert that God does, or might do so."[19] This would seem absurd applied to the personal knowledge of a friend or spouse: "I cannot assert that I know or relate to my wife until after I understand and explain how it is scientifically possible for communication between two human minds." Even the title of his book is revealing: theology is *for* a scientific age, rather than simply *in* it. Our goal, he says over and over, must be to revise traditional doctrines so that theology can be "credible" to scientists.[20] Here we can see the effects of a

fourth order of consciousness: in actual practice, it collapses theological rationality into relativism. Peacocke approaches knowledge with an initial vision of two distinct sides, and then tries to formulate the possibility of a relationship, indicating a "relativist" structure of rationality.[21]

Complementarity. Niels Bohr also addressed the relationship of subject and object using the language of complementarity:

> In order to describe our mental activity, we require, on the one hand, an objectively given content to be juxtaposed to a perceiving subject, while, on the other hand, no sharp separation between object and subject can be maintained, since the perceiving subject also belongs to our mental content.[22]

Bohr realized that this complementarity of subject-self and object-self was the prior condition necessary for us to have conscious constructs at all. I am arguing that underlying what Bohr refers to as the relationship between "the conscious content and the background we loosely term ourselves"[23] is an order of consciousness that upholds the relationship between them. I believe that Bohr's application of complementarity logic to the relationship of subject and object, along with his insistence on the irreducible role of the observer in all knowing, points to an exciting possiblity for overcoming the postmodern dilemma.

A problem may arise, however, if the concept of "complementarity" is used in the context of a "relativist" structure of rationality. One such example may be K. Helmut Reich's argument that the Chalcedonian formulation (two natures, without confusion, without change, etc.) is an example of complementarity thinking. Setting aside the *content* of Reich's solution for now, it seems that he has *constructed* his solution out of a "relativist" structure of rationality. He begins by framing the problem in terms of logically conflicting statements.[24] By beginning with the "poles" of Christ's humanity and his divinity, and then trying to explain the relationship, Reich appears to be constructing the relationship out of a "fourth" order of consciousness. He does not see the relational unity of the person of Jesus Christ as hermeneutically prior to the two natures. Nor does he include the role of the council members (or of the contemporary believer), as observer/worshippers in relation to the experienced reality of Jesus Christ, in his application of complementarity. Yet, it is the insistence on including the relational role of the knower in the description of the knowing event that provides the power behind the concept of complementarity.

Reich also exhibits a "relativist" structure of rationality when he describes "thinking in terms of complementarity" in ways that lean almost exclusively toward the subjective side of knowing. For example, in an article on religious education, he refers to young people who are able to maintain two conflicting statements, as in the case of religious vs. scientific accounts of the origin of the universe, as thinking in terms of complementarity.[25] However, simply holding two conflicting statements simultaneously is not the same as "complementarity" in the complex sense in which it emerged with Niels Bohr (involving asymmetry, coinherence, coexhaustiveness, etc.). The reasoning capacities of the children and adolescents tested by Reich illustrate a kind of thinking that requires nothing more than blind paradox, which can be constructed as *content* by a third order of consciousness (typical of adolescents in Kegan's scale). Reich's use of complementarity fails to overcome the postmodern dilemma because his structure of rationality leads him to collapse the tension toward subjective constructivism, which leans toward relativism.

The "Relationalist" Structure of Rationality

To illustrate the "relationalist" structure of rationality, we will explore two additional attempts to resolve the postmodern dilemma: the *critical realism* of W. van Huyssteen and the use of *complementarity* logic by W. Jim Neidhardt. It is important to remember that we are dealing with a shaping, and not a causal, relationship. On the one hand, a person with a fifth order of consciousness *may* construct his or her knowledge in a way that leans toward absolutism or toward relativism. On the other hand, a person with an "absolutist" or a "relativist" structure of rationality *may* embrace the *content* of critical realism, complementarity, or some other conceptual resolution of the postmodern dilemma. In the latter case, however, such constructs would be inherently unstable, as we saw with Peacocke and Reich, because the underlying order of consciousness is insufficiently complex to support the resolution. There are clues in the writings of van Huyssteen and Neidhardt, however, that suggest a fifth order of consciousness underlying and shaping their rationality.

Critical Realism. Like Peacocke, van Huyssteen proposes a critical realist epistemology that is explicitly designed to overcome what I have called the postmodern dilemma. Arguing for a position between what he calls "literalism" and "fictionalism," van Huyssteen defends a view of knowledge that takes seriously, but not literally, the idea that our

partial, provisional language does refer in an "ontological or cognitive sense."[26] He suggests that we retrieve critical realism as a "fallibilist, experiential epistemology" to help us construct a "post-foundationalist" model of theistic belief, which avoids the absolutism of foundationalism and the relativism of anti-foundationalism.[27] How is this different from Peacocke?

First, van Huyssteen starts by affirming "the *relational* character of our being in the world ... the *fiduciary rootedness* of all rationality."[28] The adjective "experiential" in his epistemology indicates that his *terminus a quo* is the relationality of subject-object in the knowing event. This suggests an order of consciousness that does not assume a bifurcation of knower and known and then try to explain how they relate. Rather, van Huyssteen argues that the essential post-foundationalist move entails an *interactionist* or "*relational* model of rationality" that recognizes concepts and theories as "products of an interaction in which both nature and ourselves play a part."[29] He does not start with "critical" on one side and "realism" on the other, and try to force them together (as Peacocke does). Instead, he takes that kind of systemic knowing as *object* rather than *subject*, constructing his resolution *out of* the relational unity of a "relationalist" structure of rationality.

Complementarity. Like Helmut Reich, W. Jim Neidhardt was a trained physicist who turned later in life to the science/theology discussion. He too became specifically interested in the possible heuristic analogy between the hypostatic union in the Chalcedonian formulation and the complementarity interpretation of wave/particle duality in quantum theory. As I argued above, any attempt to apply complementarity logic should take into account the role of the rational agent, and be based in a "relationalist" structure of relationality. I believe Neidhardt's approach fulfills these criteria.

First, regarding the role of the knower, Neidhardt follows the post-critical philosophy of Michael Polanyi, and argues for the "participatory" nature of all knowledge, whether theological or scientific.[30] For example, unlike Reich, Neidhardt sees the Chalcedonian fathers as starting with the relational unity of Jesus Christ as truly God and truly human. They included their own roles as knowers and worshippers in their description of the knowledge of the One who can only be known completely and truly through participating in his inner life with the Father by the Spirit. As he explains in *The Knight's Move: The Relational Logic of the Spirit in Theology and Science*, a work co-authored by theologian James Loder, this is not trying to force two opposites together, but the attempt of "participating" knowers to carry out the most rigorous effort reason could make, which in this case was structurally compatible with the complex inner logic of complementarity.[31] Neidhardt starts with the hypostatic union as the indissoluble unity between God and humanity in Jesus Christ, and then argues that this relationality "constitutes the ontological ground for claiming that relationship is definitive of reality."[32]

Neidhardt also speaks of a figure-ground reversal between relationality and its polarities, so that relationality is viewed as fundamental. In terms of the subject-object relationship, he argues that "the intelligible order of reality is not in the mind, as Kant thought, or in nature, as Newton thought, but it resides in the relationship between mind and nature, the observer and observed."[33] Concerning the postmodern dilemma, he offers a resolution, using the terminology of Kierkegaard, that does not collapse into either side, but maintains the tensional unity: "only through deeply indwelt particularity is universality able to be known and appropriated."[34]

In relating science and theology, Neidhardt explicitly rejects starting with the disciplines as separated and trying to "integrate" them. Instead, he begins with a "fundamental epistemology"[35] in both fields that consists of "reciprocal asymmetric relations between two poles, the reciprocal relations between the poles maintaining a unitary structure that represents the complex unity intrinsic to the object and the representation of the object as the object shows forth to us."[36] These clues from his work indicate that Neidhardt's attempts to overcome the postmodern dilemma are upheld by a fifth order of consciousness. Because his epistemological resolution is analogically related to a central resource of the Christian faith (the logic of Chalcedon), Neidhardt provides an excellent example of the influence a "relationalist" structure of rationality may have on the interdisciplinary dialogue between science and theology.

Conclusion: Implications for Interdisciplinary Method

The blurring of boundaries between disciplines in our "postmodern" world has made the task of relating science and theology significantly more complex.[37] Is it possible that the development of a "relationalist" structure of rationality, as a resource shared by both scientists and theologians, may help to heal some of the epistemic wounds of the infamous "warfare" of the past few centuries? It is critical that we attempt such a move because, as I have

argued elsewhere,[38] we are in a situation worse today than that described by C. P. Snow several decades ago when the "two cultures" of the arts and sciences could no longer communicate. We now have dozens of "cultures" (disciplines) that cannot communicate, with the threat of further fragmentation from relativists who would argue that each one of us constructs our own culture.

The ASA has contributed greatly to the healing of this fragmentation by encouraging exploration of the relationship of science and Christian faith. In this paper, I have tried to suggest that these efforts may be undergirded by a deeper examination of the underlying structures of rationality which shape the way we as scientists and theologians *hold onto* our beliefs and practices. A "relationalist" structure of rationality may propel us to move beyond "integrative" or "dialogue" models of interdisciplinarity. It may require a recognition of the relationality between us as prior to either "conflict" (*confligere*) or "consonance" (*consonare*). Instead, we may think of interdisciplinary method as a "conquest," or a seeking-together (*conquirere*) after the intelligibility of creation. Such an approach would include the goal of helping one another, as *individuals*, develop structures of rationality truly capable of overcoming the postmodern dilemma. ★

Notes

[1]Robert Kegan, *In Over Our Heads: The Mental Demands of Modern Life* (Cambridge, MA: Harvard University Press, 1994).

[2]Harold Brown, *Rationality* (New York: Routledge, 1990).

[3]For a critique, cf. A.A. Van Niekerk, "To follow a rule or to rule what should follow? Rationality and judgement in the human sciences" in J. Mouton and D. Joubert (eds.), *Knowledge and Method in the Human Sciences* (1990): 179–94. Pretoria: HSRC.

[4]Harold Brown, *Rationality*, 185.

[5]Kegan, *In Over Our Heads: The Mental Demands of Modern Life*.

[6]———, *The Evolving Self: Problem and Process in Human Development* (Cambridge, MA: Harvard University Press, 1982), 108.

[7]———, *In Over Our Heads: The Mental Demands of Modern Life*, 114.

[8]Ibid., 97.

[9]Ibid., 316.

[10]Ibid., 330.

[11]Ibid., 333.

[12]Ibid., 313.

[13]Ian Barbour, *Religion in an Age of Science* (San Francisco: HarperCollins, 1990).

[14]Cf. Stephen Toulmin, *The Return to Cosmology: Postmodern Science and the Theology of Nature* (Berkeley: University of California Press, 1982), 237.

[15]Cf. John W. Murphy, *Postmodern Social Analysis and Criticism* (New York: Greenwood Press, 1989), 21.

[16]William C. Placher, *Unapologetic Theology: A Christian Voice in a Pluralistic Conversation* (Louisville, KY: John Knox Press, 1989), 13.

[17]Wentzel Van Huyssteen, *The Shaping of Rationality in Science and Religion*. Paper presented at the Religion and Science Conference of the Royal Institute of Philosophy, University of Warwick, UK (March 1995): 4.

[18]Arthur Peacocke, *Theology for a Scientific Age* (Minneapolis: Fortress Press, 1993), 12.

[19]Ibid., 150.

[20]Ibid., 335.

[21]Cf. Arthur Peacocke, "From DNA to DEAN" *Zygon* 26, no. 4 (1991): 490.

[22]Quoted in Abraham Pais, *Niels Bohrs Times: In Physics, Philosophy and Polity* (Oxford: Clarendon, 1991), 440.

[23]Niels Bohr, *Atomic Physics and the Description of Nature* (Cambridge: Cambridge University Press, 1961), 100.

[24]K. Helmut Reich, "The Chalcedonian Definition: An Example of the Difficulties and the Usefulness of Thinking in Terms of Complementarity" in *Journal of Psychology and Theology* 18, no. 2 (1990): 153.

[25]K. Helmut Reich, "Between Religion and Science: Complementarity in the Religious Thinking of Young People" *British Journal of Religious Education* 11 (spring 1989): 68.

[26]Wentzel Van Huyssteen, *Theology and the Justification of Faith*, trans. H. F. Snijders (Grand Rapids, MI: Eerdmans, 1989), 157.

[27]———, "Critical Realism and God: Can there be Faith after Foundationalism?" In A. van Niekerk, et. al., (Ed.), *Intellektueel in Konteks Opstell vir Hennie Rossouw* (1993): 254.

[28]Ibid., 257, emphases mine.

[29]Van Huyssteen, *The Shaping of Rationality in Science and Religion*, 29.

[30]W. Jim Neidhardt, "The Participatory Nature of Modern Science and Judaic-Christian Theism," *Journal of the American Scientific Affiliation* 36, no. 2 (1984): 98.

[31]James Loder and W. Jim Neidhardt, *The Knight's Move: The Relational Logic of the Spirit in Theology and Science* (Colorado Springs: Helmers and Howard, 1992), 85.

[32]Ibid., 200.

[33]Ibid., 43.

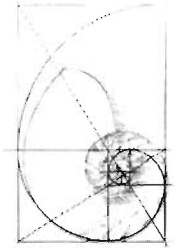
[34]Ibid., 104.

[35]Cf. Lee Wyatt and W. Jim Neidhardt, "Judeo-Christian Theology and Natural Science: Analogies An Agenda for Future Research" *Perspectives on Science and Christian Faith* 43, no. 1 (1991): 14–28 and F. LeRon Shults, "A Theology of Chaos: An Experiment in Postmodern Theological Science," *Scottish Journal of Theology* 45, no. 2 (1992): 223–36.

[36]W. Jim Neidhardt, "The Creative Dialogue Between Human Intelligibility and Reality: Relational Aspects of Natural Science and Theology" *The Asbury Theological Journal* 41, no. 2 (1986): 60.

[37]Cf. Raphael Sassower, *Knowledge Without Expertise* (New York: State University of New York Press, 1993) and G. J. Roussow, "Theology in a Postmodern Culture: Ten Challenges" in *Hervormde Teologiese Studies* 49, no. 4 (1993): 894–907.

[38]F. LeRon Shults, "Integrative Epistemology and the Search for Meaning," *Journal of Interdisciplinary Studies* 5, no. 1 (1993): 125–40.



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The Mediterranean Flood

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In this paper,[1] a novel theory of Noah's flood is presented which is based upon the desiccation of the Mediterranean Sea Basin. This hypothesis assumes that Noah's flood was a local event which occurred in the Mediterranean basin when it was a desiccated desert. The prediluvial events are postulated to have taken place in the eastern Mediterranean. This hypothesis explains the biblical references to lack of rain, dividing rivers, and water coming out of the earth based on natural causes. The geological and anthropological data are incorporated.

The Bible is unique among the world's religious writings in its dependence upon critical historical events. Without the creation, without Adam and Eve, without the historical events of the Fall, without the incarnation, and without the resurrection, Christianity is left in shambles. These events have traditionally been viewed as actual events in space-time and are intimately intertwined in Christian theology. In short, Christianity is a historically based religion and as such, the events depicted in the Scriptures must be historically verifiable.

There is one other important historical event mentioned in the Bible and that is the Flood of Noah. The Flood, while not crucial to the theological basis of Christianity (a Christianity lacking the text describing a historical flood would still be the same), is crucial to the veracity of the scriptural documents. The Flood story is related to us by the same document that informs us of three of the five crucial Christian doctrines. If science were to conclude that no flood occurred, then serious doubt would be cast upon the authority of the Scripture and, thus, on the historicity of the earlier temporal events: creation, Adam and Eve, and the Fall.

It is not the purpose of this paper to attempt a thorough review of previous flood theories. Others have written excellent reviews of the struggle between science and Scripture over the past few centuries and the reader can consult them.[2] The important and obvious fact is that modern geology has totally rejected the concept of the global flood and this rejection has important consequences for the authority of Scripture. It is difficult, at least for me, to conceive of a divinely inspired Genesis being historically accurate in chapters 1–3 and historically false in chapters 6–9. It follows from the claim of divine inspiration that both sections are true or both are false.

In response to the rejection of the global flood by modern science, conservative Christianity has generally only offered one comprehensive view of Genesis 6–9 to the geologist and the layperson. It is the very view that geology has rejected, namely the position outlined best in Whitcomb and Morris' *The Genesis Flood*.[3] Christian laypersons desiring a historical framework for the early chapters of Genesis accept this view eagerly. As Davis Young noted:

> The only widely publicized contemporary flood theories available to evangelicals are those of scientific creationism. Small wonder that on the issue of the flood evangelicals are so attracted to that voice; it is virtually the only one speaking among us.[4]

Because of this, it is important to find an alternative flood view.

When reading the first few chapters of Genesis, the distinct impression is gleaned that the hydrology of the world was much different in the antediluvian world. The first indication of the difference occurs in Gen. 2:5, 6 (NIV) which state:

> and no shrub of the field had yet appeared on the earth and no plant of the field had yet sprung up, for the LORD God had not sent rain on the earth and there was no man to work the ground, but

*ASA Member

> streams came up from the earth and watered the whole surface of the ground ...

The first noticeable item is that there was no rain. This is an odd state of affairs. Presumably the world was still spherical before the flood, and if so, it is difficult to understand why rain did not occur. Calculations and observations reveal that the north and south poles receive, on average, only 10–20% of the solar energy as is received at the equator.[5] If the equatorial energy is not transported, and equalized, the equator will become too hot for life, and the polar region too cold. Ocean currents like the Gulf Stream, and atmospheric currents like the jet stream, work to move the excess heat from the equator to the pole. While moving the heat around, masses of cold, dense air meet masses of hot, moist, and rarefied air. Hot air rises over the cold, and in doing so, moisture condenses and rain develops. The movement of the air—and thus rain—is an outcome of the geometric shape of the earth. To put it succinctly, a spherical earth causes lots of rain.

Even the idea of a water vapor canopy which is supposed to even out the temperature difference between the pole and the equator will only work when the earth has achieved temperatures far in excess of those hospitable to life.[6] And if the earth's axis was tilted before the flood as it is now, the six months of darkness would cool the canopy to temperatures below which it could remain as a vapor. The vapor would condense to water causing rain.

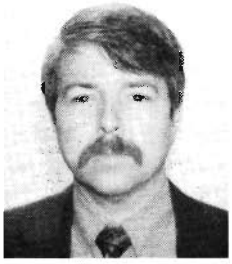
From a physical point of view, it is unreasonable to say that streams arose to water the earth. The forces acting on water always attempt to achieve a level surface. Thus when water fills the pores of rock layers in the subsurface of the earth, it fills the rock to approximately the same elevation above sea level. For water to rise out of the ground, the entire subsurface must be saturated with water up to the ground level. This happens in a bog or swamp, where the water level does rise above the ground surface. However, this does not seem to be what Genesis is describing. Today we do not see mists rise to water the earth; rain falls to achieve that objective. The only phenomena we have that approximates what is described are artesian springs and geysers, but they are too limited in extent to water the large areas apparently implied by the Bible. We can say today that mist (i.e., rain) goes into the earth but does not come out as mist. Genesis seems to have it backwards.

In just a few verses further, the hydrology of the ancient world gets even stranger.

> A river watering the garden flowed from Eden; from there it was separated into four headwaters. The name of the first is the Pishon; it winds through the entire land of Havilah, where there is gold. (The gold of that land is good; aromatic resin and onyx are also there.) The name of the second river is the Gihon; it winds through the entire land of Cush. The name of the third river is the Tigris; it runs along the east side of Asshur. And the fourth river is the Euphrates (Gen. 2:10–14 [NIV]).

The oddity in these verses is that one river leaving Eden splits into four rivers. Nowhere in the world today can this phenomenon be observed. Rivers join, merge, and then flow on together, but they do not split into four rivers after having merged. The Ohio River joins the Mississippi; the Missouri then joins both of them. After a confluence, each river segment is bigger, wider, and deeper. Genesis is implying that after the river left Eden, the flow was split into four rivers with each river smaller, narrower, and shallower. Again, Genesis seems to have reversed the normal state of affairs. Why is the normal hydrology reversed?

Finally, the last oddity of the early Genesis record is the Noachian Flood. It is one of those biblical events that makes many people uncomfortable because there has never been a widely accepted explanation for the physical cause of the events described. Scientists reject the whole notion; conservative Christians, if they think about it at all, generally



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accept the notion of a global flood. Others simply say that it is a legend about a Mesopotamian flood. Those who wish to hold to scriptural historicity are forced to develop a theory for the mechanism of these events. The fact that Jesus spoke of the Flood in Matthew 24 makes it far more difficult to ignore the issue. If the Son of God spoke of the Flood as a real event, then it must have been a real event; it cannot be relegated to the status of myth without doing damage to Jesus's claim of divinity. On the other hand, those who know geology know that there is little or no evidence in the geologic record for the deluge. For one who prefers biblical historicity and is in the geological sciences, the tension between these two demands can be quite difficult.

Flood Theories

Generally, flood theories have been divided into two broad classes: local and universal flood theories. Both views have their own set of problems that seem to defy both logic and scientific data. These are outlined below.

Problems of the Universal Flood Theory

The universal flood theory has the following major scientific difficulties.

1. Where did the water come from? Most advocates of the universal deluge postulate one of two mechanisms for the water's source. The first is a water vapor canopy: a layer of water vapor surrounding the earth high in the atmosphere, which when it collapses deluges the earth. Even the most determined of the canopyists can only place 40 feet of precipitable water in the canopy.[7] This means that only 40 feet of water would be added to the earth's surface which, while quite damaging, is not enough to cover the mountains. The second view postulates the sinking of the continents under the present ocean level. The sinking of the continents is used by Rehwinkel and Whitcomb and Morris to account for how the water could cover the continents.[8] Yet, observed rates of continental-sized vertical movements (one centimeter per year) are too slow to have submerged the continents in ten thousand years, much less in a year, unless it was done miraculously.[9]

2. Where did the water go? If the present earth were covered by water to a depth of 30,000 feet—enough to cover all the mountains on earth—the earth would forever after be covered to that depth. There is no place for such a quantity of water to go. This is the primary reason that vertical continental motion is advanced. With a vapor canopy alone, the water would merely run off into the oceans; but there is not enough water to have buried the mountains.

3. How did it rain for 40 days and nights? A cloud is nothing more than tiny water droplets. These water droplets are falling to earth under the influence of gravity, as any object would do. Why do clouds not fall to the earth? Updrafts blowing against the droplets balance the force of gravity, suspending the particles in midair. As droplets collide and coalesce, the droplets become so large that the updraft can no longer support them and they fall to earth as rain. These facts make it very difficult to understand how it could rain over the entire earth for forty days and nights. If rain requires an updraft, how could there be an updraft over all the earth at the same time? This is a scientific impossibility.

Thus, most universalists have felt the need for having a vapor canopy. Again the vapor canopy will not really solve this problem, since as committed canopyist Dillow has pointed out, the heat given off by a collapsing water vapor canopy would be enough to raise the temperature of the atmosphere to 2100° C. To avoid the heat problem, Dillow proposes that in the year before the Flood, the canopy began to condense into a worldwide cloud cover, raising again the difficulty noted above.[10]

4. How did the animals migrate to the ark? The migration of the world's species to the ark is required by the universalist but that event leaves many problems unanswered. Without divine intervention, New World amphibia would be hard pressed to travel to the ark. As Dodson and Dodson note:

> Even a small amount of salt water is a nearly absolute barrier to amphibians. For this reason, the Pacific Islands are usually uninhabited by amphibians, except where they have been introduced by man, as in Hawaii. Salt water also separates many freshwater fishes. For example, on the Pacific coast many freshwater streams follow more or less parallel courses to the ocean. Typically, each stream will have its own subspecies or even species. Although the expanse of salt water separating the mouths of neighboring streams may be small, the fish do not cross it.[11]

If the Flood was universal, then the flood waters would have been brackish, which would have killed most of the amphibians, freshwater fish, and many of the ocean species. Each type is adapted to live within a particular salinity range.

Mammals also would have problems migrating to the ark. Due to the specialized food requirements

of certain species, even land can be an impassable barrier. The red tree mouse eats fir needles, nests in fir trees, and lives entirely within the boundary of the fir forest. Grasslands are as impassable to these mice as is the harshest desert to most other species. Forests lacking fir needles are a barrier to them. Without fir needles the mice starve to death. The arctic hare lives in all European mountains from the Urals west to the Atlantic, but is unable to survive in the lowlands. It is believed to have been able to migrate across these lowlands only during the time that the glaciers covered much of Europe. Its migration to the ark, as well as the migration of the red tree mouse, would seem impossible.[12]

Geographic features also serve as impassable barriers to other species. The opossum has been unable to invade the mountains.[13] Occasionally mice are unable to cross rivers, leading to separate species on each bank.[14] The armadillo, a permanent fixture on Texas highways, is not native to Texas. Being unable to swim, they did not begin moving north out of Mexico until bridges were built across the rivers. With these difficulties, it seems hard to believe in any form of naturalistic migration to the ark.

5. How were the animals cared for? Assuming that the 21,000 species of amphibian, reptile, bird, and mammal had to be represented on the ark, it would require around 42,000 individuals. Assuming that each of the eight people on the ark had to take care of their share of the animals, each person would have 2,637 cages to visit each day for feeding and cleaning. If each person worked a 12-hour shift, then each cage would only get three and two-thirds minutes of attention per day. The feeding of my cat takes more time than that each day.

A straightforward reading of the chronology outlined in Gen. 7:1–10 indicates that Noah and his family had only one week during which to load all the animals. If the eight people were required to lead the 35,000 animals from the ark's door to its cage, the work load would have been crushing.[15] Each member of the ark's crew would have to climb the equivalent of a 19.5 story building every hour, day and night, for the entire week prior to the Flood.[16] Even the time constraints are imposing; two pairs of animals per minute must be loaded.

Other physical problems include the generation of 78,750 liters of urine per day. To carry fresh water on board to replenish this lost water would occupy 70% of the ark's volume.[17] The only other alternative is for Noah to have had some type of desalination plant aboard the ark with a capacity of 80,000 liters per day.

Wood, of which the ark was constructed, is an excellent insulator and would not allow the heat to escape easily. Everyone has had the unpleasant experience of being in an overcrowded room where the body heat of the occupants makes the room unbearable. The same thing would happen on the ark. Calculations show that over ten million calories per hour would be generated by resting animals on the ark. The temperature inside the ark can be calculated to be 115° C. Water boils at 100° C.[18] Those who have been in the Navy know how cold it can get in the bottom of a modern ship. Modern ships are made of iron, an efficient conductor of heat, while the ark was made of wood, an extremely inefficient conductor.

6. How did the plants and fish survive inundation by brackish and salty water? Very few land plants can survive in sea water for a very long time and all their seeds would be in jeopardy from the salt water bath. As noted above, the brackish water would kill both oceanic and freshwater fish.

7. How did the olive leaf grow? In Genesis 8, Noah released a dove from the ark, but it returned to the ark having no place else to go. Seven days later, Noah released a second dove, this time the dove returned with a freshly plucked olive leaf. This incident seems strange in that Noah apparently could still see no exposed land or trees from his vantage point; apparently the bird did not either during the first flight from the ark. In fact, Gen. 8:9 states that the water still covered the earth. One week later the bird brought back a freshly plucked leaf. It seems inconceivable that this could be a new shoot. Noah's purpose in letting the birds go was to determine if there was any place for them to land, which implies that the water was still so deep that Noah could not see any land or tree tops around him. The water, therefore, was still much too deep for the dove to bring back a brand new shoot from a seedling or small cutting. The only explanation is that the dove landed on the newly exposed top of a submerged tree. That raises the question of how a fully grown tree came to be in the shallow waters around the ark. This issue will be addressed later.

Any global flood model which purports to be a scientifically supportable view of the Flood *must* answer the above questions. When a global flood model fails one of the above empirical tests, the perceived authority of the Scripture is undermined.

Does Genesis really teach a universal flood? While the interpretation of the Bible is far from my field of expertise, as an interested layperson, I am going to make a couple of observations about the

interpretation of two critical phrases in the Bible. Throughout the English translations of Gen. 6–9, the Hebrew word *eretz* is translated "earth." This is unfortunate since the connotation which the English word "earth" has may not be quite the same as the Hebrew connotation of *eretz*. Of the usages of *eretz*, it is translated "land" 1,458 times and "earth" 677 times. In at least 100 occurrences where it is translated earth, it could just as easily be translated "land."[19]

The extent of several events is determined by which English word is used as the Hebrew equivalent. In Gen. 12:10 there was a famine in the *eretz*. There are no contextual clues to the extent of this famine. All versions consulted translate this occurrence of *eretz* as "land" thus limiting the extent of the famine. How can we be sure that it was not a previously unrecognized worldwide famine? In Ex. 10:15 of the Authorized Version Bible, the King James, and the New American Standard, *eretz* is translated as earth, giving the impression that the plague covered the whole Earth, rather than just the land of Egypt. If it were not for verses 12 and 14, we would have no way of knowing that the most reasonable translation is "land" (used by the New International Version and the Revised Version). Again the choice of the English word would seem to determine the extent of the plague. If the verse is relating that locusts covered all the planet Earth in a previously unrecognized locust catastrophe of global extent, the first choice is correct.

1 Sam. 30:16 of the King James version has the Amalekites spread across all the Earth. Surely, the Amalekites were not in the New World. In Gen. 12:1, Abraham is told to get out of his *eretz*. Surely, God was not telling him to get off the planet Earth. In Gen. 41:57, the famine was said to have been severe in all the lands and people from all countries came to buy grain from Joseph. The American Indians certainly did not. In all these cases, the word *eretz* has the connotation of a limited area of the Earth.

The point of all this is that in the case of the Flood, it is the extent which is precisely what is at issue. Context is not very helpful in choosing how to translate the word *eretz*. Thus the extent of the Flood appears to the layperson to be determined by the belief of the translator.

Even the phrase "under the whole heaven" in Gen. 6:17 and 7:19 may not have universal implications. In Deut. 2:25, we are told that the fear of the Israelites was beginning to be upon all the nations "under the whole heaven." Again it is doubtful that British tribesmen in the second millennia B.C. were afraid of the Hebrews nor do primitive Papua New Guinea tribesmen fear them today. The same phrase occurs in Job 37:3. The Job 37:2–5 passage seems to be a clear reference to hearing the thunder from the lightning which in verse 2 had been unleashed beneath the whole heaven and sent to the ends of the earth. Since it is impossible to hear in Dallas, the thunder generated by a lightning strike in New York City, it would appear that the heaven in the phrase "beneath the whole heaven" is much more limited in connotation than it is usually interpreted in the Genesis passages. It appears to me that "under the whole heaven" refers to an area from horizon to horizon and not to the entire surface area of the Earth. Thus, from the textual evidence, imputing a universalist interpretation on the Gen. 6–9 flood may not be correct.

Problems of the Local Flood Theory

However, pointing out problems with the global flood alone is not enough. The local flood theory also has major problems that are equally difficult to answer. The following problems with the local flood view have led to its rejection by many conservative Christians.

1. How could the human race be localized? This is an absolute must for the local flood theory, since it is difficult to read Genesis in any other manner than the destruction of the entire human race. The entire population must have been localized along some river valley or topographic low. As mobile as humankind is, this localization could only have occurred early in humankind's history. But most of the topographic lows on earth have local places people could easily flee to and survive outside the ark.

2. Where did humankind live? This question has always plagued this view. Without an identified locality, the local flood viewpoint can neither be attacked nor defended. It retains the appearance of the fictional movie, *Star Wars*; it happened long, long ago in a valley far, far away.

All attempts to specify the location have met with failure. In 1929, Sir Leonard Woolley announced the discovery of the famous "Flood layer" at Ur in Iraq. Many local flood theorists immediately latched on to this layer as evidence of Noah's flood. A few months later Stephen Langdon announced the discovery of some similar strata a few hundred miles to the north at Kish. This was trumpeted as proof that a huge flood had wiped out Mesopotamia several thousand years ago. Glee turned to sorrow when it was later discovered that the flood layer did not even cover all of Ur and that the clay layer at Kish

was not contemporaneous with that at Ur. The two layers were not even in the same century.[20]

Other local flood advocates also suggested locations for the Flood. Hugh Miller advocated that the Flood occurred in the Caspian Basin,[21] but there is no evidence of such an event within the past several thousand years. To have a flood—global or local—leave no evidence of itself strains credibility.

3. How did the ark land on a mountain if the ark was carried downhill in a local flood? This is the most serious objection to the local flood theory and barring the solution of this puzzle the local flood theory *must* be rejected. In 1993, flooding occurred in the upper Mississippi River Valley. There were nearly thirty days of rainfall causing the river to overflow its banks. If the ark had been in the Mississippi flood plain, the waters would pick it up and carry it down to the Gulf of Mexico. Once in the Gulf of Mexico, it is difficult to see how it could land on a mountain in Montana. Gen. 8:4 (NIV) states clearly: "and on the seventeenth day of the seventh month the ark came to rest on the mountains of Ararat." This problem must be answered in order to have a viable local flood theory.

4. Why was the ark necessary? If the flood was local, then why did Noah and the animals not simply migrate? After all, that is the technique used to save Lot and his two daughters from the destruction of Sodom. They simply left before burning sulfur rained down on the town. Custance suggests that God did not want to destroy the ancient world without fair warning and indeed, this is the way God often works in impending disasters.[22] He warned Ninevah with Jonah's visit; and the people repented. God warned Jerusalem of its impending destruction before Nebuchadnezzar, but the people did not repent. So Custance's idea sounds like a reasonable suggestion. However, when looked at in more detail, the suggestion falls apart. Noah could have preached and then left just before the Flood. Custance responds rather weakly that Noah was ignorant of the Flood's extent and assumed it to be universal.[23] The verbal warning of Jonah worked quite well, so it is difficult to see why it would not have worked with the antediluvians.

5. Can a local flood last for a full year? The length of time that it took for the flood waters to rise seems extraordinarily long, if the Flood were merely a local one. According to Genesis 7, the waters rose for 40 days and remained for another four months before beginning to abate. Although the time frame for a major riverine flood can last that long, the events surrounding such a flood do not match the biblical account. Instead of having merely 40 days of rain, a major flood requires months of heavy rain. Champ Clark relates the events surrounding a major Mississippi flood:

> In August 1926, unusually heavy rains began to fall over much of the Mississippi drainage basin. By September, tributaries in eastern Kansas, northwestern Iowa and parts of Illinois lapped over their banks. Throughout the autumn and winter the rains continued: on New Years's Day, 1927, a Cumberland River gauge showed a record reading of 56.2 feet, more than 41 feet above the reading of the previous August.[24]

The crest of the flood did not reach southern Louisiana until the middle of May 1927. The basin had experienced nine months of flooding, but much less than that at any one point along the river. At Vicksburg, Mississippi, the hydrograph showed that the river was in flood for only four months.[29] The second largest flood on the Mississippi this century was in 1973. The hydrograph shows only three months of flooding at Vicksburg for the 1973 flood and only two months of flooding for the third greatest flood in 1937. If the ark could float along with the crest, then the length of time for flooding would be about correct but the period of rainfall would be wrong.

Riverine flood waters generally travel at a few miles per hour. If the ark were in Mesopotamia, the flood waters in the river would push the ark out into the Persian Gulf within a week. As far as Noah would be concerned, the Flood would be over within a week.

6. Why such a large ark for a local flood? The ark was much bigger than was necessary for a local flood. This objection to a local flood is based upon the assumption that the unit of measurement, the cubit is known. According to Whitcomb and Morris, the cubit measured from 17.5 to 20.65 inches in length.[26] Under the assumption that the cubit was 17.5 inches, the ark would have been 437 feet by 73 feet by 44 feet. A boat of this length was not made in historical times until the fifteenth century. It was the seaworthy, Chinese navy's *Cheng Ho*—the longest wooden boat ever made—estimated to have been 538 feet long, built in 1420.[27]

The carrying capacity of a vessel such as the ark was surely too large to build simply for the preservation of a few local varieties of animals, which is what the local flood advocates often suggest. Custance suggests an escape for this conundrum; he suggests that the length of Noah's cubit was much smaller than the commonly accepted value.

> The dimensions of the Ark are given as 300 cubits long, 50 cubits across, and 30 cubits deep. This is generally interpreted as meaning that the vessel was 450 feet by 75 feet by 45 feet. This is an immense structure. It may be that the Ark really was of such proportions: but may also be that the *terms* of measurement are no longer correctly known. The cubit may not at this early period have been equal to 18 inches.[28]

If Custance is correct, the Ark may have been significantly smaller than is commonly assumed.

These are the problems which each viewpoint of the Flood—global and local—must overcome to be viable. The hypothesis must be absolutely conformable to the information given in Scripture and consistent with scientific observation. At least one of these views is wrong. But until a hypothesis is presented which can solve the unique problems of either view, it is scientifically impossible to determine the correct one. While I am still unable to present a coherent view of the global flood which solves its problems, there is a hypothesis which does solve the scientific problems of the local flood. It is to that hypothesis that we now turn.

The Desiccation of the Mediterranean Basin

Over the past century as more was learned of the geology of the Mediterranean region, a picture developed which pointed toward some strange events having taken place in the region's history. When workers were drilling for water in southern France, a deep erosional channel was found beneath the Rhone River. The Rhone, which empties into the Mediterranean, had cut a massive channel into the hard granite bedrock 300 feet below the ocean surface at Valence, France. Subsequent drilling proved that the channel continued for more than 124 miles south to La Camarque, where the canyon bottom was found to lie more than 3,000 feet below sea level.[29] Rivers are unable to cut the bedrock below sea level, but the Rhone had. In Sicily a deep-water deposit called the Trubi marl lies directly atop a shallow-water salt deposit.[30] In 1961, when the first seismic data were collected in the Mediterranean Sea, amazing features were discovered on the sea floor. The sound reflections revealed features in the deep, abyssal part of the sea that looked exactly like the salt domes drilled in the Gulf of Mexico and elsewhere. Salt domes reflect almost no sound and produce a characteristic quiet zone on a seismic line. The mystery which salt domes present to the geoscientist is that there is no known manner in which 6,500 to 10,000 feet of salt can be deposited on the floor of a deep ocean basin.[31] In the late 1960s, the *Conrad*, a seismic survey vessel from Lamont-Dougherty Research Institute, collected data which displayed a massive *erosional* channel across the Mediterranean Ridge thousands of feet below sea level.[32] At the time, nobody really believed what the data clearly showed.

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Geologists studying the coastal regions of Libya and Egypt found numerous river-cut channels buried beneath the North African coast, including one under the Nile cut into bedrock to an astounding depth of 4,500 feet.[33] A cave system, extending deeper than 6,600 feet below sea level, was found on Malta. Because caves can only form in rocks lying above sea level, this constituted a major mystery.[34] Finally, karsts (sink holes related to caves which also can only be formed above sea level—like those in Florida) are found on the Mediterranean Ridge more than 6,600 feet below sea level.[35]

All these facts, and others, formed an incongruous set of facts which needed explanation before the geologic history of the Mediterranean Sea could be outlined. It was not until the August and September 1970 voyage of the *D/V Glomar Challenger*, a research vessel used to drill into the oceans' bottoms to sample the sediment, that these discordant facts were joined into a coherent and understandable picture by the work of Kenneth Hsu and W. B. F. Ryan.

Off the coast of Majorca in the Balearic Sea, the drill ship recovered a core which contained both anhydrite and stromatolite. Anhydrite is an evaporitic mineral which forms only at temperatures higher than 35° C (95° F).[36] Finding this mineral under 8,500 feet of water, where the temperature is always less than 4° C, was quite a shock.[37] But the discovery of the stromatolite proved at once that this ocean basin had been nearly empty.[38] Stromatolite is a peculiar, shallow-water, thinly-layered algal deposit which depends upon photosynthesis to form and is only found in waters less than 30 feet deep!

The voyage also discovered desiccation cracks filled with salt, eolian (wind-blown) silts, shallow-

water ostracods (small clam-like creatures) and desert-like alluvial fan deposits (an alluvial fan is a conical-shaped deposit of sediment which occurs at the base of mountains, not under the sea).[39] It gradually became obvious that the Mediterranean Basin had largely been a dry desert, but how could this have been?

The juxtaposition of a shallow-water deposit overlaid by a deep-water deposit is only understandable if an empty Mediterranean basin is suddenly, catastrophically refilled by the opening of the Gibraltar dam.

If the Strait of Gibraltar were to be dammed up today, the Mediterranean would evaporate in approximately 1,000 to 4,000 years. This is prevented only by the continued influx of new Atlantic waters, since more water is lost by evaporation than is replenished by river flow. Small basins with brine lakes would be all that would remain in a Mediterranean basin in which Gibraltar was closed.[40] The continents of Africa, Europe, and Asia would appear as a surrounding ring of 10,000-foot-tall mountains. The rivers pouring off the continents would begin to erode huge canyons into the continental shelves, like those discovered over the past century. Huge alluvial fans would be deposited at the base of the continental slope, like those discovered by the *D/V Glomar Challenger* in 1970. Anhydrite would be deposited on the former sea floor since the temperature would easily be above the critical 35° C temperature. Salt would also be deposited in some areas, while fresher water areas would allow for the deposition of stromatolites. Rain water falling on Malta would percolate through the subsurface limestones forming a cavern system all the way down to the abyssal levels of the Mediterranean. Caves cannot form under sea level since sea water is so full of lime that it cannot dissolve the limestone rock and form the cave. The erosional channel on the Mediterranean Ridge could easily have been cut 6,600 feet below sea level as one Mediterranean sub-basin spilled into another through a narrow opening. The feature has the appearance seen where Lake Erie spills into Lake Ontario, eroding a channel between the two lakes by means of Niagara Falls.

If the Gibraltar Strait were then to be suddenly opened, the Mediterranean would quickly fill with water again. As mentioned above, the Sicilian Trubi marl is a deep water deposit lying directly on top of a shallow water salt deposit. The evidence which proves that it is a deep water deposit is that it contains the remains of ocean life-forms which only live 3,000 feet below sea-level. The juxtaposition of a shallow-water deposit overlaid by a deep-water deposit is only understandable if an empty Mediterranean basin is suddenly, catastrophically refilled by the opening of the Gibraltar dam. Geologically speaking, one day the sea floor was desert; the next, it was deep ocean.

When was the Mediterranean a desert? Five and one-half million years ago. This is coincident with the appearance on earth of the first hominids. The oldest known hominid is from Lothagam, Kenya and is dated to 5.5 million years ago.[41]

The Prediluvial World

The Mediterranean desiccation has major implications for the interpretation of the first few chapters of Genesis and the lack of rain. The lack of rain would be understandable, since the major source of water for rainfall in the Mediterranean region is the Mediterranean Sea itself. Without that abundant supply of moisture, rain would practically cease in the region. The prevailing wind in this region is from the north in January and from the east in July.[42] This would make it extremely unlikely that any rain would fall in this basin. It is a well-known fact that there is a rain shadow in basins immediately downwind from mountains because an air mass moving downhill lowers its relative humidity. This means that any moisture contained in the air as it spilled over into the desiccated Mediterranean basin would be even less likely to form rain clouds. The basin would be on the lee side of huge mountains in all directions.

While it is rare for a region not to receive rainfall, it is not unknown. The Atacama Desert in Chile, a 600-mile-long region of the Andes, has been nearly rainless for the past 400 years. It has regions where rainfall has never been observed.[43] Other areas go as long as five years or more without any rain and the rains which occur only fall on small parts of the desert only two to four times per century.[44] Thus, for the Mediterranean to dry up, creating a region which did not receive rain, would not be that novel.

The reversed hydrology becomes understandable if the Bible is describing an area similar to the desiccated Mediterranean basin. Concerning the mists or streams which rose out of the ground, two pos-

sibilities exist. First, the hydrostatic head on the aquifers underlying the surface of the continental plateaus would have been busy disgorging their contents along the former continental slope, which was a mountainside when the Mediterranean basin was emptied. As an example, today the coastline of Egypt has the potential of discharging 1.5 billion cubic meters of water per year from subsurface flow without depleting the underground reserves of water.[45] Second, the strange description of the division of the rivers can only be accounted for in a situation similar to that of the desiccated Mediterranean. At the foot of the continental slope, where a prediluvial river's gradient would begin to level out as it approached the level of the abyssal Mediterranean plain, two things would occur. The river would begin to deposit its load of sediment, causing the formation of a conical shaped alluvial fan. This, in turn, would cause the stream to split into many smaller channels. This phenomenon can be observed today in smaller versions such as deltas, submarine fans, and alluvial fans. Today the Nile River splits into two major and three minor streams at its delta. This split continues onto the sea bottom, where five submarine canyons radiate out from the Nile delta onto the Nile submarine fan. A similar split in the Mississippi River can also be seen in southern Louisiana.

Consider the first description of Eden:

> Now the LORD God had planted a garden in the east, in Eden; and there he put the man he had formed (Gen. 2:8 [NIV]).

Why is it mentioned that the garden is in the east? In the east of what? The location is a relative term and has been normally interpreted to imply somewhere east of Israel. It is possible, considering the paucity of evidence, to claim that the term refers to the eastern Mediterranean basin. The characteristics of a desiccated eastern Mediterranean basin seem to match those described in Genesis which, by itself, should be a powerful argument.

The next few verses lay out the prediluvial geography quite specifically.

> A river watering the garden flowed from Eden; from there it was separated into four headwaters. The name of the first is the Pishon; it winds through the entire land of Havilah, where there is gold. (The gold of that land is good; aromatic resin and onyx are also there.) The name of the second river is the Gihon; it winds through the entire land of Cush. The name of the third river is the Tigris; it runs along the east side of Asshur. And the fourth river is the Euphrates (Gen. 2:10–14 [NIV]).

If the land spoken of here is in the eastern Mediterranean basin, the rivers spoken of could be the branching of the Nile flow after it fanned out on the abyssal floor. One branch flows slightly northeast; one flows north; and the other two flow to the northwest. One of these rivers flowed through the land Havilah, where there was gold and onyx, and "aromatic resin." According to Derek Kidner, the word which is translated as "aromatic resin" might be better translated as pearls.[46] Resin seems to be a poor match with the other riches found in Havilah, but pearls would fit the nature of the listed items. There is a place on the Mediterranean floor which would fulfill this description.

The characteristics of a desiccated eastern Mediterranean basin seem to match those described in Genesis ...

Biju-Duval et al. note that an ophiolitic complex extends from Oman to Turkey and then continues across the Mediterranean floor across Cyprus.[51] Ophiolites are igneous rocks which were once part of the ocean floor and are well known for their mineral deposits. One part of this ophiolite chain presently rises above sea level on the island of Cyprus. These mineral rich deposits contain onyx (Chalcedony),[47] copper,[48] iron, manganese,[49] silver, and gold.[50] If the area of Cyprus was part of the land of Havilah, then oyster beds with pearls inside them would have been exposed high on the slopes of the continent of Asia. The oysters which grew along the Asiatic seashore prior to the time when the Mediterranean dried up, would be stranded high on what then appeared as a mountain chain. One could walk along the mountain slope, open the shells of dead oysters, and find pearls.

One might object to this identification by pointing out that some geographical features are named: two rivers in Mesopotamia, the Tigris and Euphrates, the country of Asshur and the land of Cush which lies south of Egypt, at least according to later designations. How are these issues to be resolved?

One possibility is that the rivers of Genesis 2 are rivers which formerly poured into the Mediterranean. The Pishon could have been a river coming off Cyprus, where there is gold. The Gihon could have been an ancient name for the Nile which flowed through Cush, located in its traditional place south

of Egypt. The Tigris and Euphrates refer to the ancient courses of those rivers.

If the land spoken of [in Gen. 2:10–14] is in the eastern Mediterranean basin, the rivers spoken of could be the branching of the Nile flow after it fanned out on the abyssal floor.

In the past 5.5 million years, Africa has continued to drift northward crashing into Eurasia. The Tethys Sea formerly stretched between Africa and Europe and India and Asia. As Africa and India have drifted north, they have closed the Tethys Sea. The Black and Mediterranean Seas are the last remaining remnants of a once large ocean.

This continental collision has caused much alteration in the topography of the Turkish highlands by altering and creating new river courses. It is in the Turkish highlands that the Tigris and Euphrates begin. They go to the southeast today because of the doming of the land along the Dead Sea Rift. This doming creates a highland on each side of the rift and has cut off the paths of these two rivers. Initially, the Tigris flows southwest toward the Mediterranean out of its source, Lake Van. The Euphrates has an initial southwestward course out of the central Turkish highlands but is turned back to the southeast toward the Persian Gulf by the highlands which exist running north-south with the Dead Sea Rift. Even today the Euphrates comes within 62 miles of the Mediterranean Sea. Only slight alterations in the present topography would allow the Euphrates to once again pour into the Mediterranean.

Another objection might be that deep basins like the one being postulated would be too hot for creatures to live. There is paleogeographic evidence that this is not so. The hippopotamus was able to travel from the Nile to Cyprus during this time frame.[52] The Hippopotami inhabiting the Nile simply followed it down into the Mediterranean from where they traveled a short distance to another river coming off Cyprus. From there, they merely followed the Cyprus river upstream.

The desiccation of the Miocene Mediterranean did have an effect on the climate of Europe. Hsu notes:

> Although the deterioration of climate in the east preceded the Messinian Stage, the desiccation of the Mediterranean Sea had nevertheless left its imprint on the European climate, as illustrated by the fossil floras of the Vienna Basin. During the Middle Miocene (Helvetian) large evergreen leaves *Cinnamomophyllum* (Poltawa element) were predominant. During the early Late Miocene (Tortonian) small, serrated, thin-skinned deciduous leaf forms (Turgaya element) became more numerous. Both of these became rare or disappeared altogether during the late Late Miocene (Sarmation or Messinian time), when tough, mostly smoothed-edged rounded leaflets of woody, *Leguminosae* became the dominant flora remains. Apparently a warm and dry savanna covered the Vienna Basin when the Mediterranean was being desiccated. Willows, poplars, and water elms grew only along water courses. As the forest was turned into a grassland, the grazing animals moved in: the late Miocene fauna of the Vienna Basin consisted largely of antelopes and gazelles. A cooler and damp climate returned at the beginning of the Pliocene when the Mediterranean assumed its present configuration; the Turgaya elements reappeared and the Vienna Basin was again turned into extensive deciduous forests.[53]

The Mediterranean Basin Model

In this model of the Flood, Noah and the preflood world would have been living on the floor of the Mediterranean. Noah would have built the ark there with the local animals being loaded onto it. Since they might never have seen rainfall, the idea that it could rain would be quite a difficult concept for the antediluvians to swallow, thus explaining their rejection of Noah's warnings.

A prediction of this view is that humanity had lived on the Mediterranean Sea floor. Another prediction is that at some time such evidence will be found. But this view also requires some type of human to exist from 5.5 million years to the present. There are two anthropological discoveries separated by 30 years which indicate that the genus Homo, our genus, may extend back to at least 4.2 million years ago.[54]

For the antediluvians, life would have come to an end when the dam at Gibraltar catastrophically failed. Hsu hints at the size of the failure needed to cause the Flood described by Noah when he states:

> One can picture the desiccated Mediterranean as a giant bathtub, with the Strait of Gibraltar as the faucet. Seawater roared in from the Atlantic through the strait in a gigantic waterfall. If the falls had delivered 1,000 cubic miles of sea water per year

(equivalent to 30 million gallons per second, 10 times the discharge of Victoria Falls), the volume would not have been sufficient to replace the evaporative loss. In order to keep the infilling sea from getting too salty for even such a hardy microfauna as the one found in the dark gray marl the influx would have had to exceed evaporation by a factor of 10. Cascading at a rate of 10,000 cubic miles per year, the Gibraltar Falls would have been 100 times bigger than Victoria Falls and 1,000 times more so than Niagara. Even with such an impressive influx, more than 100 years would have been required to fill the empty bathtub.[55]

All it would take for the Flood to occur would be for these falls to erode their way through to the Atlantic Ocean. There is an indication of how deeply the Gibraltar Dam collapsed. The Trubi marl in Sicily, mentioned above, contained bottom dwelling animals that can only live in water depths in excess of 3,000 feet. The dam at Gibraltar must have broken at least to that depth so that these animals could crawl or be washed into the Mediterranean basin. This means that the collapse would have been catastrophic. Calculations show that with a break 3,000 feet deep, 15 miles wide, and a water speed of 15 miles per hour, the entire Mediterranean would refill in 8.4 months, an extremely short time compared with the massive quantity of water needed to fill this large basin.

As the water rushed in, the first phenomenon which would occur is that the air would begin to rise as it was replaced by the fluid filling the basin. The air would pick up moisture via evaporation from the flood water as it continued to pour into the Mediterranean. As the air rose, adiabatic cooling would take place. Adiabatic cooling is the cooling that occurs in a rising body of air which cools at 10° C per kilometer. As the air cools, the moisture contained in the air condenses to form clouds which eventually will produce rain. Since the air over an area of 964,000 square miles was moving upwards simultaneously, the rains from this mechanism would be torrential! The modern world has never seen such a convection cell. Forty days of rain is easy to account for without having to postulate the impossible (e.g., air moving upwards all over the world for the year prior to the flood as required by Dillow's suggestion).

In this hypothesis of the Flood, Noah would have looked out his window and seen the tallest peaks in his land being covered by the deluge. His entire land and all that was in it would be destroyed. The rain would not be confined entirely to the Mediterranean basin. The air rising out of the basin would push out in a way that would cause torrential rains far from the present shorelines. Thus even the surrounding regions would not have escaped the deluge which is one possible explanation for the need of an ark. If the ark grounded on the Mediterranean shore, which Noah formerly knew as the mountains of Ararat, all he would see would be a flooded landscape. The continuing rains and humidity in the air would prevent him from seeing distant peaks. Ft. Worth is 30 miles west of Dallas. On a clear day one can see the skyline of that great city from Dallas, but if there is much humidity or haze, no amount of squinting will allow those buildings to be seen. Similarly, Noah would not be able to see very far. As the rain tapered off, Noah would have seen the distant peaks.

Since the ark would have landed on the present seashore—known to Noah as the mountains of Ararat—the subsequent generation... would not believe that what they now see as coastline was really the mountains of Ararat.

The astute reader will question the flow direction of the water running off the flooded rim of the Mediterranean basin. Water would be flowing off the land toward the center of the basin. Any object attempting to float toward shallow water would be pushed back by the advancing water. So how was the ark able to land on the shoreline of Turkey?

The addition of the weight of 3.7 million cubic kilometers of water would depress the basin causing earthquakes which would continue over the next few centuries. However, the earthquakes, making that adjustment, would begin immediately. The ark could have been pushed onshore by a minor tsunami. All tsunamis do not have to be huge; they come in all sizes. One only ten inches high struck Seattle, Washington in response to a minor Pacific earthquake.[56] Once grounded, the ark would most likely remain stranded.

Since the ark would have landed on the present seashore—known to Noah as the mountains of Ararat—the subsequent generation, hearing that the ark had landed on mountains, would not believe that what they now see as coastline was really the mountains of Ararat. They would presume that the landing site was further inland or further north, where there were "real" mountains: mountains

which they could see. Thus, the misidentification of the present Mt. Ararat.

The ark would either have rotted, been plundered for housing, firewood, etc., or have sunk beneath the Mediterranean due to the tectonic down-warping of the coastline in response to the new weight of water in the basin. If this view is correct, the search for the Ark on the present Ararat is futile.

The incident with the olive tree and the dove is really only understandable with a local flood. It is inconceivable that the olive leaf had survived one year under water and there certainly was not enough time for a new olive plant to sprout, barring the miraculous. In this model, the olive tree could have lived along a stream course somewhere higher than the general inundation that would have taken place along the coastline. When the bank gave way, the tree was washed downstream and grounded in the area of the ark, where the dove took the leaf and returned it to the ark. Noah would then know that the land was nearby.

Whitcomb and Morris attempt to explain the olive by saying that only a few months are necessary between the planting of an olive branch and the sprouting of the leaves.[57] Only forty-seven days had elapsed between the appearance of the mountain tops and the plucking of the olive leaf. There would not have been enough time for the olive to sprout.

Conclusion

The model of Noah's Flood presented here is a novel but plausible scenario for the Flood, which fits all the disparate facts outlined in Genesis and in the geological record of the Mediterranean. The model handles the listed problems as follows:

1. The localization of the human race. The view must assume that one of three conditions held: (1) the flood occurred early enough in human history so that there was not widespread migration throughout the world; (2) the lands surrounding the Mediterranean were too hostile to navigate (but this violates God's command to fill the earth); or (3) humankind, in its rebellion, refused to disperse. A refusal to disperse could have some bearing on God's reaction to a similar refusal to disperse at Babel.

2. The location of the local flood is identified. The importance of this is that it allows rational discussion of the implications which the view predicts. Evidence for and against the view can be collected. It also removes the nebulousness of most local flood theories.

3. The Mediterranean basin provides the only location on earth in which a local flood could transport the ark to the top of 10,000-feet-tall mountains. This most serious of objections to a local flood is negated by the chosen location. Furthermore, the Mediterranean basin exactly fits the hydrologic and mineralogic description of the preflood countryside.

4. The ark was needed to save the lives of Noah and his family and the animals. Due to the vast areas over which rain would occur in such a catastrophe, migration of Noah and the animals would be unlikely.

5. The Mediterranean basin provides the only location which can explain why the flood would last a little over one year in duration.

6. The size of the ark is poorly understood due to a loss of the relevant length of the cubit.

One objection which must be countered is the charge that advocating a local flood is equivalent to giving in to the demands of modern geology. Strictly speaking this is not true since as Filby notes, Matthew Poole in 1670 and Edward Stillingfleet in 1662 both argued for a local flood prior to the advent of geological knowledge.[58]

From the point of view of a geoscientist who believes the biblical account, it is reassuring that there exists a hypothesis which exactly fits the facts outlined in the biblical record. While this hypothesis is not concordant with the most widely held view of the Flood, it should be judged not upon how well it fits our present view but upon how well it fits the available facts of theology, geology, and physics. ★

Notes

[1]This paper is a slightly modified extraction from Glenn R. Morton, *Foundation, Fall and Flood: A Harmonization of Genesis and Science* (Dallas: DMD Publishing Co., 1994).

[2]Davis A. Young, "Scripture in the Hands of Geologists (Part 1)," *Westminster Theological Journal* 49 (1987): 1–34; ———, "Scripture in the Hands of Geologists (Part 21)," *Westminster Theological Journal* 49(1987): 257–304; Martin J. S. Rudwick, *The Meaning of Fossils* (New York: Neale Watson Academic Publications, Inc., 1976); and John C. Greene, *The Death of Adam* (New York: The New American Library, 1959).

[3]John C. Whitcomb and Henry M. Morris, *The Genesis Flood* (Grand Rapids: Baker Book House, 1961).

[4]Davis A. Young, "Scripture in the Hands of Geologists (Part 2), *Westminster Theological Journal* 49 (1987): 288.

[5]M. I. Budyko, *Climatic Changes* (Washington, DC: American Geophysical Union, 1977), 37.

[6]Glenn R. Morton, "Can the Canopy Hold Water?" *Creation Research Society Quarterly* 16 (1979–80): 164–7. Often Venus is cited as an example of a canopied planet with uniform temperatures but its temperature pole to pole is in excess of 900° F. See also, David E. Rush and Larry Vardiman, "Pre-Flood Vapor Canopy Radiative Temperature Profiles," *Proceedings of the Second International Conference on Creationism* 2 (Pittsburgh: Creation Science Fellowship, 1990), 231–45 esp. 238.

[7]Joseph C. Dillow, *The Waters Above* (Chicago: Moody Press, 1981), 237.

[8]Alfred M. Rehwinkel, *The Flood* (St. Louis: Concordia Publishing House, 1951), 124; and John C. Whitcomb and Henry M. Morris, *The Genesis Flood* (Grand Rapids: Baker Book House, 1961), 77.

[9]Frank D. Stacey, *Physics of the Earth* (New York: John Wiley and Sons, 1969), 199.

[10]Dillow, *The Waters Above*, 272–3.

[11]Edward O. Dodson and Peter Dodson, *Evolution: Process and Product* (New York: D. Van Nostrand, 1976), 356.

[12]Dodson and Dodson, *Evolution: Process and Product*, 19.

[13]Ibid., 356–7.

[14]Arthur C. Custance, *The Extent of the Flood*, Doorway Paper No. 41 (Ottawa: Privately Published, 1958), 24.

[15]Whitcomb and Morris, *The Genesis Flood*, 69.

[16]Using the standard interpretation of 18 inches for the length of the cubit, the second floor of the ark is 15 feet above the first floor and the third deck is 30 feet above. Dividing 17,500 pairs of animals among eight people yields 2,187 pairs to be loaded by each human. Assuming that one-third will be loaded on each floor, then 729 will be loaded on the second floor and 729 will be loaded on the third floor. The floor in a modern office building is about ten feet tall. Thus a trip to the third floor of the ark is equivalent to a three story trip and a trip to the second floor is a 1.5 story trip. Thus, during the week each person must climb the equivalent of a 3280 story building. Dividing 3280 by 168 hours in a week yields 19.5 stories per hour which must be climbed each hour of the week.

[17]A human, on average passes 1.5 liters of water per day. If we assume that the average size of the ark occupant was that of a sheep, which has 1.5 times the mass of the human, the average output each day is 2.25 liters per animal. 35,000 x 2.25 = 78,750 liters = 21,000 gallons = 78.75 cubic meters. A 365-day supply of water occupies 28,743 cubic meters. Using an 18-inch cubit yields a volume of the ark of 39,560 cubic meters, meaning that the needed fresh water would fill 72% of the ark's volume. Of course, this need will be reduced somewhat by the quantity of rain which can be collected on a daily basis. If the rain ceased after 40 days, there would still be a need for 64% of the ark's volume to carry water.

[18]Very slight motion produces 288 calories/hour in man. Scaling this value for the 35,000 sheep-sized animals, means that 10,080,000 calories per hour are generated by the animals aboard the ark. This is convertible to 22,715 joules/sec.

Due to structural considerations, the sides of the ark would have had to have been constructed of thick wood to resist the forces of the waves. Very little heat would be able to escape through these thicker portions. Most of this energy must therefore be radiated from the top of the ark. The top of the ark can be made from thinner, more conductive wood. The area of the ark's top is 137.2 meters x 22.8 meters = 3137 square meters of surface area. The heat radiated from any surface is governed by the Stefan-Boltzman law. The temperature at the top of the ark needed to radiate away this energy is:

$$(T_{ark}-T_{sky})^4 = E/A\sigma$$

where A is the surface area, σ is the Stefan-Boltzman constant (5.67×10^{-8} Joules/$m^2/K^4/s$ and T_{ark} is the temperature in degrees of the Kelvin scale of the ark's top surface, T_{sky} is the temperature of the atmosphere (~25°C) and E is the energy needed to be disposed of (22,715 joules/sec.) Plugging the above values into the equation yields a value of 115° C for the top of the ark. Water boils at 100° C.

[19]Custance, *The Extent of the Flood*, 3. According to Strong's Hebrew's Dictionary, *The Bible Library* (Oklahoma City: Ellis Enterprises, Inc, 1992), CD-ROM, *eretz* (776) means country, earth, field, ground, or land. In all meanings except one, "earth," the word has a meaning which is limited in geographical extent.

[20]Whitcomb and Morris, *The Genesis Flood*, 110–1.

[21]Hugh Miller, *Testimony of the Rocks* (New York: Hurst and Co., 1957), 357.

[22]Custance, *The Extent of the Flood*, 18.

[23]Ibid.

[24]Champ Clark, *Flood* (Alexandria: Time-Life Books, 1982), 73.

[25]Ibid., 87.

[26]Whitcomb and Morris, *The Genesis Flood*, 10.

[27]Alan Russell, editor, *Guinness Book of World Records* (New York: Bantom Books, 1988), 278.

[28]Custance, *The Extent of the Flood*, 20.

[29]Kenneth Hsu, *The Mediterranean Was a Desert* (Princeton: Princeton University Press, 1983), 102.

[30]Ibid., 104, 112.

[31]Kenneth J Hsu, "When the Mediterranean Dried Up," *Scientific American* 227 (December 1972): 27.

[32]Hsu, *The Mediterranean Was a Desert*, 119–20.

[33]Ibid., 173–4.

[34]Ibid., 175.

[35]Kenneth J. Hsu, "The Miocene Desiccation of the Mediterranean and Its Climatical and Zoogeographical Implications," *Die Naturwissenschaften* 61 (1974): 140.

[36]Hsu, "When the Mediterranean Dried Up," *Scientific American* 227 (December 1972): 31.

[37]M. Grant Gross, *Oceanography* (Columbus: Charles E. Merrill Books, Inc., 1967), 71, 74.

[38]Hsu, *The Mediterranean was a Desert*, 14–7.

[39]———, "The Miocene Desiccation of the Mediterranean and Its Climatical and Zoogeographical Implications," *Die Naturwissenschaften* 61 (1974): 139; K. J. Hsu, W. B. F. Ryan, and M. B. Cita "Late Miocene Desiccation of the Mediterranean" *Nature* 242 (1973): 242–3; Hsu, *The Mediterranean was a Desert*, 104, 149.

[40]Hsu, "When the Mediterranean Dried Up," 29 and A. Debendetti, "The Problem of the Origin of the Salt Deposits in the Mediterranean and of Their Relations to the Other Salt Occurrences in the Neogene Formations of the Contiguous Regions," *Marine Geology* 49 (1982): 96. See also N. V. Yesin

and V. A. Dmitriyev, "On the Possible Mechanism of Formation of the Messinian Evaporites in the Mediterranean Sea," *International Geology Review* 29 (March 1987): 64–70. It is interesting that the data in favor of the complete desiccation of the Mediterranean is all observational and the objections are all theoretical.

[41]A. T. Chamberlain, "A Chronological Framework for Human Origins," *World Archaeology* 23, no. 2 (1991): 140.

[42]Howard J. Critchfield, *General Climatology* (Prentice-Hall: Englewood Cliffs, 1966), 93–4.

[43]Anonymous, "Atacama Desert," *The Multimedia Encyclopedia* (Novato, CA: The Software Toolworks and Grolier Inc., 1992).

[44]Anonymous, "Atacama Desert," *Encylcopaedia Britannica* 2 (1982), 254 and Anonymous, "Deserts," *Encyclopaedia Britannica* 5 (1982), 606.

[45]Robert P. Ambroggi, "Water Under the Sahara," *Scientific American* 214 (May 1966): 28.

[46]Derek Kidner, *Genesis: An Introduction and Commentary* (Downers Grove, 1967), 64.

[47]B. Biju-Duval et al., "Geology of the Mediterranean Sea Basins," in Creighton Burk and Charles L. Drake, *The Geology of Continental Margins* (New York: Springer-Verlag, 1974), 714.

[48]I. G. Gass, *The Geology and Mineral Resources of the Dhali Area*, Geological Survey Department, *Cyprus Memoir* 4 (1960): 79.

[49]Th. M. Pantazis, *The Geology and Mineral Resources of the Pharmakas-Kalavasos Area*, Geological Survey Department, *Cyprus Memoir* 8 (1967): 158.

[50]P. S. Bagnall, *The Geology and Mineral Resources of the Pano-Lefkara-Larnica Area*, Geological Survey Department, *Cyprus Memoir* 5 (1960): 16, 70.

[51]Gass, *The Geology and Mineral Resources of the Dhali Area*, 92, 102.

[52]Hsu, *The Mediterranean was a Desert*, 177.

[53]Hsu, "The Miocene Desiccation of the Mediterranean and its Climatical and Zoogeographical Implications," *Naturwissenschaften* 61 (1974): 141.

[54]B. Patterson, and W. W. Howells, "Hominid Humeral Fragment From early Pleistocene of Northwestern Kenya," *Science* 156 (1967): 64–6. See also Charles Oxnard, *Uniqueness and Diversity in Human Evolution: Morphometric Studies of Australopithecines* (Chicago: University of Chicago Press, 1975), 98; Peter Andrews, "Ecological Apes and Ancestors," *Nature* 376 (Aug. 17, 1995): 555–6; and M. G. Leakey et al., "New four-million-year-old hominid species from Kanapoi and Allia Bay, Kenya," *Nature* 376 (August 17, 1995): 565–71.

[55]Hsu, "When the Mediterranean Dried Up," 33.

[56]*Science and Technology Week*, Cable News Network, July 31, 1993.

[57]Whitcomb and Morris, *The Genesis Flood*, 104–6.

[58]Frederick A. Filby, *The Flood Reconsidered* (Grand Rapids: Zondervan Publishing Co., 1970), 83–4.

Soteriology: Adam and the Fall

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This paper considers the soteriological issue of Adam and the Fall in a manner that is faithful to the Bible and science. It argues that "from the beginning of the creation" of man, when "God made" the first two human beings, Adam and Eve (Mark 10:6; cf. Gen. 1:27; 5:1, 2), he gave them perfect sinless natures (Matt. 19:3–8). For the world inside Eden and its environs, in accordance with the classic Christian picture, there was no death, misery, thorns, or thistles; but outside Eden and its environs, in accordance with the classic scientific picture, there was. It was God's plan to expand Eden and its environs to cover the planet, but the Fall got in the way.

Dating Adam

The genealogies of Gen. 5:3–31 and 11:10–26 may not seem to be *prima facie* capable of admitting further names. But in Gen. 10:24 and 11:12, 13 (LXX), instead of Arphaxad begetting Shelah at 35 and living another 430 years (Hebrew), he begot Cainan at 35 and lived another 430 years (LXX). According to the Septuagint, Cainan begot Shelah at 130 and lived a further 330 years.[1] If the Septuagint is correct, then the Hebrew really means that Grandfather Arphaxad begot his grandson, Shelah, at 35, i.e., in the sense he was in his son, Cainan, whom he begot when he was 35 (cf. Heb. 7:5, 9, 10). Then Grandfather Arphaxad died 430 years after the progenitor of Shelah (i.e., Cainan) was born. If so, then the genealogies of Gen. 5 and 11 are incomplete to an unspecified extent because when the Hebrew says x begot y, y might mean x's grandson or, many times, great-grandson. The period of years x is said to live after begetting y is really the period of years x lived after begetting the first "son" between x and y. This first "son" is known by the name of his and x's famous progeny, y, rather than his own name. Thus, for example, x might be long dead before his descendant y (whom he begot through many intermediate "sons") further begets. Importantly, St. Luke follows the Septuagint reading on "Cainan" (Luke 3:36), and thus endorses this esoterical meaning of the Hebrew.

How long might these missing gaps be? To the Hebrew mind, "son" (*ben*) could span many generations, as there is a sense in which a man "begets" all his descendants. Thus, for example, in NT times, a member of the Jewish race removed from Abraham by many generations of c. 2,000 years, can still refer to Abraham as his "father," and Abraham can still refer to him as his "child" (for example, Luke 16:24, 25; cf. Luke 1:67, 73; 13:16). That is, genealogies sometimes only included names which were regarded as the important ones.[2]

Notably, in the Genesis genealogies (on inclusive reckoning), there are ten generations from Adam to Noah and ten generations from Shem to Abraham. This seems to indicate that they are symbolic selections of important names. Abraham is usually dated at c. 2000 B.C. and David at c. 1000 B.C. Gen. 11:26–32 seems to require that there was no such gap between Terah and Abraham, whom I shall therefore date at the same approximate time. Also, Gen. 11:10 requires that there is no gap between Shem and Arphaxad, whom I shall thus date at the same time. Therefore, for the ten names between Shem and Abraham, there may be seven gaps. Jesus, who is called the "son of David," was removed from King David by c. 1,000 years. Likewise using c. 1,000 years for the time gap between the various sons, it would mean that there would be 7,000 years for ten names before Abraham, putting Noah's son Shem at c. 9000

**ASA Friend*

B.C. The story of the flood necessitates that there be no gap between Noah and Shem and Gen. 5:28, 29 requires that there be no gap between Lamech and Noah. Thus I shall make Noah's approximate date the same as Lamech's and Shem's. The story of Abel and Cain, with Seth being born to replace Abel, necessitates that there be no gap between Adam and Seth. So I shall make Adam's approximate date the same as Seth's. Thus, for the ten names between Adam and Noah, there also may be seven gaps. Based on this calculation of 1,000-year gaps, Adam would be dated at c. 16,000 B.C.

Alternatively, various NT Jews who were racial "sons of Abraham" were separated by c. 2,000 years. Based on 2,000-year gaps, Noah and his son, Shem, are dated at c. 16,000 B.C. and Adam at c. 30,000 B.C. Members of the Jewish race are now separated by c. 4,000 years, and if 4,000-year gaps are used Noah and his son Shem could be c. 30,000 B.C. and Adam c. 58,000 B.C. Of course, the periods between the various "sons," Adam and Noah, and Noah and Abraham, may not be the same. For example, I think that the first human being, Adam, should be dated to c. 45,000 B.C. +/- c. 20,000 years, and Noah at c. 43,000 B.C. +/- c. 20,000 years.[3]

Adam's Creation

I will not repeat my *raison d'être* for being an evolutionary creationist.[4] Rather, I simply state my view that (like other earth life forms[5]) humans were created progressively, that is, via theistic evolution. God took two hominids to become the first human beings, Adam and Eve (1 Tim. 2:13). In Eve's case, God provided the new genetic information needed to make her human by using some genetic material taken from "one of" Adam's "ribs," so she too would be of Adam's race (Gen. 2:21–23; see "Adam" Luke 3:38 and "from one" Acts 17:26, NASB; 1 Cor. 11:8).[6] Thus Eve's existence as a person was made racially dependant upon Adam; and these two *alone* are the rest of the human race's progenitors.

"God made man upright" (Eccl. 7:29, ASV), i.e., with original righteousness. Unlike fallen humankind, I think that God gave Adam and Eve the same type of sinless nature (i.e., they had no propensity toward evil) and bodily immortality that glorified Christians will receive after the Second Coming. Therefore, notwithstanding certain differences between these two events, the theology of glorification and resurrection bodies associated with the Second Coming provides a comparable (though not identical) example to show how it is theologically tenable to picture God creating a glorified human being from something lower. In this transformation context, it is notable that Isaiah pictures God making a "wilderness like Eden," a "desert like the Garden of the Lord" (Isa. 51:3).

Furthermore, from Gen. 4 and 5, I think it is necessary to recognize, as part of this Edenic perfection, that the genetic make-up of Adam and Eve was such that for a certain unspecified number of generations, it was possible for close relatives born from them to marry and have healthy children (Gen. 4:17; 5:4; 11:27–29; 17:15, 16; 20:11–14; Exod. 6:20; although Gen. 19:30–38 shows parent-child incest was prohibited for sociological reasons). But much later, this ceased to be possible; so biblical law later forbade such incestuous marriages (Lev. 18:6).

Inside and Outside Eden

In the first Eden and its environs, death was unknown (Gen. 2:17), humans were vegetarians (Gen. 1:29), and so were the animals (Gen. 1:30). Likewise in the second Eden, "they shall not hurt nor destroy in all my holy mountain" (Isa. 11:9). Therefore, in both the first and second Edens, the lamb and lion lay down together, for God also gave the animals in the first Eden and its environs the same nature they will have after the Second Coming (Isa. 11:6, 7). But on my model, this was not so outside Eden and its environs. References to such violent and meat-eating animals as the "wolf," "leopard," "bear," and "lion"

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(Isa. 11:6, 7; cf., 51:3) are thus quite significant. This theologically shows how it is viable to argue that God can change these animals' natures in a glorified world, i.e., the picture is *not* of new animals being created, but of old ones being given new natures.

There is ample evidence in the fossil record of carnivorous and omnivorous animals existing before the time of Adam and Eve. This is not problematic if Eden and its environs was a segregated geographical area rather than a planetary-wide phenomenon, a view supported by Gen. 2:10–14. Furthermore, it appears that such creatures lived outside Eden and its environs contemporaneously with Adam. Hence if Adam had not sinned, the history of the planet would have been different. As humans gradually spread out, I think that the area of Eden and its environs would have been expanded. God would have changed the animals' natures in wider and wider regions and given them bodily immortality until the earth was covered—just as he will in the second Eden (Isa. 11:6, 7). But because of Adam's sin, humankind is fallen, and this plan was not realized. However, after the Second Coming, this plan will be realized as part of redemption. Humankind again will have access to the Tree of Life and Eden will be restored on a planetary-wide basis (Isa. 66:22; Rev. 21:1; 22:14).

Death before Eden

In Gen. 2:10–14, we are given to understand place names, and reference is made to "gold" and "onyx stone" in certain geological layers. Since the deep geological layers under these areas are of the same general type as elsewhere on the globe (and must have been there when Eden was), it follows that they (and their fossil fuel deposits) are also pre-Edenic. This is also consistent with the presence of antediluvian "pitch" (Gen. 6:14). Therefore, a combination of revelation and reason leads me to conclude that there must have been both animal and plant death for hundreds of millions of years before Eden.

Scripture reveals that there are many worlds (Rom. 1:8, 20; 1 Cor. 4:9; 6:2, 3; Heb. 11:3). St. Paul says that by Adam "sin" and "death" "entered into the world" (Rom. 5:12). But what "world"? Contextually, the anthropological world of "all men."

Death after the Fall

On my model, Adam and Eve were given conditional bodily immortality in Eden (Gen. 2:9, 16, 17) and human death is the result of the Fall (1 Cor. 15:22). St. Paul says: "the whole creation groaneth and travaileth in pain together ... and not only they, but ourselves also ... groan within ourselves, waiting ... the redemption of our body" (Rom. 8:22, 23). There are sins of omission (Luke 12:47; 1 Cor. 7:3–5, ASV; James 4:17) and sins of commission. On my model, Adam's act of eating the forbidden fruit constituted not only a sin of commission resulting in death to the human race, but simultaneously a sin of omission. Because of the Fall, the various animals (and much of the plant life) outside Eden and its environs, which would otherwise have received bodily immortality as Eden was expanded to cover the planet, have instead been subjected to the "futility" (NASB) of an unrealized greater potential. (By contrast, this greater potential did not exist in that pre-Fall time as a possibility for the various nonhuman species. Thus there is no sense in which the pre-Fall creatures were in this "bondage," since relative to this possibility of bodily immortality, their species did not suffer the "pain" of being "subjected in hope" to the "futility" of an unrealized greater potential until after the Second Coming.)

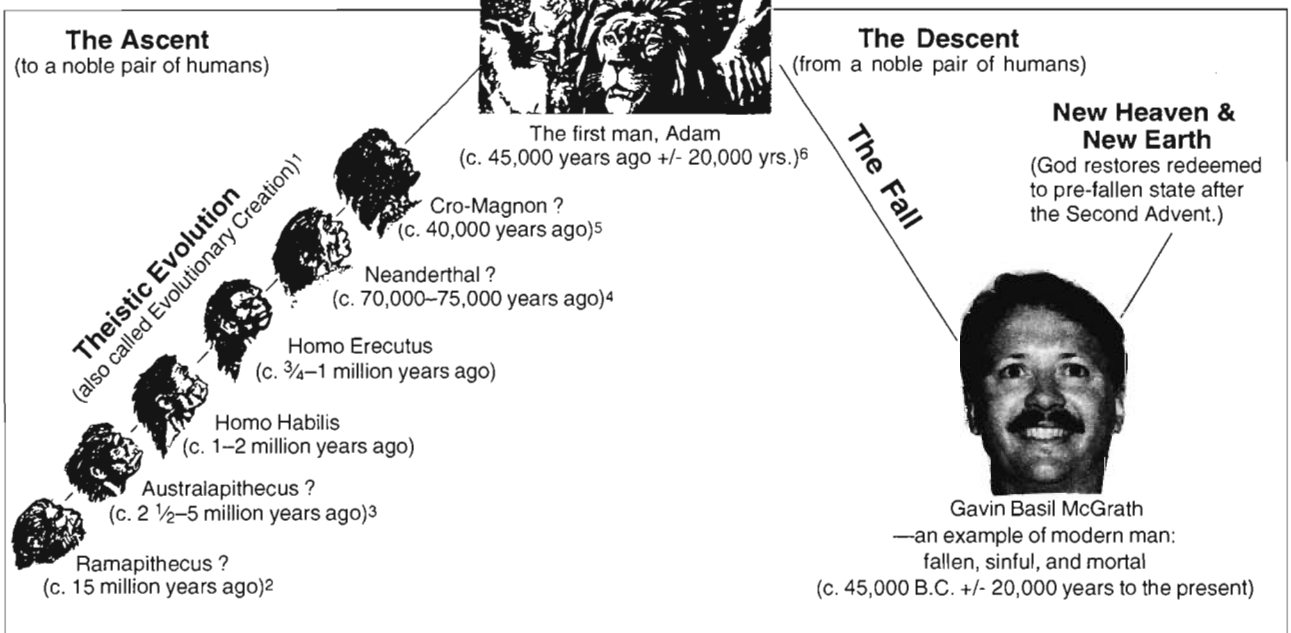
While the Bible does not provide a time scale for the envisaged expansion, the expansion of Eden and its environs to cover the earth (although not necessarily the full population levels of humans, plants, and animals) would have had to have been completed in the c. 45,000 years +/- c. 20,000 years between Adam's creation and NT times. This is so because St. Paul pictures "the whole creation" waiting, because of Adam's sin, for the bodily immortality that will come after the Second Coming.

Objections to my model

Newman and Kline claim that Gen. 2:7 requires "the same divine act that constituted" Adam "the first man ... also imparted to him life."[7] But I note that while *nephesh* here can mean "being" (NASB), it can also mean "soul" (AV, ASV, and NASB footnote) and refer to that higher part of humans which distinguishes them from the animals. This understanding is supported by, for example, the parallel usage of "soul" (*psuche*) and "spirit" (*pneuma*) in 1 Cor. 15:45; quoting Gen. 2:7 (LXX), i.e., God breathed *new* life into a hominid; thus "man became a living soul" (cf. Eccl. 12:7). Theistic evolutionist Augustus H. Strong (1836–1921) argues this very view in *Strong's Systematic Theology*.[8] Moreover, unregenerate humans are "dead in trespasses and sins" until they are "quickened," and given the gift of *faith alone* by which they accept God's gift of salvation given by *grace alone* (Eph. 2:1, 5, 8). Thus this basic category of thought, in which God takes something that is physically alive but spiritually dead and breaths *new* life into it, is a biblical one.

It may be objected that the proposition that life inside and outside the world of Eden and its environs was qualitatively different is a theory without clear biblical proof. But it can be argued that this is hinted at, since the Lord originally "took the man" from an outer region's "dust of the ground" and put him in the inner region of Eden (Gen. 2:7, 8, 15).[9] The borders of Eden (Gen. 2:10–14) introduce a sharp contrast to this larger "earth" of, for example, Gen. 1:1, 28 which Gen. 3:22–24 indicates was habitable by humans. Elsewhere in Scripture, Eden is used in a metaphoric sense when it is clearly surrounded by non-Edenic regions (Ezek. 36:35; Joel 2:3). Thus Scripture allows, but does not require, my understanding.

Because the reference to vegetarian animals is placed after the focus on the creation of humans (Gen. 1:26–30), rather than after the focus on the animals (Gen. 1:20–25), I think this lends itself to the interpretation that these vegetarian animals are those of the humans' world, i.e., Eden and its environs, rather than the larger planetary world. But since Gen. 1 generally refers to the planetary world, and in this immediate passage reference is made to humankind's dominion "over all the earth," Gen. 1:30 also indicates God's future plan to expand Eden and its environs to cover the planet. This picture of Eden necessarily includes the environs of Eden since on the one hand, the world of Eden is smaller than the second world of Eden's environs and the third world of the wider globe. This is seen by the fact that Adam names "every beast of the field" (Gen. 2:20), which are a subset of the "beast[s] of the earth" (Gen. 1:24, 25), and no water creatures are included in Gen. 2:19, 20. But on the other hand, some "beasts of the earth" were also vegetarians (Gen. 1:30), i.e., in the second world. Because no water creatures are mentioned in Gen. 1:30, I think that this second world of Eden's environs had no sea-line and so could not have been particularly large relative to the globe. Eden and its environs were thus "the heavens and the earth" of the world "created, in the [sixth] day" (Gen. 2:4; cf. the sixth "day" of Gen. 5:1, 2 and Gen. 1:26, 27). (Alternatively, it might be argued, based on the general planetary focus on "the earth" in Gen. 1, that "the earth" of Gen. 1:30 is that of the planetary world, rather than the Edenic world and its environs, and that by extended analogy



[1]There is some disagreement on dates. For example, some have earlier dates for Neanderthals and later hominids.
[2]In general, contemporary evolutionists have moved away from the theory that Ramapithecus is an ancestor of man.
[3]Evolutionists differ in their theories as to whether or not Australapithecus is an ancestor.
[4]In general, Darwinist natural process evolutionists have moved away from the theory that Neanderthal is an ancestor because he is too different and close in time to modern humans for Darwinian theory to explain; whereas a theistic evolutionist may consider these same facts suggest this is a point of divine intervention.
[5]Some regard Cro-Magnon as a race of modern humankind. If so, he should be placed after, not before, the Fall.
[6]Adam was made in the image of God (thus *not* an animal), and given a perfect, sinless nature by God and conditional, bodily immortality in the Garden of Eden.

one can extrapolate and presume the view that the water creatures were also vegetarians. Thus Scripture allows, but does not require, either view.)

An associated objection to my inside-outside Eden distinction is captured in William Blake's poem, "The Tyger," when he asks the tiger, "Did he who made the Lamb make thee?" In Job 38–41, the Creator is glorified for making animals that are harsh, carnivorous (or like the raven, omnivorous), and dangerous (Job 38:39–41; 39:13–18, 27–30; 41:23–33); indicating that from God's perspective such creatures may be classified as "good" (Gen. 1:21, 25). For example, eagles whose young ones "suck up blood" from the prey their parent has killed, are good because in acting this way they are obeying God's command. Likewise the clouds and waters of the second day can satisfy an ecological system "wherein there is no man" (Job 38:25–27) and sometimes produce thunderstorms, floods, and hail; or the scorching sun of the fourth day is sometimes responsible for bushfires which burn some of the vegetation of the third day. But because the rain, frost, snow, thunder, whirlwinds (Job 37:5, 6, 9, 10), and fire are "fulfilling his word" like all the "fruitful trees," "cedars," animals, or "stars," they "praise the Lord" (Ps. 148:1, 3–10). Hence though man was not originally meant to live in such a world, this third world like the first world of Eden and the second world of Eden's environs was pronounced by God to be "very good" (Gen. 1:31; cf. Ps. 104)—although it is now sullied by fallen man's misuse and spiritual, moral, and physical pollution. On this principle, for soteriological purposes, death is only a bad thing in the context of it entering humankind's world (Gen. 2:17).

While at the time of the Creation God declared it all "very good," he was not finished with it. Unlike the second world of Eden's environs which he actively cursed by introducing thorns and thistles into it after the Fall, in the third world beyond Eden's environs, God passively cursed it by not actively moving it on to Edenic perfection. So this same third world paradoxically became by virtue of its incompletion, like the actively cursed second world, part of the Cursed Creation (Gen. 3:14, 15, 17–19). Thus while the third world is not, like humans and the second world, fallen; like them, as a consequence of the Fall, it is cursed (Rom. 8:20–23).

Isaac objects that "it would be hard to imagine" an inside-outside distinction for Eden, with "two radically different strains of animal life" existing "simultaneously in the world."[10] But I note that within Gen. 1–3, somewhat different strains of life are referred to in the form of animal life (fifth and sixth creation days), as opposed to plant life (third creation day). Surely the simultaneous presence of humans and angels on the earth (Gen. 3:22–24) is a good example of two radically different strains of life. Furthermore, after his resurrection, Jesus Christ had a body that was radically different to other strains of life existing simultaneously in the world (Luke 24:31, 37–43).

To the extent the inside and outside Eden and its environs distinction is not contrary to the Word of God, I regard it as a theologically legitimate model.

Importantly, I maintain based on Scripture, for example, Rom. 1 and 2, that it is quite right to use a combination of reason and biblical exegesis. For instance, as a traditional evangelical Anglican, I endorse the Reformation Anglican view that a church tradition, such as the liturgical calendar, based on reason may be maintained, providing it is not contrary to the Word of God. But by contrast, the Reformation Zwinglian tradition holds that a specific biblical injunction is required to have a Gentile church liturgical calendar or stained glass windows. Thus while Scripture would allow for a variety of interpretations, my model is the consequence of both reason and biblical exegesis. To the extent the inside and outside Eden and its environs distinction is not contrary to the Word of God, I regard it as a theologically legitimate model. However, other evangelicals might be unhappy with the absence of a clear biblical statement to this effect.

I shall now consider some further objections to my model by reference to Dick Fischer's criticisms. Fischer, who argues that Adam should be dated at c. 4000–5000 B.C., rejects my type of understanding of the Gen. 5 genealogy.[11] He argues "the seventh from Adam" in Jude 14 requires an absence of gaps. But as I show in my above analysis, only prominent names are sometimes recorded. For example, St. Matthew refers to three lots of "fourteen generations" (Matt. 1:17) meaning *significant* generations; and I see no reason why on this precedent Jude 14 should not likewise mean the seventh *significant generation*.

But "more importantly," Fischer then asks three very probing questions. "How would livestock raising and farming" in Gen. 4:2 "have come before hunting and gathering?" The development of to-

day's farming techniques is usually dated to c. 8000 B.C., whereas on my model Adam and his sons, Cain and Abel (whom I place contemporaneously with Adam), are dated to c. 45,000 B.C. +/- c. 20,000 years. Additionally, "how could metal working" in Gen. 4:22 "have preceded the Neolithic (Late Stone Age) period?"

On my model, after the Fall Adam and Eve ate "bread" from Adam's farming of the ground which God had cursed (Gen. 3:17–19, 23); and Adam's descendants engaged in farming, metal working, tent-making, carpentry, brick making, and "city" building (Gen. 4:2–4, 12, 17, 20, 22; 5:29; 6:14; 9:20, 21; 11:3, 4, 5, 8). Thus I must theorize the existence of civilizations that collapsed and were followed by uncivilized societies. For example, the Myan civilizations of ancient Central America collapsed, and from their ruins came some uncivilized people encountered by the Spanish Conquistadors; or the white man found only tribal Africans living near the collapsed Zimbabwe civilization. Concerning the metal working of Gen. 4:22, I note that beads made from meteoric iron dating from c. 3500 B.C. or earlier have been found in Egypt. This shows what may have been the source for such metals.

Fischer also asks how could the "sophisticated musical instruments" of Gen. 4:21 "predate simple bone flutes?" However one translates "harp" (AV) and "organ" (AV), the basic point seems to be that Jubal is the father of stringed instruments, "harps," and wind instruments, "organs." Such "organs" may have been bone flutes. If not, any number of reasons could be given about why such instruments might fall into disuse or why some less-sophisticated, bone made modifications might appear in later societies. Perhaps the most obvious reasons are a lack of requisitely talented people, difficulties of carrying more complex instruments in a hunter-gatherer society, or the availability of raw materials. Moreover, there are two broad possibilities about what is meant here by Jabal and Jubal being the "fathers" of tent-dwellers, shepherds, musicians, and smiths. It could mean that they are the originators among humankind, or it could mean they are the "fathers" "of all" such antediluvian Cainites. If the latter, then tent-dwellers, shepherds, musicians, and smiths may have existed prior to them among Seth's race, but not among Cain's race. In favor of the latter proposition, I note that long before Jabal and Jubal, Abel was a shepherd (Gen. 4:2, 4).

Fischer's concerns about the absence of rain (Gen. 2:5, 6), are answerable by my inside-outside Eden and its environs distinction. I consider that whereas Gen. 1:1–2:3 largely has a global focus, by contrast, Gen. 2:4–25 has a regional focus on the "heavens" (sky) and human-inhabited "earth" of Eden's world. Thus while God had not caused it to rain upon that world's "earth" after he cleared it in preparation to make it the Garden of Eden (Gen. 2:8, 9, 19), Gen. 2:5, 6 does not refer to either this land before he so designated and cleared it, or to other parts of the planet earth.

Fischer's polygeny claim that Gen. 4:15 requires human beings outside Eden who were not Adamites reads too much into the text. This polygeny embraces at least some aspects of Pelagianism, and is inconsistent with the clear monogeny teaching that Eve is "the mother" of the human race and she was monogamously married to the father of the human race, Adam (Gen. 3:20; cf. 2:21–24; 3:8, 17, 21; 4:1, 25. Cf. 1 Tim. 2:13, 14). Thus it is more natural to understand "Adam" as the name of "the first man," and then, because like Seth all human beings "have borne" his "image" (Gen. 5:3; 1 Cor. 15:45, 49), to apply the Hebrew meaning of "man" to the human race as the Adamic race (Gen. 5:1, 2; cf. Rom. 5:12, 14; 7:18). (Human polygeny is also at variance with general soteriological doctrine, Acts 17:26, 30, 31, NASB; Rom. 5:12–19; 1 Cor. 15:21, 22.)

Any interpretation of "every one that findeth me" (Gen. 4:14) must recognize that Adam and Eve are the parents of the human race.

Hence any interpretation of "every one that findeth me" (Gen. 4:14) must recognize that Adam and Eve are the parents of the human race. For instance, might this refer to Cain's parents? Or Cain—whose wife might have been an Adamite sister born after Seth (Gen. 4:17; 5:4)—may have been concerned that at some future point in time some Adamite(s) such as Seth (or of Seth's race) would seek "blood revenge." Alternatively, for example, Rev. John Brown (1722–1787) conjectured that in Gen. 4:2, "Abel is born, perhaps with twin-sisters."[12] Given that Hebrew genealogies only identify important names, it is certainly possible that Adam and Eve had other children at the time of Gen. 4:14.

Notably, the dough for Myan "bread" was rolled out corn—a fact illustrating how "bread" (*lechem*) in Gen. 3:19 need not, as Fischer argues, be what has later come to be called bread. Indeed, the Hebrew word can simply mean "food" (Deut. 9:18). The Septuagint here translates the Hebrew word *lechem* with

the Greek word *artos*. This is the same word our Lord used when he said in The Lord's Prayer, "Give us this day our daily bread" (Matt. 6:11).

I consider the logical conclusion to draw both then and now is that the known civilizations of c. 4250–2200 B.C. are being used as symbolic types pointing back to some long lost and more ancient civilizations ...

Fischer argues with reference to the Genesis genealogies, archaeology, farming, and metal tools that Adam's date "fits best" at c. 4000–5000 B.C. On the one hand, I do not consider one can just assume it is a quaint coincidence that the genealogies *prima facie* place Adam at c. 4004 B.C. +/- c. 250 years. For example, in the Hebrew genealogies Adam is dated at c. 4154 B.C.; on the well-known Protestant chronology of the Anglican Archbishop of Armagh and Primate of Ireland, James Ussher (1581–1656), Adam is dated at 4004 B.C.; and on the traditional Jewish chronology, Adam is dated at 3760 B.C. (year starts Oct. 3761 B.C.). But on the other hand, I regard Fischer's claim as an overstatement. After all, on the *prima facie* dates in the Genesis chronologies, Noah's flood can be dated no earlier than c. 2600 B.C. For example, on Ussher's starting date of 4004 B.C., the *prima facie* 1656 years in Gen. 5:3–30; 7:6 ("500" in Gen. 5:32 and/or "600" in 7:6 and/or "100" in 11:10 is a rounded number) yielded Ussher Noah's flood date of 2349 B.C., and he then put the Tower of Babel at 2247 B.C. Or a similar calculation based on the traditional Jewish Adamic date would put Noah's flood *prima facie* at c. 2100 B.C. Since Gen. 11:10–26 puts a *prima facie* 390 (Hebrew) or 520 (LXX to the extent arguably consistent with Luke 3:36) years between Shem and Abraham's birth, the *prima facie* flood date cannot be realistically pushed back earlier than c. 2500 B.C. (Hebrew), or if one includes the "130 years" of "Cainan" (LXX and Luke 3:36) c. 2600 B.C.

But Sinology shows that the Chinese civilization was established by then (Gen. 10:17[13]). With the well-known civilizations in Egypt and Mesopotamia of the late 3000s and first half of the 2000s B.C., who after c. 2600 B.C. could have believed that during c. 2600–4000 B.C. there had been only two significant races of man—Cain's race and Seth's race (Gen. 4 and 5)? Or after c. 2600 B.C. "all" human beings had been killed in a flood (Gen. 6:12, 13) and their present population levels could have grown so quickly from eight people? Or there had been "one" common "language" among all people till sometime after c. 2600 B.C. (Gen. 11:1)?

Therefore, I consider the logical conclusion to draw both then and now is that the known civilizations of c. 4250–2200 B.C. are being used as symbolic types pointing back to some long lost and more ancient civilizations; and some relatively small flood(s) is (are) being used to type an earlier Noah's flood. Could this include the flood deposits at Kish in Mesopotamia (northeast of Babylon) dated to c. 2600 B.C.?[14] Thus I consider we should carefully study these ancient civilization symbolic types.

This poses the problem of where to draw the line between symbol and reality. For example, bronze appears c. 2500–3000 B.C. in the Tigris-Euphrates delta, and Tubal-Cain dates to sometime around the beginning of the Early Bronze Age (c. 3100–2100 B.C.). Thus in Gen. 4:22 did Moses use a double *entendre* meaning something like, the "brass" (AV), "copper" (ASV footnote), or "bronze" (NASB) and "iron" metal working of Tubal-Cain's *prima facie* date of c. 2500-3100 B.C. points back to the metal working of Tubal-Cain? Peleg's *prima facie* dates (during which time the earth was divided at the Tower of Babel) are c. 2397–2158 B.C. Is (Are) some ziggurat(s) from this period meant to symbolically type the much earlier Tower of Babel?[15] Should the boat-like shaped object in the Akyayla Range of East Turkey be understood as a symbol of Noah's Ark resting on the mountains of Ararat?

A final objection is the evidence for the relatively small ancient civilizations I have theorized. Given they were very small and vanished a long time ago, given The World-Wide Deluge[16] and other factors of climate and environment in southwest Asia; I consider the future recovery of archaeological remains is possible but improbable. (Of course, the Tree of Life—and possibly all of Eden—has been miraculously preserved by God, to be returned after the Second Advent to the New Earth, [Rev. 2:7; 22:14].)

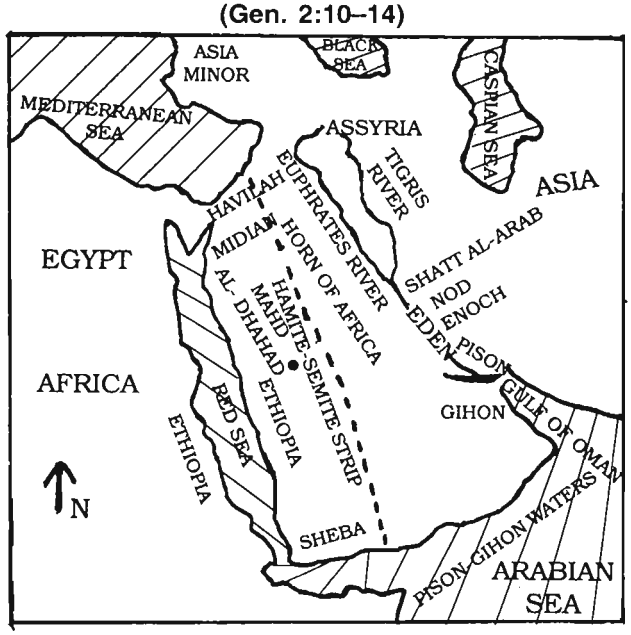
My preferred location for Eden and its environs is the Persian Gulf region. From c. 70,000–17,000 years ago continental conditions existed in most of the Persian Gulf, the sea withdrew to the Hormuz Strait, and at maximum regression the basin was a large river carrying Tigris-Euphrates water directly into the Gulf of Oman. But there was a partial return of the sea, previously thought to be either c. 30,000–45,000 years ago (Fairbridge) or c. 25,000 years ago

(Curray), although now thought to be c. 29,400–22,800 years ago (Swift et al.).[17]

What about Gen. 2:10–14? This passage means that Eden's entrance waterway was connected to the Shatt al-Arab. I think that this waterway's parting includes both its entrance and exit waterways. Is the Pison a southern exit route that flowed into the Gulf of Oman, the Arabian Sea, and the Red Sea? In Gen. 2:11, 13, *sabab* while it can mean "compasseth" (AV) also can be used figuratively, especially with reference to borders, to mean curve or turn round (Num. 34:4; Josh. 15:10; 16:6; 19:14). There can be no doubt that the waters from the Pison curved round the southeastern, southern, and western sides of the Horn of Africa, and thus round Havilah in Arabia (Gen. 25:12–18; 1 Sam. 15:7).[18] I think that the Gihon was also an Edenic exit waterway. The waters of Gihon and Pison joined, or had already joined, when they reached the waters of the Arabian Sea. Thus, there can be no doubt that the waters from the Gihon curved round the southeastern, southern, and western sides of the Horn of Africa via the Gulfs of Oman, Masira, and Aden, and flowed into the Red Sea and the Gulfs of Suez and Aqaba, and then southward, at northern Somalia, down the eastward side of Africa. That is, opposite biblical Ethiopia on the east of the Gihon's waters in the Red Sea—comprising a joint Hamite-Semite western strip on the Horn of Africa (something like Alsace-Lorraine) from "Sheba" (Gen. 10:7b, 21, 28) in the "south" (1 Kings 10:1; Matt. 12:42), through "Midian" east of the Gulf of Aqaba (Gen. 25:1, 2, 6; Hab. 3:7—where "Cushan" and "Midian" are placed in Hebraic poetical parallel; and Moses' wife Zipporah is described variously as Midianite or Ethiopian, Exod. 2:15, 16, 21; Num. 12:1)—and Havilah east of Egypt (Gen. 10:7a, 21, 29; 25:18); and biblical Ethiopia comprising northeast Africa south of Egypt (Gen. 10:6, 7a; Ezek. 29:10) i.e., west of the Gihon's waters in the Red Sea below Egypt, and west and south of the Gihon's waters in the Gulf of Aden around north Somalia. Thus the Gihon "compassed" around (biblical) Ethiopia. Hence the intermingling of the waters from the Pison and Gihon to form a joint Pison-Gihon waterway "compassing" (what in Moses' day were called) Havilah and Ethiopia is contextually similar to the intermingling of the Tigris-Euphrates waters in the Shatt al-Arab to feed the Edenic waterway.

Approximate Location of Eden

(Gen. 2:10–14)



Area of Persian Gulf generally dry land until c. 9,500 B.C. (The extent of the Havilah and Sheba regions is uncertain but their borders may have met, possibly with a shared area, around Mahd Al-Dhahad—which may be Ophir and King Solomon's Mines.)

The plausibility of the Flood in this region has been shown by Olson, who demonstrated the existence of two basins in the Persian Gulf. During the late Ice Age, the western basin had rich soil and sunshine. Thus he says, "It might even be the site of the Garden of Eden." (On my model, it might be the fertile legacy of Eden's environs. But it is also possible that Eden and its environs was somewhere else in this same general area of southwest Asia, and either it was totally destroyed by the Flood and/or some other environmental factor[s] or its remains have not been discovered.) Around 9500 B.C. the eastern basin flooded due to glacial melting, and this caused a sudden flood in the western basin killing nearly all people and domestic animals, with a few survivors reaching the Zagros Mountains' foothills either "by ark or by land" where they re-established agriculture and housing.[19]

These same contour lines, which allow for "a sudden and catastrophic flooding in the area of the Persian Gulf" c. 11,500 years ago,[20] also mean these basins may have been supernaturally flooded before this time. An associated downpour and coastal flooding could have taken Noah's ark to the Zagros Mountains' foothills,[21] i.e., one of "the ends of the earth" under the "heavens" (sky) on "the earth" of the antediluvian's "world" (cf. Gen. 7:19; Matt. 12:42; Heb. 11:7; 2 Pet. 3:6, 7).[22] Might these basins and/or water from a number of Shatt al-Arab exits be *some* or *all of* "the fountains of the deep"? (Gen. 7:11; 8:2). The fact that the Zagros Mountains extend from the Armenian Knot, southeast along the Iraqi border, down to the Persian Gulf's northern shore in South Iran; plus the fact that by the time Moses

wrote Genesis, the southeast "Ararat" border was the Zagros Mountains southeast of Lake Urmia,[23] must raise the possibility that the Ararat/Armenian Mountain Range (Gen. 8:4) included all of the Zagros Mountains and thus its southern regions. The absence of later biblical references to Enoch, Nod, the Gihon, and the Pison is consistent with my theory that from c. 9500 B.C., the remains of the Edenic region went under the waters of the Persian Gulf.

The absence of later biblical references to Enoch, Nod, the Gihon, and the Pison is consistent with my theory that from c. 9500 B.C., the remains of the Edenic region went under the waters of the Persian Gulf.

This same problem of a hostile environment emerges north of the Persian Gulf. In c. 4000 B.C., the northern shore line of the Persian Gulf extended c. 250 miles/400 km north of its present position.[24] Since the Euphrates and Tigris flood annually—and have done so for thousands of years, the whole Mesopotamian region southwest of Baghdad, down to the Persian Gulf, is a well-known flood region. Certainly, if one wanted regions that would preserve relics of small long lost civilizations, these southwest Asian areas would be unfortunate choices.

But archaeology and geology are not the only possible extra-biblical witnesses. There is the human witness, and here there is a positive piece of evidence from anthropology. There are many flood stories from cultures around the world where there is a general agreement with the broad biblical picture i.e., the whole human race was killed by a universal flood except for a few individuals protected by some being(s) with supernatural powers.[25] I think that these stories are consistent with, and act to strengthen the plausibility in the extra-biblical data of, Noah's flood. Another positive piece of anthropological evidence is the location of racial and linguistic groupings which look like they spread out from Southwest Asia. Therefore while geology, archaeology, and anthropology show it is plausible to theorize that such small ancient civilizations may have existed; in the final analysis such a theory is neither proven nor undermined from this extra-biblical data. Thus within the parameters of reason given above, an act of faith is required. But surely these Gen. 1–11 stories were written (at least in part) for this very purpose, i.e., *to elicit faith*! For "without faith it is impossible to please him" (Heb. 11:6).

Conclusion

Humankind's common descent from Adam (Deut. 32:8; 1 Chron. 1:1–23) is important for recognizing the universal Fatherhood of God (Luke 3:38; Acts 17:28, 29) and brotherhood of humankind (Luke 3:38; Acts 17:26, NASB) with respect to God's creatorship and our common humanity in the genetic unity of the human race respectively; although the spiritual Fatherhood of God (John 8:41–44; Gal. 4:4–6) and associated spiritual brotherhood of men (Mark 3:33–35; Gal. 4:31) belong exclusively to Christians. It is also important for the soteriological teachings of original righteousness and original sin[26] (and thus original guilt[27]); and associated Christological distinction of the incarnate God having a sinless human nature like Adam before the Fall,[28] and overcoming where Adam failed—rather than where fallen men always fail[29]; although eventually redeemed Adamic racial slaves of sin and death will be emancipated from our bondage (Rom. 6:15–8:25, NASB).

On my model (which I premise on theistic evolution, but which could also be used by some old earth separate species creationists, or some of those who adhere to various combinations of old earth separate species creation and evolutionary creation), in the Garden of Eden and its environs all was rosy—and there were no thorns on the rosebushes. Humans were made by God with a perfect sinless nature and given conditional immortality in Eden, but because of Adam's sin every member of the human race is *imputed* with the first Adam's sin, for which reason humans have sinful natures and are a fallen race; and together with the physical world around us, are subject to death. But Christ, who had a perfect sinless human nature with no innate propensity towards evil, has proven Adam before the Fall need not have sinned; and those who accept the gift of eternal life (Eph. 2:1, 8, 9) obtained by his vicarious and substitutional atonement, are *imputed* with the second Adam's righteousness (Rom. 5:6–8, 12–21; 8:3, 4, 17–23, 32; 10:3, 4). Thus the first Adam's story of Paradise Lost, is reversed with the second Adam's story of Paradise Regained (1 Cor. 15:45; Rev. 21–22). Alleluia! Amen! ★

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

Notes

[1]Unless otherwise stated, all biblical references are to the Authorized Version (AV).

[2]In Matt. 1, Nahshon dates from pre-Conquest times (Num. 1:7; 2:3; 7:12, 17; 10:14), Rahab from the Conquest period (Josh. 2:1, 3; 6:17, 23, 25), Boaz and Ruth from the period of the Judges, and three generations are omitted in vs. 8, cf. 2 Kings 8–15; 2 Chron. 21–26.

[3]Cf. J. O. Buswell III dates Noah at c. 15,000–100,000 years ago (J. C. Whitcomb, & H. M. Morris, *The Genesis Flood*, [Philadelphia, PA: Presbyterian & Reformed Publishing Co., 1961], 484, footnote #1); or H. Ross c. 30,000–35,000 years ago (*Facts & Faith*, Reasons To Believe 10, no. 5 [1996]: 5).

[4]See my article, "Religious Liberty in Conservative Liberalism," *American Journal of Jurisprudence* 40 (1995): 229–85, at pp. 235–64. Unlike *creation by law* religious liberals who deny the possibility of creation miracles (Ibid., pp. 235, 240–1; 255–63), for example, A. Peacocke and J. Polkinghorne; my own *creation by law and divine intervention* religiously conservative view, which allows for the possibility of creation miracles, and having done so, then recognizes the reality of such miracles, is closer to that of, for example, St. G. Mivart, A. H. Strong, or G. C. Mills (for example, compare, "I also maintain that at times God ... specifically altered the genetics of a given creature" Ibid., p. 255, with G. C. Mills, "A Theory of Theistic Evolution ...," *Perspectives on Science & Christian Faith* 47 [1995]: 112–22; "DNA Sequences ...," *Perspectives on Science & Christian Faith* 48 [1996]: 241–9). I note that the criticism of divine intervention as "God of the gaps theology" (47 *PSCF* op. cit., pp. 112; 117–8) is a *non sequitur*, since *all models are "Theories of the Gaps"*—Darwin's theory, theistic evolution, etc. Furthermore, the view that God supplied new genetic material is not founded on the negative basis that "we currently cannot explain" genetics, but on the positive basis that we can currently explain genetics so well, that we know that (in Mills' words,) "science will never provide a naturalistic answer to" the "question: What is the source of new genetic information?" I also concur with Mills that God has "a continuing involvement in creation" as the "sustainer" of the "natural processes" he made (Ps. 104:19, Col. 1:17; Heb. 1:3). By contrast, invoking "miracles" in support of *Young Earth Separate Species Creationism* or the *Old Earth Gap Theory* is indefensible, since such models violate established geological facts. Moreover, if unlike A. R. Wallace, J. Orr (in *The Fundamentals*) et al., Darwin's view is followed and one denies God specifically intervened in the process to create man, then this necessarily results in embracing at least some aspects of Pelagianism.

[5]I consider that the story of God's cursing the serpent shows the extent of supernatural change sometimes accomplished in a moment of time through theistic evolution. That is, while God guided the evolution of snakes over long periods of time outside of, and before Eden, in Eden and its environs he appears to have greatly modified this creature so that it did not slide along on the ground. Thus if Adam had not sinned, as God moved snakes onto immortality, it seems that he would have also quite substantially modified them. But as part of the Fall and in consequence of Satan's demonic possession and usage of the serpent, God placed a curse on serpents so that they are now very similar to, or the same as, what they were outside of Eden and its environs. Thus when we see a slithering snake, we would do well to remember that this creature is only like this because of God's curse on it at the time of the Fall.

[6]The phrase "bone of my bones, and flesh of my flesh" (Gen. 2:23) clearly indicates (Adamic) racial commonality, since this type of phraseology is used elsewhere to indicate genetic commonality, whether it is clannish (Gen. 29:14; Judg. 9:1,2) or ethnic race (2 Sam. 5:1 parallels 1 Chron. 11:1; 2 Sam. 19:12) commonality.

[7]M. G. Kline, "Space & Time in the Genesis Cosmogony," *PSCF*, 48 (1996): 2–15, at p. 15, endnote 47; R. C. Newman, "Scientific & Religious Aspects of the Origins Debate," *PSCF*, 47 (1995): 164–75, at p. 170.

[8]Augustus H. Strong, *Strong's Systematic Theology* (Philadelphia: Judson Press, 1907), 465–76, at 465, 466–7, 469.

[9]Re: "the dust of the ground" (Gen. 2:7, 1 Cor. 15:47–49) see G. Schroeder, *Genesis and the Big Bang* (NewYork: Bantam Books, 1990), 52, 114–5, 149–52.)

[10]R. Isaac, "Chronology of The Fall," *Perspectives on Science & Christian Faith* 48 (1996): 34–42, at p. 37. His "most important" view, that "the spiritual truths in Scripture ... are never in question" in the models he refers to (p. 42), is an unorthodox opinion since some of the models he isolates embrace various aspects of Pelagianism. N.B., forsaking his originally orthodox position that "The sinnerhood of man is traced to a *historical* fall" (*Protestant Christian Evidences*, [1978; reprint, Chicago: Moody, 1953], 245), B. L. Ramm later came to typify some such contemporary efforts to promote elements of the Pelagian heresy (*Offense To Reason*, [San Francisco: Harper & Row, 1985], for example, pp. 27–8, 51, 76). As a Federalist, I certainly do not regard St. Augustine's relevant discourses to be without error. (For example, I do not regard normal sex between a man and his wife as sinful. It was ordained before the Fall, Gen. 1:27, 28; 2:24; and after the Fall, it is a remedy to sin, 1 Cor. 7:1–9, ASV.) But Ramm's attempt to trivialize the *Augustine vs. Pelagius* debate to a *personality clash*, is indefensible. Pelagianism is also condemned by, for example, Jerome, the Council of Ephesus (431), Luther, Melancthon, Calvin, the Anglican's *39 Articles*, and Presbyterian's *Westminster Confession*. See, for example, *Strong's Systematic Theology*, pp. 597–627 (An Augustinian's View) & *Berkhof's Systematic Theology* (1976; reprint, Banner of Truth Trust, 1939, 1958), 211–43 (A Federalist's View).

[11]R. Fischer, "In Search of the Historical Adam: Part 1," *Perspectives on Science & Christian Faith*, 45 (1993): 241–51.

[12]*Brown's Bible* Revised Edition by the Rev. Drs. Porter & Cooke, (London & Glasgow: Gresham, 1778), 61, *Brown's Chronological Index*.

[13]Cf. Isa. 49:12. I consider the Mongoloids are Hamite-Japhethite admixed, with their Hamitic component from Sineus, and their Japhetic component possibly from Magog (Gen. 10:2). A. C. Custance, *Noah's Three Sons* (Grand Rapids, MI: Zondervan, 1976), 90, 105–7.

[14]L. R. Bailey, *Noah* (Columbia, SC: University of South Carolina Press, 1989), 33 (map), 35.

[15]I consider Babel was in southwest Asia, and the later Mesopotamian Babel was named after it; like, for example, Birmingham, Alabama, USA was named after Birmingham, England, UK.

[16]I consider *The Table of Nations* requires that the Flood was (anthropologically) universal since it includes, for example, the common ancestry to African Negroids ("Cush" Gen. 10:6) and Caucasian Caucasoids (Gen. 10:4), and so in

Noah's family one has gone far enough back to also have the common ancestry for the rest of the human race. Moreover, if the Flood was limited to a portion of humankind, then the message would surely be, *"It could happen again!"* But the clear message of Gen. 9:8–17 is, *"It cannot happen again!"* That is, "the earth" here *must* mean the human inhabited world and the animals of that world, which due to the expansion in Gen. 10 and 11, is so geographically widespread as to be safe from a second anthropologically universal flood. Depending on context, Genesis conceptualizes "the earth" either regionally and ethnocentrically (Gen. 41:57, NASB), or globally (Gen. 1:1). Hence it is *prima facie* possible for the Flood to be either regional or global. But I consider the scientific data only allows for a regional flood. Thus I understand the terrain (Gen. 7:19, 20) and "all" the animals referred to on this land/"earth" (for example, Gen. 6:13, 17), to be those in this human inhabited "world." That is, there are good biblical reasons for characterizing the Flood as "world-wide" (N.B., "world" in Heb. 11:7; 2 Pet. 2:5; 3:6), however the relevant "world" is not the globe, but the human inhabited world of Noah's day. (N.B., the preservation of a regional eco-system is consistent with the principles of Deut. 20:19, 20; 22:6, 7. But the command to populate the earth is global in Gen. 9:1, 7; cf. 11:8, and thus Gen 9:3, 4 looks forward to man's environment including a global world of animals who [for the first time] will experience "fear" of man, and the rainbow covenant of Gen. 9:9–17 is thus also global since its orbit must expand as the human inhabited world expands). Though a number of the particulars differ, compare A. C. Custance, *The Flood: Local Or Global?* (Grand Rapids, MI: Zondervan, 1979); H. Ross, *The Universal Flood & Noah & the Ark* (1991); "The Flood" and "Extent of the Flood" in *Halley's Bible Handbook*, pp. 73, 74; "Tower of Babel," ch. 7, s. 4 in Philo's *Biblical Antiquities*; and J. Orr in *The Fundamentals* (First ed. Vols. 486, final ed. Vol. 1).

[17]P. Kassler, "The Structural & Geomorphic Evolution of the Persian Gulf," in B. H. Purser, (Ed.) *The Persian Gulf* (Berlin & New York: Springer-Verlog, 1973), 1–32, at pp. 24, 32; S. A. Swift, et al., "Gas venting and late Quaternary sedimentation in the Persian (Arabian) Gulf," *Marine Geology*, 129 (1996): 237–69.

[18]How far south Havilah extended on the Horn of Africa is uncertain. North of Mecca, gold has been mined at Mahd Al-Dhahab (c. 160 km or 100 miles southeast of Medina) since the second millennium B.C., and so it is a candidate for King Solomon's Mines (1 Kings 9:26–28). Given the phenomenon of shared border regions, the fact that "Sheba, and Ophir, and Havilah" are mentioned together in Gen. 10:28, 29 means that it is certainly possible that if Mahd Al-Dhahab is Ophir, it was on the southern border of Havilah—a fact also consistent with the more southerly Queen of Sheba hearing about Solomon (1 Kings 9:26–10:13). Further north, gold has also been found at Sukhaybarat (about 300 km or 185 miles east of Medina). (J. E. Peterson, *Historical Dictionary of Saudi Arabia* [Netuchen, NJ: Scarecrow Press, 1993], 96–7.) Thus both Mahd Al-Dhahab and Sukhaybarat must also be candidates for "Havilah ... gold" (Gen. 2:11). If Mahd Al-Dhahab is both Ophir and the source of Havilah gold, then the "precious stones" there (1 Kings 10:11) might have included "bdellium" and/or "onyx" (Gen. 2:12); or "aromatic resin" (Gen. 2:12, NIV) might have come from Ophir or elsewhere.

[19]W. S. Olson, "Has Science Dated the Biblical Flood?" *Zygon* 2 (1967): 274–7.

[20]L. R. Bailey, op. cit., pp. 40–3, 46, 51.

[21]It is possible that due to the relatively flat nature of the terrain here, with only gradual contours down towards to sea level, that the flood water could have accumulated and simply taken a long time to flow out through the Gulf of Oman. It is also possible that God may have created a temporary dam, presumably somewhere around the Strait of Hormuz (cf. Exod. 14).

[22]Recognizing that "with many ... floods" of the past, "most traces ... have long been swept away" (*Cambridge Ancient History*, 3rd ed., Vol. 1, Pt. 2 [Cambridge: Cambridge University Press, 1971], 243), given that from the time the flood waters started, to the time they were completely dried up, was 370 days, and bearing in mind that the waters of the Persian Gulf now cover the area where the antediluvians lived; see, for example, Schroeder, who considers "[s]ediments from so brief a period" as "the Biblical Flood of Noah's time," "would probably not be extensive and, therefore, firm archaeological evidence may never be found" (Schroeder, op. cit., p. 28).

[23]L. R. Bailey, op. cit., p. 57.

[24]G. A. Cooke, "Reconstruction of the Mesopotamian Coastline in the Holocene," *Geological Society of America Abstracts with Programs* (1985): 552; W. R. Dickinson, "The ... Holocene saga," *Geological Society of America Bulletin* 107 (1995): 1–7, at p. 3.

[25]See R. Noorbergen, *The Ark File*, (London: New English Library, 1980), 9, 30–53, 147; F. A. Filby, *The Flood Reconsidered* (London: Pickering & Inglis, 1970), 37–58; A. C. Custance, *Noah's Three Sons*, pp. 35, 81, 105–6; and *The Flood: Local or Global?* pp. 67–98; or J.G. Frazer, *Folk-lore in the Old Testament* (London: Macmillan & Co., 1918, reprint: 1919).The sceptical Frazer's incomplete work omits reference to, for example, Australia's Northern Territory (see R. Robinson, *Aboriginal Myths & Legends* [Melbourne: Sun Books, 1966], 85–90); but nevertheless records over 100 flood and Tower of Babel stories in chapters 4 and 5.

[26]E.g., Art. 9 *The 39 Articles*, "Original Sin standeth not in the following of *Adam*, (as the *Pelagians* do vainly talk;) but ... naturally is ingendered of the offspring of *Adam*; whereby man is very far gone from original righteousness, and is ... inclined to evil ... whereby the lust of the flesh ... is not subject to the Law of God ..."; Art. 2 *Augsburg Confession*; and ch. 6 *Westminster Confession*. But N.B., (1) Gen. 2:25; 3:7–11, 21; 8:21; (2) Job 31:33; Job's statement in Job 14:4, and (although they are not always right,) his friends' agreement in Job 15:14; 25:4; (3) Ps. 51:5; (4) Gen. 25:26; Isa. 48:1, 8; Hosea 12:2, 3a; (5) Matt. 19:4–8; (6) Rom. 5:12; 7:14, 17, 20; Gr. *sarx* or "flesh" (AV) in, for example, 7:18, 25; 13:14; (7) Pelagian teachings, for example,"everything good and ... evil ... is *done by us*, not *born with us*" (Pelagius); and (Pelagius' disciple, Coelestius:) "Adam was created mortal, and he would have died, whether he sinned or not," "Adam's sin injured himself alone, not the human race," "new-born infants are in the same condition as Adam before the Fall," "infants" who die necessarily "have eternal life," "it is not through the death or the fall of Adam that the whole human race dies." By contrast, see, for example, Augustine's *Anti-Pelagian Writings*.

[27]E.g., Art. 2 *The 39 Articles* refers to "original guilt" (in contrast to "actual sins"); although various Semi-Pelagians

deny that original guilt attaches to original sin. Is a person *guilty* or *not guilty* of sin from the time of his conception? (1) On general biblical principles there is a nexus between sin and guilt (for example, Lev. 6:4), and so there must be a nexus between original sin and original guilt. (2) Due to his biological inheritance, from the time of his conception, a man is tainted with original sin (Ps. 51:5). As a consequence of this racial curse, in moral and spiritual terms every man has a fallen/sinful human nature (Eph. 2:3, 5a). Thus every man is *guilty* of sin, irrespective of any actual sin(s). This is recognized by Placeans, Augustinians, Federalists, and (in a qualified way) Wesleyan Arminians (*Strong's Systematic Theology*, pp. 602–3; 628; *Berkhof's Systematic Theology*, pp. 241, 245, 250–1). *Significantly then, the racial theoretics for explaining man's sinful nature require that Adam is mankind's progenitor.* (3) If a man is *not guilty* of sin, he cannot die, but if *guilty* of sin he can die, since for men, "the wages of sin is death" (Rom. 6:23). But we know that a man can die at any time after his conception, and so he must have been *guilty* of sin. Hence there must be a nexus between original sin and original guilt, for "in Adam all die" (1 Cor. 15:22). St. Paul says "all have sinned," and so "death passed upon all men." That is, all men are guilty of at least one actual sin, namely, the "sin" of the "one man," Adam, by whom "death" came "into the world" (Rom. 5:12 cf. 3:23) (for which reason they have sinful natures). Indeed, while on the one hand, before the law was given at Mt. Sinai humans had sinful natures (Gen. 6:5; 8:21), and there were various laws by which men were judged at a moral and civil level (for example, Gen. 9:6); on the other hand, violations of these laws were not deemed by God to be actual sins *for soteriological purposes* (as opposed to moral and civil purposes). But sin's wages of death meant that humans between Adam's and Moses' time still died. Why? Because they were *guilty* of Adam's primal sin (Rom. 5:12–14). Thus by the sin of "one" man, death reigned over the race, and after the law was given, violations of the Moral Law were deemed by God to be actual sins not only for moral and civil, but *also soteriological*, purposes; and so transgression increased for these purposes (Rom. 5:15–21; cf. 7:7). Thus original guilt involves guilt for Adam's primal sin, as recognized by Augustinians and Federalists. Augustinians consider all men were racially in Adam, and so all participated in a common primal sin with him (cf. Heb. 7:9,10). Federalists (such as myself) consider Adam's sin is imputed to the race, since he was appointed as the covenantal head because he is the human race's progenitor. Thus because humans' very existence as persons is racially dependant upon him, under the Adamic Covenant a God decreed condition for their personhood's existence is that they are imputed with any adherence to, or violation of, the covenant by its federal head, Adam (cf. Hosea 6:7, NASB). *Significantly then, the racial theoretics for both Augustinianism and Federalism require that Adam is humankind's progenitor.*

[28]E.g., Arts. 2 &15, *The 39 Articles*. See 2 Cor. 5:21; Heb. 4:15; 7:26; 9:14; 1 Pet. 1:19; 2:22 parallels Isa. 53:9; 1 John. 3:5; The Council of Chalcedon (451); and "perfect man" (*Athanasian Creed*). The Son's existence as a person is not racially dependant on Adam since he existed as a divine person before the Incarnation. He became man "not through changing [his] Divinity into humanity, but through taking humanity into [his] Divinity" (*Athanasian Creed*). He is one Person, with both a human nature and a Divine nature. Thus he did not need to take the sinful nature common to other humans into himself; that under the Adamic Covenant is part of those who are racially dependant on Adam for their existence as persons. However, the Son came "in the likeness of sinful flesh" (Rom. 8:3) i.e., "Although the flesh of Christ was unpolluted by any stain, it had the appearance of being sinful, since it sustained the punishment due to our sins, and certainly death exerted every part of its power on the flesh of Christ as though it were subject to it. Because our High Priest had to learn by his own experience what it means to assist the weak, Christ was willing to undergo our infirmities ... In this respect too there appeared in him a certain resemblance to our sinful nature" (Calvin's *The Epistles to the Romans & Thessalonians*, cited in ICC on *Romans*, p. 380). As represented by *The Egyptian Antichrist*—the Coptic Orthodox Pope, Coptic Orthodoxy denies Christ's humanity via the monophysitist heresy (see 1 John 4:2, 3, [NASB]; 2 John 7).

[29]1 Kings 8:46; Matt. 6:12; Rom. 3:23; ch. 7, 1 John 1:8. For example, contrary to the claims of Roman Catholicism (Immaculate Conception teaching) and Antiochian Orthodoxy (sinless perfection of "Saints" teaching), Mary committed such sins as negligence (Luke 2:41–45 cf. 2 Chron. 29:11a), ignorance (Luke 2:49 cf. Lev. 4:2, 27, 28), dishonesty ("Why have you treated us this way?" Luke 2:48, 49 [NASB]), and presumption (John 2:3, 4 cf. Ps. 19:13). Cf. Coelestius's Pelagian teaching, "there were men without sin before Christ's coming;" and the point raised against him concerning, "a man can be without sin, if he chooses."

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The ASA/CiS International Conference will be held in Cambridge, England at Churchill College, 2–5 August 1998. We are open to contributions on any topic related to the purpose of CiS and the ASA.

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Communication

The Precambrian to Cambrian Fossil Record and Transitional Forms

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There is much confusion in the popularized literature about the evidence for macroevolutionary change in the fossil record. Unfortunately, the discussion of evolution within the Christian community has been greatly influenced by inaccurate presentations of the fossil data and of the methods of classification. Widely read critiques of evolution, such as *Evolution: A Theory in Crisis* by Denton,[1] and *Darwin on Trial* by Johnson,[2] contain serious misrepresentations of the available fossil evidence for macroevolutionary transitions and of the science of evolutionary paleontology. In "On the Origin of Stasis by Means of Natural Processes," Battson similarly does not accurately communicate the rapidly growing body of evidence relevant to the Precambrian/Cambrian transition.[3]

The implication of much of the evangelical Christian commentary on macroevolution is that the major taxonomic groups of living things remain clearly distinct entities throughout their history, and were as morphologically distinct from each other at their first appearance as they are today. There is a clear interest in showing the history of life as discontinuous, and any suggestion of transition in the fossil record is met with great skepticism. The purpose of this short communication is to dispel some of these misconceptions about the nature and interpretation of the fossil record.

**ASA Member*

Taxonomy and Transitional Forms

The recognition of transitional forms is as much a question of taxonomy as it is a statement about the nature of the fossil record. Taxonomy, the process of classifying living and fossil organisms, produces its own patterns which order the diversity of life. It is thus important to recognize that names do much more than describe nature. They also interpret it. There is considerable ferment now within the field of taxonomy because of conflicting philosophies of classification, and different perceptions of which patterns in the history of life should be reflected in the taxonomic hierarchy.[4] Higher taxa can be either groupings of species with similar morphologies, or "natural" groups sharing derived characteristics inherited from a common ancestor. Thus, the taxonomic assignment of organisms cannot be used uncritically in the reconstruction of the history of life as though taxonomic names were raw data.

The Linnean classification system was originally based on a typological concept of species. All individuals were compared to an ideal "archetype" that defined the species, and all observed variation was understood as variation from that type. Typology thus excluded transitions *by definition*. Denton appeals to this typological model as a basis for arguing that it represents an objectively accurate picture of biologic reality. He fails to see that typology imposes its own order on the natural variation of the biologi-

cal world and is not objectively descriptive of it. To use an illustration given by Denton, triangles and quadrilaterals have clear typological definitions and are easily separated into two classes of geometric shapes. Now, if one side of the quadrilateral were reduced in length by infinitesimal amounts until it was only two geometric points wide, it would still be a quadrilateral by definition although absolutely indistinguishable from a triangle. The most conceivably gradual transition has been made, yet typologically there were no intermediates! For Denton to apply this typology to living organisms and the fossil record, and then claim the absence of intermediates is meaningless.[5] Such arguments hinge on our human constructions and categories, not on the reality of variation in the biologic world.

The Linnean classification system is also hierarchical, with species grouped into genera, genera into families, families into orders, etc. This system reflects the discontinuity and hierarchy that are commonly, but not always, observed among living organisms. However, "this system leads to the impression that species in different categories differ from one another in proportion to differences in taxonomic rank."[6] This impression is false. Higher taxa are relatively distinct and easily recognizable groups only when we ignore the time dimension of the history of life. Taxonomic categories are blurred during times representing the branching points of the tree of life. Once a lineage is split, its branches continue to evolve and diverge such that their morphological (and genetic) distance increases and they become more readily distinguished taxonomic entities.

Since taxonomy is superimposed on a branching tree of life, a higher level in the taxonomic hierarchy does not imply a greater degree of morphologic distance. For example, two species which belong to different classes are *not necessarily* more different from each other than two species belonging to different genera. When using the fossil record to look backward through time, it is found that representatives of different higher-level taxa become more "primitive," that is, have fewer derived characters, and appear more like the primitive members of other closely related taxa.[7] The more complete the fossil record of the origin and early radiation of higher taxa the more similar the transitional species, and the more difficult it is to determine their taxonomic assignments. Species placed into two different higher taxa may thus have very similar morphologies. Were it not for the subsequent evolutionary history of the lineages, species spanning the transitions between families, orders, classes, or phyla would be placed in the same lower taxon.[8] This is completely consistent with the paradigm of common descent, and with the origin of higher taxa through evolutionary processes at the population and species level.

Based on the above discussion, a transitional form is simply a fossil species that possesses a morphology intermediate between those of two others belonging to different higher taxa. Such transitional forms commonly possess a mixture of traits considered characteristic of these different higher taxa. They may also possess particular characters that are themselves in an intermediate state. During the time of origin of a new higher taxon, there are often many described species with transitional morphologies representing many independent lineages. It is usually very difficult if not impossible to determine which, if any, of the known transitional forms actually lay on the lineage directly ancestral to the new taxon. For this reason, taxonomists commonly have difficulty defining higher taxa, and assigning transitional fossil species to one or another taxon.[9] But, although the details may elude us, the patterns of evolutionary change are in many cases well recorded in the fossil record.

Battson emphasizes the pattern of appearance of higher taxa in which phylum-level diversity reaches its peak in the fossil record before class-level diversity, and class-level diversity before that of orders, etc.[10] Battson and other critics of macroevolution interpret this apparent "top-down" pattern as contrary to expectations from evolutionary theory. However, this pattern is generated by the way in which species are assigned to higher taxa. When a hierarchical classification is applied *retrospectively* to a diversifying evolutionary tree, a "top-down" pattern will of necessity result. Consider, for example, species belonging to a single evolving lineage given genus-level status. This genus is then grouped with other closely related lineages into a family. The common ancestors of these genera are by definition included within that family. Those ancestors must logically be older than any of the other species within the family. Thus the family level taxon would appear in the fossil record before most of the genera and species included within it. The "top-down" pattern of taxa appearance is therefore entirely consistent with a branching tree of life.

The origin of any new higher taxon, including phyla, must ultimately have occurred through the origin of a single new species—that is, by a speciation event. The diversifying descendants of this founding species are then included within that new higher taxon. If common descent is accepted as a working hypothesis, this must be the case. This is recognized by all evolutionary paleobiologists, even

those who stress the uniqueness of the origins of phyla and classes. As stated by Valentine:

> A phylum has had to originate as a founding species by definition, and thus via microevolutionary processes. The microevolutionary questions concern how and why such a speciation occurred: what genetic, ecologic, or other features in the population biology of the lineage conspired to produce the new species. There are macroevolutionary questions as well; they concern how and why a particular new species founded a higher taxon, such as an entire phylum, rather than being just another species within an extant taxon.[11]

The Cambrian "Explosion" and the Origin of Invertebrate Phyla

The presentation by Battson seriously misrepresents our present knowledge of the Latest Precambrian and Early Cambrian fossil record.[12] There has been a flood of major fossil discoveries within the last decade or so that has shed great light, and overturned many established views on the origin and early diversification of the metazoans. Our understanding of the early history of life is presently in an exciting stage of rapid change and revision.

The Late Precambrian and Early Cambrian fossil record of the metazoan phyla shows the same pattern as that of class- and order-level taxa in the Phanerozoic. Near the origin of these higher-level taxonomic categories, the boundaries between the taxa become blurred and fossils become difficult to classify. Moving back in time toward their presumed point of diversion from a common ancestor, organisms belonging to separate phyla converge in morphology. Several Early Cambrian organisms possess morphologies that bear similarities to more than one phylum, making their placement in existing phyla a matter of dispute. This classification problem is resolved either by erecting new phyla or by broadening definitions to include the new forms.

Some Late Precambrian Ediacaran fossils (~580–560 My) bear strong resemblances to colonial coelenterates called pennatulids, or sea pens.[13] Others appear to have been solitary coelenterate medusoids attached to the sea floor.[14] Some of these medusoid fossils show clear impressions of tentacles around their margins. There are also sack-shaped organisms interpreted as sea anemones.[15] Although Seilacher has questioned the placement of many Ediacaran fossil forms in living phyla,[16] he also recognizes the presence of a group of sand-filled cnidarian coelenterates he has called the Psammocorallia.[17] The fossil record thus indicates that the Late Precambrian was dominated by solitary and colonial coelenterates that may have included all four living cnidarian classes.[18] Recently spicules from sponges of the class Hexactinellida have been identified in Ediacaran age rocks.[19] There is also evidence for the presence of arthropods as well as echinoderms before the beginning of the Cambrian.[20]

The other major component of the ancient Ediacaran communities was burrowing and trail-making worms of unknown affinity. These trace fossils increase in abundance and diversity throughout the Latest Precambrian indicating both an increase in the diversity of organisms, and in the variety of feeding and locomotory behaviors.[21] Annelid worms may be represented by the mineralized tubes of *Cloudina* and by multi-segmented forms such as *Dickinsonia*.[22] Casts interpreted as echiurid worms have also been described from the Ediacaran.[23] Nearly half of all living phyla are worms, and only a few phyla have a significant fossil record, so that it is clear that the phylum-level diversity of the Late Precambrian may have been much greater than I have indicated. Certainly some modern phyla appeared before the end of the Precambrian.

The Cambrian, particularly the Early Cambrian, was a time of amazing diversification among the metazoans. Two aspects of the Early Cambrian fossil record will be emphasized here. First, with important new fossil discoveries and the redescription of previously known forms, the many peculiar Cambrian taxa are now being grouped into coherent phyla. These phyla include living phyla and groups interpreted as ancestral to living phyla. Secondly, many Early Cambrian taxa have morphologies that bear similarities with more than one living phylum, that is, their morphologies are mosaics of phylum-level characters.

Probably the most bizarre Burgess Shale fossil is *Hallucigenia*. This fossil has been completely reinterpreted since the description presented by Gould.[24] This reinterpretation has resulted both from more detailed study of existing fossil specimens and the discovery of exceptionally well-preserved fossils of similar organisms in China.[25] *Hallucigenia* is now recognized as a member of a diverse and widespread group of Cambrian organisms called lobopods. They are very similar to, and may belong to, an obscure living phylum called the Onychophora. These caterpillar-like organisms walked on fleshy legs and bore plate-like or spine-like mineralized structures on their dorsal sides. Although these small plates and spines were previously recognized as part of the Early Cambrian "small shelly fauna," their biological affinities were unknown until these recent discoveries.

The Cambrian lobopods occupy a transitional morphological position between several living phyla. The oldest known lobopod from the Early Cambrian is *Xenusion*. This organism bears similarities to both palaeoscolecid worms and to living onychophorans and tardigrads.[26] Furthermore, lobopods also have morphological features in common with the arthropods, particularly with peculiar Cambrian forms such as *Opabinia* and *Anomalocaris*.[27] Recent redescription of *Opabinia* has also disclosed the presence of lobopod limbs strongly suggesting a lobopod to arthropod transition.[28] The discovery of a Cambrian gill-bearing lobopod reinforces this conclusion.[29] These forms fall nicely into a transitional position between extant phyla.

Another very important group of Early Cambrian fossils is represented by a wide variety of tiny cap-shaped and scalelike skeletal elements. It is now known that many of these belonged to slug-like animals that bore these hollow mineralized structures like a dermal armor. Two well-known, and well-preserved, examples of this group of organisms are *Wiwaxia* and *Halkieria*. Called the Machaeridia or the Coelosceritophora, these organisms are mosaics of phylum-level characteristics, and their taxonomic affinity is a matter of present debate. A strong case can be made for the assignment of at least some of these taxa to the Mollusca.[30] However, a relationship to the polychaete annelid worms is also strongly suggested by some workers, as with *Wiwaxia*.[31] The taxonomic confusion associated with these scale-bearing slug-like animals, and with the lobopods, is consistent with their stratigraphic position at the base of the Cambrian metazoan radiation.

The above discussion shows that the presentation of the Precambrian to Cambrian fossil record given by Battson does not reflect our present understanding of the history of life.[32] Many metazoan groups appeared before the Cambrian, including representatives of several living phyla. Furthermore, the many small scale, plate, and spine-bearing organisms of the earliest Cambrian, while sharing characteristics with several living phyla, are also similar enough to each other to be classified by some workers into a single phylum.[33] Even when the metazoan fossil record for the entire Cambrian is considered, the morphological disparity cannot be equated with that of living organisms, unless the subsequent appearance of all vertebrate and insect life be ignored. In addition, many living phyla, including most worm phyla, are unknown from the fossil record until well into the Phanerozoic.[34] Thus, to claim the near simultaneous appearance of virtually all living phlya in the Cambrian is not an objective statement of the fossil evidence but a highly speculative, and I believe unsupported, interpretation of it.[35]

Finally, there is a question of whether the rapid diversification of metazoans in the Late Precambrian and Early Cambrian reflects an equally rapid increase in complexity. An interesting study by Valentine and others uses the number of cell types as a useful measure of morphological complexity. They plot the estimated times of origin of major body plans against their cell type numbers. The resulting plot shows that the upper bound of complexity has increased steadily and nearly linearly from the origin of the metazoa to the present. Furthermore, they conclude that "... the metazoan 'explosion' near the Precambrian/Cambrian transition was not associated with any important increase in complexity of body plans ..."[36] This suggests that the appearance of new higher taxa in the Cambrian did not involve the sudden appearance of major new levels of complexity. ★

Notes

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Book Reviews

SCIENTIFIC KNOWLEDGE by Barry Barnes, David Bloor and John Henry. Chicago: The University of Chicago Press, 1996. 230 pages, index. Hardcover, $38.00; Paperback, $15.95.

The authors are well qualified to write a text on the sociology of science. Barnes is a professor of sociology at the University of Exeter, Bloor is a reader at the University of Edinburgh, and Henry is a senior lecturer at the University of Edinburgh. All have published in the field. This book was written as an introductory text for graduate students in sociology, and for those interested in the history or philosophy of science. It has seven chapters beginning with "Observation and Experience" and ending with "Proof and Self-Evidence." The intent of the authors is to "state precisely and clearly where and why sociological analysis is necessary in the understanding of scientific knowledge" (p. 8).

The introduction is a helpful overview of the book, giving methodology and approach. The authors argue that they are not seeking to justify science because one cannot simultaneously adopt a scientific approach and celebrate it. Yet the presence of the book indicates a high value attached to science.

In chapter one, observation is viewed as both theory laden and "modular," that is, only in a limited way influenced by the other components of cognition. This material must still be processed into scientific reports and this is where the sociologist comes in. In the second chapter, a case history (of Millikan's oil drop experiment) is used to illustrate this point. In the third chapter, we have an analysis of how words relate to the world; the conclusion is that classification is determined by experience and previous classification schemes. The authors also recognize that scientific classification deals with objects that are essentially identical to one another: (atoms, molecules, electrons). The next chapter argues that scientific theories are best thought of as evolving ideas, rather than fixed meanings. The fifth chapter reveals that scientific research is concerned with goals and interests. The final two chapters cover how scientists defend themselves and how even mathematics is subject to a sociological analysis.

The authors appreciate Thomas Kuhn and agree with him that the fundamental units of science are not theories, but solved problems, which become the exemplars or the tools of the scientists. It is argued that these exemplars are what the text books use to convey science to the next generation.

The work has value to those who have never looked at science in its broader cultural setting but it was not written with the usual clarity that one has come to expect from British authors. This makes it less accessible to the beginner. The authors set out to prove the value of a sociological analysis in the understanding of scientific knowledge. In the sense that they demonstrated that knowledge is influenced by its social context, they did. But what knowledgeable person would contest this point?

The book also seems to belabor the obvious. Newton knew that he accomplished what he did because he stood on the shoulders of giants. Those of us in the field know that we are influenced in our topics and our research by our social environments. The social context funds us and, in so doing, determines the direction of our research. It also judges us, and rewards us.

The book does not index Christianity, or religion, and does not relate this topic to the development of science. Yet those of us in the ASA know of the deep Christian faith of many scientists, and the profound effect of Christianity on the rise of science. In this regard it reveals the agnostic context of the sociologists. It is of limited value to the members of our organization.

Reviewed by Fred Jappe, Professor of Chemistry, Mesa College, San Diego, CA 92111.

THE SCOPES TRIAL by Don Nardo. San Diego, CA: Lucent Books, 1997. 96 pages, bibliography, illustrations, index. Hardcover; $16.95.

Nardo has written over seventy books; his works include biographies of Charles Darwin, Thomas Jefferson, and H. G. Wells. *The Scopes Trial* gives the reader a glance at the overall trial and it includes annotated bibliographies, a thorough list of works consulted, and a comprehensive index. Moreover, the purpose of this book is to give the big picture of the trial and to provide sources for further research.

Even though *The Scopes Trial* is only 96 pages in length, it gives many of the little known details of the trial. For instance, the prosecution team included a local attorney named Sue Hicks (the original "Boy named Sue" of the Johnny Cash hit song) who had been named for his mother (p. 29). The trial was the first to be broadcast on radio, and Judge Raulston declared, "My gavel will be heard around the world" (p. 43). Loudspeakers were set up on the courthouse lawn "for the crowds who were unable to squeeze into the courtroom" (p. 46). Ironically, when the jurors were asked to step out of the courthouse, they still heard the testimony (p. 46). Just before William Jennings Bryan took the stand, cracks appeared in the ceiling of the courthouse; as a result, court reconvened on the front lawn (pp. 66–7).

After reading *The Scopes Trial*, I felt like I had actually been there in Dayton in 1925. This was due in part to

Nardo's excellent choice of over 40 pictures and his discussion of the events of the trial. Nardo writes:

> Under Darrow's relentless and skillful stream of questions, Bryan had revealed his nearly complete ignorance of world history ... After more than an hour on the stand, Bryan showed not only that he was ignorant of history, but that he knew practically nothing of the established and universally accepted facts of archaeology, geology, astronomy, and other scholarly disciplines. The man who had so vigorously advocated limiting the teaching of science in the schools had just demonstrated that he had not the foggiest notion of what science was all about (p. 74).

The Scopes Trial does have a weakness though. Nardo fails to mention that much of the evidence presented by the scientists at the trial was later proven faulty. Judge Raulston ruled that all testimony bearing on the meaning of evolution or its truth or falsity had nothing to do with whether John Scopes had broken the law and should therefore be excluded from the trial (p. 59). But the Judge did allow the defense to read some of the expert testimony into the record while the jury was excused (p. 66). Part of that testimony read into the record included the two popular biological arguments for evolution—embryonic recapitulation and vestigial structures. Medical science has since disproved both of these views. Furthermore, the evolution of the horse was called "conclusive" and the Piltdown fossils were said to be supporting evidence for evolution. Needless to say, these two pieces of evolution are no longer presented by evolutionists. In fact, evidence surfaced recently that indicates who the Piltdown hoaxer was (Henry Gee, "Box of Bones 'Clinches' Identity of Piltdown Paleontology Hoaxer," *Nature*, 381 [1996]: 261–2).

On the other hand, creationists too have been guilty Of mistakes. John George, the author of *They Never Said It!*, pointed out that many creationists have mistakenly attributed these words to Clarence Darrow: "For God's sake, let the children have their minds kept open! Close no doors to their knowledge; shut no door to them. Let them have both evolution and creation! The truth will win out in the end." Actually it was Darrow's co-counsel, Dudley Field Malone, who was the speaker. And what Malone said was rather different: "Make the distinction between theology and science. Let them both be taught." Nardo states, "The speech was so eloquent and passionate that the audience, even including many of the fundamentalists who supported Bryan, gave Malone a long and respectful ovation" (p. 63).

In sum, *The Scopes Trial* is well researched and well written. I highly recommend it to the readers of *PSCF*.

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

THE STORY OF CREATION: Its Origin and Its Interpretation in Philo and the Fourth Gospel by Calum M. Carmichael. Ithaca, NY: Cornell University Press, 1996. 136 + xii pages, Index of Sources, Subject Index. Hardcover; $24.95.

Carmichael, professor of Comparative Literature and Biblical Studies at Cornell University, wants to show how the exodus story was the foundation for the creation story as written in Genesis 1. Later, John used that creation story in his gospel to transform historical reporting about the life of Jesus into a cosmological scheme. For that reason the order in which John tells happenings is different from the order in the other gospels. Carmichael says that John used Philo's methods of interpretation to write about Jesus. In that way this book is an exercise in hermeneutics. It is true that John used Genesis 1 when he started writing the gospel story, but he did not necessarily use Philo's methods and ideas.

Philo was an Alexandrian Jewish philosopher who wanted to read Scripture using pagan Greek philosophy. Philo did not recognize that pagan Greek philosophy and biblical writings are irreconcilable as Raymond E. Brown shows in *The Anchor Bible, The Gospel According to John*, vol. I, appendix II. He discusses similarities between Philo and John. For example, he mentions that Philo used the word *Logos* more than twelve hundred times in his writings. Philo tried to combine Greek and Hebrew thinking about *Logos*. According to Brown, their common Jewish background can explain some similarities between John and Philo. He denies that Philo influenced John. Brown points to the use of the word *dabar* (word) in the Bible and Semitic Wisdom literature and points then to Prov. 6:23 and Ps. 119:105 where *word* is used in combination with *light*. Brown denies that the gospel has a Hellenistic background. The concept of *Word* is far closer to biblical and Jewish thought than it is to Hellenistic ideas, says Brown.

However, we should not reject out of hand the suggestion that the biblical writer had the exodus story in mind when he wrote Genesis 1. Moses had trouble keeping the people of Israel focused on the only true God. For example, read the story of Aaron and the golden calf, while Moses was with God on the mountain. In the story about the forty years' wandering the Israelites did not trust God. In those circumstances, Moses had to remind them that God was in charge.

Realizing that Jews wrote the Old Testament, we should try to listen to the Bible as the Old Testament Jews did. That is difficult. I mentioned the word "*Logos*." Another word that indicates a different concept now than it did in Old Testament time is "Truth." Leon Morris, in *The New International Commentary on the Gospel According to John*, writes that truth refers to "faithfulness, reliability, trustworthiness, sureness, and the like" (p. 293). It means that we cannot agree with all the premises of Carmichael's book. The basic difficulty is that for Carmichael it is a given that Philo influenced John because John lived after Philo. However, that fact does not automatically mean that John knew and agreed with Philo's work and thoughts. Since both were well versed in the books of the

Old Testament, as Brown shows, they read Scriptures in a Jewish way. Philo wanted to combine it with Greek philosophy, so he introduced much Greek philosophy in his writings. If we accept with Carmichael that John followed Philo's ideas, we may read the Bible with pagan Greek glasses on.

Despite this major disagreement, I want to recommend this book for study. As with any book, we must read it critically. Some remarks Carmichael makes are farfetched. He sometimes gives the impression that he wants to press everything into the scheme which he sets up. If the reader keeps this in mind, the book may help in studying the first chapter of Genesis and the Gospel of John.

Reviewed by Jan de Koning, 20 Crispin Crescent, Willowdale, ON, M2R 2V7.

CREATION OF THE SACRED: Tracks of Biology in Early Religions by Walter Burkert. Cambridge, MA: Harvard University Press, 1996. 255 pages, index. Hardcover; $29.95.

Burkert is Professor of Classics at the University of Zurich, Switzerland. He has also written *The Orientalizing Revolution* and *Greek Religion*. This book is an anthropological treatment of religious behavior, by which he seems to mean a behavior for which there is no other readily available term. His approach is strictly naturalistic; he views religious behavior as an entomologist might view a butterfly collection: interesting, perhaps beautiful, curious, but not to be taken seriously.

Considered from the perspective of the goal expressed in the subtitle, the book is, expectably, a failure. After the first chapter, which is supposed to establish the reasonableness of a biological, i.e. evolutionary, explanation of religion, there are only occasional and scattered references to Darwinism and sociobiology—just enough to remind the reader that he really hasn't forgotten his intention. Aside from these intrusions, the book is a treasure of folklore, myth, and strange cults.

There are chapters dealing with "Escape and offerings," "Hierarchy," "Guilt and causality," and "The validation of sign." I found particularly interesting the discussion of the "quest" tale. Following Vladimir Propp's *Morphology of the Folktale* in which the elements and sequence of events are astonishingly stable where and whenever found, the tale starts with some damage, lack, or desire; the hero is told to go somewhere; he meets some being which tests him; he receives some magical aid; final success, the hero is recognized and the imposter punished; and the hero marries and becomes king. Not all elements are always present but for those that are, the sequence is fixed. Burkert argues that the legends of Perseus and of the labors of Heracles, the story of the Argonauts, Gilgamesh and Huwawa, Ninurta and the Asakku, and the Descent of Inanna to the Netherworld all fit this schema well. (It may also of interest to Christians that it is a snake that robs Gilgamesh of the plant of life, the result of which is that man remains bound to death.) An anthropologist would consider diffusion from a common source as the explanation of this kind of similarity; the alternative is considered to be independent invention. This logic is strictly evolutionary; homologies are evidence of common ancestry. Burken does not deal with these issues. Considering that Propp's work was concerned with contemporary Russian folk tales the congruence is even more remarkable. The inability to establish diffusion should be taken as evidence for a common psyche of man, which generates Jungian and other archetypes. Since I am unable even to consider the number of different, sensible possibilities available, clearly this is an impressionistic statement. In the case of the Propp sequence, it is worth emphasizing that structure, not content, is the focus. Burken shows that, for example, finger amputation is also wide and deeply distributed. But a specific act such as this is not nearly so problematic as the structure of a literary product.

Burkert, and others, considers the ritual of shamanism to be the origin of storytelling and hence of literature. The Book of Daniel and the performance of the Passion Play at Oberammergau in Bavaria are both claimed to be shamanic in origin. In a state of altered consciousness, the shaman performs a quest of supernatural extent. In the Siberian and Eskimoan traditions, he retrieves the souls of the sick, or releases animals for the hunt. A shamanic performance is public and he keeps his audience, who already know what must happen, informed, by mimicry, symbolism, and speech, of the progress of his adventure. In other traditions there were stringent tests for fraud—those convicted were killed—with the inevitable result that the surviving shamans learned to give obscure and similar pronouncements.

This is an interesting book. It is too superficial for the expert, and for many topics he takes expert knowledge for granted. However, even with the shortcomings it is quite informative. While definitely not scientific or, for that matter, Christian, it contains a kind of background which is of concern to both.

Reviewed by Braxton M. Alfred, Department of Anthropology, University of British Columbia, Vancouver, BC, V6T 1Z1.

THE ORIGIN OF HUMANKIND by Richard Leakey. New York: Basic Books, 1994. 171 pages, bibliography and index. Paperback; $10.00.

Leakey, world-renowned paleontologist and conservationist, has written several books on the subject of human origins, including *The Making of Mankind, Origins* and *Origins Reconsidered* (with Roger Lewin). His latest book (also with Roger Lewin) is *The Sixth Extinction: Patterns of Life and the Future of Humankind*.

At 171 pages, *the Origin of Humankind* is necessarily a brief introduction to the field of paleoanthropology and to the issues and debates which surround the study of human origins. As part of a broader series of publications

representing a variety of disciplinary areas (Basic Books' Science Masters Series), this is precisely what *The Origin of Humankind* is intended to be. It succeeds admirably.

Leakey has crafted an accessible yet challenging introduction to a broad and complex field of study. *The Origin of Humankind* is more than an introduction however; the book is impressively comprehensive in scope and offers a stimulating and sometimes provocative treatment of its subject matter. It informs and occasionally inflames, and does so in prose that is a pleasure to read. For these reasons the book should appeal to both specialists as well as to others who wish to learn more about the history and current state of anthropological knowledge on human evolution.

In *The Origin of Humankind,* Leakey addresses the whats, whens, and whys of human prehistory, focusing on four key evolutionary developments: the origin of the human family itself, the proliferation (or adaptive radiation) of bipedal species, the expansion in brain size, and the origin of modern humans (*Homo sapiens* or "us" in other words). Leakey addresses the major theories and controversies pertaining to these events, drawing upon the fossil, archeological and genetic evidence to explain and defend—and occasionally to refute—the variety of interpretive positions which exist. In the process, he advances several of his own opinions (particularly with regard to the emergence of language and the origin of modern humans), but is careful throughout to distinguish between what is *known* about the course of human evolution, what is *probable* or *assumed,* and what remains speculative pending new evidence and/or a new understanding of the evidence we currently possess. *The Origin of Humankind* is accessible but never condescending. Leakey invites the reader into the often arcane, sometimes "untidy" and confusing, but always fascinating world of paleoanthropology. His passion for "the sheer magic of the enterprise" is obvious throughout.

One of the major themes of the book concerns the nature of humankind's relationship with the rest of nature. The traditional approach within anthropology was to emphasize our *uniqueness* as a species, focusing on those capabilities and characteristics which set us *apart* from nature. The emphasis has shifted over the last few decades and now acknowledges our very intimate connection with the natural world. From the outset, it is clear that Leakey firmly embraces this latter view. While he does not dismiss the uniqueness of *Homo sapiens*—pointing to spoken language as our most significant and distinguishing attribute, he affirms that those things which set us apart can be fully explained within "a strictly biological context." Our ancestors did not embark on their evolutionary journey—which eventually but not inevitably, led to us—endowed with capacities which *destined* them in any way to become the dominant species. Whether we consider bipedalism or brain size, toolmaking ability, language—or indeed, any other attribute we possess as contributing to our success as a species, Leakey maintains that each can be understood as a product of natural selection, subject to the same evolutionary forces and principles which determine adaptive success or failure in all species. *The Origin of Humankind* locates humans securely and inexorably within the natural world and admonishes us to "rejoice at so wondrous a product of evolution."

Members of ASA will undoubtedly find the last chapter, "The Origin of Mind," to be the most provocative. Herein, Leakey ponders the origins and evolutionary significance of human consciousness—the capacity for introspection, or "reflective self-awareness" that we possess. Here, also, he adopts the evolutionary point of view, maintaining that our sense of "self" as well as "other," and our concern with mortality as well as morality are products of natural selection and confer adaptive advantages in the same way that bipedalism and large brains do. Apparently, an awareness or "self" and "other" is tremendously beneficial to a species as supremely social as *Homo sapiens.* Such intelligence has allowed us to out-wit, outmaneuver, and consequently "out-adapt" those species less endowed with such a decidedly Machiavellian ability. I'm not quite sure *how* I feel about that.

Reviewed by Janice Drodge, Assistant Professor of Anthropology, University College of Cape Breton, Sydney, NS, B1P 6L2.

DICTIONARY OF CREATION MYTHS by David Leeming with Margaret Leeming, Eds. Oxford: Oxford University Press, 1994. 330 pages, bibliography, index. Paperback; $16.95.

Leeming is an authority on the literary world of myths and is joined by an understudy, Margaret Leeming, in editing this concise but skillfully written collection of creation myths. It appears in the "Oxford Paperback Reference series, written for a popular rather than a specialized audience.

The Introduction is brief but explains very well the "world" of myth: "A myth is a Projection of an aspect of a culture's soul. In its complex but revealing symbolism, a myth is to a culture what a dream is to an individual." The author notes further that cultures create an "understanding" about the origin of the cosmos unrelated to scientific descriptions, yet expressing an intellectual reality that is remarkably pervasive in almost all human cultures. Despite the variety of cultures, all creation myths share a few basic concepts which, in turn, illustrate the communality of the human experience.

Perhaps of greatest interest to ASA readers is the treatment of the biblical account of creation, listed under "Hebrew Creation." Following their perspective that all myths are primarily symbolical linguistic constructs, the Genesis account is duly explained as myth and not history. The editors do, however, mention that there is an unusual portrayal within a "historical climate" not found in other myths. In fact, the Hebrew account could be described as a "demythologized myth" because the biblical scribes attempt to distance their account from the contemporary cultural myths wrought with idolatry.

Nonetheless, the Leemings describe the Bible story as a myth, following closely the Graff-Wellhausen documen-

tary hypothesis. That is, "P," the priestly author, compiled an account of creation at the time of the Babylonian Exile in such a way as to counter some of the spiritual extravagances of contemporary Babylonian culture. Without explaining how the two were brought together, the editors turn to the allegedly older "J" document to explain the apparent discrepancies between Gen. 1:1–2:4a and 2:4b–4. Although they do mention the unusual historicity of the biblical account, it, along with all the other creation accounts, are basically mythical.

Theirs is not a theological work nor was their purpose to give much more than an introductory overview of a remarkably large number of creation myths, but it is interesting that no other myths included in the book were as "troubled" with a historical perspective as the biblical account. It would also not be fair to criticize too sharply a work whose purpose was not theological. On the other hand, although the documentary thesis is widely accepted among biblical scholars, it is by no means without considerable controversy. A more accurate treatment of even a dictionary-length entry should at least mention in passing the dissenting perspective.

The authors also give quite a bit of attention to the Native American myths, which would, of course, be particularly appealing to the American audience intended.

The authors write well and present the material in a very readable style. The jacket states that the work is "the most comprehensive work devoted to creation stories." This may be a bit of a stretch, particularly in regard to detail, but it does offer quick and informative access to a very wide range of creation myths.

Reviewed by Wes Harrison, Professor of History/Political Science, Alderson-Broaddus College, Philippi, WV 26416.

ARCHAEOLOGY by Paul Bahn. New York: Oxford University Press, 1996. 102 pages. Paper; $7.95.

Paul Bahn, with a Cambridge University doctorate in archaeology, shares his discipline with the world via writing, translating, and broadcasting. This short book has been hailed as "quite brilliant" and "remarkably perceptive." For those who are not archaeologically informed but would like to be, this book, with its succinct writing and amusing cartoon illustrations, might just fit the bill.

Its ten short chapters can be read in one sitting. To help you locate information, there is a combined name and topic index, and to aid you in further exploration, there is a compact up-to-date bibliography. Bahn's purpose in writing is to "whet the appetite" so "that the reader may be stimulated to delve more deeply." He approvingly refers to Gly Daniel's observation that "archaeology is nothing if it is not about pleasure."

Bahn's English background is revealed by his quaint spelling of such words as "artefact" and his un-American punctuation. (By the way, the first "artifact" appeared in East Africa about two and a half million years ago.) In the preface, the author writes as though he is trying to enlist his readers to become archaeologists. He cautions that while the notoriety and pay will not be great, and while you may not be very good at it, you can "just learn to enjoy doing it badly."

What do archaeologists do? They spend time "nosing around in dead people's leftovers and trying to guess how they lived their lives." Somewhat startling is the fact people leave amazingly few leftovers to study: "... an infinitesimal portion has been recovered by archaeology, of which an even smaller part has been correctly construed."

We learn some basic information from Bahn. For instance, famous persons of the past who showed an interest in antiquities include Nabonidus, king of Babylon and the earliest known archaeologist, Julius Caesar, and Augustus. Archaeology became scientific in the nineteenth century. Archaeology has produced a huge collection of unstudied, unpublished and uncatalogued artifacts. Radiocarbon dates are only accurate for 50,000 years. Grave robbers have plundered all of Egypt's royal tombs.

While this is not a book on biblical archaeology (some archaeologists claim there is no such thing), some references occur to biblically related topics such as the Negev Desert (p. 27), the Roman period (p. 31), religion (p. 48), and Egypt (p. 79). I recommend this book. Find a comfortable chair and a good light, and allow this volume to transport you into the mysterious and fascinating past. It may provide a better grip on the trajectory of the future.

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

THE PREHISTORY OF THE MIND by Steven Mithen. New York: Thames and Hudson, 1996. 288 pages, index. Hardcover; $27.50.

For those Christians who believe in evolution, the question of the soul and its origin must merit some thoughtful consideration. The biblical description of the soul being imparted by God as a special gift is at odds with a gradual development of the soul. Mithen, an archaeologist at the University of Reading, U.K., and author of one previous book on ancient man (*Thoughtful Foragers*) has written an easy to read, well-illustrated book with a large bibliography. Mithen declares up front that his book will disprove the supernatural origin of the mind. Any book with such a claim deserves to be read and considered.

After a brief overview of the broad outlines of the hominid fossil record, Mithen delves into the cognitive structure of the modern mind. The mind is composed of a set of independent mental modules. The oldest, possessed by all animals, is general intelligence. It solves general problems faced by an animal. Each of the other modules control one area such as language, natural history, social relations, and technical abilities. Each module is "content rich." This means that each module is not a *tabula rasa* but brings content to the problems it encounters. Grammar is

wired into the structure of the brain in the linguistic module; the meaning of facial expressions is hardwired into the social module; and knowledge of the physical properties of objects are hardwired into the natural history module. In humans, there is a super-module which is able to access all of the other modules and create "cognitive fluidity" which one could loosely say is equivalent to the Christian soul.

Mithen then traces the evolution of the mental modules. The chimpanzee stands in place of the ancient common ancestor, which only possessed general and social modules and a limited natural history module. Chimpanzees, therefore, are unable to form hypotheses about food source locations unless they have actually seen them. They are only able to remember what they have seen. *Homo habilis*, about two million years ago, was engaged in behaviors which predicted the future location of food supplies and prepared for it. Mithen cites the inability of chimpanzees to make stone tools or speak as evidence that the common ancestor did not have technical or linguistic modules. Technical intelligence arose around 2.5 million years ago with the first stone tools and language arises, he says, at least by 250,000 years ago. But even with all the intelligence modules developed, Mithen argues that each module was unable to share knowledge with other modules until the super-module arose and provided humankind with cognitive fluidity between the independent modules. This module arose 60,000 years ago and for the first time allowed information flow among the various modules. Art, science, and religion could only arise after cognitive fluidity was complete. In Mithen's view, cognitive fluidity is what makes us human; it is our soul.

The biggest disappointment is that Mithen does not deal with or even cite evidence contrary to his thesis. He claims that the oldest representational art was the 33,000 year old lion-headed man from Germany. He does not mention the crude 300,000 year old Berekhat Ram figurine recently acknowledged as man-made by Alexander Marshack, a leading paleolithic art expert. He claims that Neanderthal never placed offerings in their graves and thus show no ritual, yet does not mention Le Moustier Cave where a young man, head resting on a pillow of flints, was sprinkled with red-ochre and surrounded with burned wild cattle bones. He says early man could not make multi-component tools, yet such tools were just found in 400,000 year old strata in Germany. He says early man was unable to work bone but does not mention the 400,000 year old bone spear points from Ambrona, Spain, or the 80,000 year old bone flute from Libya. Early man was not supposed to be able to build boats, yet *H. erectus* made wooden planks and crossed the ocean to Flores, Indonesia as early as 700,000 years ago. Many such examples could be cited.

While enjoyable, Mithen's book does not disprove the creation of the mind. The archeological data requires either an earlier advent of cognitive fluidity or an earlier supernatural creation of the mind than either Mithen or most Christians would advocate.

Reviewed by Glenn R. Morton, 16075 Longvista Dr., Dallas, TX 75248.

AN INTELLECTUAL HISTORY OF PSYCHOLOGY by Daniel Robinson. Madison, WI: University of Wisconsin Press, 1996. Paperback; $19.95.

In *An Intellectual History of Psychology*, Robinson traces the roots of psychology back to Hellenistic philosophy and follows its transformation into its present form. This book strives to give a general view of how psychological thought was influenced by philosophy, religion, and society. Unlike many other history texts which chronologically trot out the dusty old names of those who have made contributions to their respective fields and then are quietly put back in their place on the shelves, Robinson focuses more on the development of ideas which are the fundamental topics of the science of psychology (i.e., nature vs. nurture, free will vs. determinism).

Many point to Wilhelm Wundt as the father of modern psychology, but Robinson looks to Aristotle as the one who, ultimately, began the search for a science of the mind. Throughout the first section of the book, Robinson focuses his attention on how the Greek philosophers had defined the general outline of psychology. It is here that the basic areas of interest that would become the subjects of study are examined. At first blush, the section reads as a history of Hellenic thought. Socrates, Plato, and Aristotle are brought to the fore and their views on knowledge and what is knowable are dissected. They are followed by those who attempted to integrate Aristotle's ideas with the teachings of the Catholic church. Robinson portrays the influence of Christianity on the philosophy of science and psychology in a very flattering manner which contrasts with a typical representation of the Dark Ages as a time of intellectual arrest. He examines cultural events and how they affected the philosophies of this time.

The second section of the book focuses on the likes of Bacon, Locke, Hume, Descartes, and Spinoza and reads much like a contemporary history of the philosophy of science. While keeping the overall focus on how the schools of thought (empiricism, rationalism, materialism) developed, the emphasis is placed on how the Enlightenment shifted perception of the mind and further defined the realm of the discipline. The issue of the authority of experience is dealt with and a foreshadowing of science in its present form begins to take shape.

In the last part of the book, Robinson deals with systems and what might be considered to be the beginning of the science of psychology. The time has now come when, "... the methodology has caught up with the metaphysics in the nineteenth century, the essential character of what we take to be 'modern psychology' was in place." It is here that a brief description of the present divisions of psychology such as behaviorism, cognitive and physiological psychology are shown to be not truly original, but merely the same old ways of asking the same old questions clad in new, technologically advanced clothing. While spending little more than a chapter on what might be considered an "official" beginning of psychology (Wundt) up to the present time, Robinson sheds light on how, from Darwin to James, psychology began to take its present shape.

Without reservation I would recommend this book to those who are interested in gaining a deep understanding of the development of psychological inquiry and the underlying philosophical assumptions and schools of thought which have brought the realm of "mind" from the abstract to the measurable. This book is an absolute must for those who are looking for a resource on psychology's history or planning to teach this topic but is overwhelming for those looking for a more concise understanding. It is not light reading material and is not for those seeking only an undergraduate level familiarity with psychology. An understanding of philosophy is a necessity for readers who might otherwise find themselves wading through metaphysical definitions and complex theorems. However, Robinson has provided a carefully crafted tour of reflections on human nature and the mind for those looking for more than a list of contributors. If you are willing to spend the time and effort, this book will give you an understanding of psychology and a better understanding of science.

Robinson, a professor of psychology at Georgetown University, has written several books dealing with the history and philosophy of psychology and science and has acted as a chief consultant on PBS's *The Brain* and *The Mind* television series.

Reviewed by William M. Struthers, Biopsychology doctoral student, Department of Psychology, University of Illinois at Chicago, Chicago, IL 60607.

THE UNIFICATION OF SCIENCE AND HUMANITY: Agony and Ecstasy East of Eden by Peter Fong. Stillwater, OK: New Forums Press, 1996. 237 pages, index. Paperback.

Fong, Physics Professor at Emory University, is internationally known for his work on the statistical theory of nuclear fission. A theoretical physicist, he has written books and research papers in physics, biology, and humanities as well as newspaper articles on current issues. *The Unification of Science and Humanity* is a sequel to his earlier book, *East of Eden.*

The main purpose in this book, as in *East of Eden,* is to apply reductionism in physical sciences to the study of humanities and social sciences. Fong maintains that the existing physical laws, theories, and principles plus information theory are sufficient to explain not only the known physical and biological phenomena, but also human activities, indeed, our civilization. Thus, sciences and humanities can now be unified. The author developed this unifying thesis from his two fundamental papers on the phenomenological theory and thermodynamic-statistical theory of life. He then used this thesis to illustrate the observed social evolution and cultural evolution of human, macrohistory, and even matter and mind interactions.

The Unification of Science and Humanity seems the result of monumental work. It is full of fascinating case studies of a wide variety of topics, such as ethics and morality, government systems, ideals, forms of currency, life-styles (like human consumption of animal flesh and organs, monogamy versus polygamy), arms race and world peace, capitalistic economy, musical harmony, development of modern languages, unification of China, and others. The discussion on unification of science and religion should be interesting to members of the American Scientific Affiliation.

This book will generally be comprehensible to those with a good background in natural sciences. The author's choice of words is precise. However, some passages do need further clarifications. A number of proper names in the text also require identification. A few topical discussions (for example, on income taxation) appear to be outside the main theme of the book. Lastly, the book lacks adequate proofreading, as shown by numerous typographical errors and some references being out of order. In spite of these shortcomings, I highly recommend this book to those who appreciate humanities and social studies in terms of "hard" sciences. It is a joy to read this scholarly work.

Reviewed by James Wing, 15107 Interlachen Drive, Unit 1014, Silver Spring, MD 20906-5635.

SOCIOLOGY THROUGH THE EYES OF FAITH by David A. Fraser and Tony Campolo. New York: HarperCollins Publishers, 1992. 308 pages, indices. Paperback; $11.00.

In many ways the relationship between Christian faith and the science of sociology is one of the most difficult of the faith/science interactions to portray accurately. Both areas are heavily involved with personal interactions that add obvious elements of subjectivity to the pursuit of scientific descriptions. The science involved in understanding human society is a good deal more complex and difficult than the science involved in physics or biology. In the middle of the book, the authors say explicitly, "It is not legitimate to group sociology with either the natural sciences or the humanities."

In the foreword Nicholas Wolterstorff of Yale sets the tone for the book by pointing out that the authors, both on the sociology faculty of Eastern College, not only *look* at sociology through the eyes of faith to tell us what they see, but also *listen* to sociology with the ears of faith to tell us what they have heard. Both authors, deeply involved personally in both sociology and Christian faith, carry on a dialogue between their two kinds of insights with integrity and clarity, emphasizing from the beginning that they are writing from within a Christian worldview. Their central concern is the setting forth of the gifts that sociology bears for humanity and Christianity, and the gifts that Christian faith bears for sociology. The book is divided into three main sections: five chapters discussing "The Confrontation Between Christian Faith and Sociology," four chapters discussing "The Varieties of Sociological Experience," and seven chapters discussing "Faith Seeking Social Understanding."

The first section deals with the issues sometimes leading to hostile interactions between Christian faith and sociology, starting with a sociological analysis of how the secular biases of many sociologists affect their work. As with many of the other sciences, there is the curious mixture of a strong anti-Christian bias among many sociologists and at the same time the obvious evidence that it has been Christians who have often encouraged and developed sociology. Key phenomena in the modern world causing problems for traditional Christian thinking can be linked under the names of pluralization, privatization, and secularization. Suggesting that the growth of psychological counseling in the private realm naturally led to the need for sociological counsel in the public realm, the authors conclude that "Sociology often has the uncomfortable job of revealing differences between what people want to believe is happening in society and what actually is going on." The final chapter in this section provides two basic definitions: "Sociology is a set of explicit theories about society wedded to the modern, secular symbolic universe and organized by the professionalized standard of science," while "Christian faith is both a set of explicit theories and a symbolic universe in its own right." As a consequence, "Christians claim that the symbolic universe of Christian faith, along with its plausibility structure, includes science in a way that the symbolic universe of modernity, with which sociology frequently allies itself, does not include Christian faith." With these kinds of differences, developing a positive relationship between sociology and Christian faith requires a deeper understanding of both.

This is the subject of the second section of the book. Sociological thought must be understood in terms of the sociological paradigms that form the perspectives of sociological research. Three of these paradigms can be described by the terms order, conflict, and diversity. The paradigm of order stresses the concept that "society is an organic, collective, cohesive reality." In the paradigm of conflict, "struggle, warfare, competition, battle, rivalry, and contest are emphasized as central aspects of the human experience." And in the paradigm of "many definitions, many words, ... the diversity, heterogeneity and complexity of human social worlds" are pictured. Sometimes it is necessary to realize the limitations of such paradigms, and to recognize "how the ideology of the symbolic universe of modernity can influence what is seen and not seen."

Sociology is involved in the analysis of modernization, seeking answers to questions such as, "What is going on here? ... Why is it happening? ... What is it like for actors living in it?" and "How good or bad is it for humans?" Such analyses inevitably result in value judgments. Christian sociologists cannot avoid these questions, but add "the larger plot of history," with particular reference to idolatry and injustice. Beyond all else is the general realization that "Since Christians see human life as embedded in the cosmic drama of creation, fall, reconciliation, and redemption, the full complexity of human life cannot be fully accounted for simply by sociological (or psychological) explanations."

How to combine the best of sociology with the perspectives of Christian thought is the subject of the third section of the book. In many ways this is the most vital section of the book since it deals with practical issues that every thinking Christian must face. Two delicate tasks are involved in understanding the Bible: seeing "how people who lived in those ancient worlds thought and experienced their world, *in their own terms*. Then one must create one's own systematic models of their world, *in modern terms*. But one must not confuse these two accounts." This is in many ways the basic approach of authentic hermeneutics in all biblical interpretation.

An examination of theological paradigms reveals that there is a diversity in them similar to the diversity in sociological paradigms, a fact that only accentuates the complexity of a conversation between Christian faith and modern sociology. "Insofar as Christians become sociologists, they bring to their professional role the motivation of faith active in a love that seeks social justice. There is no necessity to create a distinctive Christian sociology." A key problem arises in "spelling out how and why that which is genuinely Christian is to distinguish itself from the surrounding culture." Some fundamental Christian emphases are summed up in such terms as covenant, koinonia, neighborliness, and the Kingdom of God. The authors consider in particular the position of the Reformed tradition for which "the basic doctrine is the Lordship of Christ, his right of rulership over all the affairs of the world he made." They enumerate some basic patterns governing relationships between sociology and faith, and conclude with a final strategy that "thinks of the two as dialogue partners in a long-term conversation whose goal is to express the truth about social reality." This strategy can be seen, with appropriate modifications, to be similar to the best of the complementarity patterns advocated for setting forth the relationship between science and Christian faith in general. It involves the lifelong task of blending "as much as one knows well in sociology with as much as one knows well in Christian faith."

This book presents extensive and perceptive insights into the issues relating sociology and Christian faith. It deserves wide recognition and use.

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

BRAVE NEW FAMILIES: Biblical Ethics and Reproductive Technologies by Scott B. Rae. Grand Rapids: Baker Books, 1996. 238 pages, index. Paperback; $16.90.

Rae, who teaches biblical studies and Christian ethics at Talbot School of Theology, has put together a well-balanced coverage of the science and the ethics of reproductive technology. The book is designed particularly to assist pastors who must counsel couples that are considering using one or more of the many techniques available to supplement natural reproductive processes. While Rae has definite views on which techniques are or are not consistent with biblical teachings, the presentation of ma-

terials is thorough and fair. Thus, readers are in a position to make informed choices for themselves, confident that they have examined all of the possibilities.

The first two chapters of the book present an overview of the different options available to assist infertile couples, within the context of biblical teaching on the family and the Roman Catholic conception of natural law. While Rae concludes that the outright prohibition on reproductive assistance advocated by the Catholic church is too extreme, he argues that those techniques which involve third-parties, such as sperm or egg donation, are highly suspect.

The third and fourth chapters review the major legal cases around procreative liberty and present an interesting discussion on the moral status of fetuses and embryos. Rae argues that the legal right to employ reproductive technologies does not oblige society to make these technologies available, nor does it follow that legal right implies moral correctness. Further, Rae suggests that the unborn fetus is a person from the point of conception, and thus parents and society have a responsibility to protect the right to life that the fetus deserves.

Chapters five through seven are devoted to examining the specific techniques that are available. These include: artificial insemination by husband or donor, in vitro fertilization, gamete and zygote intrafallopian transfer, and various kinds of surrogate motherhood. Rae balances his presentation of the technical aspects of these options with case studies and thorough examinations of the ethical interpretations and implications of each.

Chapter eight on embryo cloning is particularly interesting in light of recent developments in reproductive science. Rae clearly distinguishes between the "science" of embryo cloning and the "science fiction" of cloning adult humans. While science is rapidly pushing forward in this area, Rae's comments help to contextualize the coverage that these issues are receiving in the media. He is particularly concerned with the moral problems around the products of cloning, especially leftover embryos that may be disposed of, frozen for future use, or sold for commercial use.

Chapters nine and ten deal with prenatal genetic testing and the potential maternal-fetal conflicts that may arise during pregnancy. While Rae is reluctant to condemn prenatal testing, he points out that it should be used as preparation for dealing with the child when it is born, and not for abortion. At the same time, he argues that the life of the mother, and hence of any future child, is more important than the life of an unborn child when there are medical complications.

The book concludes with pastoral advice for infertile couples, suggesting a series of decisions to be made as the different options are explored and evaluated. Rae raises a number of provocative issues throughout his text, and he is careful to supply a method for working through the challenges that these issues present.

I found this book to be an interesting and enjoyable read that provides a balanced view of the biological and ethical implications of reproductive technologies. This book would be of particular use to teachers of Christian ethics and pastors, but it should also appeal to anyone interested in or concerned about the future of the natural family.

Reviewed by Robert A. Campbell, University College of Cape Breton, Sydney, NS, B1P 6L2.

IS THERE LIFE AFTER DEATH? The Latest Evidence Analyzed by Robert Kastenbaum. North Pomfret, VT: Prion, 1995. 288 pages, index. Paperback; $13.95.

Kastenbaum is a distinguished clinical psychologist who has published several books in this area. This book is a revision of an earlier one published in 1984. It is intended for a general audience, and attempts to answer the question, "Is there life after death?" not from a religious perspective, but by investigating the principal data. The author sets out a most difficult agenda, which he calls "experimental belief" in which he tries to argue and critique all positions. So, throughout the book, evidence and arguments for and then evidence and arguments against each position are presented. A summary chapter at the end gives his position, which is that death may not end life, provided you are content with some "cosmic flow" view of continued existence.

The following will illustrate this approach. In the first chapter, Kastenbaum deals with the most popular topic of the day in this field, near death experiences (NDE). After presenting a strong list of examples, and explaining how this experience changed lives in a very positive way, Kastenbaum, the critic, responds by saying none of these people really died. Neurological research is presented to suggest that a NDE is the brain's response to oxygen starvation. We have read this explanation before, but the question remains: "How did natural selection do this?" This topic is not raised. (So many of these experiences have occurred that there is now a periodical called *The Journal of Near Death Experiences.)*

The second chapter deals with the angels that escort the dead to the worlds beyond. Following his standard approach, seemingly foolproof angel escort stories are presented, collaborated by attending people, only to be sarcastically attacked by the critic who claims them to be wish-fulfilling fantasy. The third, fourth and fifth chapters deal with the departed coming back and making contact with the living. Again, the depth of the material is extensive and selected with care to avoid the possibility of fakery. There are surprises here. For example, we find that Sir William Crooks photographed these apparitions, often with multiple cameras. Crooks was convinced of the reality of spirits. The critic is unmoved. The data is either too old, or the collection process flawed, etc. It is still just the mind playing tricks on us. But, now, Kastenbaum is getting more concerned, and starts talking about ESP and psi

research, even arguing for psychokinesis rather than poltergeists. By now, I think, most readers are more swayed by the positive evidence than the negative. And I would surmise that this is the author's intent.

Chapter Six deals with mediums and their new age counter part, channelers. Consistent with his approach, Kastenbaum presents some remarkable case histories, including his own experience in this field. Edgar Casey falls in this group, and here the philosophy of this phenomena is presented. It is the idea that mind is not the exclusive property of an individual, and that the universal mind remembers everything. The subconscious mind is in contact with all other minds in a non-analytic way. We are all channelers; that's what our intuition is. Some, however, are more sensitive to this cosmic mind than others. Here, Kastenbaum, in his critic mode, explains these events as telepathic psi experiences, coupled with great insight on the medium's part into the individual's body language, etc. The book finishes with a chapter on the cryogenic storage of bodies as a way to avoid death.

What is a Christian to make of all this? First, we should note that the author goes from pure skeptic in the denial portion to the invoking of ESP and a cosmic consciousness. The progression occurs simply because the data is so strong. My experience in Africa, and the experience of others who have traveled extensively, indicates that people all over the world share the phenomena of communicating with the dead. It is how we interpret these events that matters. For example, Richard Feinman in one of his books tells the experience of his beloved first wife coming back to him while he slept, telling him everything was all right. Feinman sees this not as a message from the other side, but as a message from his brain. In the first chapter, Kastenbaum criticizes the NDE as a proof that there is life after death, reasoning that none of these people really died. The implication is that proof for life after death would require at least one person who had really died to come back from the dead (p. 21).

As Christians, we believe we have that in Jesus. The other biblical example that comes to mind is that of Saul and the witch at Endor. Here the Bible suggests that the spirits of the dead, on certain occasions, can be called up, or at least demonic spirits can simulate them. As Christians, we are not to indulge in such experiences, because our faith would then be in the voice of a spirit rather than in the voice of the living God.

If you are interested in a volume that gives a lot of data that the scientific community tends to overlook, this is a good source.

Review by Fred Jappe, Professor of Chemistry, Mesa College, San Diego, CA 91911.

Upcoming ASA Conferences

Aug. 2–5, 1998: Churchill College, Cambridge, England
July 30–Aug. 2, 1999: John Brown University, Siloam Springs, AR

DIGNITY AND DYING: A Christian Appraisal by John F. Kilner, Arlene B. Miller and Edmund B. Pellegrino, Eds. Grand Rapids: Eerdmans, 1996. 256 + x pages, index. Paperback; $19.00.

This book is one of a series, Horizons in Bioethics, by the Center for Bioethics and Human dignity in Bannockburn, Illinois. Kilner is director of this organization. There are twenty chapters, each by a different author, including one each by the editors. There is no biographical information, other than the affiliation of each author. Pellegrino is a well-known bioethicist. I had not read about any of the others. The authors include various types of academics, nurses, physicians, and pastors. Two of the authors, one writing about the Oregon Death with Dignity act, are from Europe.

The book is divided into a three-chapter introduction, and four parts: Guiding Vision, Pressing Challenges, Particular Settings and Constructive Alternatives. As these titles aren't self-explanatory, I list the topics in these parts: Introduction—experiences of a physician, a nurse, and a pastor; Part I—autonomy, a theology of death (by an MD), suffering, faithfulness to the dying; Part II—forgoing treatment, medical futility, definition of death, euthanasia and assisted suicide; Part Ill—Nazi Germany, Oregon, North America, The Netherlands; Part IV—hospice, long-term care, advocacy, parish nursing, and congregational ministry.

I wish to discuss a few of the chapters. John Dunlop's "Death and Dying," is the only treatment of the theology of death that I can remember reading. (Dunlop has almost no references. Most of the other chapters have quite a few.) Certainly this is an important subject. Dunlop doesn't say anything surprising, but it is good to read an essay on the subject, liberally studded with Scripture. The Bible teaches, says Dunlop, that death is an enemy, but a defeated enemy. Since it is hanging over us, we will, he says, be aware that our time on earth is limited, and anticipate heaven. Dunlop not only reviews Scripture, but states several principles which should guide the medical community in dealing with patients who are threatened with death.

Every citizen should probably become informed about the initiatives in Oregon and the Netherlands, and the chapters in this book would be one place to start. Oregon's Death With Dignity Act is so new that it wasn't possible for Jerome Wernow to evaluate its effect, so he analyzes the Act itself, and the moral issues surrounding it. Henk Jochemsen's chapter on the Netherlands confirms what the opponents of active euthanasia have been saying, namely that other questionable practices will follow. Both of these authors clearly oppose active euthanasia, so readers should not expect an unbiased treatment. This is not a criticism; there are few, if any, authors who don't feel strongly about this issue, one way or another, and they do present both sides.

James R. Thobaben's article "Long-Term Care" argues that the church, as a whole, has abdicated her responsibility for healthcare, and should get back into the business in

a big way. Norma Small's "Parish Nursing," is a proposal that nurses join church staffs and minister to the health needs of parishioners.

The chapters discussed in this review were the most thought-provoking to me. All chapters were well written and the book was almost devoid of errors. The authors seem to take a high view of Scripture, and most of them use some Scripture in their chapter.

The book might be of use as a supplementary text in a medical ethics class. It does present information which I wasn't aware of, from a Christian viewpoint. Presumably it would be of interest to pastors, nurses, physicians, and academics. It certainly covers topics which are central to the interests of the ASA. There are no illustrations, save for a table or two. There is an adequate index.

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

THE SENSATE CULTURE: Western Civilization Between Chaos and Transformation by Harold O. J. Brown. Dallas: World Publishing, 1996. 257 pages, index. Hardcover; $21.99.

Brown is presently professor of biblical and systematic theology at Evangelical Divinity School, Deerfield, Illinois. He is director of the Center on Religion and Society at the Rockford Institute and writes a monthly newsletter, *The Religion & Society Report*. Some of the issues raised in this publication are also addressed in the book under review.

Although this book deals primarily with sociological and cultural trends, the author has primarily made his mark in historical theology. His book, *Heresies: The Image of Christ in the Mirror of Heresy and Orthodoxy from the Apostles to the Present* (Baker, 1984), is—to this reviewer—the best current work on the subject.

In this book, Brown uses the work of Pitirim Sorokin *(The Crisis of Our Age)*, as his starting point. Sorokin, a Russian expatriate sociologist, was informed by a Christian worldview and produced a careful analysis of the decline of Western civilization. Sorokin believed that there is an interconnectedness between different aspects of a particular culture. This integration of the arts, entertainment, different systems of truth and the like Sorokin called a *sociocultural supersystem.*

This supersystem historically passes through three phases: *ideational, idealistic and sensate.* "The ideational mentality sees spiritual truth and values as virtually the only truth and values worthy of the name" (p. 9). The idealistic phase pays lip service to the ideational but opens the door to the influence of material values (The Enlightenment Period?). Finally, "The sensate mentality is the exact opposite of the ideational mentality. It is interested only in those things, ... that appeal to or affect the senses" (p. 9). Brown uses this framework to analyze modern Western culture.

The Preface is written by William Bentley Ball, an astute observer of cultural trends in his own right. An orthodox Roman Catholic, Ball is a constitutional lawyer who has argued cases in 22 states and nine times in the Supreme Court of the United States.

The volume contains an introduction, 13 chapters, a concise bibliography and an index. The chapters each deal with such subjects as the arts, systems of truth, ethics, social disintegration and crises in education and medicine. Brown shows how the "three phases cultural paradigm" discussed earlier has impacted these subjects.

In Chapter 2, "The Crisis in the Arts," the observations of Allan Bloom *(The Closing of the American Mind)* on the institutions of higher learning and art forms are noted. Readers will recognize that this is one of the themes addressed by the Reformed theologian Francis Schaeffer *(The Collected Works of Francis Schaeffer*, 5 vols., Crossway). This reviewer finds Brown's assessments to be more nuanced and measured than Schaeffer's.

"Mysticism and the scientific method" is also addressed in Chapter 2. "Paradoxical as it may seem, the rise of modern science was initiated not by the kind of skepticism that believes only in what can be seen and felt but by confident Christian faith in an orderly creation by a wise God" (p. 42, note 17). This is a point that Herbert Butterfield (*Origin of Modern Science*) and recently Stanley L. Jaki *(The Origin of Science and the Sciences of its Origin*, et al.) have made.

Modernism and the denial of truth (post-modernism) is mentioned in Chapter 3. Chapter 4, "The Crisis in Religion," discusses pluralism, multiculturalism—as descriptive vs. prescriptive—and syncretism. Chapter 5, "The Crisis in Ethics and Law," examines the rise of biblical criticism, evolution, and the Reformation period. Brown states that the latter reflected the "ideational" view (p. 103f). He concludes that concerning ethics and law, "Sensate ethics have taken over" (p. 110).

The following chapters deal with such subjects as the crises in democratic theory, education, and medicine. Concerning the latter subject, Brown (a solid pro-life advocate) discusses how the "sensate culture" has contributed to the shattering of the Hippocratic tradition and has led to such moral aberrations as abortion and euthanasia.

Brown has drawn a bleak picture of Western culture. However, this trend is not irreversible. In chapter 12, "End or New Beginning," the failure of communism (which few would have predicted) and the eighteenth century revival in England led by the Wesleys and George Whitfield are noted. These movements, along with current examples such as Charles Colson's Prison Fellowship, while spiritual in origin, can have immense impact on society in general.

The volume ends with, "There is a way that leads to destruction, as Jesus said, but there is also a way that leads to life" (p. 251). The Gospel of Jesus Christ can not only convert individuals but revitalize society. Readers of the

ASA Journal will find this work invaluable. Harold O. J. Brown brings encyclopedic knowledge from a number of different disciplines to bear on his endeavors. This book is highly recommended.

Reviewed by Ralph E. MacKenzie, Lecturer: Historical Theology, 5051 Park Rim Drive, San Diego, CA 92117.

ATHEISM AND THEISM by J. J. C. Smart and J. J. Haldane. Cambridge, MA: Blackwell Publishers Inc., 1996. 234 pages, bibliography, index. Hardcover; $54.95.

Smart, an atheist, is emeritus professor at the Australian National University, Haldane, a theist, is professor of philosophy at the University of St. Andrews. In the introduction we read that scientific inquiries, though necessary, operate against a background of assumptions which may be questioned. I agree. However, I do not agree when they say that the concern of a philosophical investigation is to try to provide ultimate explanations. Only God can provide ultimate explanations. Both authors claim to be metaphysical realists. For Smart that leads to atheism and for Haldane to theism. Smart wrote chapter 1; Haldane chapter 2. Smart answers in chapter 3; Haldane answers in chapter 4. The final chapter is a conclusion by Haldane.

Haldane declares in chapter 2 that he is a Christian of a largely "unreconstructed" sort, an orthodox Roman Catholic. He explains that he accepts the teachings of the church fathers and the church and points especially to the teachings of Thomas Aquinas. He rejects trends emerging in nineteenth-century Protestantism which, he says, are an "autonomous mode of personal engagement in the world."

Smart and Haldane wrote a philosophical book, with some theology in it. Some natural scientists may be interested in it. However, the price of the book is quite high.

Reviewed by Jan de Koning, 20 Crispin Crescent, Willowdale, ON, M2R 2V7.

THE SCATTERED VOICE: Christians at Odds in the Public Square by James W. Skillen. Edmonton, AB: Canadian Institute for Law, Theology and Public Policy, Inc., First Canadian edition, 1996. 252 pages. Paperback.

Skillen points to a sinful weakness of Christians on the political scene. Christians attack each other in politics; instead they should stand together as brothers and sisters in Christ. He describes seven different attitudes of Christians and writes a chapter on each: Pro-American conservatives, Cautious and critical conservatives, Sophisticated neo-conservatives, Traditional and reflective liberals, Civil right reformers, Pro-justice activists, and Theonomic reconstructionists. Chapter 1 discusses the roots of the conflicts while chapter 9 urges better communication. The last chapter asks: Is there hope for the future? The description of the different ways of political involvement is based on U.S. politics. In Canada there are no Republicans and Democrats but rather Conservatives (includes Reform Party) and Liberals. The attitudes are the same, however. Skillen's remarks are valid in both countries. He says: "They then draw the lines of opposition between good conservatives who identify with a better, earlier, and more Christian America, on the one side, and bad liberals who are progressive, modern and secularistic, on the other side" (p. 191). Indeed, such an approach draws a false antithesis and hides Christian norms. It tends to ignore many economic, racial, or international issues. When international issues are not ignored, they are often framed in a way which pits an isolated American society against the interdependent, international society.

Skillen is not alone in noticing the extreme inward look of U.S. citizens. In an article in *Themelios* (January 1997), an international magazine for theological and religious studies, Vinoth Ramachandra writes: "But if democracy means the right to participate in decision-making that affects my life and my community, then the conditions of late modernity seem to make democracy an impossible goal." American "domestic" issues, like taxation, subsidies for farmers, interest rates, and military spending have major repercussions on the economies of other nations. However, nobody in the U.S. thinks of consulting other countries on those issues. Some Christians may even go to those countries to assist locally, without realizing that some countries are in bad situations because of "domestic" policies of Western nations. U.S. and Canadian Christians are definitely not the only blind ones in this respect.

The writer notes that science and technology have not produced heaven on earth. He quotes Charles Colson: "... modern governments have devised nothing to cure the unbridled passions of man" (p. 222). It is easy for scientists to think that politics is not for them. Politics often has a dirty name. As nations, Canada and the United States have high standards of living. Are they entitled to that? Do Christian consciences speak in political matters? Or is economic well-being the most important thing in our politics? It is often obtained at the cost of poverty for others.

James Skillen wrote the book originally in 1990 as Executive Director of the Association for Public Justice and the Center of Public Justice, a Christian organization that pursues policy research in areas such as abortion, military defense, economic justice, and European economic integration. All Christians, including scientists, should listen to him and try to define what Christian politics means for them.

Reviewed by Jan de Koning, 20 Crispin Crescent, Willowdale, ON, M2R 2V7.

SERMONS IN STONES by Ernest C. Pollard. Dobbins, CA: Inkwell, 1996. 215 pages. Paperback; $21.95.

When I first saw this title, I naively thought it might be a treatise on biblical archaeology (like the similarly titled *The Stones and the Scriptures* by ASA member Edwin M. Yamauchi). I was wrong. This book is not about archaeol-

ogy or geology. Neither is it religious in a biblical theistic sense. Its author admits that the "sermons" are really essays, some with ethical overtones. The title came from lines spoken by the Duke in *As You Like It:*

> Sweet are the uses of adversity,
> Which like the toad, ugly and venomous,
> Wears yet a precious jewel in his head;
> And this our life exempt from public haunt,
> Finds tongues in trees, books in the running brook,
> *Sermons in stones*, and good in everything.

Shakespeare's poetry aptly describes this book: it is a compilation of wisdom that the author has gleaned through his lifelong study of nature.

Pollard has impressive scientific credentials. He is a retired nuclear physicist. He holds baccalaureate and graduate degrees from Keys College, Cambridge, England. His Ph.D. adviser was James Chadwick. He was in the Cavendish Laboratory when Chadwick discovered the neutron in 1932; he presents an eyewitness account of that research in chapter two. Pollard taught 24 years at Yale, then 11 years at Pennsylvania State. He wrote four physics textbooks; more recently, he has written six books (including this one) directed to lay readers. *Sermons in Stones* was prompted by Pollard's experiences teaching physical science for nonscientists at Penn State; he dedicated this book to the dean who assigned him that responsibility.

Since Pollard says this book is about his religious beliefs, his family background is pertinent. His grandfather was a Bible Christian minister in Cornwall, England. His father was a United Methodist missionary to southwestern China; he married a fellow missionary. Ernest and his three brothers were born in China. Pollard makes it clear that he does not share the religious views of his forebears. He writes:

> ... just as my father had his religious conversion at age eleven, so did I make a decision at that age, only mine was to make my whole career resolutely as a scientist, and that I have done now for seventy years or so (p. 186).

Pollard believes in God, but thinks of him as a distant, impersonal being who set the cosmos in motion. He prefers to call that being *the Deity.* He finds the word *God* too personal; he dislikes the traditional portraits of Jesus, and he is offended by the use of masculine pronouns for God. Nevertheless, Pollard says he sometimes experiences the divine presence.

> Where I feel the hand of God upon me, and on occasion I do, it is to hold me to gain understanding of Natural Law and to develop that potential for love and kindness that is part of my make-up. In that sentence is the statement of my religion (p. 162).

The basic premise of *Sermons in Stone* is that scientific study of Nature reveals invariant laws. Scientific truth is the only reality; we must base our beliefs and actions on reality or tragedies will result. The tragic consequences of ignoring reality include:

1. In nineteenth-century Vienna, many women died after giving birth in hospitals. Dr. Ignaz Semmelweiss postulated that child-bed fever might be transmitted by an infectious agent. He required his staff to wash hands with chloride of lime before handling patients; the mortality rate dropped significantly. But the hospital administrator didn't believe his theory, and staff members resented being told to wash. Eventually Semmelweiss lost his job; doctors and nurses stopped using disinfectant; and thousands of women died unnecessarily.

2. Galileo's intellectual freedom was abridged because leaders of the Roman Catholic church insisted on teaching that the universe was geocentric, despite evidence to the contrary. Pollard thinks this was tragic, not only because Galileo suffered unjustly, but also because the guilty parties never received blame, and because anti-science bias still persists among religious people today.

Pollard's discussion of these incidents exposes his personal bias against organized religion. S. I. McMillen *(None of These Diseases)* pointed out that Semmelweiss's strategy for preventing childhood fever recalled the biblical command to wash after touching a corpse (Num. 19:11–19). Religion was right and the medical establishment was wrong. Pollard could have given credit to religion, but didn't. As for the Galileo affair, scientists were right and the church was wrong; but the Roman Catholic church has recently acknowledged its error and issued an apology. Pollard could have noted this and given the church credit for humility, but he didn't.

Ethical conduct, Pollard argues, must be based on scientific reality. Thus racial discrimination is wrong, not because all men were created in the image of God, but because all humans have virtually identical genes. Nuclear arms reduction should occur, not because war is morally repugnant, but because nuclear weapons are so powerful that only a few are needed for deterrence.

Pollard makes some recommendations with which I agree wholeheartedly. He thinks schools should teach science to everyone (not just future scientists), both to acquaint them with the way the world really is and also because science influences so many human activities *(e.g.,* personal hygiene, driving a car, preserving the environment). He wants preachers to spend 5% of their pulpit time teaching science (since a valid religion doesn't contradict reality). He wants us to be humble when discussing our ideas with others; he says natural scientists are inherently humble anyway. He wants us to be tolerant of people whose traditions and beliefs are different from ours.

Unfortunately, Pollard also makes bald assertions that are unsupported by scientific evidence, and that are hostile to theistic religions. He claims our ability to love has evolved. He thinks some humans are genetically incapable of loving. He says God was invented by man; nevertheless, some religions are beneficial and should be allowed. In his opinion, 60% of the world's religions are harmful because they are used primarily to control people; 40% of religions are good because they help people

improve themselves or become better-adjusted to society. Here Pollard is making conjectures about matters far removed from his professional expertise. He is entitled to his opinions, but given his harsh criticism of other people whose beliefs are unsupported by scientific evidence, I found his pronouncements extremely hypocritical.

Sermons in Stones should be read by scientists and clergy who are well established in the faith. They will appreciate Pollard's struggles and will be challenged by his pleas for religious tolerance and intellectual humility. I cannot recommend this book for new Christians or for students seeking to discover the harmony between science and the Christian faith; it will not be helpful to them.

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HARD SAYINGS OF THE BIBLE by W. C. Kaiser, Jr., P. H. Davids, F. F. Bruce, and M. T. Brauch. Downers Grove, IL: InterVarsity Press, 1996. 808 pages. Hardcover.

This is how the publisher summarizes this book: "If you find yourself tied up in scriptural knots, here's the book that will cut them. When a verse of the Bible seems to be wrapped in mystery, *Hard Sayings* is the resource you need to solve the puzzle." Why does the Bible contain difficult texts? Bruce's answer is because of differences in culture and time, and differences in the way we think and act. This book aims to provide short, easy-to-understand explanations. It does so in an interesting and non-dogmatic way.

Hard Sayings, a series of five volumes published from 1983 to 1992, has over a quarter million copies in print. Now these five volumes are combined into this large one. Some new material has been added, including over 100 new verses and a dozen introductory articles. The articles are particularly helpful because they address troubling issues often neglected: "Why does God seem so angry in the Old Testament and loving in the New?" "When the prophets say, 'the word of the Lord came to me,' what do they mean?" and "Are the New Testament accounts of demons true?" Helpful scripture and subject indices are included. With the exception of two Old Testament books, every book in the Bible provides a hard saying.

The authors are well qualified. Kaiser is the president of Gordon Conwell Theological Seminary; Davids is director of the Schloss Mittersill Study Center in Austria; Bruce, prior to his death, was professor at the University of Manchester; and Brauch is president of Eastern Baptist Theological Seminary.

This volume will appeal to all curious Christians. However, some of its topics (including animals, creation, earthquakes, ecology, nature) will hold special interest to ASA members. *Hard Sayings* contains apologetic as well as instructional value. It fits into that growing genre of publications which attempt to explain many of the conundrums of the Bible. It is a good book to add to your science and Bible shelves.

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

ROMAN CATHOLICS AND EVANGELICALS: AGREEMENTS AND DIFFERENCES by Norman L. Geisler and Ralph E. MacKenzie. Grand Rapids, MI: Baker Books, 1995. 538 pages, bibliography, person and subject indices. Paperback: $24.99.

In the modern church we see the devastating effects of disagreements. We have thousands of denominations which have hardly any ecclesiastical contact. Each denomination is right in her own eyes. In 1 Cor. 1:12, Paul condemns divisions in the Church. In synods, concilia, and other meetings, clerics gather to decide what Scripture really says. If you don't agree with what your denomination decides you may be called a heretic. The "church" may even throw you out. Considering these facts I appreciate the book under review. It tries to show differences and agreements between two main streams of Christianity. It is, of course, an oversimplification to talk about the "Evangelicals," as if they are unified, just as it is incorrect to think that everyone in the Roman Catholic Church agrees on every subject.

The book is important because it tries to show that we really belong together, though the second part (eight chapters) discusses areas where agreement does not appear to be possible at all. It is good to know our differences. Unity is only possible if we try to clear our differences out of the way, or at least declare them to be unimportant. The writers seem to be pessimistic about that possibility. While I am aware of the very great difficulties, reality is more promising. For example, in a talk with a Roman Catholic bishop, he and I agreed that the Lord will throw us together in the end times. We will most likely never completely agree on all points of doctrine. Do we have to? Is it not our experience when talking with other Christians, even in our own church, that it is very difficult to reach agreement on all points?

For the reasons mentioned above, I recommend this book to all Christians. Natural scientists should know their allies and not avoid a book like this simply because it is a theological book. There are some errors in the book. For example, when it says, that the Thirty Year War, 1618–1648, was the longest and most destructive war of religion (p. 11), it overlooks the Eighty Year War, 1568–1648 which the Dutch fought against Spain. Also, just like some say of the Dutch war, that it had economic causes, some say that the oppression of the farmers in Germany caused the Thirty Year War. Nevertheless, in both cases the length of the wars show that religious convictions kept them going for that length of time. You may find other small errors in the book.

In general the book gives a fair treatment of both sides. Part 1 (eight chapters) shows the areas of agreement. The

third part of the book (four chapters) shows areas in which we cooperate. Examples are social action, educational goals, spiritual heritage and evangelism. After Part 3, we find an epilogue and six appendices: the Churches of the east, the Counter-reformation and later developments, modern/liberal Catholicism, Vatican II and the current situation, baptismal regeneration, and the Colson-Neuhaus declaration. Note that in some of these areas both Protestants and Roman Catholics are not agreeing within their own churches.

Reviewed by Jan de Koning, 20 Crispin Crescent, Willowdale, ON, M2R 2V7.

JESUS MATTERS by C. J. den Heyer. Valley Forge, PA: Trinity Press International, 1997. 193 pages. Paperback.

C. J. den Heyer, professor of New Testament at the Theological University of the Dutch Reformed Churches, has written a volume which seeks to summarize the last 150 years of research on Jesus. This research is motivated by a desire to discover the "real Jesus" through examination of new discoveries concerning the world in which Jesus lived. *Jesus Matters* attempts to offer an up-to-date, readable, and reliable guide. It also seeks to provide recommendations for further study which it partly accomplishes with 20 pages of endnotes.

Among the topics addressed in the book's 13 chapters are the problems of investigating Jesus' life after a lapse of 2000 years, the findings of research over the last 150 years, the significance of the discoveries at Qumran and Nag Hammadi, current scholarly and popular accounts of Jesus' life, and the current state of research in the United States and Britain.

According to Heyer, "the historical Jesus" was born about 150 years ago when exegetes started critically examining the traditional picture of Jesus as presented in the creeds and dogmas. This pursuit eventually resulted in the question of whether the four gospels provide accurate information about Jesus. Today there is so much literature available on this topic that scholars who specialize in the topic cannot read it all. Although Heyers believes progress has been made, "anyone who hopes for sensational discoveries will put the present book aside with feelings of disappointment."

Heyer provides, in broad strokes, a chronological progression in the development of ideas about Jesus. In the first century, the gospels provided the canonical interpretation of who Jesus was. This was followed in the second century by "pious fantasy," or apocryphal gospels, which created events in Jesus' life not found in the canon. In the following centuries, the church fiercely debated christology resulting in the Chalcedon Definition of 451 which stated that Jesus is truly God and man combined in one person.

During the Reformation period, the discussion shifted from Jesus' nature (christology) to Jesus' work (soteriology), and resulted in the Protestant emphasis of justification by faith. With the beginning of the Enlightenment in the seventeenth century, the view arose that faith and reason could not conflict. With a liberated mind, some theologians started looking beyond church dogma for the "real" or "historical Jesus." The early answer was that, thanks to historical criticism, the real Jesus was revealed in the historically reliable gospel of Mark. (William Wrede dissented by arguing that Mark gave a "theologically coloured interpretation of the past.") Adolf von Harnack put forth the idea that Jesus was a teacher of exalted ideals, a prophet of progress. Albert Schweitzer showed that each theologian constructed his own Jesus. However, Schweitzer was accused of using the very approach he condemned by putting forth an apocalyptic Jesus who preached the coming of God's kingdom. The optimistic views of Harnack and Schweitzer "died a horrible death in the trenches of the First World War."

Martin Kahler urged the church to forsake the debate over the historical Christ and accept the biblical Christ. Rudolf Bultmann developed Kahler's thought further which led to the idea that the synoptic gospels are constructed of pericopes which provide the life of Jesus. The evangelists were not historians but collectors of stories, sermons, and miracles which they strung together. Anything in the gospels which is metaphysical can be rejected including Jesus' preexistence, the virgin birth, miracles, the resurrection, and ascension. Thus, Bultmann's "form criticism marks the end of the quest of the historical Jesus" and aids in the demythologizing of the biblical message. The real Jesus to Bultmann is the kerygmatic Christ whom the early church preached, not the historical Christ who is impossible to access. Of course, to evangelical Christians, the real Jesus is the historical Jesus whom the early church preached.

Heyer discusses the manuscripts found at Nag Hammadi (the most important being the gospel of Thomas) in 1945 and Qumran in 1947. Heyer thinks these discoveries have not added a great deal to our knowledge of Jesus although "certain aspects of Jesus' words and actions stand out more clearly." Heyer devotes a chapter about Jesus to a summary of non-academic pursuit which he calls an "unacademic intermezzo." In this chapter Jesus is looked at in different ways including "an un-churchly Christ," "a rebel Jesus," "a friend of women," "a liberator," and "a searcher."

Heyer concludes that the focus today, especially in the Anglo-Saxon and Scandinavian countries, is again on the historical Jesus. Supporting this view he offers John Robinson's contention that the New Testament was completed before 70 C.E., Jose O'Calaghan's belief that three fragments from Qumran are parts of the New Testament, and Carson Peter Thiede's finding of a Greek fragment of Matthew in Oxford University's Magdalen College. Although Heyer labels the finds as "not convincing," he does acknowledge them as "interesting and even revealing." Heyer also thinks recent publications such as E. P. Sanders' *The Historical Figure of Jesus*, R. W. Funk's *The Five Gospels*, and John Dominic Crossan's *The Historical Jesus* advance the historical debate over who Jesus is.

The title of Heyer's last chapter summarizes well the current state of research on Jesus' matters: "Jesus Has Many Faces." Heyer concludes: "Clearly the last word about him (Jesus) has yet to be said and perhaps will never be said. Jesus is always different, surprising and confusing, known and familiar and yet again a stranger or unexpectedly new." To those who care enough to pursue "Jesus Matters," the question of who He was/is will always be important. This book serves as an excellent summary of the answer to that question over the past two millennia.

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

GOD ON TRIAL: The Book of Job and Human Suffering by Bill Thomason. Collegeville, MN: The Liturgical Press, 1997. 101 pages. Paperback; $9.95.

Thomason has taught philosophy and religion at the University of Louisville and Stetson University. He is also the author of *Real Life, Real Faith* (Judson Press, 1994). *God on Trial* consists of seven chapters. The first six are a study on the Book of Job (chapters 3–42). Chapter seven is entitled "Suffering and a God of Love," and is intended "to go beyond" the book of Job in a search for a solution.

The purpose of the book of Job is "to confront human suffering in a world created by God" (p. 9). Thomason comments, "The Book of Job struggles with one of the most profound questions we can ask—why do people suffer? There are only two possible answers. First, there is no adequate answer—suffering just occurs by chance, and the sufferer is simply unlucky. Second, there is an adequate answer—suffering serves some meaningful purpose, and the sufferer can learn to bear the suffering without being broken" (p. 11).

Thomason notes that for Job and his friends "modern day atheism (à la Thomas Hardy) was not really a live option" (p. 84). Hardy is referred to several times (pp. 16, 17, 30, 84, 87) because he "believed that there is no explanation for suffering and the life of the sufferer is meaningless" (p. 17). Thomason observes, "Job, too, is threatened with the possibility that nihilism is the truth about human existence" (p. 17).

According to Thomason, Job correctly denies that only the wicked suffer. Furthermore, Job "resolutely holds out the hope that somewhere, somehow, he will know the reasons for his suffering" (p. 60); but, finally, God becomes "a living presence in Job's life" (p. 86). However, Thomason observes that the "Book of Job itself does not offer a solution. We need, therefore, to go beyond it" (p. 88).

Here in the final chapter, Thomason is at his best. In this chapter he defends the idea of human free choice. He states, "What does it mean to say that we could be granted free choices but be unable to choose anything but the good? The problem with this argument is that it vacates the concept of human goodness of its ordinary meaning. How can I be called good if there was never any choice at all for me to be bad? For human beings, at least, the concept of goodness implies the possibility of being bad" (p. 95). This does away with the most formidable objection to the Free Will Defense as stated by the late J. L. Mackie. In fact, shortly before he died, Mackie conceded that the "problem of evil does not, after all, show that the central doctrines of theism are logically inconsistent with one another" (J. L. Mackie, *The Miracle of Theism* [Oxford: Clarendon Press, 1982], 154).

Nevertheless, there are two weaknesses in this fine book. After the excellent defense of human free choice, Thomason fails to tie that in with man's fall in Genesis 3. Francis Schaeffer stated, "Christianity's answer rests in the historic, space time, real and complete Fall. The true Christian position is that in space and time and history, there was an unprogrammed man who made a choice, and actually rebelled against God" (Francis Schaeffer, *The Complete Works of Francis Schaeffer*, vol. I [Westchester, IL: Crossway Books, 1982], 262). Second, this book lacks a bibliography, and it does not include an index. A suggested reading list would have been nice too.

All in all this book is masterfully written. The problem of evil and suffering is the toughest question thoughtful Christians ever have to answer, and Thomason handles this issue in a scholarly way. Those interested in this subject would benefit from reading *God on Trial*.

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

THE OXFORD DICTIONARY OF THE CHRISTIAN CHURCH by F. L. Cross and E. A. Livingstone, Eds. New York: Oxford University Press, 1997. 1786 pages. Hardback; $125.

This third edition of a book first published in 1957 is a one-volume reference work on all aspects of the Christian Church. Last revised in 1974, this edition updates previous and incorporates new material. Increased coverage of the Eastern Churches, critical issues in moral theology, and items from the Second Vatican Council are included. New entries include black churches, ordination of women, liberation theology, and Christian attitudes to Jews. The over 6000 entries, written by nearly 500 contributors, cover theology, patristic scholarship, churches and denominations, the church calendar and organization, the Bible, and biographical entries. The contributors come from different religious backgrounds and countries.

Biographical entries include Billy Graham, C. S. Lewis, D. L. Moody, and Charles Haddon Spurgeon. I was particularly pleased to see that Samuel Johnson, the great lexicographer, the Venerable Bede, who first translated the gospel of John into Anglo-Saxon, and Deitrich Bonhoeffer, Lutheran pastor and Nazi opponent, were included. Notably missing are such conservatives as John

Walvoord, Gresham Machen, Billy Sunday, Carl McIntire, Charles E. Fuller, Bob Jones, and F. F. Bruce. Obviously the editors faced hard choices, and exclusions were necessary. Entries of interest to ASAers include apologists, creation, Darwinism, evangelicalism, fundamentalism, Pascal, etc.

F. L. Cross was a divinity professor at the University of Oxford; E. A. Livingstone has been responsible for the organization of the International Conferences on Patristic Studies from 1971 to 1995 and has edited the proceedings. Dr. Livingstone presents some interesting tidbits in her preface. For instance, the majority of Christians now reside in Africa, Asia, and South America, not Europe and North America.

This is a helpful book. It is obviously incomplete, but it is concise and wide-ranging. Certainly every public library should possess one as well as those interested in the current knowledge about religion, especially Christianity, in the world. Readers may also find useful a volume with a narrower focus, *Dictionary of Christianity in America* (published by IVP).

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

Letters

Response to Plantinga

In *Methodological Naturalism?* (Sept. 1997: 143–54), Alvin Plantinga argues for the scientific validity of the "God did it" hypothesis that Christians may legitimately reject methodological naturalism if the occasion demands, and, by playing with words, offers yet another God-of-the-gaps theology while claiming he is not doing so (we are amazed to learn, for example, that Newton "was not endorsing *any* of the characteristic ideas of god-of-the-gaps thought" [my emphasis]). Plantinga's insular, our-science-against-yours tone is indeed common in this deconstructionist, post-modern world, and he is by no means the only one calling for a revision of naturalistic criteria for doing science and the creation of a "science" that will serve special interests. Muslim scholars such as Nasr and Butt urge an "authentic Islamic science" that will be based on the Qu'ran rather than on foreign western values. Other call for a distinctively African science that will incorporate a multitude of spiritual powers in nature as part of its explanatory nexus. Yet others argue that dreams and mysticism can be legitimate alternatives to Western naturalistic science, at least for particular cultural groups such as Native Americans. But is science as done by Christians also destined to become just one more of this multitude of inward-facing practices carried out by particular religious communities, whose visions for the universe will possess validity only for the members of that group?

What concerns me most, however, is an assertion that appears repeatedly throughout the paper and which I will call "Plantinga's principle:" Christians should practice a science that takes into account all they know, including that known as the result of God's special revelation in the Scriptures and through the church. Given the centrality of this concept to his argument, it is strange that he makes no attempt to clarify or explain its meaning: he apparently is content to assume that such knowledge is single-valued and agreed upon by all Christians. In fact, however, as even the most casual reflection will reveal, this notion of "what Christians know" is profoundly problematic. As one example, consider Henry Morris. I think no one will doubt that he is sincerely motivated by what he knows as a Christian, particularly as a result of his extensive biblical studies, and his theories have received their greatest support among precisely those who regard the Scriptures as inerrant and infallible. We are nevertheless all aware of the conflict his theories have precipitated, particularly among Christians who practice science professionally. As a broader example, consider the entire history of post-Reformation theology and the twenty-some thousand different Christians churches and organizations in the world today. They stand as monuments to the diversity and divisiveness that so often seem to be an integral part of "what Christians know about God." I offer one additional example, this one drawn from the history of science.

Cardinal Roberto Bellarmino [Bellarmine] (1542–1621), prosecutor of both Bruno and Galileo, was a brilliant, capable, and very influential theologian-philosopher, perhaps as eminent in his own day as Plantinga is in ours. Like Plantinga, Bellarmine was firmly convinced that there was no such thing as an allegedly neutral or purely objective perspective from which a Christian could study and understand God's created universe. It is also evident that nearly four centuries ago he would have fully supported Plantinga's principle. In the *Letter to Foscarini* which set the stage for Galileo's trial and in which Bellarmine outlined his opinions of the heliocentric theory, he clearly recognized that the theory might have some advantages over the geocentric one if considered only form the instrumentalist perspective of what might well be called "methodological naturalism." But, he pointed out, since all parties involved in the controversy were Christians, they must use all of what they know to be true form the teachings of the Scriptures and from the church, and from that perspective the theory was simply unacceptable. Even apart from the Galileo affair, Bellarmine was personally dedicated to a Plantinga approach to nature. In spite of the formal commitment to Aristotelian philosophy that was required of him as a Jesuit, he deliberately incorporated non-Aristotelian features into his

own geocentric cosmology because he felt that hey were required by specific biblical passages which, for him, took precedence over the natural reasoning of Aristotle. Bellarmine's conclusion that the heliocentric theory was incompatible with both the clear teaching of Scripture and the doctrines and interpretations of the church over the centuries is surely one of the best examples of Plantinga's principle in action in the entire history of science. Given Bellarmine's commitment to that principle and his intellectual rigor, it is not only easy to understand and even respect the stand he took, it is difficult to see how he could have possibly concluded anything else.

And what was the result? An unmitigated disaster for future relationships between science and Christianity, and a major step toward the anti-clerical and anti-religious sentiments of the Enlightenment.

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Response to O'Conner

As with most articles I've read defending methodological naturalism (MN) against an intelligent design alternative, I thought Robert O'Conner's article "Science on Trial: Exploring the Rationality of Methodological Naturalism" (March 1997: 15–30) largely missed the point. As is clear from Steve Meyer's article that O'Conner cites, the real issue with which advocates of intelligent design are concerned is not whether an intelligent design research program should be labeled as "science," which in and of itself is an uninteresting verbal dispute, but whether it should be *treated* in certain important respects in the same way as we treat science. Should, for instance, intelligent design research receive the same sort of government funding and prestige as origins research based on Darwinian evolution? To simply label intelligent design research as "unscientific" does not answer these sorts of questions, and neither does O'Conner's assertion that the aim of science in the last 100 years has been to find explanations in terms of natural causes.

Of course, seriously addressing these questions opens up a Pandora's box of hard issues connected with how we treat science, issues such as the prestige of science relative to the humanities and the rationale for public funding of those theoretical branches of science that offer little promise of direct practical benefits. I'm sure that to many scientists, especially those who worry about their research dollars drying up, these are unwelcome questions since they inevitably will call into question the status quo. Indeed, perhaps this is the real fear underlying much of the vehement dismissal of intelligent design research as unscientific. But these questions nonetheless need to be addressed.

The insufficiency of arguments that ignore these deeper questions and simply claim that MN is somehow part of the aim or essence of science, I believe, can be brought home with particular force by the following thought experiment. Suppose that, ten years from now, the intelligent design research program mined out to be extraordinarily empirically fruitful, producing all sorts of correct novel predictions and new technology, and opening up significant new domains of research. Could we honestly say that despite its success, intelligent design research would not deserve the same sort of prestige and funding as what we presently call science simply because it violates the strictures of MN, and thus cannot be considered "scientific"?

Of course, advocates of MN could argue, as O'Conner does later in his article, that intelligent design research is unlikely to be empirically fruitful. The first thing to note about such a response, however, is that it ends up conceding that what makes a research program worthy of being treated in the same way we treat (good) science is not its adherence to MN, but its potential empirical fruitfulness. Moreover, I find the typical arguments against the potential empirical fruitfulness of intelligent design particularly weak. O'Conner, for instance, claims that the empirical success of science has largely been the result of scientists' adherence to MN, and hence that it is very likely that following MN in the future will be successful. Not only does he offer no evidence for his claim that MN played such a role in the past success of science, but even if it did, it does not follow that adherence to MN will continue to be the path to success. Indeed, unless we believe in an infinite regress of naturalistic explanations for phenomena—as no Christian theist should—we know that the project of seeking naturalistic explanations will eventually reach a dead-end. This might have already happened with regard to the origin of the Big Bang, the fine-tuning of the Cosmos, and the origin of life. Clearly, however, whether or not MN has reached a dead-end in these areas cannot simply be decided by citing the past success of MN, but must be evaluated on all the available evidence.

If we judge that, on the available evidence, these are very likely to be places where naturalistic explanations end, I can see little merit in continuing to beat our heads against the wall in the hope of finding a naturalistic explanation simply because this is what science is supposed to do. And I think the taxpayers would agree with me! But does this mean we should pursue intelligent design explanations instead? Part of the answer depends on whether we have good reason to think that intelligent design research in these areas will be fruitful, a question that can only be fully addressed by looking at individual design programs in the relevant sciences. Apart from doing this, however, we can say that *treating the world as if it were designed* by an intelligent creator has been tremendously successful, and is probably largely responsible for the rise of science in the West, as many historians have argued. In fact, this way of treating the world is still very successful today, such as in the continual search for elegant and simple theories in physics, and the pervasive use of teleological and mind-laden concepts in biology, such as that of the *function* of a biological system or the *information content* of DNA. The question remains, however, Is the intelligent design program the natural extension, to those domains in which MN seems to fail, of this pervasive operative principle of treating the world as if it were de-

signed? If the answer is yes, then the past success of this operative principle gives us good reason for thinking that the intelligent design program will be successful.

Finally, in response to O'Conner, I would like to address several other worries scientists might have with intelligent design research. First, O'Conner raises the concern that if we allow non-naturalistic explanations into science, scientists will too easily abandon a search for naturalistic explanations of phenomena. Unless O'Conner is concerned that scientists will undergo mass conversions to belief in an intelligent designer—something I would consider an extraordinarily good thing—I'm sure there will be plenty of scientists around who will continue the search for naturalist explanations. Second, one might worry that treating the intelligent design program as we do in science will prove impossible, since once one gives up MN, one opens the door to judging theories and methods of research on the basis of contentious theological issues, thereby mining any hope of reaching consensus, something that has been special hallmark and merit of science. Finally, Christians might worry that an intelligent design research program will threaten the transcendence of God, making God and God's intentions something that can be scrutinized by science. One way of addressing these latter two concerns is to note that one can pursue an intelligent design research program without actually committing one's self to an account of the designer's intentions, character, or even existence. Instead, one can treat the world *as if* it were designed by a designer with certain intentions based on the fruitfulness of such an approach, while considering the *actual* character and existence of a designer as a philosophical and theological concern. After all, this is the sort of approach many Christians have already adopted with regard to the theory of evolution: for purposes of doing biology, they treat life *as if* it evolved by merely chance events, while at the same time maintaining as a matter of religious belief that God designed and guided the whole process. And, it is an approach that atheistic biologists, such as Richard Dawkins, already use when using mind-laden concepts in biology, such as that of the *purpose* or *function* of a biological system. The intelligent design approach would just require those who deny the existence of an intelligent designer to adopt an *as if* approach on a much broader scale.

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Dembski's Dogma Denied: Natural Causes Produce Information

In "Intelligent Design as a Theory of Information" (Sept. 1997: 180–90), William A. Dembski gives four corollaries to what he terms the Law of Conservation of Information. Two of these are: (3) The CSI (Complex Specified Information) in a closed system of natural causes either has been in the system eternally or was at some point added exogenously. (4) Any closed system of natural causes that is also of finite duration received whatever CSI it contains before it became a closed system. If the genomes of living things are CSI, these claims are not true. While I cannot claim to show that CSI originates *de novo* through natural causes, I find that, given CSI in a genome, it can multiply.

It appears that the application of information theory to living things has not recognized a fundamental difference between them and what is normally discussed. There is no question that two copies of the Declaration of Independence do not carry more information than one. Further, some mischance that garbles the transmission of information does not thereby increase CSI. One reason for this is that natural languages contain words that vary in length from a single letter to dozens of letters, with only a few sequences forming words, let alone sentences. For example, if one takes a three-letter word and changes one letter while keeping the other two, relatively few of the variants will be words. For example, excluding proper names, out of 75 possible sequences derived from "and" by this process, only "add," "aid," "end," "ana," "ant," and "any" are English words, about one in ten. But not one is a conjunction, and so would probably destroy the grammatical structure by being substituted.

In contrast, either DNA or RNA consists of four nucleotides or "letters," rather than the 26 of English. All "words" or codons are three nucleotides long, giving a total of 64, every one of which codes for something, an amino acid, a starting point or a stopping place. Consequently, a change in a nucleotide in a gene, whether a substitution, a deletion or an addition, can almost always be read by the microsomes to encode a protein, although loss of a start codon may prevent this. Granted, many such changes will harm the organism. But one may note that the change in one of the genes for hemoglobin which produces sickle-cell anemia and the various thalassemias is, in the heterozygote, protective against malaria. This increases fitness where malaria is endemic, even though the homozygous condition is classed as a lethal. It has also been argued that "sloppy" copying of the genome in a retrovirus like HIV allows the production of so many different strains that the immune system is eventually overwhelmed. This is surely increased CSI.

Another factor allows the duplication of genes. While extra chromosomes usually give rise to problems (trisomy 21 or Down's syndrome is probably the best known), it appears that the results of unequal crossing over and the transfer of part of one chromosome to another is often benign. Were the insertion of genetic material not usually harmless, genetic engineering would be impossible.

While no one can absolutely prove that these processes have generated new information in genomes, there are observations which can best be interpreted this way. First, *Drosophila* has a single TATA box, a sequence of four genes with the distinctive series of nucleotides that gives it its name. These genes are activated sequentially to control specific steps in embryonic development. If my memory serves, the sequence is twice triggered at different stages. In *Homo*, there are four TATA boxes, all of them so similar to the *Drosophila* version and to each other, in sequence

and in function, that the simplest explanation is that they have a common origin. But the human set are sufficiently different from each other that they are triggered at different times to control different aspects of development. Thus it seems that the human set picked up new information through natural causes. Someone knowledgeable in the area can probably fill in the information that I have missed about TATA boxes in other phyla and classes.

A second set of duplicated genes with new functions involves the visual pigments. It appears that the somatic blue-sensitive pigment is sufficiently similar to rhodopsin, the most common light-sensitive material, to have been derived from it by duplication and mutation. The single sex-linked visual pigment of the New World monkeys is very similar to the blue-sensitive pigment, but a few coding changes shift its peak absorption toward the longer wavelengths. The Old World apes have all these pigments and add another, to give trichromatic color vision. At least in some human beings, the gene for this last green-sensitive pigment, is duplicated or triplicated. Moving from simple sensitivity to light to special sensitivity to one, two and then three spectral areas surely involves an increase in information, most probably by natural causes. Consequently, Dembski's application of information theory to living creatures must be modified.

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

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