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

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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 contributions 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.

1. Address all manuscripts (except Book Reviews) to: Roman J. Miller, Editor, 4956 Singers Glen Rd., Harrisonburg, VA 22802. E-mail: millerrj@rica.net Submissions are typically acknowledged within 10 days of their receipt.
2. Authors must submit **3 paper copies** (double spaced) for review purposes (an original and two copies) and **1 electronic copy** submitted on a DOS formatted floppy disk or as an email attachment. Typically 2–3 anonymous reviewers critique each manuscript submitted for publication.
3. Use endnotes for all references. Each note must have a unique number. Follow *The Chicago Style Manual* (14th ed., sections 15.1 to 15.426).
4. If possible, include graphics (electronic file preferred) that enhance the theme of the paper. Figures and diagrams not in electronic format should be clear, black and white, line ink drawings or glossy photographs *suitable for direct reproduction*. Provide captions separately.

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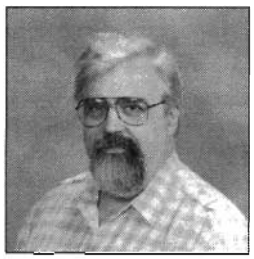
The View from Shepherd's Knoll ...



The Gathering

As a young boy an early highlight of my church experience was the Annual Conference, a gathering of representatives from many other Mennonite congregations across the United States. This inspirational gathering featured spirited singing, plenary sessions with dynamic preaching, and specialized sessions for youth, children of different ages, women, men, and pastors. These routine elements along with times of fellowship and informal conversation attracted a loyal audience. Our family typically set aside a week in early August to attend this Annual Conference as part of our family vacation experience. Since the location varied from year to year, we incorporated scenic and educational experiences along with the setting of the church conference. I vividly remember seeing Niagara Falls for the first time while attending a conference in New York state and Brookfield Zoo in Chicago while attending a conference in northern Indiana.

The Annual Meeting of the American Scientific Affiliation takes on a similar character. Those who gather on a regular basis from year to year attest to the invigorating and stimulating experience of the conference coupled with beautiful scenic settings. For example, last year we had the privilege of meeting on the attractive campus of Pepperdine University in Malibu, CA, overlooking the Pacific Ocean, and meeting distinguished scientists such as Francis Collins, Ian Hutchinson, Charles Townes, and others. I become invigorated listening to the insightful ideas of ASA notables as debates and discussions emerge over a host of faith and science topics. The typical pre- and post-conference field trips are interesting excursions into new vistas of experience.

This summer, the ASA Annual Meeting will convene at Colorado Christian University in Lakewood, CO, July 25-28. This meeting's "Astronomy/Cosmology" theme features renowned astronomical researchers such as Eilene Theilig, Alan Stockton, and others. As a biologist, I anticipate learning much about this area of science. I also am looking forward to attending special thematic sessions such as "Faith and Science at Work and at Church," "Divine Action in Nature," "Bioethics and Stewardship," and "Technology Development from a Christian Perspective." Unfortunately, I probably will not have the opportunity to attend all of these sessions, since the program chairperson generally plans concurrent sessions, resulting in the dilemma of being forced to choose! If you have not attended an ASA Annual Meeting, consider putting this meeting on your schedule. You will find it to be a time of refreshment and stimulation. Check out the registration form on the ASA website.

Gatherings are part of God's divine initiative and planning. The Apostle John in his vision describes the "parent of all gatherings" when he writes:

> *After this I looked and there before me was a great multitude that no one could count from every nation, tribe, people and language, standing before the throne and in front of the Lamb ... And they cried out in a loud voice: "Salvation belongs to our God, who sits on the throne and to the Lamb"* (Rev 7:9-10, NIV).

You may miss your annual church conference or even the annual ASA meeting, but do *not* miss this eschatological gathering! It involves an *eternal* life-transforming experience!

See you later,
Roman J. Miller, *Editor*

In This Issue

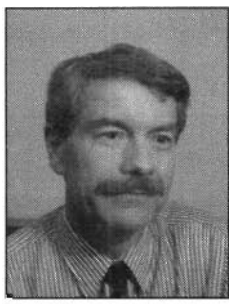
We begin our pages with an occasional feature — "Plenary Speakers" — that highlights keynote speakers from previous ASA Annual Meetings and other conferences. This issue focuses on the insights of Ian Hutchinson and Owen Gingerich to the Faith and Science dialogue. In the September issue, we hope to feature other plenary speakers from the 2002 ASA Annual Meeting.

Next we include a Dialogue on "Interpreting the Book of Nature" initiated by Angus Menuge with Walter Thorson responding. This section is followed by two articles. Lawrence Burkholder tackles the metaphysical problem of "energy" in healing, while Robert Newman points out issues that theistic evolutionists need to consider.

A selection of twelve book reviews and six letters contribute to the final pages of this issue. The last page provides the opportunity for you to join ASA if you are not already a member.

Science: Christian and Natural

Ian Hutchinson



My conversion as an undergraduate was founded on a conviction that the Christian faith made intellectual sense of the world, of history, and of personal experience.

My conversion as an undergraduate was founded on a conviction that the Christian faith made intellectual sense of the world, of history, and of personal experience. For me, despite the expectation of my secular friends, there was no inherent contradiction between a thorough Christian commitment and the pursuit of natural science. That harmony of thought is something I have sought and treasured through my professional life and in my service of God, though it always has not been easily maintained.

In large measure, my early convictions have been borne out, not just because I have found that God's truth and scientific truth are compatible, but because it is hardly an overstatement to say that science is a Christian pursuit. The giants of science have been predominantly people of faith. The philosophical roots of science sink deep into the fertile soil of the Christian world view. And many essential traits of the personal practice of science – truthfulness, objectivity, openness, thoughtfulness – are echoes of spiritual values.

My research field, fusion plasma physics, has attracted many Christian scientists, probably because it combines the highest of intellectual challenges with the opportunity to develop a technology of great human benefit. Exercising scientific leadership within this big-science environment brings personal and moral challenges as well as technical and intellectual ones. Jesus' lordship needs ever to be our guiding principle. Our public discourse will rarely make that explicit, but many around us will sense, however dimly, our distinctive vocation. And some will seek its source.

Faith and Science: A Personal View

I became a Christian while I was an undergraduate at Cambridge University, and was baptized on my twentieth birthday in King's College Chapel. The courses I was studying were mathematics and physics, but I had read widely both at Cambridge and before, since a breadth of knowledge and interest seemed to me the mark of a serious intellectual, which was what I intended to be.

My prior exposure to Christianity had given the impression of a vague and unsatisfactory sentimentality, a psychological prop that I felt no need of, and a system of thought that was in the process of repudiating its roots. I was, despite that exposure, almost completely ignorant of the historical message of Christianity. That perhaps seems strange since I had attended a school where prayers were regularly said in the assembly, and which had a close relationship to Worcester Cathedral. Nevertheless, it seemed really a totally new revelation to me, when at the invitation of some Cambridge student friends, I attended a series of lectures by Michael Green (later published under the title *Jesus Spells Freedom*). The ideas that seemed so novel to me were, for example, that there are strong historical reasons to believe that Jesus was who he said he was; that the theological teachings of Christianity had an inner consistency that made sense of the world and of human experience; and strangest of all, that a personal relationship with God was possible, entered into by faith, but lived out in action in the world.

ASA member **Ian H. Hutchinson** *is professor of nuclear engineering at MIT and Fellow of the American Physical Society and of the Institute of Physics. A graduate of King's College at the University of Cambridge, and of the Australian National University, his primary research interest is the magnetic confinement of plasmas; seeking to enable fusion reactions, the energy source of the stars, to be used for practical energy production. He is head of the Alcator Project, the largest university-based fusion research team in the nation.*

Dr. Hutchinson has written and spoken widely on the subject of Science and Christianity, both in academic and congregational contexts, and is the founder of "The Faith of Great Scientists" seminar at MIT. He presented this article as a plenary address at the 2002 ASA Annual Meeting. His email address is: hutch@psfc.mit.edu

Many of my secular friends thought that I was committing intellectual suicide by my conversion to Christianity. I cannot say that I was surprised by their reaction—I was perfectly aware of the antagonism between much modern thought and Christianity—but I definitely had no sense of repudiating my intellect. If God and Christ were true, as I had come to believe, then that truth must be consistent with intellectual truth and I would understand, with time, how their respective claims might be reconciled.

I did well academically at Cambridge, and I also grew rapidly in my understanding of the faith, largely through the college Christian fellowship, affiliated with the Cambridge Intercollegiate Christian Union (and hence the Inter-Varsity Fellowship). On graduation, I worked for a few months in a Church Army hostel for homeless men, seeing first hand both the degradation to which some fall and the dedication of those who feel a call to serve them full time in the name of Jesus. I went to Australia where I did a Ph.D. in plasma physics, and studied various Christian topics in my spare time: theology to become an accredited Methodist local preacher and Hebrew for interest, to complement the Greek I had learnt at school.

During this time, and ever since, I have felt remarkably little direct intellectual conflict between my faith and my science. Perhaps the greatest intellectual challenge to Christianity I sensed during my theological studies was a course fully committed to liberal theology and higher criticism. In the end, though, it seemed absurd to me that theology should adopt the naturalist presuppositions that dominate liberal theology, and then, after constructing elaborate stories about how the scriptures came to be what they are, conclude that the Bible is nothing but a human book. Of course, the conclusion is already effectively embodied in the presupposition. It might be useful to study the Bible in that way, but it could hardly be considered the most natural or fruitful way to study it. For natural science, though, the naturalist presupposition seems completely ... well ... natural.

One challenge that I wrestled with was the question: "Why is it that in natural science, knowledge seems eventually to gain almost universal acceptance, whereas in theology the same sense of consensus and certainty almost never exists?" I came to the conclusion that the persuasiveness of science is a function of its subject matter. Natural science takes as its purview to study those aspects of the world which are truly reproducible and about which common agreement can be reached by all observers.[1]

If this view of science—or perhaps one should say—this functional definition of what constitutes nature is correct, then it immediately raises the question whether there is true knowledge that is not about reproducible phenomena which lend themselves to consensual observation. The driving force behind the scientization of all intellectual disciplines, during the nineteenth and the first half of the twentieth centuries, is undoubtedly the answer, "No." During that movement, the underlying presupposition was that in order to be true knowledge, any discipline had to be science, implicitly pursued in the manner of the natural sciences. This attitude was explicitly reinforced by the scientism of some famous and successful scientists and popularizers; often it still is today. More than anything, it was promoted by those who took it as their mission in the late nineteenth century to free higher education from its enthralment to "sectarian" theology.

Natural science takes as its purview to study those aspects of the world which are truly reproducible and about which common agreement can be reached by all observers.

Andrew Dickson White makes clear in his preface to the famous *History of the Warfare of Science with Theology in Christendom* that the work is intended as a manifesto in support of his battle, associated with his presidency of the newly founded Cornell University, against denominational control of higher education.[2] Therefore, in his portrayal of the "warfare," he includes—alongside natural science—chapters on philology, comparative mythology, economics, and biblical criticism, referring to all as science and implying that the intellectual methodologies of all are similar. This approach bolsters his case for universal liberalism, by tying all disciplines to his contention that for centuries orthodox Christianity has viciously opposed every new discovery that threatened its traditional theological positions. Thus there is strong reason to suspect that the adoption of scientism was, in part, a tactical manoeuver to gain secular independence for universities.[3] By portraying all real knowledge as being science and science as implacably opposed by, but eventually victorious over, Christian doctrine, that doctrine could be effectively neutralized as an intellectual force.

I conclude on the contrary that the answer is obviously "Yes": that nonscientific knowledge is, or can be, true knowledge in the many disciplines that do not lend themselves to the methods and presuppositions of natural science, e.g., the arts, humanities, history, most social studies, and theology. Of course, the past decade or two of postmodernism have overturned the dominance of scientism in the academy—perhaps not in a way that is particularly friendly to Christianity. Nevertheless, postmodernism has reshaped the debate in ways that often place science and Christianity more in consonance than in conflict.

Plenary Presenters

Science: Christian and Natural

Science studies the world insofar as it behaves in regular ways readily investigated using the reductionist methods of the physical sciences, and ... theology finds its place ... in understanding the human, personal, purposeful, and spiritual aspects of the world, which are not describable in reductionist terms.

I take the position that science and faith are complementary views of the world; that science studies the world insofar as it behaves in regular ways readily investigated using the reductionist methods of the physical sciences, and that theology finds its place along with many other disciplines, in understanding the human, personal, purposeful, and spiritual aspects of the world, which are not describable in reductionist terms.

Science-and-faith philosophers might label such a position as dividing intellectual endeavor into distinct "spheres of influence." However, I resist that designation because I see the division as a matter of perspective more than subject, and because the expression implies that the spheres are chosen arbitrarily or for the convenience of the protagonists. The division of Europe into spheres of influence after World War II reflected no particular political or cultural characteristics of the countries on the two sides. In contrast, I regard the intellectual divisions as being logically inherent in the methods chosen for study. In other words, science has no choice but to limit its scope of study by the presuppositions in its methods of study, just as do other disciplines by theirs.

Such a position gives freedom for both science and faith, but that freedom is not unconstrained. The discoveries of science and the picture of the universe it has developed do not allow theology the freedom to adopt whatever view of cosmology, e.g., might seem most comfortable for traditional doctrines. We do not, and cannot, now believe the earth to be flat or covered by a crystal firmament, in which are embedded the stars. We do not, and cannot, believe that the sun, moon, and planets revolve around the earth. We do not, and cannot, believe that the earth is only 6,000 or so years old. These beliefs are all more easily reconciled with a literal reading of the first few chapters of Genesis, and with much of the apparent world view of the New Testament writers, than modern cosmology. But science says, insofar as the world is governed by repeatable events accessible to consensual observation, it appears the earth is spherical, in orbit around the sun, and roughly three billion years old. It would be possible for a perverse theology to say, "Fine," but the reason is that God created the world in such a way that it just *appears* this way, whereas the reality is that Genesis is a literal description of nature. Such a position, however, while not logically untenable, is *theologically* untenable, making God into a trickster.

There are many tensions between the natural sciences and the traditional embodiments of Christian doctrines, but these tensions are not fatal. The church hierarchy *did* resist the heliocentric model. They did so, in large part, because church teaching was entangled in the old cosmology, and they feared the consequences of any untangling. Nevertheless, Christian faith outlasted their fears. The same can be said of many other deeply held beliefs; it can also be said of many popular superstitions thankfully dispelled by scientific understanding.

I believe that the calling of the American Scientific Affiliation is to help Christians to understand what is and is not true scientific knowledge and to promote an understanding of the world consistent with science and with the Lordship of Jesus. To do this requires us to engage in a prophetic role toward the Church as much as to the world.

Distinctively Christian Science

There have been a number of initiatives fairly recently among Christian scholars to rediscover a distinctively Christian approach to their studies. The Society of Christian Philosophers is one notable example. Their influence has been considerable, in their discipline, in the church, and in theology. I think there is much merit in their efforts. In discussions with scholars outside the sciences, this idea naturally leads scientists, me included, to ask, "Is there such a thing as a Christian science?" By this phrase I mean not the peculiar sect with which it unfortunately has become associated, but natural science within the mainstream of scientific thought (or, at least, not off in some fantasy land like so-called "Creation Science") that is distinctively Christian.

In thinking about this question with students and other Christians, I soon came to two conclusions. The first is that there are many aspects of science that are obviously the same whether pursued by Christians or atheists. It is not possible, I hold, to solve a differential equation, e.g., by techniques that

are different for a Christian than for someone else. Some knowledge and thought is truly common, regardless of conviction. Scientific knowledge, perhaps more than any other discipline, is common because of its methods of investigation. The second conclusion is that if Christian science means an approach to natural science that seeks scientific data in the scriptures or some other religious authority rather than in nature itself, then I am deeply suspicious of it. That would sound too much like a return to the sterile Aristotelian and Scholastic philosophizing that modern science has overthrown. I hold that the Book of Nature contains different aspects of revelation than the written Word of God. God intends the unwritten book to be read, as he intends the Bible to be read: on its own terms, before all else.

Modern science is already, in a very serious sense, Christian. It germinated in and was nurtured by the Christian philosophy of creation, it was developed and established through the work of largely Christian pioneers, and it continues to draw Christians to its endeavors today.

Going further, though, I believe there is a constructive case to be made for the phrase Christian science. First, as represented by the theme of this conference "Christian Pioneers," we should recognize that modern science is built upon the foundational work of people who more than anything else were Christians. Christians were the pioneers of the revolution of thought that brought about our modern understanding of the world. MIT, my home institution, the high-temple of science and technology in the United States, has a pseudo-Greek temple architecture about its main buildings. The fluted columns are topped not with baccanalian freizes, but with the names of the historical heroes of science (not to mention William Barton Rogers, the founder). Some years ago, a few of us made a rough assessment of the percentage of the people listed there who were Christians. The estimate we arrived at was about 60%. Any list of the giants of physical science would include Copernicus, Galileo, Kepler, Boyle, Pascal, Newton, Faraday, and Maxwell, all of whom—despite denominational and doctrinal differences among them, and opposition that some experienced from church authorities—were deeply committed to Jesus Christ.

Second, over the years in my interactions with Christians in academia, I observed that far from scientists being weakly represented in the ranks of the faithful, as one would expect if science and faith are incompatible, they are strongly over-represented. The sociological evidence has been studied systematically, e.g., by Robert Wuthnow, who established that while academics undoubtedly tend to be believers in lower proportion than the US population as a whole, scientists among academics were proportionally *more likely* to be Christians that those in the nonscience disciplines.[5] The common misconception that scientists were or are inevitably sundered from the Christian faith by their science is simply false.

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

Stanley Jaki, amongst others, has made a cogent case that far from being an atmosphere stifling to science, the Christian world view of the West was the fertile cultural and philosophical soil in which science grew and flourished.[6] He argues that it was precisely the *theology* of Christianity which created that fertile intellectual environment. The teaching that the world is the free but contingent creation of a rational Creator, worthy of study on its own merits because it is "good," and the belief that because our rationality is in the image of the Creator, we are capable of understanding the creation: these are theological encouragements to the work of empirical science. Intermingled with the desire to benefit humankind for Christian charity's sake, and enabled by the printing press to record and communicate results for posterity, the work of science became a force that gathered momentum despite any of the strictures of a threatened religious hierarchy.

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

Obviously this view is very different from the common misperception of the relationship between science and faith, which is far more like White's warfare. The common

misperception is fed by many science popularizers and many leading scientists. The commencement speaker at my son's graduation from Bates College in May 2002 was Steven Weinberg, an outstanding scientist, Nobel prize-winner in physics, and a highly articulate advocate of scientism. The gist of his commencement message was to welcome the students to the enlightenment, explicitly to disparage all religions as superstition and medievalism—Islam came in for special criticism, which was a change from the usual academic anti-Christian bias—and to debunk postmodernism while praising science. Weinberg is just one of the highly influential scientists who have gained media attention as the champions of scientism. A more nuanced understanding of science and society does not make such good copy. The media loves the extremists.

Our task as scientists and Christians is ... to help the church respond to, and accommodate what science is showing us about the natural world, including those facts that are uncomfortable for traditional or literalistic scriptural interpretation. It is also to bring our faith and commitment to science.

What troubles me more than this, though, is that the common misperception is fed just as much by well-meaning Christians. The opinion that established science and Christian faith are at war, seems to be promoted deliberately by ongoing debates suggesting that incompleteness of scientific knowledge or understanding should be cause for satisfaction on the part of Christians.

Certainly it is incumbent upon Christians to point out, forcefully if need be, when scientists or others turn the success of science into advocacy for materialism or atheism. For example, when the inability of science to detect purpose in nature is interpreted as a proof that the universe is purposeless, rather than an obvious consequence of science ruling out purpose from its methodology right at the beginning. What needs to be opposed is bad logic; it is not science but scientism: the unjustified belief that all useful knowledge is science.

The United States is remarkable in being the culture above all others that continues to promote the warfare misperception. My observation (though only anecdotal) is that Christians in most of the rest of the world spend far less of their time worrying about how to undermine evolutionary teaching in schools. Perhaps part of the reason is that Christians are a smaller fraction of other societies; they see their priorities as more to do with getting out a positive message rather than continuing intellectual arguments from the nineteenth century.[7] I have a theory, however, that the main reason for the prevalence of this argument in the US is the interpretation of the non-establishment clause of the First Amendment that has mostly banished faith from public schools. Christians want faith to be part of their children's background in schools. If only science is permitted by the constitution, then the only way this can happen is to make faith into science, hence the popularity of Creation Science, and more recently of Intelligent Design. I take this to be a potentially disastrous mistake.

My son in his elementary school days once did a school project around Christmas time collecting together the words of songs. On the cover of his project, he put the title "Christmas Carols." His teacher was scandalized, and told him that he must not call them that—even though that was largely what they were—but he must call them "Holiday Songs." This is the sort of anti-Christian dogma that we *should* oppose. Non-establishment is not the establishment of atheism, but we do not do our cause any good by trying to get equal time for creationism in biology class by arguing that it is a scientific theory.

If I am right, and the expression Christian science is not an oxymoron but a reflection of history and reality, despite the warfare advocates on both sides, then I think it becomes clear what our task as scientists and Christians is. It is to help the church respond to, and accommodate what science is showing us about the natural world, including those facts that are uncomfortable for traditional or literalistic scriptural interpretation. It is also to bring our faith and commitment to science. It is to this second aspect that I now turn briefly.

Scientific Spiritual Service

When I argue that science is in a deep sense Christian, I do not intend to say thereby that all science or its products are good. I think an incarnational approach here is critical, which I will explain by an analogy, imperfect though it is. To practice science is Christian in some analogous ways as it is Christian to drink wine. The drinking of wine is the enjoyment of the benefits of a good creation; it is explicitly sanctioned and

blessed by our Lord. Indeed Jesus has raised the drinking of wine to our most hallowed spiritual sacrament. Nevertheless, not all wine drinking is beneficial. Some of it is deeply fallen. But it is by the way humans participate that the wine drinking becomes what it is—a blessing or a curse. I think much the same is true of science.

There is much more that I could say about ways in which I think we can make our science a spiritual service. But the organizers asked me to include some discussion of my own scientific field and my experience in it. Perhaps that material will address some of those questions, though more indirectly.

My research for practically the whole of my career has been in plasma physics, the study of the collective behavior of ionized gases. The motivating application of my work is to make fusion energy, the energy source of the sun and stars, available on a human scale. The fusion reaction of most interest is shown in Figure 1. This reaction has the potential to produce energy that could be turned into electricity, utilizing roughly 250 lbs of hydrogen fuel per year to power a large (1 GW) generating station. No climate-damaging emissions would be produced.

To make the reaction happen, though, requires very high temperatures, roughly one hundred million degrees Celsius. At that temperature all matter is turned into plasma and a solid containment device is useless. Creation's fusion reactors, the stars, have plasma confined by the weakest fundamental force: gravity. This is a gloriously stable and efficient design, but unfortunately too large for human control. The humans' scale needs a different nonmaterial force for plasma containment: the magnetic field. I began fusion research not long after the tokamak, the magnetic confinement configuration pioneered by the Soviet Union's scientists, became predominant by virtue of its excellent performance. Since then, plasmas heated to temperatures even beyond those necessary for efficient fusion reactions have been achieved. Figure 2 shows an internal view of the vacuum vessel in which the JET tokamak plasma is formed.

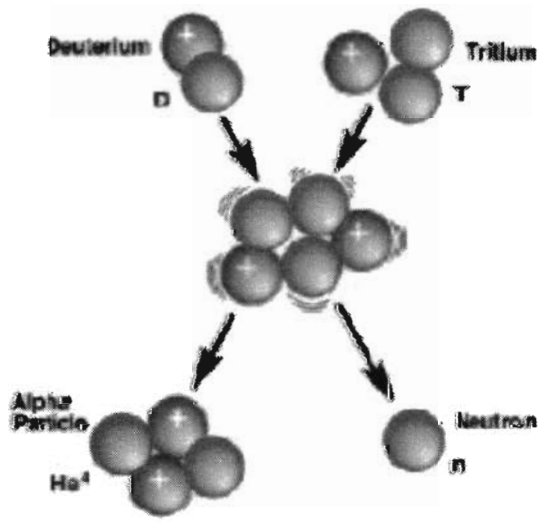


Fig. 1. The Deuterium-Tritium fusion reaction.

On the way, we have learned the science of Magneto-HydroDynamics (MHD), which describes the global equilibrium and stability of a plasma whose multi-atmospheric pressure is constrained by nothing but the magnetic field. The knowledge gained allows us to predict with remarkable reliability these aspects of plasma performance. See Figure 3.

Our knowledge of the mechanisms that transport heat and particles across the field lines, leading to slow leakage of the plasma from the magnetic bottle, is less complete. This is a grand challenge of physical science. It is no less than to understand how to calculate turbulent transport, not of neutral fluids such as water or gas (which are tough enough), but of electrically conducting plasmas which combine many of those fluids' challenges with additional degrees of freedom. We are making striking progress. A theoretical simulation of the sorts of density fluctuations that are responsible for plasma losses is shown in Figure 4.

Progress in plasma performance has, if anything, been even more striking. The rate of increase of experimentally achieved fusion power generation over the past thirty years has exceeded Moore's law (more than doubling every eighteen months) so that, in 1997, 16 MW of fusion power was briefly produced from the JET experiment.

To progress to the next stage in fusion research, exploration of a plasma kept hot by its own internal fusion heating, needs a new experiment. An international design called ITER has been developed, illustrated in Figure 5. This design is not yet funded for construction. It will be expensive, about five billion dollars shared among three or four international partners. The decision to proceed with such an experiment must be made at the highest levels of

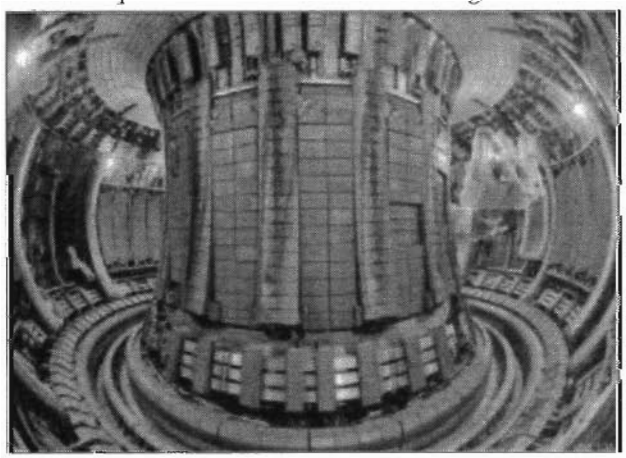


Fig. 2. Wide-angle view of the inside of the world's largest tokamak, JET. The large ports allow heating of the plasma via energetic neutral particle beams, and radio wave launchers allow direct resonant heating. The plasma exhaust is managed by a so-called "divertor" in the bottom of the chamber.

Plenary Presenters

Science: Christian and Natural

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government. And it is an experiment. We believe the science is sound, but whether devices like this can be engineered into an economically competitive energy system is still unknown, in part because economics is not a law of nature.

I know many Christians among the scientists of the fusion community. I suspect there are so many because of the high ideals of the program and the underlying motivation to benefit humankind. Indeed most of my colleagues, whether Christian or not, can testify to some degree of idealism motivating their choice of fusion as a research career. What is perhaps more remarkable is that the percentage of my students that have been Christians or at least strongly interested in spiritual matters, is probably at least 25%. Again I think this supports my use of the phrase Christian science.

Large scale science like fusion research places many nontechnical challenges before a scientist such as myself. Leading a group of 100 people (rather a small group by fusion standards) is more akin to running a small company than to the ivory-tower intellectual individualist experience that is commonly portrayed. Following Jesus Christ in such a situation calls for the same commitments as in many such positions of leadership: clarity of thought, integrity, compassion, as well as resisting the temptations that go with power and intelligence: arrogance, self-justification, self-aggrandisment, and so on. Moreover, it demands management skills for which scientists are often poorly prepared. I find that my Christian experience in small group dynamics, in personal interactions, and speaking from the pulpit is often far more important than that I know how to evaluate an integral or operate a lab instrument. My wife is a nursery school teacher and I am reminded of a book she showed me once entitled something like "All I really needed to know I learnt in Kindergarten." Being a scientist, I would remove the hyperbole, but I would still be able to say in somewhat the same spirit that "most of what I need for scientific leadership I learnt in Sunday school" (in my case, adult Sunday school and small group Bible study).

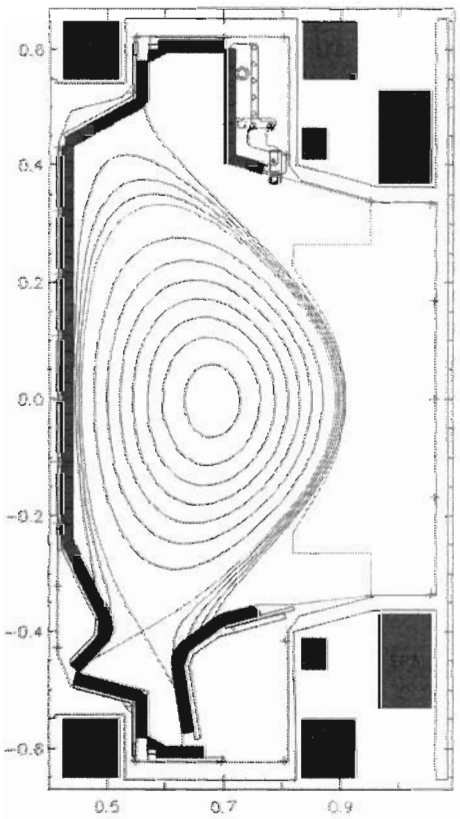

Fig. 3. An example of a section through the Alcator C-Mod tokamak showing the field lines of the tokamak which are responsible for containing the plasma pressure. The detailed shape of this equilibrium is accurately described by MHD.

At MIT I have had opportunities to speak the Gospel to colleagues, to pray with students in my group struggling with personal or educational challenges, to share in exploring the faith with Christian faculty and students, and to lead seminars specifically focused on Christian content. These "extracurricular" activities are precious gifts from God—to be part of his Kingdom's direct action in the world. But I believe these are but the tip of the iceberg of what it means to be a Christian scientist.

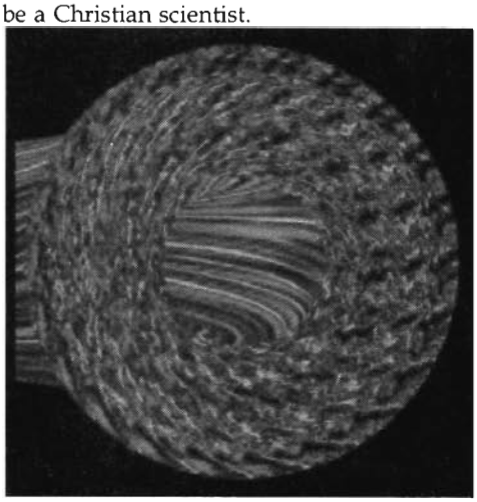

Fig. 4. Turbulence simulation of tokamak transport (Courtesy G. Kerbel).

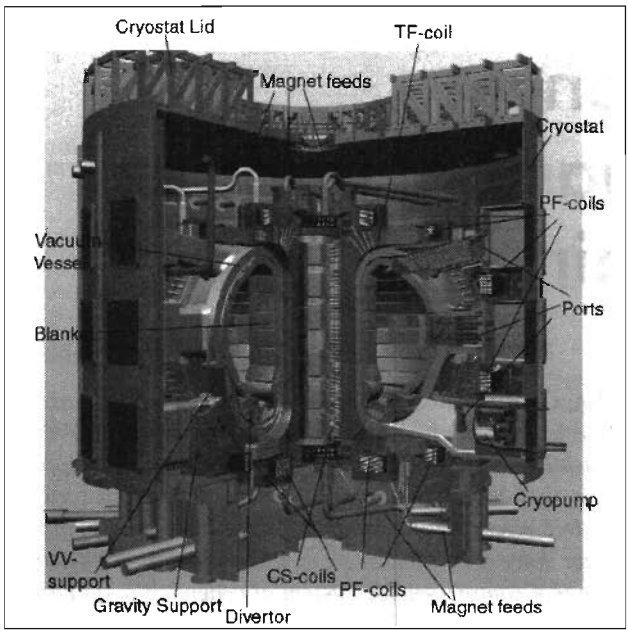

Fig. 5. A burning plasma experimental design (see www.iter.org).

The marvels of the scientific world are little revelations of God's creative thoughts. They are uncovered by attention to Christian mental virtues of objectivity and truthfulness—which a secular scientific establishment finds, to its surprise, do not necessarily come naturally to a post-Christian society. They are part of a centuries-long heritage built by remarkable thinkers, many of whom were devout Christians, on a Christian philosophy of the world as an intelligible but contingent free creation. And they give opportunities for benefitting humankind: relieving hunger, need, and suffering as Jesus calls us to do.

What a travesty of this heritage it is when natural science is put at war with Christian faith either by the bigoted arrogance of scientific secularists blind to the epistomological presupposition of science, or, more distressingly for me, by often equally bigoted Christian apologists, who fall into a similar error when they pit specific scriptural interpretations against observations of nature. ✦

Notes

[1]I have explained my view more completely in "Faith's Failure of Nerve," *Cross Currents: Religion and Intellectual Life* 40 (1990): 213.

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

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

[4]Hutchinson, "Faith's Failure of Nerve."

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

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

[7]A recent study by P. J. Bowler, *Reconciling Science and Religion: The Debate in Early-Twentieth-Century Britain* (Chicago: University of Chicago Press, 2001), explores other causes of the different trajectory of the science-religion debate in the UK.

Truth in Science: Proof, Persuasion, and the Galileo Affair

Owen Gingerich

In 1616 in a letter destined for Galileo, Cardinal Roberto Bellarmine (the leading Catholic theologian of his day) expressed his doubts about finding evidence for a moving earth. Would the annual stellar parallax or the Foucault pendulum have convinced him? The historical setting explored in this essay suggests that the cardinal would not have been swayed by these modern "proofs" of the heliocentric cosmology, even though they are convincing to us today because in the meantime, we have the advantage of a Newtonian framework. What passes today for truth in science is a comprehensive system of coherencies supported more by persuasion than "proofs."

What kind of evidence convinced Galileo and Kepler that the Copernican system was the correct, physically real description of our universe, and yet failed to convince Bellarmine?

On April 12, 1615, Cardinal Roberto Bellarmine, the leading Catholic theologian, wrote an often-quoted letter to Paolo Antonio Foscarini, a Carmelite monk from Naples who had published a tract defending the Copernican system. Bellarmine's letter, which was obviously intended as much for Galileo as for Foscarini, opened on a conciliatory note:

> For to say that assuming the earth moves and the sun stands still saves all the appearances better than eccentrics and epicycles is to speak well. ... But to affirm that the sun is *really* fixed in the center of the heavens and that the earth revolves very swiftly around the sun is a dangerous thing, not only irritating the theologians and philosophers, but by injuring our holy faith and making the sacred scripture false.[1]

Bellarmine made very clear that he was unwilling to concede the motion of the earth in the absence of an apodictic proof when he added:

> If there were a true demonstration, then it would be necessary to be very careful in explaining Scriptures that seemed contrary, but I do not think there is any such demonstration, since none has been shown to me. To demonstrate that the appearances are saved by assuming that the sun is at the center is not the same thing as to demonstrate that *in fact* the sun is in the center and the earth in the heavens.[2]

Bellarmine's letter sets the stage for a challenging inquiry: What kind of evidence convinced Galileo and Kepler that the Copernican system was the correct, physically real description of our universe, and yet failed to convince Bellarmine? What would it have taken to convince Bellarmine? For example, most astronomy textbooks today list the Foucault pendulum as the proof of the earth's rotation, and the annual stellar parallax as the proof of the earth's yearly revolution around the sun. Would these evidences have converted Bellarmine to the Copernican doctrine, and if not (as I shall argue), why not? Framing the question in these terms will enable us to distinguish between proof and persuasion, and to gain some insight into the matter of truth in science.

ASA Fellow **Owen Gingerich** *is a senior astronomer emeritus at the Smithsonian Astrophysical Observatory and Research professor of astronomy and of the history of science at Harvard University. He has served as vice president of the American Philosophical Society and as chairman of the U.S. National Committee of the International Astronomical Union. A member of the Mennonite Congregation of Boston and an active participant in the international science-religion dialogue, he has twice given an Advent sermon at the National Cathedral in Washington. As a plenary speaker at the 2002 ASA annual meeting, he read a chapter from his forthcoming volume,* The Book Nobody Read, *which has an expected publication date of November 2003. Correspondence may be sent to him at: ginger@cfa.harvard.edu*

Copernicus himself does not state directly what induced him to work out the heliocentric arrangement, apart from some rather vague dissatisfaction with his perceived inelegance of the traditional geocentric pattern. But Copernicus was nothing, if not a unifier. In the Ptolemaic astronomy, each planet was more or less its own independent entity. True, they could be stacked one after another, producing a system of sorts, but their motions were each independent. The result, Copernicus wrote in the preface to his book, was like a monster composed of spare parts: a head from here, the feet from there, the arms from yet another creature. Each planet had a main circle and a subsidiary circle, the so-called epicycle. Copernicus discovered that he could eliminate one circle from each set by combining them all into a unified system, and when he did this, something almost magical happened. Mercury, the swiftest planet, circled closer to the sun than any other planet. Lethargic Saturn automatically circled farthest from the sun, and the other planets fell into place in between, arranged in distance by their periods of revolution.

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His monumental treatise, *De revolutionibus*, was published in the year he died, 1543. In chapter 10 of Book I, Copernicus summed up his aesthetic vision: "In no other way do we find a wonderful commensurability and a sure harmonious connection between the size of the orbit and the planet's period."[3] It is the most soaring cosmological passage in his entire book. The key word is commensurability, the translation of Copernicus' *symmetria* (literally *syn* = common and *metria* = measure). The common measure was the earth-sun distance, which provided the measuring rod for the entire system.

Once this heliocentric unification was accomplished, the system showed other advantages. There was, e.g., the curious fact that whenever Mars or Jupiter or Saturn went into its so-called retrograde motion, the planet was always directly opposite the sun in the sky. As Gemma Frisius was to describe it soon after the publication of *De revolutionibus*, from antiquity this had been merely a "fact in itself," but in the Copernican system, it became a reasoned fact.[4]

In the cosmological chapter 10 of Book I, Copernicus noted that the heliocentric arrangement finally provided a natural explanation of this otherwise unexplained coincidence. He mentioned as well that it explained why the retrograde motion of Jupiter was smaller than that of Mars, and why that of Saturn was still smaller. As Copernicus's only student and disciple, Georg Joachim Rheticus put it:

> All these phenomena appear to be linked most nobly together, as by a golden chain; and each of the planets, by its position and order and every inequality of its motion, bears witness that the earth moves and that we who dwell upon the globe of the earth, instead of accepting its changes of position, believe that the planets wander in all sorts of motions of their own.[5]

Yet these explanations were not enough to win the day. Astronomers of the sixteenth century belonged to a long tradition that had distinguished astronomy from physics. At the universities, astronomy was taught as part of the quadrivium, the four advanced topics of the seven liberal arts. The astronomer instructed his students in the celestial circles, the geometry of planetary mechanisms, and the calculation of positions required for making up horoscopes. However, the physical nature of the heavens was described not in Aristotle's *De coelo*, but in his *Metaphysica*, and that text belonged to the philosophy professor. The distinction was clearly stated in the anonymous "Introduction to the Reader," added to *De revolutionibus* by the Lutheran clergyman Andreas Osiander, who had served as proofreader for the publication. He wrote (and I paraphrase):

> You may be worried that all of liberal arts will be thrown into confusion by the hypotheses in this book, but not to worry. It is the astronomer's task to make careful observations, and then form hypotheses so that the positions of the planets can be calculated for any time. But these hypotheses need not be true, not even probable. A philosopher will seek after truth, but an astronomer will just take what is simplest. And neither will find truth unless it has been divinely revealed to him.[6]

Osiander has been much castigated for having had the presumption to preface Copernicus' treatise in this manner, but he was preaching to the choir in what he added. The Protestants in Wittenberg endorsed the interpretation, and surely would have invented it if Osiander had not already clearly stated it. The Catholics likewise fell in line, as Bellarmine's opinion reveals. In the opening lines of his letter to Foscarini, he stated: "First, I say that it appears to me that your Reverence and Signor Galilei did prudently to content yourselves with speaking hypothetically, as I

Tycho Brahe, the second most distinguished astronomer of the sixteenth century, ... had no problem with the Copernican system as a mathematical construction, but he believed that Copernicus fell short with respect to physics.

have always supposed Copernicus did."[7] When Galileo was negotiating with Cosimo de Medici for his new position in the Florentine court, he was comparatively indifferent about his salary, but he was insistent on the title: Mathematician *and Philosopher* to the Grand Duke. In other words, he wanted to be credentialed not just to make mathematical astronomical models or hypotheses, but he intended to speak authoritatively about how the universe was really constructed.

Along these same lines Tycho Brahe, the second most distinguished astronomer of the sixteenth century, remarked:

> This innovation expertly and completely circumvents all that is superfluous or discordant in the system of Ptolemy. On no point does it offend the principles of mathematics. Yet is ascribes to the earth, that hulking, lazy body, unfit for motion, a motion as fast as the aethereal torches, and a triple motion at that.[8]

Thus Tycho had no problem with the Copernican system as a mathematical construction, but he believed that Copernicus fell short with respect to physics. Copernicus had attempted to describe the earth's motion as "natural" in a sort of Aristotelian manner, but he was not persuasive. It is interesting to notice that Tycho always put physics first when he criticized the Copernican doctrine, saying that it went against both physics and holy Scripture. Surely if the earth were spinning at a dizzying speed, stones thrown straight up would land far away. And if the earth was wheeling around the sun, how could it keep the moon in tow? These consequences would require new physics, which was not anywhere in sight. But it was not just a problem with the physics. Philosophers and churchmen surely felt threatened by a potential challenge to traditional sacred geography. Where would heaven and hell be found in the new picture? And did not Psalm 104 say that the Lord God laid the foundation of the earth, that it would not be moved forever? Surely the task of reading the evidence was confused, scientifically as well as culturally.

Nevertheless Tycho, being a perceptive and highly motivated scientist, set out to distinguish observationally between the Ptolemaic and Copernican arrangements. He knew that in the Ptolemaic system, the epicycle of Mars always lay beyond the sun, whereas in the Copernican arrangement, Mars at its closest was only half that distance away. Because Tycho, like Copernicus and Ptolemy before him, accepted an erroneously small earth-sun distance (in fact, too small by a factor of 20), he believed that he had a chance to triangulate the distance to Mars using as his baseline the difference in viewpoint between an evening and a morning observation, the so-called diurnal parallax. We know today that this parallax is actually too tiny for naked-eye visibility, though if the solar distance had been as small as he believed, he could just have managed to detect it.

Tycho's quest for the parallax of Mars was a driving factor during the golden years at his Uraniborg observatory in the 1580s. At first, when he found no parallax, he believed that the Copernican arrangement had to be rejected since Mars seemed, even at it closest approach, to be farther than the sun. But he continued his assault on the problem and two years later discovered that he had to correct for differential refraction of the earth's atmosphere. As it subsequently worked out, his refraction table had an error exactly equal to the effect he was seeking, which led to a spurious result for the distance to Mars. Believing that he had proved that Mars came closer than the sun, he then declared against the Ptolemaic arrangement. Interestingly, however, he did not endorse the Copernican system, but rather, he adopted his own geo-heliocentric scheme. In the Tychonic system, the earth remained fixed in the center of the cosmos, with the two great luminaries cycling around it. In turn, the sun carried a retinue of planets around it. These were spaced with intervals exactly as in the Copernican system, except that the fixed earth broke the pattern, as may be seen in the detail from the frontispiece of Riccioli's *Almagestum novum* (see Figure 1).

Consequently, by the 1590s, there was no unambiguous evidence in favor of a moving earth. Why, then, did Kepler and Galileo both opt for the Copernican arrangement at that time, when the choices were so confused? The sole observational distinction between the Ptolemaic and Copernican blueprints resided in Tycho's claim about the parallax of Mars, which remained unpublished until he printed an unsubstantiated

remark in his 1596 volume of letters. As Galileo would say, he could not sufficiently admire those who had embraced the heliocentric arrangement *despite* the violence to their own senses.[9] As for the advantages pointed out by Copernicus, most of these inhered equally in the Tychonic arrangement.

Nevertheless, what was perhaps the most attractive aesthetic feature of the Copernican arrangement was shattered by Tycho's alternative. This was the sheer beauty of all the planets arrayed around the bright central sun, with the planets naturally ranked according to their periods of revolution. Copernicus wrote:

> In the center of all rests the sun. For in this most beautiful temple, could we place this luminary in any better position from which it can light up the whole at the same time? For the sun is rightly called by some the lantern of the universe, by others the Mind, and by still others its Ruler. ... So the sun, sitting as upon a royal throne, governs the family of planets that wheel around it.[10]

In placing his paean to the sun at this central juncture in his soaring cosmological chapter, Copernicus must have understood that this would necessarily be the crux of his argument and the key to the new physics. Traditionally the driving power for the planets had come from outside, from the prime mover that spun the entire system in its swift daily motion, with each successively further inward sphere lagging more and more behind, so that the moon circled the earth in about 24½ hours. Hence, compared to the starry background, the moon appeared to move the fastest, though in reality it was the tardiest. It was all tied into a very neat package with Aristotle's remark that it was the love of God that kept the prime mover spinning, so from the beginning the arrangement of the heavens had theological overtones.

Now to anyone who thought in deeply physical terms, as both Kepler and Galileo did, an alternative source of motion would be required for the Copernican system, because in it the stars, in the outermost sphere, were fixed. Somehow the sun had to offer this motive power, and

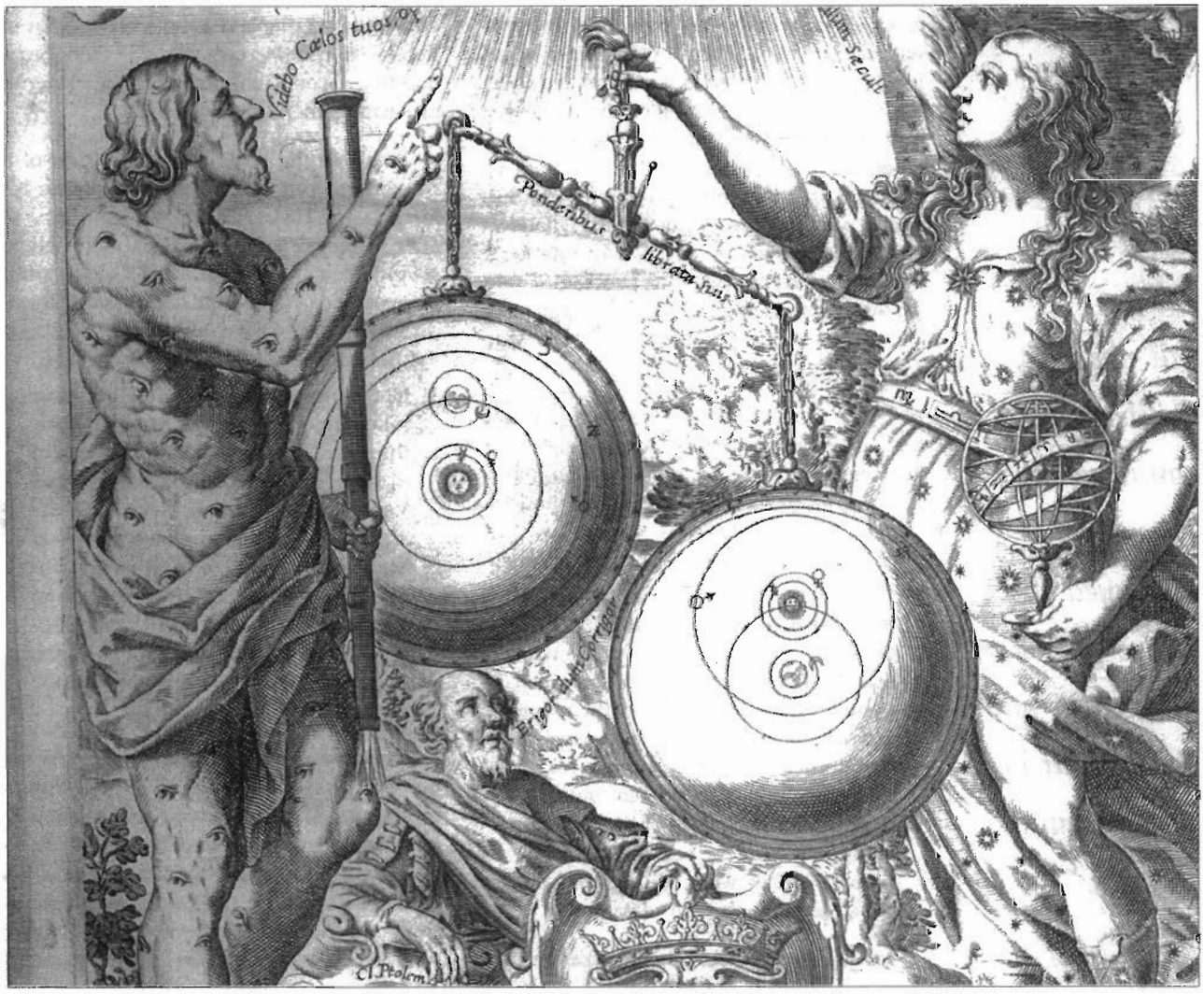

Figure 1. Tycho's geo-heliocentric system, with a fixed, central earth, hangs more weightily in Urania's balance than Copernicus' heliocentric system in this detail from the frontispiece of Giovanni Battista Riccioli's *Almagestum novum* (Bologna, 1651).

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In the Ptolemaic arrangement, the epicycle of Venus always lay between the earth and the sun. So if the planet shone by reflected sunlight, it could never show a full phase. ... Galileo ... confirmed that [Venus] displayed the entire gamut of phases ..., and therefore it had to go around the sun ...

Copernicus had hinted at it with his statement that "the sun, sitting as upon a royal throne, governs the family of planets circling round it." In this regard, the Tychonic arrangement was a very mixed bag. For Tycho, the stars still wheeled around a centrally fixed earth each day, but how would the sun in turn control the planets? As a unified physical system, it did not quite make it. In other words, it was simply not persuasive.

Neither Kepler nor Galileo tells us precisely why he became a Copernican. Kepler always justified his choice in terms of the Holy Trinity, but this hardly could have been the starting point. Surely it was the aesthetic appeal that arrested their attention, the sheer geometrical beauty of an arrangement that included the distant promise of a new physics. And it was Kepler who first glimpsed this new physics when he discovered not only that Mars moved in an orbit with the sun at one focus of the ellipse—that focal point is far more important than the elliptical shape itself—and also that the earth in its orbit had the property of speeding up when it was closer to the sun. I hasten to point out that this momentous physical discovery was not present in *De revolutionibus* and had to be teased out through Kepler's insight into the nature of the problem. These discoveries were made by 1605, though publication of Kepler's *Astronomia nova* was delayed until 1609.

It was then that Galileo turned his optical tube, not yet named the telescope, to the heavens. In the following January, he found the four bright satellites of Jupiter, and by March 1610, his *Sidereus nuncius* was in print. And there he allowed himself a Copernican remark. He wrote:

> We have here a splendid argument for taking away the scruples of those who are so disturbed in the Copernican system by the attendance of the moon around the earth while both complete the annual orbit around the sun that they conclude this system must be overthrown as impossible. For our vision offers us four stars wandering around Jupiter while all together traverse a great circle around the sun.[11]

I would suggest that this realization that the earth could likewise keep the moon in tow was absolutely central to Galileo's conversion to a strong, enthusiastic heliocentrism. Later, when he had determined the periods of the circumjovials, he realized that the innermost satellite was the quickest to round Jupiter, the outer satellite was the slowest, and so on. Behold! A miniature Copernican system! This could not but help authenticate the Copernican arrangement, and Galileo presented it as such in his *Dialogo* of 1632, the book that got him into trouble with the Inquisition.

But meanwhile, toward the end of 1610, Galileo made another discovery that bore directly on the viability of the Ptolemaic system. In the Ptolemaic arrangement, the epicycle of Venus always lay between the earth and the sun. So if the planet shone by reflected sunlight, it could never show a full phase. By late December, Galileo had confirmed that "the mother of loves" (as he encoded her) displayed the entire gamut of phases from full to crescent, and therefore it had to go around the sun as in the Copernican arrangement (See Figure 2).

Was this the brilliant confirmation of a Copernican prediction? A. D. White, in his infamous *A History of the Warfare of Science with Theology in Christendom* (published in 1896) had it so. The so-called Galileo affair played a central role in his account, introduced by the following wholly fictitious episode:

> Herein was fulfilled one of the most touching of prophecies. Years before, the opponents of Copernicus had said to him, "If your doctrines were true, Venus would show phases like the moon." Copernicus answered: "You are right; I know not what to say; but God is good, and will in time find an answer to this objection." The God-given answer came when, in 1611, the rude telescope of Galileo showed the phases of Venus.[12]

Copernicus had, in fact, mentioned the possible phases of Venus in the opening of chapter 10. The context was that those who held that Venus was a dark body, shining by reflected light, argued that its interposition between us and the sun would diminish the sun's light, and since this was never observed, Venus must lie farther than the sun. That was it, nothing more. Copernicus' passing remark may have provided the basis

for a few comments made by the English astronomer John Keill in a Latin textbook he published in 1718.[13] Thus the seeds for the myth were planted. With each retelling the story was more richly embroidered, reaching its apotheosis with White's well-embellished vignette.

Galileo indirectly informed Kepler of the phases of Venus, and Kepler promptly published the news. Galileo himself publicized his discovery at the end of his book on sunspots, printed in 1613. The Ptolemaic system thus was destined for the scrapheap; this was the situation in 1615 when Bellarmine wrote his letter to Foscarini. Recall what Bellarmine said:

> To demonstrate that the appearances are saved by assuming that the sun is at the center is not the same thing as to demonstrate that *in fact* the sun is in the center and the earth in the heavens.[14]

In other words, the Copernican system very nicely explained the appearances, the phases of Venus, but this explanation did not guarantee that the sun was fixed in the center. Why not? Because Tycho's geo-heliocentric arrangement also had Venus going around the sun, albeit a mobile sun, and therefore the Tychonic system explained the Cytherian phases equally well.

Earlier I asked the question, what would it have taken to persuade Bellarmine that the earth moved? Suppose that the Foucault pendulum had been set in motion with its shifting orientation of the swing. What would Bellarmine have made of that? Why not suppose that the influences of the whirling stars caused the plane of oscillation of the pendulum to rotate? This is not a frivolous way out, for it is the general relativistic explanation. And what if the annual stellar parallax had been found? Why not let each star have its own tiny epicycle, cycling around each year? I think such an explanation would have naturally occurred to Bellarmine. You may immediately think of Ockham's razor, that the simpler explanation would surely prevail. But remember that Ockham's razor is not a law of physics. It is an element of rhetoric, in the toolkit of persuasion. In the absence of new physics, a myriad epicycles might not have been an obstacle to keeping the earth safely fixed.

Also, the absence of an observed stellar parallax worked seriously against the acceptance of the Copernican system throughout the seventeenth century. Copernicus himself recognized the problem, and he addressed it in the final sentences of his cosmological chapter 10. The parallax was not seen because the stars were so far away. "So vast, without any question, is the Divine Handiwork of the Almighty Creator."[15] When in 1616 Copernicus' book was placed on the *Index of Prohibited Books* "until corrected," one of the corrections ultimately made was to excise that sentence. It was not that the censors thought the argument was faulty. Rather, they feared that Copernicus made it read as if that was the way God actually had created the cosmos.

In 1674, Robert Hooke summarized the state of play of the arguments. The problem of the earth's mobility, he wrote, "hath much exercised the Wits of our best modern Astronomers and Philosophers, amongst which notwithstanding there hath not been any one who hath found out a certain manifestation either of the one or

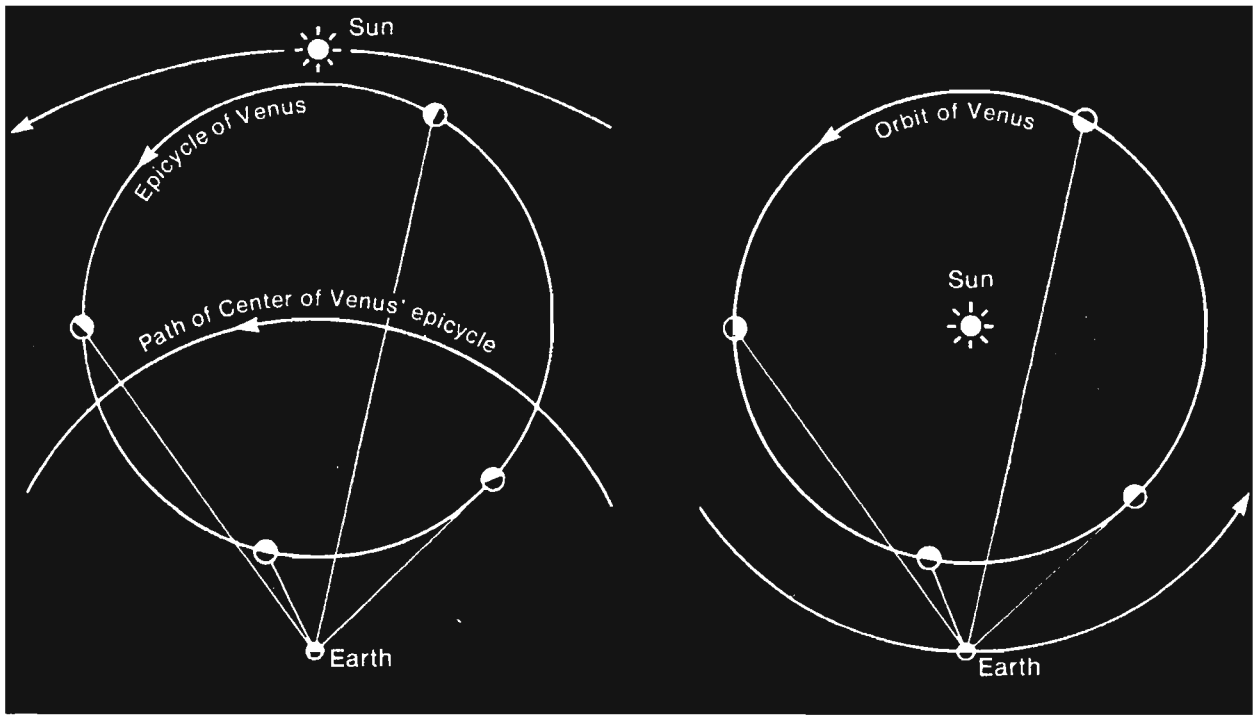


Figure. 2. In the Ptolemaic system (left), Venus rides on its epicycle always between the earth and sun, so that it would never be possible to see the fully illuminated face of Venus. In the Copernican system (right), Venus displays an entire set of phases like the moon.

Without the new [Newtonian] physics, Galileo could scarcely have found a convincing apodictic proof of the earth's motion. Yet he paved the way for the acceptance of the Copernican idea by changing the very nature of science. He argued for a coherent point of view ... and ... made it intellectually respectable to believe in a moving planet Earth.

the other Doctrine."[16] Thus, he suggested, people let their prejudices reign. Some "have been instructed in the Ptolemaik or Tichonick System, and by the Authority of their Tutors, over-awed into a belief, if not a veneration thereof: Whence for the most part such persons will not indure to hear Arguments against it, and if they do, 'tis only to find Answers to confute them."[17]

Hooke confirms what I have been arguing, namely that the best and most persuasive reason for adopting the Copernican system up through his time was the proportion and harmony of the world. He wrote:

> On the other side, some out of a contradicting nature to their Tutors; others, by as great a prejudice of institution; and some few others upon better reasoned grounds, from the proportion and harmony of the World, cannot but embrace the Copernican Arguments.[18]

But Hooke allows:

> What way of demonstration have we that the frame and constitution of the World is so harmonious according to our notion of its harmony, as we suppose? Is there not a possibility that things may be otherwise? nay, is there not something of a probability? may not the Sun move as Ticho supposes, and that the Planets make their Revolutions about it whilst the Earth stands still, and by its magnetism attracts the Sun and so keeps him moving about it?[19]

There is needed, Hooke declares, an *experimentum crucis* to decide between the Copernican and Tychonic systems, and this he proposed to do with a careful measurement of the annual stellar parallax. I will not describe Hooke's attempt, which used what might well be described as the first major instrumentation set up for a single purpose, but let me merely state that Hooke thought he had confirmed the effect and therefore the Copernican arrangement.

While it soon became apparent that Hooke's handful of observations had not established a convincing annual parallax, further attempts led James Bradley to the discovery of stellar aberration, published in 1728.[20] This phenomenon, easily explained in terms of a moving earth, did not have the historical cachet that the quest for parallax had. Hence, ironically, what persuaded the Catholic Church to take Copernicus' book off the *Index* was ultimately a false claim for the discovery of an annual stellar parallax. The new edition of the *Index* appearing in 1835 finally omitted *De revolutionibus*, three years before a convincing stellar parallax observation was at last published.[21]

Why is it that we today find the so-called proofs of the earth's motion—the stellar parallax and the Foucault pendulum—so convincing when they could not have been guaranteed to convince Bellarmine? The answer is that the required new physics has arrived. We are post-Newtonian, and it is in the Newtonian framework that these fundamental experiments provide persuasive evidence. In fact, the Newtonian achievement was so comprehensive and coherent that the specific proofs were not needed. Thus there was no dancing in the streets after Foucault swung his famous pendulum at 2 a.m. on Wednesday morning, January 8, 1851, nor had there been grand celebrations in 1838 after Bessel had announced the successful measurement of an annual stellar parallax. The Copernican system no longer needed these demonstrations to win universal acceptance. Nor was Bradley's interpretation of aberration a watershed in belief about a moving earth, which is why his work, which came a century before Bessel's findings, seems so curiously neglected in the heroic retelling of the Copernican conquest.

Without the new physics, Galileo could scarcely have found a convincing apodictic proof of the earth's motion. Yet he paved the way for the acceptance of the Copernican idea by changing the very nature of science. He argued for a coherent point of view, with many persuasive pointers, and his *Dialogo* (the *Dialogue on the Two Great World Systems*), while not containing much new science, nevertheless made it intellectually respectable to believe in a moving planet Earth. While it would be foolhardy to claim that he changed the nature of science single-handedly, he was surely a principal figure in the process. Today science marches on, not so much by proofs as by the persuasive coherency of its picture.

No doubt this is old stuff to epistemologists, whose business it is to probe how we understand things. But today it seems to be forgotten by two widely divergent camps. In one camp, there is—especially in America—a hard minority core of anti-evolutionists,

who feel that biologists should furnish apodictic "proofs" of macro-evolution, and until that demonstration is in hand, evolution is a "mere hypothesis" that should not have a place in true science. They fail to understand that evolution offers biologists and paleontologists a coherent framework of understanding that links many wide-ranging elements, that it is persuasive, and that any critique of evolution will fall on stony ground unless it provides a more satisfactory explanation than evolution already does.

Of course, the view of the nature of science that I am proposing is a two-edged sword. There are some informed people who passionately believe that a coherent framework of understanding includes the notion of intelligent design, i.e., that a hit-and-miss pattern of mutations by itself is insufficient to explain the extraordinarily pervasive complexity of the biological world. Let me give a simple example of this dichotomy. I am grasping an apple, which I am about to drop. How can I understand what is about to happen? I can hold that God, the Sustainer of the universe, is recreating the world every moment, and that in each re-creation the apple will be slightly closer to the floor. Or, I can use Newtonian physics and calculate how long it will take for the apple to reach the floor and its velocity when it smashes onto the carpet. This calculation can be very useful, but it will not explain *why* the apple went down. As Newton himself said in the General Scholium added at the end of the second edition of his *Principia:* "This most elegant system of the sun, planets, and comets could not have arisen without the design and dominion of an intelligent and powerful being," and then a few paragraphs later, "I have not yet been able to deduce from phenomena the reason for these properties of gravity, and I do not 'feign' hypotheses."[22] In other words, Newton could accept both views of gravity, as God's action and as a measurable, predictive phenomenon. The latter view can guide a spacecraft to Saturn, but the first view cannot. Likewise the stochastic view of evolution may help us understand the seemingly capricious ordering of genes on the human chromosomes, whereas the intelligent design hypothesis, which just might be true, has yet to make any brilliant predictions.

But I stated that *two* widely divergent camps somehow fail to recognize that we come to our fundamental human understanding not by proofs but by persuasion, by the coherence of the picture we construct of the world and our place in it. The other camp is inhabited by the hard core scientists who have adopted scientism as their world view, those who believe that the world of understanding runs by proofs, and who dare those of us who are theists to prove that an intelligent and powerful being exists, with design and dominion as its brief. I cannot *prove* the existence of a designing Creator any more than I can solve the problem of evil. I am simply personally persuaded that an intentionally created universe, with one of its likely purposes the emergence of conscious and self-contemplative intelligence, makes sense to me, is satisfyingly coherent, and is persuasive.

I am reminded of the poet Robinson Jeffer's lines about truth in science:

> The mathematicians and physics men
> Have their mythology; they work alongside the truth,
> Never touching it; their equations are false.
> But the things *work*.[23]

As for me, examining the great change in the world view that took place during the so-called Scientific Revolution gives me a richer understanding of the nature of truth in science: it is an intricate process of observation, interpretation, and persuasion. Ultimately it may not be true, but, for now, it makes sense. ✦

Notes

[1]Bellarmine to Foscarini, 12 April 1615, *Opere*, 12, 171–2; abridged from *Discoveries and Opinions of Galileo,* trans. Stillman Drake (Garden City: Doubleday, 1957), 162–4. (The Galileo *Opere* cited here is the so-called National Edition, ed. Antonio Favaro [1890–1909; reprint, Florence, 1968]).

[2]Ibid.

[3]My translation from Nicolaus Copernicus, *De revolutionibus orbium coelestium* (Nuremberg, 1543), Book I, chapter 10.

[4]Reiner Gemma Frisius in Johannes Stadius, *Ephemerides novae et auctae* (Cologne, 1560), signatures b3–b3v.

[5]Georg Joachim Rheticus, *Narratio prima* (1540), trans. Edward Rosen, *Three Copernican Treatises* (New York: Octagon Books, 1971), 165.

[6]My paraphrase from Andreas Osiander, "Ad Lectorem," at the beginning of Copernicus' *De revolutionibus.*

[7]Bellarmine, to Foscarini, 12 April 1615, *Opere*, 12, 171–2.

[8]J. L. E. Dreyer, ed., *Tychonis Brahe Dani opera omnia* 4 (Copenhagen, 1913–1929), 156, lines14–18.

[9]Galileo Galilei, *Dialogue concerning the Two Chief World Systems,* trans. Stillman Drake (Berkeley: University of California Press, 1953), 328.

[10]Copernicus, *De revolutionibus orbium coelestium.*

[11]Galileo Galilei, *The Starry Messenger,* in *Discoveries and Opinions of Galileo,* trans. Stillman Drake (Garden City: Doubleday, 1957), 57.

[12]Andrew Dickson White, *A History of the Warfare of Science with Theology in Christendom* (New York: D. Appleton, 1896), 130.

[13]See Edward Rosen, "Copernicus on the Phases and the Light of the Planets," in *Copernicus and His Successors* (London: The Hambledon Press, 1995), 81–98, esp. p. 84.

[14]Bellarmine to Foscarini, 12 April 1615, *Opere.*

[15]Copernicus, *De revolutionibus orbium coelestium* at the very end of the chapter.

[16]Robert Hooke, *An Attempt to Prove the Motion of the Earth from Observations* (London, 1674), 1.

[17]Ibid., 3.

[18]Ibid.

[19]Ibid.

[20]James Bradley, "An Account of a New-Discovered Motion of the Fixed Stars," *Philosophical Transactions* 35 (1727–1728), 637–61.

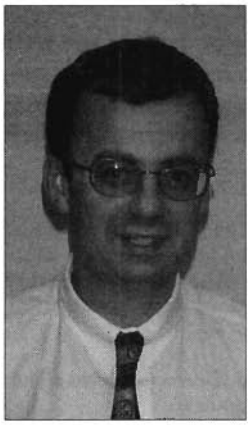
[21]See Pierre-Noël Mayaud, SJ, *La Condamnation des Livres Coperniciens et sa Révocation: á la lumière de documents inédits des Congregation de l'Index et de l'Inquisition* (Rome: Editrice Pontificia Universita Gregoriana, 1997).

[22]Isaac Newton, "General Scholium," in *The Principia: A New Translation,* trans. I. Bernard Cohen and Anne Whitman (Berkeley: University of California Press, 1999), 940, 943.

[23]Robinson Jeffers, "The Great Wound," in *The Beginning and the End* (New York: Random House, 1963), 11.

Interpreting the Book of Nature

Angus J. L. Menuge



The idea of nature as a book provides one of the richest and most often appropriated metaphors for the natural world. Plato, Aristotle, the Stoics, and Christians have all seen the work of the scientist as tracing out the telos *or* logos *inscribed in nature by some demiurge or god. Critics of design, from Francis Bacon[1] to Daniel Dennett, also see science as a kind of reading. Bacon urged that nature was a text which, to be rightly understood, must not be anticipated but humbly interpreted.[2] Dennett concludes evolutionary biology must employ "artifact hermeneutics"[3] to discern what biological structures are adaptations for. Nonetheless, for Dennett, the text is written by the blind process of natural selection, not via the agency of an author. The metaphor of nature as text is congenial to both proponents and critics of Intelligent Design.*

In this essay, I will trace the history of the idea that nature is a book from early Greek science, through the Middle Ages and Reformation, and culminating in the rise and critique of natural theology. First we will try to understand how science ever got started: What prompted some people to stand back from their busy lives to open the book of nature in the first place? Next we will draw on the recent work of Peter Harrison, in which he argues persuasively that the Reformation provided the crucial hermeneutical change that overcame scholasticism and made modern science possible. Then we move to the great controversy between natural theology and its critics. This we will consider as fundamentally a drama about rival hermeneutics and the proper limits of theological and scientific interpretation. We will attempt to show that sound hermeneutics are vital to understanding the interplay between science and religion.

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Opening the Book

Before science can get started, humans must have the idea that nature is congenial to systematic study. Not all ways of understanding nature support this assumption.[4] Animism and polytheism suggest that nature itself is sacred, so that it would be a sacrilege to dissect it, and also that nature is governed by a multiplicity of local deities and is thus too heterogeneous and capricious to support universal laws. Excessive spiritualism or exclusive concern for eternal truth may disparage nature as the realm of transience, *maya* (illusion) or corruption, making its systematic study a pointless or even sinful diversion.[5]

Even Plato had tendencies in the latter direction, but overcame them by proposing a more fruitful connection between the eternal and the temporal. If the eternal realm is fundamentally orderly and rational, and the temporal universe is a copy, then if the copy preserves enough of the original qualities, it should be intelligible to human reason. Speaking for Plato, Timaeus says that "the world has been framed in the likeness of that which is apprehended by reason and mind,"[6] that is, in the (imperfect) likeness of the Forms. The cosmos was understood as an organism, "a living creature truly endowed with soul and intelligence by the providence of God."[7] While moderns will find this picture anthropomorphic, the assumption that the cosmos is an intelligent organism rather like us at least guarantees

Angus J. L. Menuge *is a British citizen with a B.A. in philosophy from Warwick University and a Ph.D. in philosophy from the University of Wisconsin-Madison. He is an adult convert to the Lutheran Church Missouri Synod. Menuge is currently associate professor of philosophy and associate director of the Cranach Institute at Concordia University Wisconsin (www.cranach.org). Menuge's research interests include philosophy of mind, philosophy of science, and apologetics. Off duty, he enjoys the company of a group of fellow Christian professors named for the Oxford group of C. S. Lewis and J. R. R. Tolkien, "the Inklings." Correspondence may be sent to him at: Angus.Menuge@cuw.edu*

that nature's order is intelligible to humans, making the project of science possible.

Despite this nudge forward for science, Plato's philosophy inhibited its full potential. For one thing, he distinguished a corrupt sublunary realm from the superlunary region, where alone entities truly fulfilled their *telos*: "The sublunary part was ... a partial failure." Due to this distinction in Plato's vitalistic universe, he "deprived it of a thorough, universally valid orderliness."[8] Although Plato had the genius to suggest that much of physics could be reduced to geometry, thereby anticipating Descartes, Kepler, and other giants of the scientific revolution,[9] he did not think that geometry was valid for the corruptible Earth, a view hardly congenial to terrestrial physics. The major problem was that Plato divorced essences or forms from *concreta* so that universal truths were found only in the eternal realm. Thus science was viewed as speculating about the eternal mind on the basis of its temporal image, an activity that could at best yield approximations.

A decisive move away from this picture was made by Plato's great student Aristotle, who suggested that essences were actually contained in substances. If this is true, then scientific analysis of substance can hope to rival mathematics in its ability to discern forms. Aristotelian metaphysics made it possible to think that science could discover necessary connections (laws) by examining the essences of particulars. Since the Platonic realm was rational, when Aristotle imported it into particulars, these were predicted to conform to rational principles. Science became the project of discerning what a substance's nature was, which would tell us what it was inclined to do, and thus predict its characteristic behavior. The mentalism of Plato's approach to the universe was thus displaced, but not eliminated.[10]

In addition to the material and efficient causes still recognized throughout contemporary science, Aristotle also emphasized the formal and final causes. Looking at the development of embryos into chickens, Aristotle observed a programmed series of changes, which he supposed derived from the characteristic form of chickens contained in the embryo. Although contemporary science has challenged the claim that DNA is the exclusive determinant of development, it is not absurd to suggest that the discovery of DNA partially confirmed Aristotle's insight about embryogenesis, and this holds regardless of whether the properties of DNA are understood from the perspectives of Darwinism, theistic evolution, self-organization, or design.[11] Outside biology, however, modern science sees much less use for formal causes because typical physical objects are taken to be passively obedient to external laws rather than enacting active principles within themselves. Even less popular is Aristotle's idea that each substance had some final end, which provides a teleological explanation of its current behavior. Teleology of this kind is rejected by most contemporary scientists, except in the case of a human or other observable intelligent agent. Yet both the laws of thermodynamics and various anthropic principles are suggestive of a universe that has a certain in-built direction.

Darwinists like Gould have claimed that were the evolutionary tape rewound and played again, it is most unlikely that life as we know it would re-evolve. However, theistic evolutionists, self-organizers, and proponents of Intelligent Design would expect similar patterns to emerge, pointing to the fine-tuning of physical constants and the stability of species as evidence. Some Darwinists also concede that what Dennett calls "forced moves in the game of life" would channel natural selection along somewhat predictable paths.

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Aristotle sets out an early form of the design inference, arguing that if we find a natural entity whose development corresponds to an artifact which we know is designed, we can conclude that the natural entity is designed as well. Swallows make nests; spiders make webs. Aristotle concluded that these products are artifacts produced for a purpose.[12] When Aquinas taught Aristotle to speak like a Christian, he extended this argument by pointing out that if the swallow and spider lack the intelligence to direct their craft, it instead must be located in their creator and director (Aquinas' Fifth Way). Before Humean skepticism about the discernability of God's purposes and the various recent attempts to reduce intelligence to unintelligent causes, this seemed a very persuasive argument to most people. Thomist hermeneutics take us from the text all the way to its author, in cheerful disregard of postmodern claims that the author is "dead" or unrecoverable.

Christianity also provided some additional presuppositions that helped science along its way. That this is so seems to many a matter of historical record, although it does not follow that these presuppositions cannot be detached from Christianity and supported on independent grounds.[13] Christians contributed the idea that the entire universe was created *ex nihilo* by a single, rational being. As we saw, Greek science had supposed that the

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universe was bifurcated into the perfect heavens governed by celestial physics and the corruptible sub-lunar realm subject to terrestrial physics. A rational God who is sovereign of all can be expected to make no such distinction. As Jaki argues, even Buridan in the Middle Ages seems to have grasped this point, which is implied by his willingness to understand celestial motion by comparison to such mundane terrestrial examples as moving a smith's wheel and the long jump.[14] It was not until Newton that a comprehensive set of universal laws was developed and the distinction between celestial and terrestrial physics finally was abolished. Despite his unorthodox Arianism, Newton shared with Buridan a strong belief in a single rational creator of the universe, and this certainly founded his faith that universal laws were available for discovery. The theological hermeneutic that insists the book of nature is the work of a single, coherent author has been very fruitful for science.

By distinguishing the Creator from the creation while yet retaining the idea that the creation was good, Christianity removed the universe's sacred status, making its study and dissection morally permissible, while upholding the value of matter against the Gnostic disdain for it.[15] And if God is identified with the *logos*, a principle of rational order, and one in whose image we are made, there is a foundation for Plato's expectation of an intelligible, orderly universe.[16] It seems undeniable that this assumption is one that can never be justified from the bottom-up (i.e., from human perceptions of phenomena), as it is essentially equivalent to solving the insoluble problem of induction. The pragmatic need for a faith in natural order seems to be a prerequisite for doing science, and it is a major challenge for naturalism to justify this faith.[17]

In all of these ways, the idea of divine design has helped science, not so much by providing specific theories, as by legitimating general research programs directed toward the discovery of universal laws. The secularist may grant the historical value of this theological scaffolding, but claim it has been used to build a materialist edifice that no longer has need of it. Conversely, quite a few philosophers, including me, are coming to the conclusion that scientific materialism cannot justify its foundational assumptions independently of theism.[18]

Still, it must be admitted that Christianity has not always been a friend to science. To be sure, most contemporary scholars agree that the Enlightenment picture of the Dark Ages as an authoritarian stifling of science is an overdrawn caricature that ignores important scientific advances in both mathematics and theoretical physics.[19] But it is undeniable that scholasticism impeded the development of modern empirical science, and that some Christian assumptions were partly to blame for this.[20]

From Scholasticism to Modern Science

There is little doubt that the scholastic scientists of the medieval period related textual interpretation to nature in unhelpful ways. Not only Scripture, but all classical works were taken as authoritative. It was supposed that Adam's knowledge before the Fall was much more complete than our own, and that even after the Fall, early texts retained many great insights now in danger of being lost through the progressive corruption of the human mind. Thus Peter Harrison argues:

> The mastery of nature at which thirteenth and fourteenth century minds aimed, amounted to a reconstruction of a past body of knowledge, the ruins of which could be discovered in those texts of the ancients.[21]

Not only that, scholasticism followed the obsession of the early church fathers with allegorical interpretations of the text. This was extended from Scripture to the study of nature so that a hermeneutics of nature aimed not at an accurate description of the facts about an entity but at discernment of its symbolic meaning. These meanings were thought to reside in authoritative texts, making empirical investigation of the world unnecessary. Harrison writes:

> The turn to nature as an entity in its own right was a turn to texts about nature ... Such was the nature of the scholastic method that discovery took place through exegesis and argument rather than by observation and experiment.[22]

As a result, medieval bestiaries evince quite credulous acceptance of a variety of non-existent creatures (harpies, unicorns,

centaurs, satyrs and many more), and unsubstantiated fables about real creatures, such as the claim, going back at least as early as St. Ambrose, that the pelican's mother wounds itself in Christ-like manner to revive its young.[23]

Behind this approach to the study of nature lies the assumption that natural objects, especially animals and plants, are designed by the Creator to educate humans, in particular, to teach moral lessons. This assumption is one that encourages the human mind to intuit and anticipate essential meanings in an armchair fashion, rather than carefully investigate the natural facts. The idea that nature *must* be a certain way effectively precludes our checking out whether this is the case. In that sense, Bacon was surely right to complain that an a priori notion of design is an idol of the mind, deadly to scientific progress. It also warrants an important distinction between the hermeneutics of theology and science. Theologically, we can assert that God works providentially. In this sense, granted God's revelation, we do have a priori knowledge of design. However, this does not imply that science can anticipate the means God will use or his final purpose. If design has a scientific role, it must be the more modest one of an a posteriori conclusion. As a result, science needs a different, more modest hermeneutic from theology.

Oddly enough, it was improvements in textual analysis that partly explain the fall of scholasticism.[24] The emerging science of textual criticism revealed that current copies were frequently corrupt, motivating a search for the original text. In the process of sorting out variant meanings to make sense of the original, it became necessary to actually investigate the natural world directly, to see which interpretation made most sense. At this point, a crucial move was made from following the claims of the ancients to following the scientific method that the ancients had used to substantiate those claims. We might think of this in terms of a distinction Susan Blackmore makes between two ways of copying memes (i.e., discrete memorable units, such as advertising jingles or the aphorisms of an ancient writer).[25] The medieval scientists moved from copying the product (the writings) to copying the instructions (the procedures the ancient scientists used to discover which statements were true). The exegesis of ancient texts could no longer progress without some exegesis of nature itself. As soon as scientists followed this path, however, they discovered all sorts of embarrassing errors and omissions, even in the original texts. By the time America was discovered, it became obvious that there were many flora and fauna of which Aristotle was completely ignorant.[26]

But there was something else that had to happen before modern science could appear. Medieval thought was still mired in the idea that not only words, but also things are invested with a variety of symbolic meanings. The Bible and nature were alike viewed as a storehouse of allegory. As Harrison argues, the Reformation was decisive in its rejection of this view, proposing a new hermeneutic for both Scripture and the book of nature. Luther, Calvin, and others believed that allegorical interpretations allowed all sorts of false or unnecessary doctrines to occlude the simple Gospel message of the Bible. While not denying the possibility of secondary, metaphorical interpretations, they insisted on the primacy of the literal meaning of the text. When the same approach was carried over to the natural world, symbolic meanings were rejected in favor of accurate, factual description. In the case of both revelation and the book of nature, the Reformers insisted that we should humbly confine ourselves to discovering what the text actually and clearly says, avoiding anticipatory flights of fancy. This outburst of intellectual humility was essential to science's decisive turn toward the *a posteriori*.[27]

When demonstrable fact and not traditional commentary is paramount, it becomes possible for theologians to uphold God's Word and for scientists to uphold nature as their final epistemic authorities.

When demonstrable fact and not traditional commentary is paramount, it becomes possible for theologians to uphold God's Word and for scientists to uphold nature as their final epistemic authorities. Harrison writes:

> In freeing persons to make determinations about the meaning of the book of scripture without deferring to authorities, the reformers had at the same time made room for individuals to make determinations about the book of nature, unfettered by the opinions of approved authors.[28]

The Reformation emphasis on total depravity and the sovereignty of God made it inappropriate for a mere human to claim to discern via unaided reason the symbolic meanings and ultimate purposes of God. Some of these purposes are revealed by Scripture and so can be read via the theological hermeneutic. But at best, the scientist could hope, like Lutheran astronomer Johannes Kepler, to discern the patterns God had left behind in nature, and, in this limited way, to think God's thoughts after him.

Nonetheless, the idea of design was still important in shaping scientific work. As Peter Barker argues, Lutheran theology provided grounds for expecting nature to obey a discernible Logos. He writes:

> The specifically Lutheran doctrines of the ubiquity and the Real Presence of Christ in the host are the

basis for the Lutheran belief in the universal presence of a providential deity, whose design or plan may be known through the study of nature.[29]

Contrary to the assumption that Luther was anti-science, his emphasis on Real Presence and Providence predisposed him in favor of modern science. This explains the fact that Luther gave free rein to Erasmus Reinhold, Georg Rheticus, Caspar Peucer, and other Lutheran astronomers at the University of Wittenberg, allowing them to pursue the revolutionary Copernican heliocentric model even though it seemed to many to conflict with both Scripture and common sense.[30] The greatest of the Lutheran scientists was Johannes Kepler, who saw God as the Geometer of the universe, and who maintained that fallen humans retain a "natural light" of rational intuition, so that "the geometrical part of God's providential plan for the world would be accessible to human beings through the natural light."[31] More generally, the rise of modern science depended on a fundamental "change from a world which is ordered symbolically by resemblances to one which is ordered according to structural similarities, or abstract mathematical relations, and always, at a higher level, divine purposes."[32]

While Christianity – in the form of allegorical scholasticism – was certainly to blame for medieval stagnation in science, it is also true that the reinvigorated Christianity of the Reformation came to its rescue.

In this perspective, the distinct hermeneutics of science and theology are part of an integrated whole, so that, for example, the problem of the natural evil disclosed by empirical science is addressed by applying the theological doctrine of providence. The theological ideas that harmful or noxious creatures exist as agents of divine justice, or as fillings for otherwise unoccupied levels of the "Great Chain of Being," or as foils to show off the finer creatures more clearly, or as spurs to human soul-building, or simply as instruments of some divine purpose unknown to us were all developed at length, with the understanding that they were complementary, rather than irrelevant, to science. Likewise, Robert Boyle, a paragon of Christian science, saw scientific work as fulfilling God's purposes by producing medicines and technologies to aid our neighbor and partially restore the effects of the Fall.

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Natural Theology and its Critics

The powerful integration of science and religion which began on the continent, later flourished in the predominantly British school of natural theology. What remained of Aristotle after the birth of modern science was widespread, although not universal, commitment to final causes. No longer, however, were these causes viewed as occult essences within substances, as Aristotle had supposed. Rather, final causes could be discerned by straightforwardly investigating the benefits of a phenomenon to humanity. Work along these lines varied from the sensible (Walter Charleston's study of the uses of blood, respiration and muscles[33]), to the suspect (Henry More's claim that rivers are designed as natural quarries of stone[34]), to the outrageously Panglossian. Perhaps Noël Pluche gets the prize for the latter category, with the following suggestion:

> The woodworm, which eats the hull of ships, actually contributes to harmonious international relations, for it provides opportunities for some countries to sell to others pitch with which to protect ships' hulls: "Thus does this little Animal, which we so much complain of as being troublesome and injurious to us, become the very Cement which unites these distant nations in one common Interest."[35]

At this extreme, science became an exercise in post hoc rationalization with the doubtful aim of defending God's wisdom. At the same time, wiser heads like those of Robert Boyle, William Harvey, Robert Hooke, and John Ray argued that the microscope reveals an organic world brimming with evidence of design, regardless of whether or not we can discern its ultimate purpose.[36] Boyle was more careful to distinguish the theological from the scientific hermeneutic, confining his scientific investigation to the material mechanisms. Convinced that matter was completely passive and unable to give an ultimate explanation of its own order, Boyle was free to draw the theological conclusion that this order evinced divine design.[37] Indeed Boyle was concerned that

science should not try to mingle the divine and the natural, as occurred in the immanent spiritism of van Helmont's active principles, because this tended to pantheism and denied God's free and sovereign will over his creation.[38]

Although distinct from science, natural theology has undoubtedly contributed to science by motivating careful examination of the functioning of physical and biological systems.

Although distinct from science, natural theology has undoubtedly contributed to science by motivating careful examination of the functioning of physical and biological systems. For example, medicine started to flourish when scientists asked such questions as "What is the function of the heart, lungs, and other parts of the circulatory system?" Indeed, the identification of these physical structures *as* a circulatory system presupposes a functional stance of analysis, and this was contextually motivated by a belief in divine providence. But natural theology also came under increasing criticism, some friendly and some unfriendly.

As superior telescopes revealed the vastness of space, the possibility of extraterrestrial life was first discussed. To many it no longer seemed credible that humanity, residing in a tiny part of a huge universe, was the sole beneficiary of nature. This led to a decisive move away from anthropocentric to more broadly cosmological design.[39] The universe is for God's purposes to be sure, but these need not always be the purposes of humans.

At a more conceptual level, some philosophers, including Bacon, Descartes, and Hobbes, objected in various ways to the reliance of natural theologians on final causes. Bacon argued that the natural theologians were unwilling to accept the limits of human understanding and the inevitability of "brute facts" which admit of no further explanation. Instead, Bacon charged, humans project their own agency onto the world, supposing that a being like themselves is the ultimate explanation of mystery. He said:

> As it strives to go further, [the human mind] falls back on things that are more familiar, namely final causes, which are plainly derived from the nature of man rather than of the universe ...[40]

Bacon here warns against the human tendency to read human psychological categories into the universe beyond the warrant of the evidence. Hobbes made much the same point in critiquing the use of final causes in dynamics. He argued:

> Men measure, not only other men, but all other things, by themselves; and because they find themselves subject after motion to pain, and lassitude, think everything else grows weary of motion and seeks repose of its own accord.[41]

Descartes also thought that science should focus on the mathematical properties of matter in motion and that the idea of final causes was "premised on a false analogy from human actions and motivations"[42] to the divine. On the other hand, Harrison argues that the critics of final causes overplay their hand. He writes:

> The search for divine purposes in the natural order provided a clear religious warrant for a pursuit which might otherwise have been regarded as the accumulation of vain and futile knowledge, little different from the bookish and unprofitable endeavors of the encyclopaedists. The scientific achievements of men such as Robert Boyle and John Ray give the lie to Bacon's assertion of the baleful influence of final causes.[43]

It is true that Boyle did not regard final causes as part of physical science,[44] which he believed was concerned only with the secondary causes operative in material mechanisms.[45] Nonetheless, final causes were a crucial theological motivation for asking scientifically fruitful questions.[46]

Against the idea of integrating the scientific and theological hermeneutics, Bacon argued that the words of Scripture and of the book of nature are of quite different kinds. He wrote: "Heretical religion as well as fanciful philosophy derives from the unhealthy mingling of divine and human."[47] Moreover, some argued that the more nature is viewed providentially, the more acute is the problem of evil. While some of the theodicies for natural evil were ingenious, many were strained. Also, there were many different ways of accounting for the same evil, and no clear way to adjudicate which of these was correct. From these considerations, many concluded that natural theologies were engaging in fanciful speculation with no relevance to the empirical demonstrations of science.

Despite his rejection of final causes in physics, Descartes grounded science in the confidence that if we restrain our errant will, we are capable of understanding the rational, and especially the geometric, order of the universe. But both Christian theology and agnostic skepticism gave grounds for doubting this optimistic view of human cognitive powers. The reformers took total depravity to mean that human will and reason is unable to know God personally without regeneration. But does this depravity also darken the human understanding of the book of nature? A radical form of theological skepticism would argue that human reason is no longer analogous to the divine, so that scientific realism is doomed to failure. Perhaps scientific theories do not justify ontological com-

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mitments, but merely provide useful calculation devices that capture the right predictions. The agnostic Hume also tended in this direction, arguing powerfully that there is no way to justify the scientific practice of induction, and hence no basis for the assumption that science can discover the true categories and regularities of nature.

The obvious way out of this skeptical miasma is to appeal to some transcendent and authoritative word. But as the Enlightenment progresses, modernist philosophers concluded that such a word was both epistemically inaccessible and practically dispensable. In his *Dialogues Concerning Natural Religion*, Hume saw a Divine Designer as only one of many hypotheses that save the phenomena, discerning that metaphysics is radically underdetermined by the totality of natural facts. However, Kant strove to restore the confidence in human reason that Hume had lost. Impressed with the triumph of Newton, himself a firm believer in providence and final causes, Kant attempted to understand Newton's laws of motion as synthetic *a priori* statements, i.e., necessary truths of our experience, as geometry appeared to him to be. In this way, Kant hoped to escape Humean skepticism about induction and to provide a foundation of rational certainty for science which did not depend on some inaccessible or nondemonstrable revelation. While Newton himself appealed to the divine to explain the formation and stability of planetary orbits, Laplace followed the Kantian line and argued that he no longer had need of such a hypothesis.

Skepticism was replaced by a confidence in human reason that made appeals to religious foundations seem redundant. Though Kant himself was devoutly Christian, there is no doubt that his thinking encouraged the move from an interventionist natural theology to deism. If Kant and Laplace were right about the inherent rational order of the cosmos, surely the universe is more like a carefully crafted machine than a living organism. While organisms need constant support and attention, an automaton devised by a perfect engineer might easily be supposed to require no further intervention, making of God a sort of cosmic Maytag repairman, with nothing left to do except read the newspaper. Aesthetically, some preferred the idea of a God who got it right the first time and had no need to tinker with his handiwork.[48] Pushed too far, of course, this made the Incarnation itself a source of embarrassment. But it was just at this time that naturalistic criticism of the Bible began to suggest that the Bible was full of legendary material, and that the miracles did not really happen. For those who could not bear such a distant, uncaring God, pantheism and varieties of nature worship got God back into nature, sacrificing his transcendence to maintain his immanence. Such a God could easily be identified with the life force or spirit of progress that came to dominate in the eighteenth and nineteenth centuries. He was, of course, British!

Even by the nineteenth century, the criticisms of Bacon, Descartes, Hobbes, Hume, and Kant had not unseated the argument for design. Although many had unorthodox ideas about the nature of God, they were not incompatible with his being a designer, and Paley's *Bridgewater Treatises* were influential because, despite the skeptical worries about final causes, no one had a serious rival theory. To say that the divine might not be analogous to the human or that our faculties might not be able to discern divine purposes falls short of a demonstration that this is the case. Only a plausible reading of the natural text that makes appeal to a designer superfluous could justify outright rejection of the design hypothesis.[49] Such a reading was provided by Charles Darwin's *The Origin of Species* (1859).

Darwin's most important philosophical insight involved a careful distinction between the appearance and reality of design. Neither Darwin nor Richard Dawkins, his most vigorous contemporary spokesman, had any doubt that biological systems appear to be designed. This is why it is so worthwhile to treat creatures, organs, and biochemical structures as artifacts or machines. Nonetheless, from the fact that something appears to be designed, it does not follow that it actually is. Darwin's contribution was to supplement this philosophical distinction with a hypothesis that would account for the appearance of design in nature without invoking a designer. Darwin argued that living creatures diversify through a process of descent with modification, where some source of variation (unknown to Darwin) led to both advanta-

geous and disadvantageous traits among a species' progeny. The structure of the environment and competition for the crucial resources of food and mates jointly act as a sieve, tending to the extermination of the maladapted and the increase of the well-adapted. Since well-adapted creatures are those with traits that happen to suit their environment, this process of entirely natural selection fosters the illusion that the traits were explicitly designed for a purpose.

Darwin's contribution was to [formulate] a hypothesis that would account for the appearance of design in nature without invoking a designer.

The process is thoroughly mechanistic and, some felt, quite ruthless and wasteful, making it hard to see how a loving God could carry out his providential plans through such means. Deism, which was already on the theological scene, was co-opted as a means of keeping God's hands clean of the blood that ran from tooth and claw. It might be possible to explain why God would allow such goings on, but his active involvement in them seemed unjustifiable to many. Still, if evolution meant progress (a doubtful inference from Darwin's theory[50]), perhaps one could think of a World Soul or Life Force, which was propelling us ever closer to enlightenment. The carnage of the primitive past was regrettable, but perhaps it was justified if it eventually produced people as civilized as Victorians. Some, however, felt that there was simply no way to get God off the hook. If Darwin was right about how life develops, then natural evil seemed to be an essential part of the process, and the conclusion must be that either God lacks one of the traditional attributes (omniscience, omnipotence, or holiness),[51] or that he does not exist at all. Others were more determined to retain an orthodox Christian faith. Following Karl Barth, the Neo-Orthodox placed the salvific Gospel events (*Geschicte*) in a separate self-validating realm of suprahistory, where they could not be falsified by the facts of history, no matter how recalcitrant. The Gospel events then show that the Lord is a loving God, regardless what natural science uncovers. Conversely, some who insisted that God really acted in the same history about which science speaks, felt that there was no option but to reject much of Darwin's theory. To the latter group, Darwin's account was incompatible with the idea that God creates things good and continues to sustain and care for his creation.

Other approaches attempt to defang Darwin by showing that one can have one's cake and eat it, too. Some claim that the hermeneutic of science cannot uncover spiritual truths, so that the medieval and Reformational hope for an integrated interpretive strategy for both Scripture and nature must be abandoned. The problem of evil in nature only occurs if we read the scientific facts spiritually, but that is to confuse science and theology. Perhaps Bacon was right that "heretical religion as well as fanciful philosophy derives from the unhealthy mingling of divine and human." One natural outcome of this line of thinking is Gould's model of theology and science as Non-Overlapping Magisteria (NOMA), with science the authority on natural fact and theology the arbiter of morality and ultimate meaning. Others, less skeptical of God's providence, argue that the process of evolution itself evinces God's purpose of moving toward perfection through suffering. They also may point out that natural selection seems to work too well and that species seem to be too stable for evolution to be a blind process. It still seems plausible to many that humans are part of the *telos* or direction of evolution and so, it is thought, Darwinists are wrong if they suppose themselves to have abolished final causes (a view with which a minority of Darwinists and many theistic evolutionists agree). Most recently, proponents of Intelligent Design (ID) argue that the natural text is not being given a fair reading because of the background assumption of methodological naturalism. Should nature have anything to say of the supernatural, this assumption serves as a gag order, producing a censored and mutilated text akin to Jefferson's Bible.

Intelligent Design raises red flags for some who see it as a return to the confusion of science and theology of which some of the natural theologians were guilty. Walter Thorson has developed this criticism with impressive sophistication, arguing on theological and methodological grounds that science proper is not in the business of detecting divine design.[52] Thorson agrees with ID that the mechanistic, reductionist paradigm of physics is unable to account for the "functional logic" of biochemical structures, and he agrees that it is natural and warranted by the objective facts for Christians who are scientists to infer a designing intelligence. However, Thorson argues that this inference is not a scientific but a theological one. First, Thorson rightly notes that a foundational requirement of science is that its findings be accessible to all competent investigators, regardless of their spiritual condition. Second, Thorson claims on scriptural grounds that "transcendence means that God and God's agency in creation cannot be subjected to scrutiny by the *unrepentant and autonomous* rational powers of humans."[53] Unregenerate humanity cannot "name" God in the sense of identifying who he is or what he is doing in creation.

In my view, Thorson's second claim is largely, but not entirely correct. Thorson is absolutely right that unregenerate humans cannot gain a *personal* knowledge of God by their own reason; this is clearly incompatible with salvation by grace alone. But at least the more careful ID

Science may detect altars to an unknown God.

Theology will proclaim who that God is.

proponents would point out that one can detect the marks of an *unknown* agency, just as the pagans of Acts 17 had an altar to an unknown God. What is more, this agency might not even be personal. It might be the impersonal logos of the stoics. That we can detect design without knowing the agent or its motives is clear from human cases. Ancient archaeological finds include artifacts whose maker and purpose no one can identify.

Secondly, I think Thorson goes too far in limiting natural knowledge of God. Paul's Epistle to the Romans surely implies that the reason the unbeliever is "without excuse" is that he does have *impersonal* knowledge of God. Paul writes:

> The wrath of God is being revealed from heaven against all the godlessness and wickedness of men who suppress the truth by their wickedness, since what may be known about God is plain to them, because God has made it plain to them. For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse (Rom. 1:18–20, NIV).

It is clear from these verses that the unbeliever does detect the *anonymous* agency of God; in other words, he can see the marks of God's agency and even the qualities of the agent, *without thereby attributing either of them to God*. It is not, as Thorson seems to claim, that these marks or qualities are *inaccessible* to the unbeliever, so that they violate the requirement that scientific evidence must be accessible to all competent investigators. The reason that the unbeliever continues to reject this knowledge is not cognitive but volitional impairment. Unbelieving scientists can access the marks of design, but their wills are opposed to interpreting it as evidence of a designer. If science is the search for objective knowledge, it should not be constrained by the fact that some wish to suppress that knowledge when it clearly, though anonymously, implicates the divine. Intelligent Design may or may not turn out to be fruitful for science. But so long as it only claims to detect anonymous design, I do not think it muddles the distinction between the scientific and theological hermeneutics, which Thorson so rightly insists on. Science may detect altars to an unknown God. Theology will proclaim who that God is.

While hermeneutics by itself does not resolve the controversies, it is helpful to understand the various positions as ultimately tracing to rival hermeneutics. In particular, many of the most important issues in the current debates on evolution and design hinge on alternative methods of harmonizing natural and revealed texts and on alternative assumptions concerning the authority of a text and what, in principle, it is allowed to say to us.

Conclusion

Science began when nature appeared to be intelligible—something one might read like a book. Tracking the transformation and diversification of the nature as a text metaphor provides a useful means of understanding the successes and failures of science. Science stagnates when a hermeneutic for the natural text encourages a dogmatic presumption (or anticipation) of nature's proper course, as occurred in the Middle Ages. It is therefore essential to distinguish an a priori theological hermeneutic from the a posteriori hermeneutic appropriate for science. Nonetheless, the scientific and theological hermeneutics are related.

A good scientific interpretation is one that allows nature to speak for itself and yet which is motivated by and connected to an overarching frame of meaning provided by revealed theology. Such a method of reading nature was essential to the birth of modern science, but there is no guarantee it will continue to prevail today. There are now many rival hermeneutics, and some of these, by detaching natural processes from their divine direction, provide fragmentary or incoherent readings.[54] A good way to assess the overall worth of a *perspective* (that is, a family of hermeneutics) on the relationship between science and religion is to examine its overall success in providing a full and integrated reading of the texts, and this means both Scripture and the book of nature. ✦

Acknowledgments

I am indebted to Walter Thorson for his acute and insightful comments, to an anony-

mous referee of this journal for many helpful suggestions, and to Ted Davis for advice about Robert Boyle. The mistakes that remain are all mine.

Notes

[1]Francis Bacon rejected the idea of final causes in science, seeing them as camouflaging our ignorance of the real causal explanation of the phenomena. See Lisa Jardine and Michael Silverthorne, eds., *The New Organon* (Cambridge: Cambridge University Press, 2000), Bk. 1, LXV and Bk. 2, II.

[2]Bacon's *The New Organon* contrasts the "true" method of science, which proceeds via a posteriori induction from particulars (the "Interpretation of Nature"), with the a prioristic analysis of nature according to preconceived intuitions of essences (the "Anticipation of Nature"), which was employed by Aristotelian scholasticism. See Bk. 1, XXVI–XXXIII, and Bk. 2 as an outline of the method of interpretation.

[3]See Dennett's *Darwin's Dangerous Idea* (New York: Touchstone, 1995), 212–20.

[4]No one has made this point more vigorously than historian and philosopher of science Stanley Jaki. He has further pointed out that impoverished conceptions of nature tend toward stagnation and "still-births" in science. For a recent statement, see Jaki's *The Savior of Science* (Grand Rapids, MI: Eerdmans, 2000).

[5]Since our ancestors were almost universally religious, a fruitful theology of nature was practically, if not logically, essential to the birth of science. While this view was typically rejected by Enlightenment thinkers, it is uncontroversial among contemporary historians of science. See, for example, Margaret Osler's recent collection, *Rethinking the Scientific Revolution* (Cambridge: Cambridge University Press, 2000), where important essays show the connections between theological ideas and the development of modern science. The general point is also well made in the first chapter of Pearcey and Thaxton's *The Soul of Science* (Wheaton, IL: Crossway Books, 1994).

[6]Timaeus 29a. See Edith Hamilton and Huntington Cairnes, eds., *Plato: Collected Dialogues* (Princeton, NJ: Princeton University Press, 1963), 1162.

[7]Timaeus, 30b, *Plato: Collected Dialogues*, 1163.

[8]Stanley Jaki, *Bible and Science* (Front Royal, VA: Christendom Press, 1996), 77.

[9]If indeed there was a scientific revolution, a matter of much recent dispute. See, for example, the exchange between the late Betty Jo Dobbs, who questions the aptness of the revolution metaphor in her essay "Newton as Final Cause and First Mover," and Richard S. Westfall, who defends it in his "The Scientific Revolution Reasserted," both in Margaret Osler, ed., *Rethinking the Scientific Revolution*.

[10]Physics, 194a, 28-30 in Richard McKeon, ed., *The Basic Works of Aristotle* (New York: Random House, 1941), 239.

[11]On the other hand, many Darwinists will be quick to dispute Aristotle's background essentialism about species. For example, Dennett argues that biological anti-essentialism is definitive of Darwinism (*Darwin's Dangerous Idea*, 35–9).

[12]Physics, 199a, 20-33, in *The Basic Works of Aristotle*, 250.

[13]Although Jaki is vigorous in his argument that alternatives to Christianity, both religious and secular, in fact, do not provide as fertile a soil for science. That is his main thesis in *The Savior of Science*.

[14]Ibid., 54–8.

[15]Ibid., 79–81.

[16]Ibid., 83.

[17]For example, Robert Koons argues that naturalism is inconsistent with the view that science is a reliable guide to ontology. See Koons' "The Incompatibility of Naturalism and Scientific Realism," in William Lane Craig and J. P. Moreland, eds., *Naturalism: A Critical Analysis* (London: RKP, 2000), 49–63. In the same volume, Michael Rea argues that naturalism cannot even justify its commitment to physical objects, because they have modal characteristics for which spatio-temporal instantiation naturalism cannot account. See Rea's "Naturalism and Material Objects," *Naturalism: A Critical Analysis*, 110–32.

[18]I develop this case at length in my forthcoming book, *Agents Under Fire: Materialism and the Rationality of Science*.

[19]For example, consider the foundational work of the Mertonian mathematicians on the kinematics of average velocity and Buridan's own impetus theory.

[20]Although it can and should be disputed whether these assumptions were doctrinally sound.

[21]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge: Cambridge University Press, 1998), 67.

[22]Ibid., 67–8.

[23]Ibid., 24–5.

[24]Ibid., 70.

[25]Susan Blackmore, *The Meme Machine* (New York: Oxford University Press, 1999), 61–2.

[26]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 82–92.

[27]Jaki, a devout Roman Catholic, has a more negative view of the Reformation, arguing that the literalism of Luther and Calvin is responsible for bibliolatry and the excesses of creationism. See his *Bible and Science*, 109–11.

[28]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 101.

[29]Peter Barker, "The Role of Religion in the Lutheran Response to Copernicus," in Margaret Osler, ed., *Rethinking the Scientific Revolution* (Cambridge: University Press, 2000), 62.

[30]Peter Barker, "The Role of Religion in the Lutheran Response to Copernicus," 62–72.

[31]Ibid., 84.

[32]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 162.

[33]Ibid., 170.

[34]Ibid., 171.

[35]Ibid., 175. The embedded quote is from Noël Pluche himself, *Spectacle de la Nature: or Nature Display'd*, 5th rev. and corrected ed., volume III (London: 1770), 318.

[36]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 172–6.

[37]See Pearcey and Thaxton, *The Soul of Science*, 88.

[38]Ibid., 87.

[39]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 177–82.

[40]Francis Bacon, *The New Organon*, Bk. I, XLVIII.

[41]Hobbes, *Leviathan* I.2 in Works, ed. William Molesworth (Aalen: Scientia, 1962) III, 3f.

[42]Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science*, 183.

[43]Ibid., 184.

[44]Here, I am reading "physical science" as equivalent to what Boyle called "natural philosophy."

[45]However, Boyle did not think that life had a mechanistic explanation. He does seem to have allowed final causes in biological science, as Ted Davis confirmed in private communication. See also Pearcey and Thaxton, *The Soul of Science*, 88.

[46]In particular it was divine final causes that led Boyle to expect material mechanisms to obey laws. Boyle did not think that matter would obey such laws if simply left to its own devices, unlike the deistic mechanists. Rather, the orderly behavior of matter depended on God's "general concourse" with the world. See Pearcey and Thaxton, *The Soul of Science*, 88.

[47]Francis Bacon, *The New Organon*, Bk. I, LXV.

[48]Kenneth Miller argues that the dichotomy between a nature in which God can intervene and a deistic nature is a false one, because he thinks there is a third alternative: "an active and present God ... can work his will ... in ways consistent with scientific materialism ..." [Kenneth Miller, *Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution* (New York:

HarperCollins, 1999), 217.] On this view God does not need to intervene in a special way (except for miracles) because he is always involved in shaping creation via the ordinary means of his laws.

[49]The hypothesis seemed to have the a posteriori support of the scientific hermeneutic as well as the a priori support of the theological hermeneutic.

[50]Undirected evolution has no fixed and final goal. Consequently there is no way to define an absolute metric for progress. The best one can do is talk of relative progress, progress in adapting to the currently operative fitness landscape, which may change tomorrow.

[51]If God is not omniscient, perhaps he does not know about some of the evil; if he is not omnipotent, perhaps he cannot prevent it; and if he is not holy, perhaps he does not want to do so. Such a being might be a god, but not the God of Abraham, Isaac and Jacob, and perhaps not one particularly worthy of worship.

[52]Walter R. Thorson, "Legitimacy and Scope of 'Naturalism' in Science," *Perspectives on Science and the Christian Faith* 54, no. 1 (March 2002): 2–21.

[53]Walter R. Thorson, "Thorson Replies ...," *Perspectives on Science and the Christian Faith* 54, no. 1 (March 2002): 42–46, 43.

[54]For example, I think Walter Thorson is right to follow Michael Polanyi in arguing that the functional logic of biochemical structures cannot properly be read through the mechanistic lens of classical physics.

Books Received and Available for Review

(Contact the book review editor if you would like to review one of these books. Choose alternate selections.) Richard Ruble, Book Review Editor, *Perspectives on Science and Christian Faith*, 212 Western Hills Drive, Siloam Springs, AR 72761. ruble@tcainternet.com

Denis Alexander, *Rebuilding the Matrix: Science and Faith in the 21st Century*, Zondervan, 500 pages, 2003

S. M. Barr, *Modern Physics and Ancient Faith*, Notre Dame Press, 328 pages, 2003

R. J. Berry, *God's Book of Works: The Nature and Theology of Nature*, Continuum, 286 pages, 2003

Robert Buckman, *Can We Be Good Without God? Biology, Behavior, and the Need to Believe*, Prometheus Books, 278 pages, 2002

John Cavanagh, ed., *Alternatives to Economic Globalization: A Better World Is Possible*, BK Publishers, 266 pages, 2002

W. J. Elliott, *A Place at the Table: A Journey to Rediscover the Real Jesus*, Doubleday, 420 pages, 2003

George A. Erickson, *Time Traveling With Science and the Saints*, Prometheus Books, 177 pages, 2003

Donald Fernie, *Setting Sail for the Universe: Astronomers and Their Discoveries*, Rutgers University Press, 200 pages, 2002

T. M. Georges, *Digital Soul: Intelligent Machines and Human Values*, Westview, 285 pages, 2003

Wayne Grady, *The Bone Museum: Travels in the Lost Worlds of Dinosaurs and Birds*, Four Walls Eight Windows Publishers, 291 pages, 2003

J. F. Haught, *Deeper Than Darwin: The Prospect for Religion in the Age of Evolution*, Westview, 230 pages, 2003

N. L. Herzfeld, *In Our Image: Artificial Intelligence and the Human Spirit*, Fortress Press, 135 pages, 2002

Gary Kiwalski, *Science and the Search for God*, Lantern Books, 186 pages, 2003

Paul Kurtz, ed., *Science and Religion: Are They Compatible?* Prometheus Books, 368 pages, 2003

Michael Lemonick, *Echo of the Big Bang*, Princeton Press, 213 pages, 2003

D. J. Lococo, *Towards a Theology of Science*, Novalis, 80 pages, 2002

David Magnus, et al, eds., *Who Owns Life?* Prometheus Books, 291 pages, 2002

Jack Nelson-Pallmeyer, *Is Religion Killing Us? Violence in the Bible and the Quran*, Trinity, 170 pages, 2003

William Nesbitt, *Illusion of Time: Seeing Scripture Through Science*, Black Forest Press, 180 pages, 2002

Mark Noll, *America's God: From Jonathan Edwards to Abraham Lincoln*, Oxford, 620 pages, 2002

G. H. Peber, *Animals: Their Past and Future*, Pneuma Books, 77 pages, 2003

G. R. Peterson, *Minding God: Theology and Cognitive Science*, Fortress Press, 250 pages, 2003

M. W. Perry, *The Pivot of Civilization in Historical Perspective: Eugenics*, Inkling Books, 278 pages, 2001

Susan Quinn, *Human Trials: Scientists, Investors, and Patients in the Quest for a Cure*, Perseus Publishing, 295 pages, 2001

Victor Shane, *Book of Life: God, Cosmos and Man: A New Understanding of Human Nature*, Para-Anchors International, 300 pages, 2003

David Toolan, *At Home in the Cosmos*, Orbis, 250 pages, 2001

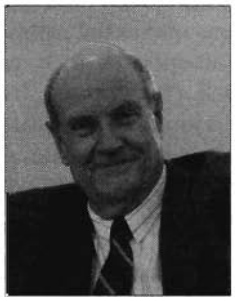
Cletus Wessels, *Jesus in the New Universe Story*, Orbis Press, 240 pages, 2003

Larry Witham, *By Design: Science and the Search for God*, Encounter Books, 200 pages, 2003

Hermeneutics for Reading the Book of Nature: A Response to Angus Menuge

Walter R. Thorson

This response discusses Menuge's paper and areas of mutual agreement and dispute regarding distinct hermeneutics for science and natural theology; claims for Intelligent Design belong to natural theology, not to science. Reasons for clearly separate hermeneutics in science and natural theology are given by contrasting Aristotle's modern and harmful influence with a different alternative for biological science.



Angus Menuge's paper "Interpreting the Book of Nature" discusses ideas of design in nature and their historical relation to science. As referee of an earlier version, I urged the author to relate his arguments to existing debate in *Perspectives on Science and Christian Faith (PSCF)* on naturalism and Intelligent Design (ID). Since many of Menuge's arguments bear on my tandem article in the March 2002 issue, I mentioned it as material to which he could establish clear connections. Menuge has responded cordially to this invitation, bringing his own philosophical "take" to it. His paper ends by discussing my arguments for naturalism, marking points of essential agreement—and some unresolved issues—in his own presentation.

That nature (like Scripture) is a book with a divine Author, and that Christians who are scientists should read it with this understanding, is foundational to the American Scientific Affiliation and to *PSCF* as its house journal. How we are to interpret this book, and relate such an understanding to the meaning and conduct of the scientific enterprise, underlies some watershed debates in the ASA's history.[1] Menuge has aptly chosen to discuss design in relation to science in terms of the *hermeneutic(s)* we choose (or use) to read the book of nature.

The Philosophical Tradition in Relation to Design and Scientific Enterprise

Menuge develops a philosopher's history of how people began to think about rational order in nature and *the part belief in, and concepts of, design played in sustaining such thinking*. While it has familiar elements, many of us would not trace this story in quite the same way. For example, the author sees Aristotle's influence on scientific thinking much more positively than many scientists would.[2]

In arguing for naturalism as a policy in science, Part I of my March 2002 article pointed out Robert Boyle's pioneering role in proposing the "mechanical philosophy": a naturalistic discourse clearly separated from theology in its presuppositions and terms of reference. Boyle argued for *two* quite distinct *hermeneutics* for reading the

Menuge and I both believe that the materialist world view informing most modern thinking about science ... likely will be unable to sustain scientific enterprise in the long run.

Walter R. Thorson *was professor of chemistry at the University of Alberta (1968–1994). A theoretical chemist, he applied quantum mechanics to small molecule dynamics and atomic collisions, and was elected a Fellow of the American Physical Society in 1987. He has a deep interest in the philosophy of science and related issues in theology, and is author of several articles on these topics in* PSCF *and elsewhere. He is an ASA Fellow, and was adjunct professor of philosophy of science at Regent College in Vancouver, BC for many years. Walter and his wife Mary now live near Sandpoint, Idaho. They have two children and four grandchildren. To contact Walter, mail correspondence to: PO Box 12, Kootenai, ID 83840 or email him at: wrmethorson@myyellowstone.net*

book of nature. One, the *limited* discourse of the mechanical philosophy, concerns itself with secondary and proximate causes of things, in particular their mechanisms, and is quite properly naturalistic. However, this is sustained and informed by a second, *broader* discourse in which the larger meaning of nature, its *telos* and/or final causes, is an important theme. This broader "reading" is concerned with philosophical ideas transcending the subject matter of science and its explanatory paradigms; for the Christian, it necessarily has *theological* terms of reference. Ideas of design or order in nature, for example, belong to this discourse and indirectly affect our thinking about science. Whether such ideas have meaningful *surrogate* representations within the naturalistic terms of reference for science is an open question, only resolved in scientific enterprise itself. (We may say, for example, that the notion of "laws of nature" in physical science, which has scientific meaning, is a naturalistic surrogate in science for essentially *theological* ideas of God's purposive and faithful sustaining of creation.)

Menuge's paper sketches how a multiple set of hermeneutics for reading the book of nature has emerged with the rise of modern science. He mostly concurs with my argument for naturalism in science: Naturalism *means* that in *scientific* discourse we deliberately refrain from introducing divine agency (or direct surrogates for it) into explanatory paradigms and subject matter. More fundamentally, we agree that the limited hermeneutic principles of science require support by a broader interpretive framework. Adequate hermeneutics for this broader reading may properly involve presuppositional beliefs about design, order, purpose, etc., which creatively inform scientific thinking. Hence *natural theology* is entirely legitimate. Menuge and I both believe that the *materialist* world view informing most modern thinking about science—particularly as manifest in dogmatic claims about evolutionary theory—likely will be unable to sustain scientific enterprise in the long run.

Design and Natural Theology

Menuge's paper deals with natural theology. I claim discussion of design properly belongs to that interpretive hermeneutic, and Menuge's general agreement with my arguments for naturalism in science mostly concedes this. Even where he disagrees (on whether evidence for an attenuated divine agency could be discerned scientifically), his arguments still concern natural theology—not how research might clearly demonstrate such evidence.

Menuge discusses implications of design in the world-picture given by modern *physical* science (the standard cosmological model and its "fine-tuning" aspects); but this too is natural theology.[3] The inference of design in the physical world is not *essential* to physical science itself, no matter how surprising are the "coincidences" we find in its physical parameters. The anthropic principle and similar arguments belong to natural theology, not to physics. That design plays no essential role in explanatory concepts of physical science, but belongs to natural theology, suggests to many of us a similar conclusion about ID in biology. This is reinforced by examining thematic concerns of many ID proponents.

Menuge's discussion suggests some discomfort with the emergence of distinct hermeneutics for science and natural theology—particularly where these appear to be rivals rather than mutually related. I believe the separation is healthy—and also theologically instructive.

Perhaps Menuge has not appreciated the real aims of my tandem article. I was not *only* "raising a red flag" about confusing science and natural theology. I further argued that a proper understanding of naturalism offers scope for new paradigms in science, which need not be limited to the *mechanistic* paradigms of physical science. While I agree with ID proponents that a materialistic world view fosters a sterile dogmatism in evolutionary theory, I have argued *against* ID as science. Instead, Part II of my article proposes that a *logic of function* offers a relevant naturalistic paradigm for biology.[4]

Reasons to Keep the Hermeneutics of Science and Natural Theology Separate

1. Aristotle's Baneful Influence. Medieval thinking about science was blocked by Aristotle's notion of the *Forms*, inherent *telos* or final cause determining the destiny of each thing in nature. Bacon and Boyle showed how to escape Aristotle's influence on physics; but for many Christians, Aristotle's view (suitably baptized) remains the determining truth for biology. Belief in the fixity of biological species may claim biblical authority in the characterizing phrase "*after its kind*" in Gen. 1:24-25—but this is *Aristotle's interpretation* of the text. For Aristotle, fixity of species provides the operative means by which a sovereign divine reason as final cause controls the world order. Medieval philosophy insisted "true" explanation of anything must link its essence/behavior to its necessary final cause or *telos*.[5] Other explanations (secondary causes/mechanisms) "*merely save the phenomena.*"

Since biosystems *do* manifest a kind of goal-directedness in their development and behavior, Boyle realized their proper explanation lay outside the limited competence of the mechanical philosophy—which could accommodate no concept of *telos* in its heuristic terms of reference. Even though he and his contemporaries saw that mechanism played some part in secondary causes, they believed a true understanding of living things necessarily entailed theological explanation. Menuge describes

how Darwin's claim that the variety and complexity of living things is the result of a purely *mechanistic* process challenged this tradition at its foundation and provoked major controversies.

But the biblical account of creation does not really support Aristotle's doctrine—or the fixity of biological species. For Genesis 1, the sovereignty of God is foundational; but the narrative *actually describes* an unfolding of God's generosity, expressed in an increasing freedom and potentiality given to creation. Divine blessings conferred on living creatures and then specially on humans are important clues. This unfolding leads to human beings in God's image—able to choose freely in personal relationships to each other and God. In Scripture, the challenge to divine sovereignty posed by creaturely freedom is only resolved by God's involvement in the contingency of creaturely suffering, with its evil and irrationality. It is *not* resolved by the intrinsic *control of destiny* which Aristotle's doctrine of the *forms* asserts.

As argued by many ID proponents, ID means God's agency is the effectual explanation for biological origins. If a *telos* is manifest in living things, it must be linked to divine agency. Mechanism has perhaps a limited part to play in the later development process, but ID has guaranteed the emergence of life as it is. Considered as *scientific explanation*, ID is far too closely tied to Aristotle. It preempts the possible *further meanings* to be discovered in living things.

2. A Creaturely *Telos*. Menuge mentions Kenneth Miller's belief that divine purpose and agency are expressed "in ways consistent with scientific materialism" (p. 97, note 48). Significantly, he does not debate Miller's thesis: If a mechanistic theory of biology *were* proved adequate, it would still be consistent with rational belief in divine purpose and agency.[6] I think Miller is mistaken in believing a purely mechanistic theory can explain biology, but this is a matter of *scientific* judgment.

However, there is another possibility: If (as Genesis describes) creation is an increasing development of creaturely liberty, a *creaturely* goal-directedness or embodied *telos* is just what we should find.[7] Even the most rudimentary biosystems manifest logical organization directed to certain (limited) achievements. As Part II of my article proposed, this logical organization according to function can be explored on its own terms—as an objective aspect of a naturalistic *science*; interpretation in terms of divine agency is not essential. By such a naturalistic study of creation in its own contingent terms of reference, we would only discern the embodied logic of creaturely things themselves, not their transcendent divine purpose or design.[8] This is characteristic of science.

While such a naturalistic enterprise necessarily remains open to the question of biological evolution, it does *not* intend to explain the *origins* of life, but only to understand the logical organization of biosystems as they *now* exist, develop and change. The mystery of life's origin may properly be left to natural theology,[9] at least for now. ✦

Notes

[1]For example, see Ronald L. Numbers, *The Creationists* (Berkeley, CA: University of California Press, 1992). Numbers discusses the history of active participation, in the ASA's earliest days in the 1940s and 50s, by recent-earth creationists and others who believed literal readings of Genesis could be supported from scientific evidence—and the eventual secession of these creationist movements and their adherents from the ASA after it became clear that under the influence of its pioneering leaders ASA's terms of reference were committed to the legitimacy of scientific evidence and scientific methods of inquiry.

[2]Of course, Aristotle's original classification of various notions of "cause" helps support the author's argument that design as a concept contributed foundationally to science.

[3]This is also true of every attempt I have seen by ID proponents to extend their argument for design to the findings of physical science.

[4]Daniel Dennett's notion of an *artifact hermeneutics* for biology (*Darwin's Dangerous Idea* [New York: Touchstone, 1995], 212–20.) tacitly acknowledges that such organization is evident in biosystems and may even offer some utility in forming explanatory paradigms—even though Dennett does not believe the organization is real. In this essentially postmodern way, Dennett rationalizes the inability of even *scientific* language about biology to avoid some notion of a limited *telos* manifest in organization/behavior of living things.

[5]T. F. Torrance, *Theology in Reconstruction* (London: SCM Press, 1965); reprinted in paperback (Grand Rapids, MI: Wm. B. Eerdmans & Co., 1975). Compare esp. section I, chapter 4 and some related discussion in other early chapters.

[6]Menuge has given some attention in his paper to theological problems posed by such an outcome. Such problems (and also their possible resolutions) are always entailed for natural theology by scientific discovery—and rightly so.

[7]Divine blessing to living creatures on the fifth day confers a limited freedom to innovate and fill the space given. In effect God is saying: *"Do your thing!"*

[8]Theologically, such a situation invites the idea that God's work of creation, like his work of redemption, may be seen as the expression of a self-giving, self-emptying love: that is, creation seen as *kenosis*. While this view poses some difficult questions, it deserves serious consideration. See John C. Polkinghorne, "God in Relation to Nature" in "The 1998 Witherspoon Lecture" (Princeton, NJ: Center of Theological Inquiry, 1998); cf. also Polkinghorne's essay in *The Work of Love: Creation as Kenosis*, J. C. Polkinghorne, ed. (Grand Rapids, MI: Wm. B. Eerdmans Publishing Co., 2001); and a few related comments by other contributors to that volume.

[9]Some proponents of ID who focus on the problem of life's origin (i.e. the origin of information in genetic material) provide a sound scientific criticism of the fallacies in all mechanistic theories to the present time; Stephen C. Meyer's negative critique of "chemical evolution" theories is particularly acute. I suggest that Meyer's proposal of design as the best logical inference to explain the problem of origins is a reasonable argument—in *natural theology*.

Indirectness and the Displacement Problem: A Reply to Walter Thorson

Angus J. L. Menuge

In Walter Thorson's response to my paper, he provides two additional arguments for his view that Intelligent Design belongs to natural theology, not science. He argues that (1) Intelligent Design makes a premature appeal to divine causes and that (2) this appeal is redundant in science. In response to his first argument, I argue that Thorson attributes to Intelligent Design an assumption about divine agency which it need not hold. In response to his second argument, I argue that the same inference that establishes creaturely telos *also points to divine design, and that limiting science to the creaturely falls afoul of Dembski's "displacement problem."*

I argue that one can defend divine design without incautious appeal to direct intervention [and] that legitimate scientific inferences are not closed under naturalistic consequences, even with the enriched notion of nature proposed by Thorson.

I agree with Walter Thorson that a purely mechanistic paradigm cannot account for the "functional logic" of living things, and that this motivates an enlarged conception of nature and a correspondingly more inclusive notion of natural science. However, Thorson sees this as an admission of "creaturely," not divine *telos*. Consequently, Thorson maintains that, insofar as it points to a divine designer, Intelligent Design (ID) remains part of natural theology, not natural science.

In defense of this conclusion, Thorson gives two main arguments. First, Thorson argues that Intelligent Design perpetuates "Aristotle's baneful influence,"[1] because it makes a premature appeal to a final divine cause, discouraging scientists from looking for "possible *further meanings*" in living things. Second, Thorson argues that because we can understand the creaturely *telos* "on its own terms,"[2] appeal to divine design is redundant in natural science.

I will try to show that a careful proponent of ID can handle both objections.[3] In reply to his first argument, I argue that one can defend divine design without incautious appeal to direct intervention. In reply to his second argument, I argue that legitimate scientific inferences are not closed under naturalistic consequences, even with the enriched notion of nature proposed by Thorson.

Indirect Divine Agency

The worry that premature appeal to divine design will inhibit scientific discovery is legitimate. However, an ID proponent can eschew the naive view of divine agency that creates this problem. Consider an analogy from Reformation theology. According to Luther, God continues his creative work through the vocations of human beings. While God could provide our daily bread *ex nihilo*, he typically works through the means of bakers, truck drivers, and store clerks.[4] Although God can create directly, he often chooses to use means. We should expect the same pattern when we investigate the world scientifically. God certainly can produce events directly (miracles). But he also can work through the laws of nature or by other means. It seems to me, however, that ID can grant all this, and that this has an important consequence: inferring that an effect is designed is not the same as inferring that the proximal cause of that effect is the designer, and so in no way discourages further examination of the cause.

This point is clear even with human design. Suppose that you are handed a piece of paper with a beautiful fractal pattern. Initially, you are tempted to suppose it sprang directly from the mind of an artist. Then you discern the telltale dots that evidence digital production, and you infer that it is a computer output. The computer is not an

intelligent designer. But the output still points to intelligent design. There is no known, unaided natural process that transfers fractal patterns onto paper in just this way. Since the proximal cause is a mindless computer, you realize that the intelligence lays further back, in the minds of computer programmers and users. But you are not discouraged from investigating how the computer generated the output.

Likewise, we should not simply cry, "Divine intervention!" upon discovery of biological systems that exhibit "complex specified information." We need not assume that the systems were created directly by God, and we should be interested both in their "functional logic," and their proximal causes. This, however, does not show that the design inference is unscientific. If a forensics expert infers that a bullet found in Madagascar was fired by a gun in Brooklyn, the inference is not undermined by the discovery that the bullet was mailed all over the world before arriving in Madagascar. Proponents of ID can agree on the importance of investigating the naturalistic chain of causes that resulted in a designed event. However, these causes are, at best, conduits of design, means of transmitting complex specified information. These conduits help to explain why such information is present at a particular time and place, but they no more explain the origin of that information than water pipes explain the origin of water.

The Design Inference and the Displacement Problem

Thus, in the human case, the fact that designers work through means neither undermines the design inference nor discourages the examination of those means. The claim of ID is that the same point holds in cases of supernatural design. As Del Ratzsch has argued, the logic is surprisingly straightforward.[5] There are certain things of which unaided nature is incapable, but which humans can do. When we discover such things, we infer that they are human artifacts, even if we do not know how or why they were manufactured. Suppose now that we discover marks of design that no human (or other natural being) could produce, such as ancient biological information or the fine structure constants of cosmology. It seems that we are using the same kind of inference in both cases; thus, if the former inference is scientific, so is the latter.

The point is very strong when the characteristic necessarily has no naturalistic explanation. For example, Robert Koons argues:

> By definition, the laws and fundamental structure of nature pervade nature. Anything that causes these laws to be simple, anything that imposes a consistent aesthetic upon them, must be supernatural.[6]

Why deny that inferences of this sort are scientific just because they do not happen to be closed under *naturalistic* consequences?

The point is strengthened by attending to Dembski's "Displacement Problem."[7] Dembski argues that naturalistic processes can shuffle complex specified information around but cannot create it *de novo*. Consequently, following the information trail through various conduits only displaces the problem of the information's origin.

Suppose now we consider the functional logic of a living structure. Thorson may be right that we can understand how the creature works synchronically "on its own terms," without considering its possible origin. However, there is also the diachronic question of the means by which such a structure was produced. This, too, is a legitimate scientific question. As we examine the chain of natural causes that terminate in the structure, suppose we discover that complex specified information is never generated, but only rearranged in various ways. Suppose further that we can show that no known naturalistic process can generate such information, while we do know that intelligent agents can produce it.[8] If there is no plausible natural candidate, why is it unscientific to *suggest* that the origin of this information is a supernatural being? The claim, of course, may be false, and it may be refuted by the discovery of some new natural process that does not merely displace the problem. But design inferences do not need to be saddled with theological finality. As putative scientific claims, design inferences lay themselves open to empirical refutation in just the same way as the claims of the naturalist. But if there is no naturalistic solution to the displacement problem, limiting ourselves to the creaturely would deprive science of discovering an important truth. ✦

Notes

[1]See "Aristotle's Baneful Influence," pp. 13–4.

[2]See "A Creaturely *Telos*," p. 14.

[3]I do not dispute that some proponents of design may be vulnerable to the objections Thorson makes. If so, however, this arises from their operating with an inadequate conception of divine agency, and is not essential to the Intelligent Design program.

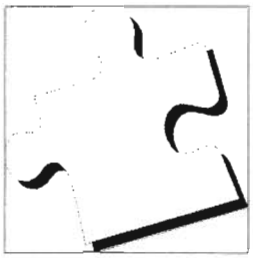
[4]See Gene Edward Veith, *God at Work: Your Christian Vocation in All of Life* (Wheaton, IL: Crossway Books, 2002), especially chaps. 1 and 2.

[5]Del Ratzsch, *Nature, Design and Science: The Status of Design in Natural Science* (Albany, NY: State University of New York Press, 2001). Ratzsch defends the legitimacy of inferring supernatural design; see especially chaps. 9 and 10.

[6]Robert Koons, "The Incompatibility of Naturalism and Scientific Naturalism," in William Lane Craig and J. P. Moreland, eds., *Naturalism: A Critical Analysis* (London: Routledge and Kegan Paul, 2000), 49–63, 55.

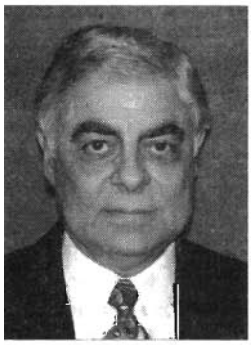
[7]William A. Dembski, *No Free Lunch: Why Specified Complexity Cannot be Purchased Without Intelligence* (Lanham, MD: Rowman and Littlefield, 2002), section 4.7.

[8]For example, we know that Shakespeare could produce the complex specified information in his sonnets.



What is the "Subtle Energy" in Energy Healing?

Lawrence E. Burkholder



Subtle energy is at the core of many modern alternative (holistic) healing therapies. Acupuncture, Therapeutic Touch (TT) and homeopathy are three popular modalities based in subtle energy ideology. Holistic theoreticians have combined the theory of vitalism – both eastern and western – with quantum speculation in forming modern energy ideology. This article's premise – that subtle energy is really the action of personal, demonic spirits – is explored with reference to mechanistic-scientific, holistic, and biblical-theological paradigms. On the one hand, energy healing fails the tests of the scientific-mechanistic paradigm. Conversely, leading holistic theorists acknowledge subtle energy as psi; and also clearly note the role of spirits in it. Biblical theology traces such "nature" forces to the Old Testament doctrine of chaoskampf *(conflict-with-chaos) – God's creational conflict with Satan. The New Testament disavows any use by Jesus of subtle energy, and warns against false demonic signs and wonders.*

[I contend] that subtle energy is really the action of personal, demonic spirits.

It is prime time for alternative medicine (energy healing). Many people in western societies are disenchanted with conventional medicine's invasiveness, cost, complexity, impersonality, chemical toxicity, technical focus and failures. As a result, increasing numbers of people are choosing a holistic option.

The New England Journal of Medicine reported in an early 1990s' survey that Americans went to providers of alternative therapies more that year than to conventional doctors (425 million visits compared to 388 million visits).[1] Depending on the country, between 30% and 70% of the Euro-American populations presently use some form of the 500-odd alternative or holistic treatments. Grassroots' testimonials, combined with explicit endorsements by some Christian health professionals, pastors, and other leaders,[2] indicate that increasing numbers of Christians are part of this phenomenal movement.

Lawrence E. Burkholder *is an independent writer currently preparing a book manuscript on the theology of deliverance healing. An ordained Mennonite minister, he holds graduate degrees from the University of Toronto (M.A.) and from Conrad Grebel College (M.T.S.). "My calling to write began when I won a Grade 8 essay contest complete with the $15.00 prize. However, being a '50s-era rural school, the complete roster of contestants was three!" Correspondence may be sent to him at: leb@globalserve.net*

The purpose of this article is to identify the energy source(s) in alternative healing. The holistic community is quite clear that such energy is "subtle energy,"[3] defined as, "A general term denoting energy that often exists outside the ordinary or positive space-time frame, i.e. magnetoelectric (ME) energy which moves faster than light."[4] In this model, a person typically is seen as a web of interlacing energy fields; sickness and wellness are measures of how these energies function within a universe which is itself a vast network of energy fields.[5] This is a modern version of the theory of vitalism, which may be defined as an essential, self-organizing, invisible teleological force that somehow permeates and gives structure to the material realm, including life.[6] This vital force can have deficiencies, excesses, or mis-patterning of its energy flows, and since wellness and sickness represent fluctuations in energy, the goal of vitalistic healing is to re-power or re-balance the energies.

Victorian era labels for vitalism included life force, physiological gradient, élan vital, biological energy, entelechy, and gestalten. Current descriptors include energy medicine, energy field healing, energetics, quantum energetics, quantum vitalism, vibrational healing, quantum healing, bio-energy intuitive meditation and others. The term coined

for this article, "Vital Energy Medicine" (VEM), effectively captures the various connections among the philosophy of vitalism, holistic energy theories, and medicine.

To narrow the focus, three popular therapies have been chosen. These are acupuncture, Therapeutic Touch ("TT," to be distinguished from massage, stroking, and hand-holding) and homeopathy. Each has deep historical roots as a healing modality[7] and, as we shall see, an unabashedly vitalistic theoretical foundation. Therefore, together they form a particularly valuable database to assess the nature of subtle energy.

It will become clear that subtle energy theory raises profound questions about the nature of God and creation, their interrelationships, and especially their energies and powers. Against the claims of VEM, I shall contend that subtle energy is not an energy at all, but is the operation of personal demonic beings within healers and clients. This conclusion follows from a sequential analysis of subtle energy's claims to be scientifically coherent, of its self-identification as a vitalistic/holistic philosophy and of the biblical view that "nature power" is demonic.

VEM and the Mechanistic-Scientific Paradigm

The mechanistic paradigm—whether Newtonian, Einsteinian or quantum—reduces reality to physical cause-and-effect phenomena. This reductionism is at once the paradigm's strength and weakness, offering great descriptive and predictive power for restricted data fields. It likewise carries an inability to deal with issues of uniqueness—the creation of the universe and life within it—and of metaphysical truth: the existence of God. Current research in information cosmology and anthropic design, which shows a universe of incredible complexity apparently designed for carbon life, underscores mechanistic science's limitations.[8]

The mechanistic paradigm brings these same strengths and weaknesses to its analysis of energy medicine. For example, consider a homeopathic substance which statistically has no active agent molecules left after repeated dilutions. If the preparation nonetheless appears to have at least occasional efficacy,[9] the explanations available to the mechanistic paradigm include: lack of observational data, the placebo effect, experimental bias, research incompetence, labeling (e.g., paranormal phenomena) or presently-obscure physical laws and processes.[10]

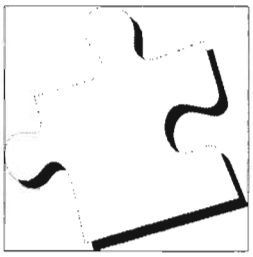
In evaluating VEM's efficacy, one notes first that up to 80% of ailments that doctors treat will self-heal with no treatment at all.[11] In addition, VEM may offer healing-enhancing psychological benefits such as sympathetic listening, stress reduction, love and respect for clients, and building the person's courage. But after these "soft" factors, is there scientific verification of energy healing claims? Though the evidence of the following nine research synopses at first seems affirmative, from a mechanistic perspective, the answer turns out to be "no."

Is there scientific verification of energy healing claims? Though the evidence ... at first seems affirmative, from a mechanistic perspective, the answer turns out to be "no."

Acupuncture: Dr. Barbara Apgar performed a 1999 meta-analysis of nine trials involving 377 patients with chronic back pain and what the author calls "a poor prognosis." The major finding was "that the combined results of the studies show acupuncture to be superior to various control interventions."[12] In a 1999 systematic literature review and meta-analysis presented to the Novartis Foundation by Adrian White of the University of Exeter (UK), he stated that there is "conclusive evidence" that acupuncture eases various pains, but that there is also "conclusive evidence" that it is no more effective than placebo in smoking cessation and weight loss.[13] The Yale University School of Medicine performed a controlled study of 82 persons with cocaine addiction who were also on methadone. The study, reported in 2000, stated that 53.8% of patients were cocaine-free during the last week of treatment compared to 23.5% in the acupuncture control group, and to 9.1% of the control group which watched relaxation videos.[14]

TT: Pioneer TT researcher Bernard Grad of McGill University reported results of clinical trials of laying-on-hands (LOH) by two healers in 1970. The trial tested the healer's ability to restrict goiter growth in mice; the hands never touched the mice, but only held the mice cage below and above. The conclusion was that goitre growth was significantly retarded by the LOH procedure.[15] A double-blind TT study done at JFK University found that surgically administered test wounds healed at a statistically significant faster rate with TT treatment than did nontreated wounds.[16] In 1997, Anna Easter, then a doctoral student at the University of Missouri, reviewed articles that reported on primary TT research in refereed professional journals. She chose nine as the best-researched trials, most of which claim to show the validity of TT.[17]

Homeopathy: J. Patterson and W. Boyd, "found the Schick test for diphtheria was changed from positive to negative by oral administration of alum-precipitated toxoid in a dilution of 10^{60}.[18] A 1997 meta-analysis of placebo-controlled homeopathic trials concluded that results "are not



Despite this combination of flawed clinical trials and a psi-echoing inability to meet replication criteria, mechanistic research continues in hot pursuit of VEM's [Vital Energy Medicine's] holy grail.

compatible with the hypothesis that the clinical effects of homoeopathy are completely due to placebo." The multi-university analysis reported 89 research trials which covered twenty-four clinical categories.[19] Morag A. Taylor, of the Glasgow Royal Infirmary, led a study, reported in August 2000, indicating that homeopathic remedies for allergic rhinitis gave a 21% improvement compared to 2% for placebos.[20]

Though these citations suggest that the three representative VEM therapies have some efficacy, they mask several problem areas. First, there has been a multiple selection process involving the reviews chosen for this tabulation, the studies which the citations excluded from their meta-analyses, and, of course, the original fashioning of the particular primary studies. The research quality difficulty is shown in Joseph Helms' search for reputable trials for his analysis of acupuncture; he was left with only ten out of a start-list of over 150.[21] In 1995 the World Health Organization published guidelines for clinical research in acupuncture,[22] acknowledging in diplomatic language the truth of Helm's assertion that "all acupuncture trials reported in the medical literature can potentially be criticized for flaws in design and execution."[23]

It is notoriously difficult to design acupuncture trials for several reasons. Trials must bridge western and eastern medical philosophies;[24] true double blind trials cannot be done;[25] sham needling is hard to define[26] and often is nearly as effective as real needling,[27] thus casting doubt on placebo controls;[28] and acupuncture more than occasionally works when a pin is stuck randomly in the body.[29] In addition, the alleged meridians, channels, and points do not correspond to the body's blood vessels, to the peripheral or autonomic nervous systems, or to the lymphatic or organ systems.[30]

The pattern holds for TT and homeopathy. Easter's nine "successful" TT trials were the survivors from a master list of thirty-seven which had been published in peer-reviewed journals.[31] Though it was not a formal meta-analysis, a literature search of information on TT by the University of Colorado during 1993–94 noted that "there is not a sufficient body of data, both in quantity and quality, to establish TT as a unique healing modality." This review—which included practitioners' and skeptics' observations—stated that "there is virtually no acceptable scientific evidence concerning the existence or nature of these energy fields. TT should remain on the curriculum, mainly for reasons of academic freedom."[32] As to homeopathy, K. Linde, et al. found that only 31% of studies in 105 publications were reported in a fashion that permitted re-evaluation of the data.[33] In 1996, an expert panel convened by the Commission of the European Communities examined 184 unpublished reports of controlled trials. Only seventeen were deemed qualified for consideration by the panel.[34]

Second, VEM trials are often unrepeatable. French biologist Jacques Benveniste's research with an anti-immune antibody solution illustrates the point. After four years of his own work, and duplications by labs in Israel, Italy, and Canada at *Nature* magazine's request, he published his results in 1988.[35] *Nature* printed an editorial disclaimer in the same issue entitled "When to believe the unbelievable." It warned that the results were unproven, that they contradicted 200 years of observations and that their application to homeopathy would be premature. This disclaimer was triggered by Benveniste's conclusion that the diluted anti-immune antibody was still effective even when statistically there was only distilled water present.[36] The dénouement came when skeptical observers went to his lab to observe further replications. Benveniste, who had replicated the original experiment seventy times himself, was unable to repeat it fully in their presence.[37]

In the same vein, Daniel T. Benor and Norman Shealy note that VEM does not meet replication criteria. Benor, who is a vigorous holistic apologist, calls the problem "vexing and serious"; he labels VEM as psi and regards its erratic replication as typical of such phenomena.[38] Shealy, citing Lawrence LeShan, writes that replication should be redefined to be a standardized procedure conducted under conditions most likely to produce the desired outcome phenomena, here meaning TT clairvoyance.[39]

Third, despite this combination of flawed clinical trials and a psi-echoing inability to meet replication criteria, mechanistic research continues in hot pursuit of VEM's holy grail. Acupuncture, for instance, em-

ploys a variety of exotic electrical and electromagnetic technologies. Helms lists SQUID (Super-conducting Quantum Interference Device), SLSEP (Short Latency Somatosensory Evoked Potentials), Kirlian photography (a procedure allegedly able to record the skin corona on a negative) and electrodiagnostic measurements with skin galvanometers.[40] The issue is complicated by the fact that acupuncture is claimed as a therapy for most branches of medicine,[41] yet it cannot be demonstrated to function primarily through any single system, whether neuromuscular, circulatory, neurohumoral, immune, or endocrine.[42] That is not all. Dr. Felix Mann has been called the leading western acupuncturist. From his perspective as a medical doctor who has practiced and taught acupuncture for forty years, he states that neither meridians nor points actually exist. They function merely as conceptualizations.[43] In the end, vitalists looking for mechanistic-scientific validation for acupuncture—like Stuart Hameroff of the University of Arizona—acknowledge that "... efforts to fully characterize its physical basis have been quite unsuccessful."[44]

Physical explanations of TT rely on healer-controlled inter- or intra-personal energy transfer of quantum and higher-dimensional energies.[45] In 1992 the Nurse Healers Professional Association claimed "[TT] is a consciously directed process of energy exchange ...,"[46] even though a person-to-person exchange has never been experimentally observed.[47] In any event, the mechanistic paradigm cannot accommodate the theory. One, the human will must—impossibly—control physical energies[48] of the magnitude of gravitation, the strong and weak nuclear forces, and electromagnetism. Two, the VEM postulation that subtle energy is faster-than-light vibrations[49] is contradicted by Einsteinian relativity.

The active agent is homeopathy's central theoretical problem, as the industry routinely markets solutions whose dilution can have no active molecule present. Homeopathy uses a labeling system based on either root 10 (using the Roman numeral "X") or root 100 (using the Roman numeral "C"). For example, a 30C (100^{30}) solution has a ratio of one part "active" drug to a distilled water carrier of 1 followed by 60 zeros. This product would require a container of solution more than 30 billion times the size of the earth for it to contain even one molecule of the ingredient.[50] Even more astounding, some functioning dilutions are 100,000C, that is, 1 followed by 200,000 zeros. These numbers explain Benveniste's hypothesis that the original active agent had left a memory of itself in the distilled water. The memory theory prompted speculation that it might be possible to encode memory information within an electromagnetic field in polarized water.[51] Thus the explanatory chain demands that the kinetic energy of homeopathic potentization (shaking, striking) transfer chemical information from molecules to electromagnetically charged polarized water.

The dosage issue would still be unresolved in such a physical energy conversion. The question is how infinitesimal amounts of a chemical agent can effect cures in light of the much larger drug dosages required for conventional allopathic medications to be effective. One argument is that the "Law of Similars"[52] shows how homeopathic medications function as a sort of vaccination process—except that the "Law" is based on symptom-correlation, not on biological causes of disease. On both statistical and biological grounds, therefore, an explanation for homeopathy must be sought outside of conventional scientific channels.

On both evidential and theoretical grounds, the mechanistic-scientific paradigm cannot identify subtle energy.

Thus physicist Bruce A. Robinson argues that science can come to only one conclusion about the hypothesized healing energy field. He says:

> It cannot be detected by any scientific instruments. If the field exists, then it is not formed from alpha, beta or gamma radiation, from electromagnetic radiation (radio waves) or from electrostatic, ultrasonic, gravitational or magnetic energy. It must be a totally new form of energy that is unknown to science and which bypasses all known sensors.[53]

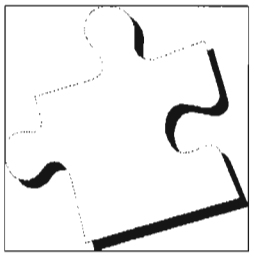
In summary, original acupuncture, Therapeutic Touch and homeopathy trials are often flawed; there are problems of trial repetition; and the theoretical scientific basis for each therapy is implausible or impossible. On both evidential and theoretical grounds, the mechanistic-scientific paradigm cannot identify subtle energy.

VEM and the Holistic Paradigm

Although the VEM therapies under consideration employ radically different methodologies, they are all vitalistic energy philosophies. This may be seen, first, in the explicit designations of the therapies as vitalistic, then in the peculiarities of subtle energy phenomena they produce, and finally in the relation of both of these to theories of the structures of creation. Each of these distinctives deserves due attention, beginning with the following philosophical definitions of VEM energies.

Acupuncture is rooted in Chinese Taoism "The Way."

> All things in the created universe arise from the *Tao*. And all things created in the universe are composed of the conflicting yet harmonious forces which are called *Yin* and *Yang*. When the physician considers any illness in the human being, he is looking for the imbalance between these forces and seeks to under-



stand where the life force, or the *Ch'i* or *Qi*, is deficient or overabundant.[54]

According to traditional Chinese medicine, the life force *Qi* is at the very heart of acupuncture.

> ... acupuncture depends entirely on the flow of *Qi*. The acupuncturist senses and directs *Qi* through the needle ... Without *Qi* there is no Chinese medicine. Without an understanding of *Qi*, Western medicine, with all its powerful science, will remain ignorant of the single greatest gift of Chinese medicine.[55]

VEM's central contention [is] that there is an unbroken continuum between the instrumentally-visible physical energies and the instrumentally-invisible subtle energies.

Next, consider TT's blend of Indian Hinduism ...

> From the perspective of this philosophy [i.e. Indian], TT is primarily concerned with the use of *prana*, which is difficult to translate and define in Western culture, but may be seen simply as the vigour and vitality of the body and all the underlying processes, such as growth, breathing, and healing. In a healthy individual, *prana* is abundant, while a lack of *prana* is the corollary of a disease.[56]

with quantum[57] physics.

> The Therapeutic Touch Network (Ontario) believes that the technique ... involves a transition from the mechanistic Newtonian model to the acceptance of the Einstein paradigm of a complex, yet interconnected, energetic field-like universe.[58]

Homeopathy's pedigree can be traced from Hippocrates through medieval alchemy, Renaissance natural magic, and eighteenth century vitalistic medical schools. In his first article on homeopathy published around 1796, German systematizer Samuel Hahnemann acknowledged the vitalistic principle.[59] He wrote:

> Incredibly great are the resources of the spirit-like vital principle imparted to man by the infinitely benevolent Creator, if we physicians did but know how to keep it right in days of health ... and in diseases to summon it forth and stimulate it up to the proper mark by pure homoeopathic treatment ... The spirit of the drug acts on the spirit in man.[60]

This modern description reiterates the spirit-nature of homeopathy's action.

> Practitioners believe that the body, not a drug, fights the disease. A person's inherent vital force is stimulated to restore balance and bring about rapid yet gentle relief of the particular illness ...[61]

How are vitalistic subtle energies perceived by the human senses? Here are some personal accounts.

- One nurse says that she "gets odd vibrations from the tips of her fingers up to her elbows when she touches the surface of the body over a diseased organ or tissue."[62]
- Another, a nursing professor, says: "I feel it as a thermal thing," noting that "areas of low energy are warmer to her hand."[63]
- A counselor who works with auras agrees. He says: "I can feel the fragments of [my client's] energy on the palms of my hands." He uses this ability to "heal" gaps in patients' post-surgery auras in order to fight infection and relapse.[64]
- Barbara Brennan reports: "[Through clairvoyance] the acupuncture points look like little vortexes of energy or tiny chakras. An imbalanced acupuncture point will have energy squirting out of it, or it will feel like a tiny whirlpool that sucks energy in."[65]
- "Frequencies associated with chakra colors and tones," says Victoria Slater, "are not the same as frequencies of visible light and audible sound ... If they were, everyone with normal vision and hearing would see and hear them."[66]

These VEM phenomena—heat, electricity or tingling sensations, clairvoyant visions, intuitive knowledge and so on—substantiate Benor's equation of holistic healing with psi and the paranormal phenomena traditionally associated with psychic healing.

These anecdotal data highlight VEM's central contention that there is an unbroken continuum between the instrumentally-visible physical energies and the instrumentally-invisible subtle energies.[67] Gary Zukav writes in his *New York Times* best-seller, *The Seat of the Soul*:

> You are a system of Light, as are all beings. The frequency of your Light depends upon your consciousness ...

> The continuum of nonphysical Light extends below and above, so to speak, the frequency range in which the human exists.[68]

He makes it clear that "Light" is not mere metaphor; that physical light is seen via the five senses, but soul light operates at a deeper/higher level. This is illustrated also by Andrew Weil, director of the Program in Integrative Medicine at the University of Arizona, and a clinical professor of internal medicine. He refers to the physical energies of X-rays, CAT scans, radiation treatments, electrical nerve stimulation, magnets, heat, light, and sound. Then he speculates that scientific study might determine how subtle energy functions, identifying it as, "the kinds of energy that are found in ancient healing traditions such as acupuncture, tai chi, and qi gong, as well as homeopathy and the energy produced by energy healers."[69]

Quantum holistic thinkers hypothesize the quantum level as the frontier between material energies and subtle energy. Slater, who is a TT practitioner and doctoral-level theorist, illustrates this with quantum electromagnetic (EM) healing. She states:

> Infusions of [subtle] energy permit information-carrying EM waves to change. Changes of information, both physical and emotional, at a person's quantum and EM core changes the person. Physical and emotional healing happens in an instant—when the information underlying the wound is altered.[70]

Even so, VEM theoreticians, including Slater, admit that subtle energy has only ever been detected through psychic means like clairvoyance, but never by instruments.[71]

In VEM anthropology, quantum energy is the basement of a multi-storied house consisting of quantum energy, subatomic particles, atoms, organic submolecules, DNA, cells, tissue, organs, and system.[72] This sequence is the launchpad for claims that quantum-level energy manipulation is able to heal human diseases which, in the end, are problems down in the basement of a deficit, surplus, or mispatterning of quantum energy. The level below—or above, if the conceptual model is the theosophic seven-layer body—is where subtle energy begins.

Physicists, however, offer several trenchant category criticisms of the quantum argument: (1) quantum physics is not a complete description of reality but a statistical means of gaining information about systems; (2) it cannot account for biological reproduction; (3) quantum physics works for classes of elementary particles but not for living organisms where individuality arises; and (4) this uniqueness demands organizing laws which cannot be derived from the laws of quantum physics but which do not contradict them.[73] This mechanistic rebuttal parallels remarks from transpersonal psychologist Ken Wilber, who agrees that holists are committing a category error. According to Wilber, quantum physics' vaunted interpenetrability of fields is a mere one-dimensional experience of its own level. "What relationship," he asks, "does ionic plasma have with, say, egoic goals and drives?"[74]

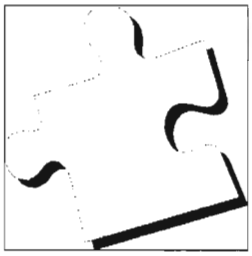
Fritjof Capra's answer comes from a mystical vision on the beach in California. He says: "I 'saw' the atoms of the elements and those of my body participating in this cosmic dance of energy ... I *knew* that this was the Dance of Shiva, the Lord of Dancers worshipped by the Hindus."[75]

VEM's fascination with quantum physics is not scientific but metaphysical ... VEM supposes that subtle energies devolve from a higher dimension to the physical realm.

As Capra's vision shows, VEM's fascination with quantum physics is not scientific but metaphysical. Philosophically, VEM is monistic and fits within a framework variously called "The Great Chain of Being,"[76] the "Perennial Philosophy,"[77] and "The Primitive Tradition."[78] Whatever the label, the system is the venerable gnostic scheme in which a series of levels of being have emanated from the Absolute—the completely "other," the ineffable One—to the human. The tally of levels does not matter. Huston Smith, depending on the Neoplatonic tradition, has four;[79] Ken Wilber lists six, five of which he correlates to Hindu and Buddhist categories.[80] (By comparison, a leading Gnostic, Basilides, had 365).[81] The point is that VEM supposes that subtle energies devolve from a higher dimension to the physical realm.

Earlier, various healers' anecdotal data gave a snapshot picture of subtle energy in action without trying to define it further. In the context of the gnostic structure of creation which VEM turns out to have, what does "subtle realm" mean? Wilber writes:

> Beyond mind, according to Hinduism, is the *vijnanamayakosa* (what Buddhists call *manas*). This is a very high form of mind, so high, in fact, that it is better to refer to it by a different name—the most common being "the subtle realm." The subtle is said to include archetypal processes, high-order insights and visions, ecstatic intuition, an extraordinary clarity of awareness, an open ground consciousness that reaches far beyond the ordinary ego, mind, and body.[82]



If ... subtle energy is really demonic manifestation, then a connection must exist between the demonic and the structures of creation. Scripture establishes this link with the interlocking theologies of creation and chaoskampf *(conflict-with-chaos).*

This definition is extremely elastic. In its archetypal usage, for instance, the subtle realm might mean Rupert Sheldrake's morphogenetic forms, his variation of "Plato's ideal, the alchemists' *prima materia* and Jung's collective unconscious."[83] Sheldrake proposes that the human body receives its pattern and sustenance through feedback loops which connect the subtle and physical realms. Second, Wilber defines the subtle realm as the place of "high-order insights and visions, ecstatic intuition, an extraordinary clarity of awareness, an open ground consciousness." This is a partial listing of paranormal psi phenomena, which in VEM includes clairvoyance, clairsentience, retrocognition, and precognition, as well as various other psychic healing abilities. The holistic paradigm sees paranormal abilities as the "normal behaviour of some very sound, serious, and creative people."[84]

Finally, moving beyond Wilber's definition, VEM defines subtle energy as disincarnate spirits.[85] Carolyn Myss, a close Shealy associate, candidly links her healing power to cosmic spiritual presences. She describes the first time a being came and gave healing help. "Suddenly I was flushed with an energy I had never felt before. It moved through my body, as if it were pushing me aside in order to make use of my vocal cords ... A voice spoke through me to the woman ..."[86] The voice took the client back through a lifetime of memories of injury, trauma, and the like. Myss' experience is echoed by many others who also refer to the healing help given by "spirit guides," "daimons," "disincarnate spirits," and so forth.[87]

A recap of subtle energy findings yields the following: that anecdotal and clinical evidence indicate that acupuncture, Therapeutic Touch, and homeopathy work occasionally; that these therapies fail the tests of mechanistic science because of selective and flawed trials, and theoretical implausibilities or impossibilities; that holistic theory sees creation as structured with higher-level subtle energies which flow into lower emanations to produce healing; that the subtle energy of alternative healing therapies is functionally equivalent to psi phenomena; and that subtle energy/psi phenomena are empowered by personal spirit beings.

VEM and Biblical Theology

In this section, I will examine spirit-empowered VEM healing from the stance of biblical theology. If, as I am arguing, subtle energy is really demonic manifestation, then a connection must exist between the demonic and the structures of creation. Scripture establishes this link with the interlocking theologies of creation and *chaoskampf* (conflict-with-chaos).

In biblical theology, creation begins, not with what or how as in mechanistic science, or with holistic philosophy's Absolute, but with whom. God is a person and through the pre-existent Word, Jesus Christ, has created all things (John 1:3; Col. 1:16) by direct *fiat*, which he upholds "by his powerful word" (Heb. 1:3). Through a series of six or so creation typologies,[88] Scripture repeatedly calls attention to God's awesomeness as kingly Creator. For example, God as Author of an ordered creation may be seen in Ps. 95:3–4, "For the Lord is a great God and a great king above all gods. In his hands are the depths of the earth; the heights of the mountains are his also," or Ps. 99:1, "The Lord is king; let the people tremble! He sits enthroned upon the cherubim; let the earth quake."

God's directly spoken word also creates humans. When Paul addresses the Athenian philosophers—themselves well aware of emanationist thought—he specifically says that "The Lord of heaven ... himself gives to all mortals life and breath ... in him we live and move and have our being" (Acts 17:24, 25, 28). Paul's words reflect Genesis' statements that peoples' bodies are from dust, *adhamah* (Gen. 2:7). The soul, *nephesh*, is directly inbreathed by God; and a 120-year maximum life-span results when God withdraws his spirit, *yadon* (Gen. 6:3). All of this mirrors the God-human, subject-object construct which ontologically separates God from the whole of creation. Biblical theology anathematizes holism's theory of multiple correspondences which, in any one person, devolve from the Divine Energy Source through spiritual, soul, mental, astral, etheric, and physical bodies.[89]

Nonetheless, God's kingship over the good creation has been met with resistance, a situation which is reflected in the *chaoskampf* typology in Scripture.[90] Various biblical creation stories allude to the mythological Canaanite monsters Tiamat, Leviathan

(Seven-Headed Serpent), Yamm (Raging Seas), Rahab (Storm) and Behemoth. They show that creation was and is a battleground where God alone proves to be the warrior powerful enough to subdue the chaos and its inhabitants, and to preserve order.[91] Consider some examples whose chronology ranges from creation to "that day":

- [God] who alone stretched out the heavens and trampled the waves of the Sea, who made the Bear and Orion, the Pleiades and the chambers of the south; ... God will not turn back his anger; the helpers of Rahab bowed before him ... (Job 9:8, 9, 13).
- Who among the heavenly beings is like the Lord, a God feared in the council of the holy ones ... who is mighty as you, O Lord? Your faithfulness surrounds you. You rule the raging of the sea; when its waves rise, you still them. You crushed Rahab like a carcass (Ps. 89:6, 7, 9, 10).
- Look at Behemoth ... It is the first of the great acts of God—only its Maker can approach it with the sword (Job 40:15, 19).
- You divided the sea by your might; you broke the heads of the dragons in the waters. You crushed the heads of Leviathan (Ps. 74:13–14).
- On that day the Lord with his cruel and great and strong sword will punish Leviathan the fleeing serpent, Leviathan the twisting serpent, and he will kill the dragon that is in the sea (Isa. 27:1).

Such texts have affinities to the near eastern *chaoskampf* motif, wherein a sea monster obstructs the pre-creation waters,[92] is overcome by a heroic god who releases the waters, and then regulates what has been made.[93] Whether *tohu wabohu* ("without form and void") and *tehom* ("deep") in Gen. 1:2 imply a pre-creation angelic revolt,[94] or refer to the unformed primordial material of creation which comes to harbor creaturely resistance later, or mean that the earth was a wasteland unfit for human habitation,[95] does not matter here. Chaos represents both opposition to God's will[96] and the state of affairs whenever God's sustaining word is withdrawn.

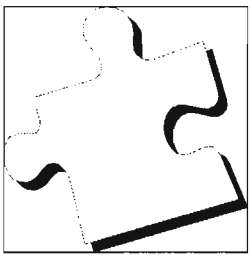
Thus *chaoskampf* functions as a recurring framework to illustrate how God continues to confront the hidden forces which threaten human well-being. Isaiah 45:18–19 states that God did not create the earth formless and void. In fact, the following prohibition—that Jacob not seek God in chaos—carries the implication that chaos is the realm of demonic operations.[97] The chaos-demon linkage is direct in Isa. 34:8–17, where Edom's judgment is marked by pitch, sulphur, everlasting smoke, and unending wasteland. In this context, several demonic animals, including Lilith, the night hag or satyr, take up residence in the chaos (*tohu wabohu*). Edom's disaster also threatens Jerusalem; Isaiah visualizes a time "when the city of chaos is broken down" (Isa. 24:10). After Jerusalem's destruction and Israel's exile, Jeremiah couches his report in chaos language, "I looked on the earth, and lo, it was waste and void; and to the heavens, and they had no light" (Jer. 4:23). And when Israel languishes in exile, chaos reappears (Jer. 51:9–11) as a three-layered reference to the destruction of Rahab at creation, the defeat of Rahab at the crossing of the Sea, and as God's promise of restoration from the [implied] Rahab of Babylon in the future.

Though Rahab, Leviathan, Behemoth, Tiamat, and Yamm are true opponents of God, they are strictly limited. When their corporate identity is conjoined as ha-satan, the adversary Satan ..., he is not an inherent part of God ... [nor] is his opposition radical Manichean dualism, for there is no eternal nor equal competitor to God.

In continuity with these texts, Herbert G. May argues that the *mayim rabbim* ("many waters," RSV) of Hab. 3:13–15 illustrate Yahweh's conquest of Leviathan and Rahab in dualistic terms. May writes:

> There is a suggestion of a cosmic dualism, for there continues throughout history the kind of conflict which is posited at creation when Yahweh's wind blew over the watery abyss, or at the time when, in the distant past, Yahweh slew the dragon Leviathan or Rahab, or conquered the rivers and the sea. In this sense, Yahweh's conquest over the enemies of Israel, whether at the Red Sea, or in the present, or at the beginning of the new age (cf. Isa. 27:1) is a victory over cosmic evil and wickedness, over the demonic, or more properly the dragonic.[98]

It is crucial to clarify this dualism from the point of view of biblical theology and VEM. Though Rahab, Leviathan, Behemoth, Tiamat, and Yamm are true opponents of God, they are strictly limited. When their corporate identity is conjoined as *ha-satan*, the adversary Satan (Job 1:6; Rev. 12:9; 20:2–3), he is not an inherent part of God (Jesus' elder brother) as in C. G. Jung's monistic quaternity.[99] On the other hand, neither is his opposition radical Manichean dualism, for there is no eternal nor equal competitor to God. Satan is very much a created being whose opposition demands policing. Scripture uses enforcement terms like "piercing Leviathan's nose," "damning the raging Seas," and "cutting Rahab's helpers to pieces." Other texts simply state that angels left their proper stations and were severely punished by God (Gen. 6:1–4; 2 Pet. 2:4;



Biblical theology rejects all benign and impersonal emanationism, and teaches the existence of a definite moral/ spiritual dualism within creation, complete with hierarchies of personal evil powers with whom God still contends. ... Today, these ancient nature demons manifest in part as subtle energy healing.

Jude 6). These data underscore that Satan's opposition to God's creational purposes are a consequence of God's self-limitation, the necessary result of granting demons freedom to rebel (cf. God's creational self-limitation with Jesus' salvational *kenosis*, i.e. self-emptying, in Phil. 2:6–8).

Accordingly, the meaning of *chaoskampf* is unavoidable. Biblical theology rejects all benign and impersonal emanationism, and teaches the existence of a definite moral/ spiritual dualism within creation, complete with hierarchies of personal evil powers with whom God still contends. In Judeo-Christian sources, these foes of God appear as Old Testament Canaanite nature deities,[100] cosmic spirits of divination and astrology,[101] as disease-causing demons in Intertestamental literature,[102] as the spirits of illness which Jesus cast out,[103] and as the principalities and powers in the pastoral epistles.[104] Today, these ancient nature demons manifest in part as subtle energy healing.

This generalized relationship between *chaoskampf* and subtle energy may be refined and amplified by reference to several New Testament healing data, beginning with Jesus' stilling of the storm on his way to heal the Gadarene demoniac (Mk. 4:35–41). The structure of the passage leaves little doubt that the chaos of the sea and the deep first encountered in Gen. 1:2–3 has deployed the storm against Jesus' ministry. Consequently, this powerful Satanic opposition to Jesus' healing mission recapitulates God's combat with Leviathan from of old. William Lane, quoting P. Reymond, observes that the sea is rebelling against its lord, *kurios*, and that the account "must be understood with all its cosmic overtones."[105] Lane himself states that Jesus' order to the wind employs the same verb as when he rebukes demons in three other Markan [healing] texts.

A directly-related question has to do with the nature of Jesus' power. The VEM community asserts that Jesus used subtle energy, labeled as *dunamis*, (power) in his healing miracles.[106] The meaning which holistic theorists attribute to *dunamis* is borrowed from Egyptian thought transmitted via pre-Christian Greek philosophers like Poseidonius. In these cases, it did mean "cosmic principle," and as W. Grundmann remarks, this ancient system stands for "dunamistic and manistic [preternatural] ideas."[107] But this is not the meaning of Jesus' exercise of *dunamis*. There is no hint of an innate vital force or cosmic principle empowering Jesus' healings; to the contrary, it is significant that the healing miracles were manifest only after his baptism in the Holy Spirit and his wilderness refusal to worship Satan. On the one hand, Jesus' healings were direct functions of Holy Spirit empowerment and on the other of explicit rejection of the subtle-energy powers which are rooted in Satan and chaos. Thus Jesus' healings were signs, not of a universally-accessible subtle power flowing through all people, but of the continuation of God's battle with the demonic beings who inhabit chaos. Constantine Sarantis says:

> ... one common theme that runs through most of the miracles of Jesus is the theme of conflict. Jesus refers to his own miracles as "works," and they are intended to recapture nature from the hostile powers of evil, sickness, and fragmentation. In the miracles of Jesus, God restores order and wholeness to his creation.[108]

Thirdly, subtle energy healing is a prime vehicle of Satan's deception of humankind. Consider Matt. 7:21–23, where at the last day "many will say to [Jesus]" that they have prophesied, exorcized and done powerful deeds in his name. In Luke's parallel (13:26), the spiritually-deceived claim to have eaten and drunk with Jesus while he taught in their streets. In each case, Jesus' answer will be, "I never knew you; go away from me, you evildoers." This can only be if the "many" are unaware that the name upon which they called is not truly Jesus of Nazareth but an impostor. This is borne out in Matt. 24:24, where Jesus warns of false messiahs and false prophets who will produce great signs and omens designed "to lead astray, if possible, even the elect." Paul also, in the direst language, warns against an impersonator in 2 Thess. 2:4. The Lawless One will exalt himself and take his seat in the temple of God, that is, in the human soul itself, "declaring himself to be God." It is this same one, Satan, who in 2 Thess. 2:9 performs "power, signs, lying wonders, and every kind of wicked deception for those who are perishing."

VEM's vulnerability to and promulgation of deception must not be underestimated.

When it uncritically welcomes spirit guides who come as the Christ light, or equally deviously, as spirits who claim the name "Jesus,"[109] VEM is, as 2 Cor. 11:4 says, in contact with "another Jesus." Satan's duplicitous and malicious use of subtle energy ideology is exposed by the fact that prayer in the name of the crucified and raised Jesus of Nazareth[110] actually deactivates energy healers' abilities.[111] VEM operates through the practitioner and user as demonically-empowered psi, a conclusion fully consistent with VEM's open reliance on disincarnate power spirits.

At the end of the day, Vital Energy Medicine has fatal philosophical, scientific, and theological views rooted in erroneous premises about God and creation, and their relationships. Mechanistic science's assessment of these therapies will always be inconclusive, since the basic operation of VEM is preternatural. For its part, the holistic community stands in the tradition of Neoplatonic and gnostic world views, with a dash of pre-Renaissance natural magic thrown in for good measure. Theologically, Vital Energy Medicine has exchanged the worship of the Creator for that of the creation, and is therefore under God's condemnation. ✦

Notes

[1]David Eisenberg, et al., "Unconventional Medicine in the United States," *New England Journal of Medicine* 328 (January 28, 1993): 246.

[2]John Miller represents a relatively early pastoral endorsement of modern alternative healing with his article, "The Pastorate and New Age Healing," *Pastoral Psychology* 27 (Winter 1978): 91–104. He argues that in continuity with Jesus the Great Physician, pastors ought to familiarize themselves with some of the new healing techniques: yoga, reflexology, Silva Mind Control, Sufi, TM, astrology, rolfing, health food theory, hand-writing analysis, numerology, tarot cards and psychic healing (p. 93). A current pastoral/professional endorsement of alternative modalities is found in the Continuing Education programme of the Toronto School of Theology. The Spring 2001 roster of courses offers "Learning How To 'Do' Spiritual Healing" under the direction of Don Evans, Emeritus Professor of Philosophy at the University of Toronto and a minister in the United Church of Canada. Evans connects the early Christian practices of healing with modern Reiki, Therapeutic Touch and meditation, which is defined to include "working with nature's energies, self-healing and welcoming spiritual presences in both heaven and earth."

[3]In western thought, the term "subtle energy" is only the most recent of many attempts to coin a descriptive label. Starting with Mesmer's "animal magnetism," Ted Kaptchuk lists several earlier tags: "psychic force," "parapsychology," "psi phenomena," "psionic energy," "auric or astral force," and now "subtle energy." Cf. Kaptchuk, "Historical Context of the Concept of Vitalism in Complementary and Alternative Medicine," in Marc S. Micozzi, *Fundamentals of Complementary and Alternative Medicine* (New York: Churchill Livingstone Inc., 1996), 37–8. Nonetheless, Kaptchuk's list is incomplete; see John White and Stanley Krippner, eds. *Future Science: Life Energies and the Physics of Paranormal Phenomena* (New York: Anchor Books, 1977), 551–5, for some 95 worldwide terms, of which more than fifty are western.

[4]Richard Gerber, *Vibrational Medicine: New Choices for Healing Ourselves* (Santa Fe: Beast Co., 1988), 541; cf. also Gary Zukav, *The Seat of the Soul* (New York: Simon and Schuster, 1990), 100; Victoria E. Slater, "Toward an Understanding of Energetic Healing, Part I: Energetic Structures: The Quantum Field and Chaos Theory," *Journal of Holistic Nursing* 13, no. 3 (September 1995); EBSCO Host; Database: Health Source Plus; Item Number: 9509144582; Oct. 15, 2000: Internet p. 4.

[5]Barbara Ann Brennan, *Hands of Light: A Guide to Healing Through the Human Energy Field* (New York: Bantam Books, 1988), 21–5.

[6]Embryologist Hans Driesch (1867–1941) adapted Aristotle's term "entelechy" to describe a separate patterning entity "acting on the physical system without being a part of it." Cited in Frithoj Capra, *The Web of Life: A New Scientific Understanding of Living Systems* (New York: Anchor Books, 1996), 26. Cf. also Paul Davies, *The Cosmic Blueprint* (New York: Touchstone, 1988), 96–7.

[7]Daniel T. Benor, *Healing Research Volume One: Holistic Energy Medicine and Spirituality* (München: Helix, 1992), 19–20, notes a description of TT on an Egyptian papyrus ca. 1550 BCE. Cf. Whitall N. Perry, "The Alchemy in Homoeopathy," *Studies in Comparative Religion* 16, nos. 1–2 (Winter/Spring 1984): 24, for reference to Hippocrates' principle that "Through the like, disease is produced, and through the application of the like, it is cured." Many treatises date acupuncture at around 2500 BCE.

[8]Davies, *The Cosmic Blueprint*, in chap. 7, "Life: Its Nature," 93–106, and on pp. 163–4, discusses the strong anthropic principle.

[9]J. Benveniste, et al., "Human Basophil Degranulation Triggered by Very Dilute Antiserum Against IgE," *Nature* 333, no. 6176 (June 30, 1988): 818.

[10]Stanislav Grof in *Beyond the Brain: Birth, Death, and Transcendence in Psychotherapy* (Albany, NY: State University of New York, 58) illustrates the point with mechanistic science's reliance on the stochastic interpretations (hidden variables) used by physicists wrestling with quantum probabilities.

[11]Elizabeth Hillstrom, *Testing the Spirits* (Downers Grove, IL: InterVarsity Press, 1995), 166.

[12]Barbara Apgar, "Acupuncture for Treatment of Back Pain: A Meta-Analysis," *American Family Physician* 59, issue 7 (April 1, 1999); EBSCO Host; Database: Health Source Plus; Item Number 1754641: 1989.

[13]Sara Abdulla, "Jury Still out on Aspects of Acupuncture," *Lancet* 351, issue 9107 (March 28, 1998) 962.

[14]"Study Supports Use of Acupuncture as Part of Cocaine Treatment Protocol," *Alcoholism & Drug Abuse Weekly* 12, issue 33 (August 21, 2000); EBSCO Host; Database: Health Source Plus; Item Number 3497564.

[15]Bernard Grad, "Healing by the Laying on of Hands: Review of Experiments and Implications," *Pastoral Psychology* 21, no. 206 (September 1970): 19–26.

[16]Benor, *Healing Research* 1, 214.

[17]Anna Easter, "The State of Research on the Effects of Therapeutic Touch," *Journal of Holistic Nursing* 15, issue 2 (June 1997); EBSCO Host; Database: MasterFILE; Item Number: 9705154782; December 5, 2000: Internet pp. 1–18.

[18]Perry, "The Alchemy in Homoeopathy," 44.

[19]Klaus Linde and Nicola Clausius, "Are the clinical effects of homeopathy placebo effects? A meta-analysis of placebo-controlled trial[s]," *Lancet* 350, issue 9081 (September 20, 1997). EBSCO Host; Database: Master FILE Premier; Item Number: 9709243918; October 31, 2000: Internet p. 11, "Table 1."

[20]Morag A. Taylor et al., "Randomised Controlled Trial of Homeopathy Versus Placebo in Perennial Allergic Rhinitis With Overview of Four Trial Series: Results," *British Medical Journal* 321, issue 7259 (August 19, 2000). EBSCO Host; Database: MasterFILE Premier; Item Number: 3456050; October 31, 2000; Internet p. 5, "Nasal Inspiratory Peak Flow."

[21]Joseph M. Helms, *Acupuncture Energetics: A Clinical Approach for Physicians* (Berkeley: Medical Acupuncture Publishers, 1995), 42.

[22]World Health Organization (WHO), *Guidelines for Clinical Research on Acupuncture* (1995), 2.

[23]Helms, *Acupuncture Energetics*, 45.

[24]Richard Hammerschlag, "Methodological and Ethical Issues in Acupuncture Research," in National Institutes of Health, *NIH Consensus Development Conference on Acupuncture* (Bethesda, MD: November 3–5, 1997), 45.

[25]Ibid., 46.
[26]E. Ernst and A. R. White, "A Review of Problems in Clinical Acupuncture Research," *American Journal of Chinese Medicine* XXV, no. 1: 5.
[27]Charles Vincent and George Lewith, "Placebo Controls for Acupuncture Studies," *Journal of the Royal Society of Medicine* 88, no. 4 (April 1995): 199.
[28]Felix Mann, *Reinventing Acupuncture: A New Concept of Ancient Medicine* (Oxford: Butterworth-Heinemann, 1992), 5; the WHO, *Guidelines* states: "... true placebo acupuncture would appear to be impossible" (p. 4).
[29]Mann, *Reinventing Acupuncture,* 17; Hammerschlag, "Methodological and Ethical Issues in Acupuncture Research," 46.
[30]Beverly Rubik, "Can Western Science Provide a Foundation for Acupuncture?" *American Association of Medical Acupuncture Review* 5, no. 1 (1993): 17; Daniel T. Benor, *Healing Research 2: Holistic Energy Medicine and the Energy Body* (München: Helix, 1994), 100.
[31]Easter, "Method – Sample" in "The State of Research on the Effects of Therapeutic Touch."
[32]"Therapeutic Touch Document List," Parascope, at: http://site034145.primehost.com/articles/1196/touch 2.htm. Quoted in Bruce A. Robinson, "Therapeutic Touch: Healing Therapy or Hoax?" www.religioustolerance.org/ther_tou.htm; December 4, 2000: Internet p. 3.
[33]K. Linde, W. B. Jonas, D. Melchart, F. Worku, H. Wagner and F. Eitel, "Critical Review and Meta-Analysis of Serial Agitated Dilutions in Experimental Toxicology," *Human and Experimental Toxicology* 13, no. 7 (1994): 481–92; www.rccm.org.uk/cisc.htm; March 15, 2002.
[34]Stephen Barrett, "Much Ado About Little or Nothing: Unimpressive 'Research,'" *Nutrition Forum* 15, issue 3 (May/June 1998): 17 *ff.* EBSCO Host; Database: MasterFILE Premier; Item Number 753336; October 31, 2000. The panel, called the "Homeopathic Medicines Research Group," included homeopathic physician-researchers.
[35]Benveniste et al., "Human Basophil Degranulation Triggered by Very Dilute Antiserum Against IgE," 816–8.
[36]Ibid. They say: "Using the molecular weight of immunoglobulins and Avogadro's number, we calculate that less than one molecule of antibody is present in the assay when anti-IgE antiserum is diluted to 1×10^{14} ... But in the experiments reported here we have detected significant basophil degranulation down to the 1×10^{120} dilution" (p. 817).
[37]Deepak Chopra, *Quantum Healing: Exploring the Frontiers of Body/Mind Medicine* (New York: Bantam Books, 1989), 118–20.
[38]Benor, *Healing Research* I, 116–21. These observations are consistent with J. B. Rhine's results at Duke University, a fact to which C. G. Jung pointed, "... in each series of experiments the first attempts yielded a better result than the later ones. The falling off in the number of hits scored was connected with the mood of the subject. An initial mood of faith and optimism makes for good results. Scepticism and resistance have the opposite effect, that is, they create an unfavourable disposition." Cf. C. G. Jung, "Appendix: On Synchronicity," in *The Structure and Dynamics of the Psyche,* Collected Works 8, Bollingen Series XX (New York: Pantheon, 1960), 524.
[39]Norman Shealy, *Occult Medicine Can Save Your Life* (New York: The Dial Press, 1975), 84.
[40]Helms, *Acupuncture Energetics,* 62–5.
[41]Ibid., 43, 71.
[42]Ibid., 56. Cf. Stanislav Grof's general comment about energy fields and energy flows, "These descriptions do not make any sense in the context of the western medical model, since they do not correspond to any known anatomical structures or physiological processes." Grof, *The Adventure of Self-Discovery* (Albany, NY: State University of New York Press, 1988), 110.
[43]Mann, *Reinventing Acupuncture,* 13–39.
[44]Stuart Hameroff, "Quantum Vitalism," *Advances: The Journal of Mind-Body Health* 13, no. 4 (Fall 1997); EBSCO Host; MasterFILE Premier; Item Number: 9711071677; Internet p. 1.
[45]Slater, "Toward an Understanding of Energetic Healing," Internet p. 4.
[46]Jeanne Sayre-Adams and Steve Wright, *The Theory and Practice of Therapeutic Touch* (New York: Churchill-Livingston, 1995), 9.
[47]Janet F. Quinn, "A Therapeutic Touch as Energy Exchange: Testing the Theory," *Advances in Nursing Science* 6, no. 2 (January 1984): 44, 48.
[48]Brennan, *Hands of Light,* 201–3.
[49]Gerber, *Vibrational Medicine,* 541; cf. note 4's citation of Zukav and Slater. In fact, more than three spatial dimensions would preclude carbon life. Cf. Hugh Ross, *Beyond the Cosmos* (Colorado Springs, CO: NavPress, 1999), 45.
[50]Barrett, "Much Ado About Little or Nothing," Internet p. 2.
[51]E. Del Giudice, "Is the 'Memory of Water' a Physical Impossibility?" in P. C. Endler, ed., *High Dilution Physiology and Physics* (Dortrecht: Kliewer Academic Publishers, 1994), 117–9. Daniel Benor proposes two potentizing explanations for homeopathy. In the first, the original substance patterns the dilution's chemistry and in the second, the original substance patterns the dilution's energy field. Cf. Benor, *Healing Research* I, 113.
[52]The "Law of Similars" states that a homeopathic remedy has been properly chosen if the ill person's disease symptoms correspond with those observed in a healthy person who has been given the same remedy.
[53]Robinson, "Therapeutic Touch," Internet p. 2.
[54]William A. McGarey, *Acupuncture and Body Energies* (Phoenix, AZ: Gabriel Press, 1974), 6.
[55]David Eisenberg and Thomas Lee Wright, *Encounters With Qi: Exploring Chinese Medicine* (New York: W. W. Norton & Co., 1995), 89–90, quoting Dr. Ai.
[56]Sayre-Adams and Wright, *The Theory and Practice of Therapeutic Touch,* 7.
[57]"Quantum," the Latin word for "how much," describes the smallest sub-atomic unit that can be called a particle. The essence of quantum physics is that this particle can also be defined as an energy wave.
[58]Bonny L Hardin and Craig R. Hardin, *Alternative Health Care: The Canadian Directory* (Toronto: Noble Ages Publishing Ltd., 1997), 228.
[59]George Ernest Stahl's vitalistic ideas influenced medical schools at Montpellier and Paris. Stahl (1669–1734) based his theory on the *Anima Sensitiva,* the "Reasonable Soul" which governed the corporeal self, "Sickness was the effort of the Anima to re-establish the normal tone, operation and harmony of disordered organs." Cf. Elizabeth Danziger, *The Emergence of Homoeopathy* (London: Century Hutchinson Ltd., 1987), 74–7. Centuries earlier, Paracelsus had used tiny dosages of active agents, so Hahnemann seems to have functioned mainly to synthesize and popularize a system.
[60]Perry, "The Alchemy in Homoeopathy," 39, 35.
[61]Linda Gray, "Homeopathy: Treating the Mind, Body and Spirit," *Executive Health's Good Health Report* 35, issue 8 (May 1999); Source: http://ehostvgw7.epnet.com/ehost.asp?key=204.179.122.141_8000_770505929 &site=ehost&return= y&custid=s4274552; July 29, 2002; Internet p. 2.
[62]Shealy, *Occult Medicine Can Save Your Life,* 190.
[63]Joe Maxwell, "Nursing's New Age?" *Christianity Today* (February 5, 1996): 97.
[64]Clyde H. Reid, "Some Strange But Exciting Frontiers in Pastoral Counseling," *Journal of Pastoral Counseling* XXI, no. 1 (Spring–Summer 1986): 4.
[65]Brennan, *Hands of Light,* 203.
[66]Slater, "Toward an Understanding of Energetic Healing," Internet p. 4.
[67]Carolyn Myss, *Anatomy of the Spirit* (New York: Random House, 1996), 77; Brennan, *Hands of Light,* 25.
[68]Zukav, *The Seat of the Soul,* 95–6.
[69]Cited in Sara Altshul O'Donnell, "The Cutting Edge of Alternative Medicine," *Prevention* 52, issue 1 (January 2000); Source: http://ehostvgw7.epnet.com/ehost.asp?key=204.179.122.141_8000_

770505929&site =ehost &return=y&custid=s4274552; July 29, 2002; Internet pp. 2-3.

[70]Slater, "Toward an Understanding of Energetic Healing," Internet p. 6.

[71]Ibid., Internet p. 5. Slater says: "At this time, no objective instruments exist to demonstrate the existence of chakras or to determine their functions." Cf. also Rubik, 23; Sayre-Adams and Wright, 10 (who prefer euphemisms like "difficult to demonstrate/measure"); Karen Piligian, "Therapeutic Touch: Using Your Hands for Help or Heal," in John T. Chirban, ed. *Health and Faith: Medical, Psychological and Religious Dimensions* (Lanham, MD: University Press of America, 1991), 139.

[72]Chopra, *Quantum Healing*,104.

[73]Davies, *The Cosmic Blueprint*, 170-9.

[74]Ken Wilber, *Eye to Eye: The Quest for the New Paradigm* (Garden City, NY: Anchor Books, 1983), 134-5.

[75]Fritjof Capra, *The Tao of Physics: An Exploration of the Parallels Between Modern Physics and Eastern Mysticism* 3rd ed. (Boston: Shambhala, 1991), 11.

[76]Arthur Lovejoy, *The Great Chain of Being* (Cambridge, MA: Harvard University Press, 1942).

[77]Wouter J. Hanegraaff summarizes the *Perennis Philosophia* with this quote from Matthew Fox, "There is only one great underground river, though there are numerous wells into it—Buddhist wells and Taoist wells, Native American wells and Christian wells, Islamic wells and Judaic wells." Cf. Hanegraaff, *New Age Religion and Western Culture: Esotericism in the Mirror of Secular Thought* (Albany, NY: State University of New York Press, 1996), 328.

[78]Huston Smith, *Forgotten Truth: The Primordial Tradition* (New York: Harper & Row, 1976), 38-48. Citing Marcilio Ficino's 1462 translation of *Pimander*, Hanegraaff refers to the supposed ancient *prisca theologia* tradition, which may be traced through Zoroaster, Trismegistus (Hermes), Orpheus, Aglaophemus, Pythagoras and Plato. Cf. Hanegraaff, *New Age Religion and Western Culture: Esotericism in the Mirror of Secular Thought*, 390.

[79]Smith, *Forgotten Truth*, 37-56; his categories match up with Neoplatonism, cf. Lovejoy, *The Great Chain of Being*, 62.

[80]Wilber, *Eye to Eye*, 128-9, articulates a set of six dimensional levels: physical, biological, psychological, subtle (which contains the transindividual realm), causal (perfect transcendence) and ultimate (pure consciousness).

[81]Bentley Layton, *The Gnostic Scriptures: A New Translation With Annotations and Introduction* (New York: Doubleday, 1987), 422-3.

[82]Wilber, *Eye to Eye*, 127. T. J. Kaptchuk suggests another model which is based on Franz Anton Mesmer's animal magnetism. Kaptchuk describes "lower mesmerism" as those forms of alternative healing which use an electromagnetic explanation, albeit one which manipulates unseen forces that evade biomedical detection. "Higher mesmerism" refers to trance states through which one contacts noncorporeal entities. Cf. Kaptchuk, "Historical Context of the Concept of Vitalism," 38.

[83]June Singer, *Seeing Through the Visible World: Jung, Gnosis and Chaos* (San Francisco: Harper & Row, 1990), 67.

[84]Joyce Goodrich, "The Psychic Healing Training and Research Project," in James Fosshage and Paul Olsen, eds., *Healing: Implications for Psychotherapy* (New York: Human Sciences Press, 1978), 85.

[85]John Rossner speaks of "thought energy fields," that is "T" fields, which "would appear to act with more of the mysterious properties of consciousness rather than with the well-known physical properties of matter." Cf. Rossner, *In Search of the Primordial Tradition & the Cosmic Christ* (St. Paul, MN: Llewellyn Publications, 1989), 14. On pp. 16-9, Rossner speaks directly of disincarnate beings known through spiritualist mediums. Also see Evans, "Learning How To 'Do' Spiritual Healing," and Brennan *Hands of Light*, 203; Judith Allen Shelly et al., *A Response to Energy-based Theories and Therapies*, (Madison, WI: Nurses Christian Fellowship, 1996), 5.

[86]Myss, *Anatomy of the Spirit* 4.

[87]Brennan, *Hands of Light*, 203; Shelly, et al., *A Response to Energy-Based Theories and Therapies*, 5, and also note 28, which cites Barbara Stevens Barnum, *Spirituality in Nursing: From Traditional to New Age* (New York: Springer Publication, 1996), 67-8.

[88]Douglas A. Knight, "Cosmogony and Order in the Hebrew Tradition," in Robin W. Lovin and Frank E. Reynolds, eds., *Cosmogony and Ethical Order* (Chicago: University of Chicago Press, 1985): 134-7.

[89]Christine Page, *Frontiers of Health: From Healing to Wholeness* (Saffron Waldon: C. W. Daniel, 1992), 39-43.

[90]Bruce Waltke writes: "I suspect that few Bible believing Christians are aware that at least in a dozen texts of the Old Testament, reference is made to the LORD's conflict with a dragon or sea monster variously named as Rahab, 'The Proud One,' or Leviathan, 'The Twisting One,' or Yam, 'The Sea.' Moreover, at least five of these texts are in a context pertaining to the creation of the world." Cf. Waltke, *Creation and Chaos* (Portland, OR: Western Conservative Biblical Seminary, 1974), 5.

[91]Gregory Boyd, *God At War: The Bible and Spiritual Conflict* (Downers Grove, IL: InterVarsity Press, 1997), chap. 2, "Locking Up the Raging Sea," and chap. 3, "Slaying Leviathan." *Tohu wabohu*, which occurs twenty times in the Old Testament (eleven in Isaiah), reflects the conviction that only God can maintain order.

[92]The "sea" in Scripture is often a metaphor for the cosmic demonic realm against which God battles. Thus in Rev. 20:13, the "sea," along with Death and Hades, will give up its dead, a more likely reference to the Old Testament *tehom* ("deep") than to sailors lost in shipwrecks. Cf. John Day, *God's Conflict with the Dragon and the Sea: Echoes of a Canaanite Myth in the Old Testament* (Cambridge: Cambridge University Press, 1985); and Cyrus H. Gordon, "Leviathan: Symbol of Evil," in Alexander Altman, ed. *Biblical Motifs: Origins and Transformations* (Cambridge, MA: Harvard University Press, 1966): 1-9.

[93]Waltke, *Creation and Chaos*, 6-9.

[94]Boyd, *God At War*, 105. Knight, "Cosmogony and Order in the Hebrew Tradition," 142, contends that the mythological monsters are mere playthings for God and that there was no struggle to bring creation into being. Boyd (p. 326, note 26) musters the evidence to show that for God to be victor in creation, a real pre-creation opponent is likely in mind. In notes 40-1 (pp. 327-8), he lists some dozen biblical scholars since 1850 who have taken this position.

[95]John H. Sailhammer, *Expositor's Bible Commentary* 2 (Grand Rapids: Zondervan Publishing House, 1990), 24-8.

[96]In *Church Dogmatics* III, 3: *The Doctrine of Creation*, trans. G. W. Bromiley and R. J. Ehrlich (Edinburgh: T. and T. Clark, 1960), Karl Barth uses the concept of *das nichtige*, nothingness/chaos, as a metaphysical construct to assert that each time God wills positively, there is an opposite will-choice which God refused (Barth, 74, 351). This leads to a theological cul-de-sac by (1) implying that God's sheer existence generates a negation in and of itself, since he wills his self-existence. Such a negation is, of course, Manichean, (2) putting Jesus in the curious situation of dying because God's positive decision to create automatically generated an *ontic* (relating to or having real being or existence) negative, and (3) ignoring Jesus' direct statement that he came to destroy Satan and his works (1 John 3:8).

[97]Kenneth H. Maahs, "Chaos," *International Standard Bible Encyclopedia (ISBE)* 1 (Grand Rapids, MI: William B. Eerdmans, 1979): 634.

[98]Herbert G. May, "Some Cosmic Connotations of MAYIM RABBÎM, 'Many Waters,' " *Journal of Biblical Literature* LXXIV (1955): 11-2.

[99]C. G. Jung, "A Psychological Approach to the Dogma of the Trinity," *Collected Works* 11, Bollingen Series XX (Princeton: Princeton University Press, 1953-1978), 165-79; Cf. also Jung, "The Autonomy of the Unconscious," *Collected Works* 11, Bollingen Series XX (Princeton: Princeton University Press, 1958-1969), 58-63.

[100]Baal (Judg. 2:13; 1 Kings 16:31; Jer. 2:8), i.e. Hadad, the Semitic storm-god of death, infertility and flood waters. His consorts included Ashtaroth (Judg. 1:13; 1 Sam. 7:3-4; 1 Kings 11:5), known as Astarte in Greek; and Asherah (Deut. 12:3; Judg. 3:7; 1 Kings 18:19).

[101]Sakkuth and "Kaiwan, your star-god" (Am. 5:26, NRSV; there is disagreement over the use of proper names here); Queen of Heaven (Jer. 7:18); "host of heaven" (Deut. 4:19a; note that 19b does *not* mean that Gentile nations are to worship the "host" but that the heavenly objects are given as natural features for the benefit of all; 2 Kings 17:16).

[102]The Testament of Solomon lists thirty-six demons who produce evil effects on people, mostly illnesses but including marital separations, mental disturbances and destroyed houses. It also gives the names of angels (and folk medicines) who/which will counteract the demons. This synopsis comes from Josephine Massynbaerde Ford, "Response to Thomas Finger and Willard Swartley," in Willard M. Swartley, ed., *Essays on Spiritual Bondage and Deliverance* (Elkhart: Institute of Mennonite Studies, 1988), 40–2.

[103]The following exemplary texts where Jesus healed a person use the word *pneuma* (spirit), a term which the holistic community interprets as a biblical reference to subtle energy: Matt. 12:45, evil spirit; Mark 9:17, dumb spirit; Luke 13:11, spirit of infirmity. D. E. Aune, "Demon," *ISBE* 1 (Grand Rapids, MI: Wm. B. Eerdmans, 1979), 919, notes that "The term *pneúma*, 'spirit,' is essentially a neutral word, but is frequently applied to evil spirits ..."

[104]Hendrik Berkhof, *Christ and the Powers* (Scottdale, PA: Herald Press, 1962 and 1977), cites Rom. 8:38 *ff.*; 1 Cor. 2:8; 15:24–26; Eph. 1:20 *ff.*; 2:1 *ff.*; 3:10; 6:12; Col. 1:16; 2:15.

[105]William Lane, *The Gospel According to Mark* (Grand Rapids, MI: William B. Eerdmans, 1974), 177.

[106]Helmut Wipprecht, "Healthy Alternative," *ChristianWeek* 14, no. 15 (November 14, 2000): 11; Miller, "The Pastorate and New Age Healing," 93, 102; Gerber, *Vibrational Medicine*, 493.

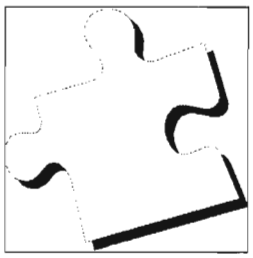
[107]W. Grundmann, "dunamai, dunamiv," in Gerhard Kittel, ed., *Theological Dictionary of the New Testament* II (Grand Rapids: Eerdmans, 1964): 287–91, with the quote on 291.

[108]Constantine Sarantis, "God, Miracles and Quantum Mechanics," in Chirban, *Health and Faith: Medical, Psychological and Religious Dimensions*, 131.

[109]Brennan, *Hands of Light: A Guide to Healing Through the Human Energy Field*, 203; also Mennonite deliverance healer Dean Hochstetler, who reports that "one frequently meets 'Jesus' demons, but not 'Lord Jesus' ones." Cf. Lawrence Burkholder, *Let My People Go: A Mennonite Theology of Exorcism* (Waterloo, ON: Conrad Grebel College, M.T.S. Thesis, 1999), 205; also Dorothy Brotherton, *Quiet Warrior* (Beaverlodge, AB: Spectrum Publications, 1991), 123, 128.

[110]The phrase "crucified and raised" is used quite deliberately, since VEM appeals to "the Christ" as a cosmic principle. Biblical healing is in the name of Jesus of Nazareth; the New Testament mandate is to test the spirits to see if they acknowledge that "Jesus Christ has come in the flesh" (1 John 4:1–3). The reason is precisely because demonic spirits will impersonate a "spiritual Jesus" and "the Christ."

[111]Jarl Omholt-Jensen, "Cure may be more dangerous than the disease," *ChristianWeek* (October 3, 2000): 6–7; Charles Kraft, *Defeating Dark Angels: Breaking Demonic Oppression in the Believer's Life* (Ann Arbor: Servant, 1992), 85.



Some Problems for Theistic Evolution

Robert C. Newman

Most readers of Perspectives on Science and Christian Faith *are acquainted with the terms "young-earth creation," "old-earth creation," and "theistic evolution."[1] These reflect the fact that, among Christians in general and within the American Scientific Affiliation in particular, there is considerable disagreement on how to relate the biblical and scientific data on origins. Some feel that theistic evolution is not the best solution. Here I wish to suggest why, by examining some problems for theistic evolution, both scientific and theological.*

Before looking at these problems, we will need to consider what theistic evolution is, and try to sort it into its various versions. After all, different forms of theistic evolution may face different problems.

What is Theistic Evolution?

Keith Stewart Thomson has a helpful discussion in *The American Scientist* entitled "The Meanings of Evolution."[2] Though he deals with evolution in general rather than theistic evolution, much of what he has to say is applicable. Thomson distinguishes three different senses for the term "evolution."

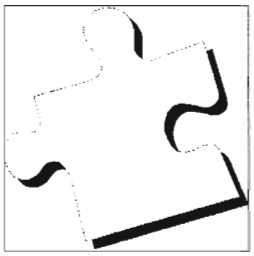
1. **Pattern:** ***Change over time.*** The first is a "general sense of change over time."[3] Stated so vaguely, this is nearly worthless for defining evolution. All but a few ancient Greek philosophers believe there has been change over time. Even when Thomson particularizes this to changes in "the qualitative and quantitative diversity of organisms over space and time,"[4] few views on origins would be excluded, except such varieties of young-earth creation as deny any change at all since creation. However, some young-earth creationists have suggested very large changes in animal diversity since the flood, e.g., deriving all cat-kinds (lions, tigers, housecats, etc.) from a single pair on the Ark.[5] This requires changes at rates even faster than the usual evolutionary models. Such young-earth creationists would thus be theistic evolutionists, though I doubt they accept the label.

In any case, Thomson couples these changes in biotic diversity with "a parallel set of data for changes in the earth itself"[6]—the geologic record—the combination producing a pattern of increasing diversity and complexity from the earliest fossils to the present. So stated, evolution parts company here with young-earth creationists, who see in the geologic column mostly the record of a one-year flood rather than a large fraction of earth's history.

But theistic evolution and old-earth creation do not divide on this matter. Thomson notes that "change over time is the most solidly based fact of evolution"[7] (based as it is on the mass of fossil evidence) but that this meaning "includes no statement or inference about process."[8] The divergence between theistic evolution and old-earth creation, it seems to me, is basically over the process God used to produce this diversity. If we could observe the geologic record at a very high time-resolution, it might be possible to see whether the more gradual transitions

The divergence between theistic evolution and "Blind Watchmaker" evolution is whether there is a God behind the process.

Robert C. Newman, *ASA fellow and chairman of its Commission on Creation, is professor of New Testament at the Biblical Theological Seminary of Hatfield, Pennsylvania and Director of the Interdisciplinary Biblical Research Institute. As a theologian, he has earned the degrees of Master of Divinity and Master of Sacred Theology. He has done further graduate work in religious thought, biblical geography, and biblical interpretation. In the field of science, he received his B.S. in physics from Duke University and his Ph.D. in theoretical astrophysics from Cornell University. He has done scientific research for the U.S. Weather Bureau and the Franklin Institute. A frequent speaker at churches and colleges, Bob is author or co-author of five books and a number of published articles. He has also made guest television appearances on "700 Club," "100 Huntley Street," and "Mysteries of the Bible." He can be reached by email at: rcnewman@erols.com.*



proposed by theistic evolution or the more rapid ones of old-earth creation are supported by the evidence. To the best of my knowledge, this is not yet possible, except as noted in our discussion of transitional fossils below.

The divergence between theistic evolution and "Blind Watchmaker" evolution is whether there is a God behind the process. This is the sort of distinction the intelligent design movement is seeking to detect.

There are those who call themselves evolutionists, even in a nontheistic sense, who would not agree with common descent.

2. **Process:** ***Descent through common ancestry.*** Thomson's second sense for the meaning of evolution is that "organisms are related by descent through common ancestry."[9] No one (including young-earth creationists) will deny that this is true for some organisms, but Thomson intends this to mean that *all* earthly organisms are so related. He notes that this is a hypothesis which logically follows from "the twin premises that [1] life arose only once on earth and that [2] all life proceeds from preexisting life."[10]

But this second sense is a bit problematic. There are those who call themselves evolutionists, even in a nontheistic sense, who would not agree with common descent. For evolutionists who believe in an extraterrestrial origin of life, there is no compelling reason why all of it reaching earth need have come from the same source.[11] And even evolutionists who believe that all terrestrial life got its start on earth need not insist that life arose here only once.[12] Thus this meaning of evolution, descent through common ancestry, divides even nontheistic evolutionists, although the majority is currently in favor of common descent.

If nontheistic evolutionists can believe that modern life derived from a few simple life forms rather than one, then theistic evolutionists need not postulate a single source either—other than God, the ultimate source. Though nearly all old-earth creationists postulate at least two independent creations (original life and humankind), one could still be an old-earth creationist while having all life descended from one original form. Here, too, it looks like it is the mechanism that distinguishes theistic evolution from old-earth creation, though that, too, may have some kinks we need to investigate.

3. **Mechanism:** ***Natural Selection.*** The third sense Thomson proposes for evolution is Darwinism, or natural selection, "a model of random variation and differential survival."[13] It is here that theistic evolutionists and old-earth creationists take different paths. But the situation is more complicated than a simple bifurcation. For one thing, nearly all theistic models of origins (including special creation) admit some measure of natural selection. This is typically limited to microevolution by young-earth and old-earth creationists, so we might say that the real divide is over whether random variation and differential survival is the *sole* mechanism to explain the diversity of life on earth, with theistic evolutionists saying "yes" and special creationists saying "no." But random variation and differential survival have nothing to work upon until one has a self-replicating automaton, whether this be a cell or a molecular system. So what is the mechanism to get from simple organics to a self-replicating system? Probably various theistic evolutionists will opt for different answers.

What are we to make of "random" variation? This will split the nontheistic evolutionists from the theists. But as Keith Miller and David Wilcox suggest in their ASA (American Scientific Affiliation) Statement on Creation (see p. 119), this will also split the theistic evolutionists into a number of groups, depending on how one defines "random." And how one defines random may also have some bearing on whether one would expect to see empirical evidence which would distinguish theistic from nontheistic evolution. Has God so hidden himself that humans could not detect his activity anywhere in the history of life on earth, not even by statistical means?

ASA Creation Statement

Consider next the statement on theistic evolution composed by Keith Miller and David Wilcox for the Creation Statement Subcommittee of the ASA Commission on Creation. Neither their statement, nor the larger whole of which it is a part, was intended to bind the ASA or officially reflect the exact diversity of views therein. The larger statement was designed to be a consensus of the views of the subcommittee, which was itself selected to reflect something of the diversity in the ASA. The individual statements on various

views of creation were composed by one or more proponents of the particular view involved. So this statement is that of Keith and David, but they attempt to reflect such diversity within theistic evolution of which they were aware. I have added the letters A, B, and C to three of the headings to facilitate reference to specific points.

Let me make a few comments on the Miller-Wilcox statement. Under theological statements that all theistic evolutionists agree on, both young- and old-earth creationists would also agree with A1 (God's freedom) and A4 (rejoicing in God's revelation in nature), and many—including me—with A2a (evolution not antithetical to God being Creator). We will respond to A2b (nothing in Scripture forbidding evolution) later on. A3 will be true only if theistic evolution is correct.

Among the theological statements on which theistic evolutionists disagree, B1 deals with mechanism. Of the four alternatives listed, it would appear that only B1b (fully-gifted creation) is likely to be testable scientifically. B2 deals with God's will in relation to creaturely freedom, and the various sub-items correspond roughly to the Arminian (B2a), Openness (B2b) and Calvinistic (B2c) models.

Among the scientific statements, C1 (ancient, changing earth and universe) is also accepted by old-earth creationists. C2 opts to limit the descent of living things (on earth, at least) to a single common ancestor, which, while rather characteristic, does not seem to be necessary to theistic evolution. Regarding C3, a model may have great explanatory power and be effective in generating hypotheses, yet not be the whole story. Atheistic evolutionists make a similar claim against theistic evolution. C4 leads us into the question of filling gaps, which we will examine later.

Having now spent some time thinking about varieties of theistic evolution, let's see if we can put together a general definition:

> **Theistic evolution** is a view of origins in which God used providential means such as mutation and natural selection as the prime or only means for producing the diversity of living things on earth.

ASA Statement on Creation: Theistic Evolution (Continuous Creation, Evolutionary Creation) View

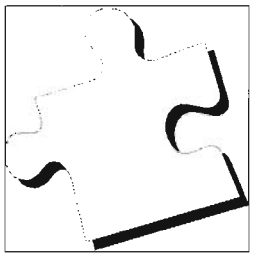
Theological Statements:

A. In addition to the theological commitments affirmed by all parties, ASA members who accept an evolutionary* perspective, would affirm the following:
   1. God is free to act in creation in any way consistent with His character. The nature of the physical universe and of God's interaction is a consequence of God's free choice.
   2. Evolutionary processes* are not antithetical to God's creative action. Furthermore, nothing in scripture provides a theological basis for rejecting the descent of all living beings from a common ancestor, including humans.
   3. An evolutionary* view of the history of life provides a positive, productive context for understanding God's relationship to creation, and our role as His image bearers. It also provides a fruitful context for considering the meaning and implications of Christology and the cross.
   4. Christians should rejoice and praise God for each new revelation of the history and character of the creation, for each new discovery that fills previous gaps in our scientific understanding.

B. Areas of theological diversity among Christians holding an evolutionary* view:
   1. How does God direct the creation to His desired ends? Various models for God's action have been proposed, of which some follow. These are not mutually exclusive, so individuals may hold more than one.
      a. God is actively directing ALL natural processes ALL the time so that all physical events are specifically willed by Him.
      b. God gave, and continues to give, being to a creation gifted with all the capabilities to bring forth all the forms, processes, and events, willed by Him.
      c. Creation responds to God's will as our bodies respond to ours. However, God's being is not embodied in creation but is transcendent over it.
      d. God acts to determine the inherent indeterminacies of physical events, at the micro level of quantum phenomena and at the macro level of chaotic systems. The physical universe is not deterministic, but rather is an inherently open causal system.
   2. To what extent has God granted freedom to His creatures? Various suggestions have been proposed:
      a. God has chosen to limit His direct control over some aspects of creation to give His creatures genuine freedom.
      b. God allows for a certain level of genuine indeterminacy in creation such that specific outcomes are not predetermined. At the same time, He remains sovereign and the fulfillment of His will is assured.
      c. All physical events are predetermined and preknown by God.

C. Scientific Statements:
   1. An ancient and dynamically changing Earth and universe is supported by overwhelming evidence from geology, physics, astronomy, and cosmology.
   2. The common descent of all living things is well-supported by diverse lines of evidence in geology, paleontology, biology, and genetics.
   3. Biological evolution* has great explanatory power and has proven effective in generating new and testable hypotheses in a wide range of scientific disciplines including historical geology, paleontology, ecology, biogeography, developmental biology, biochemistry, and genetics.
   4. New discoveries and new models are progressively closing many previous gaps in our knowledge and understanding of evolutionary history and mechanisms.* While many unanswered questions remain, current research is raising many exciting possibilities for studying previously intractable problems.

*The various references to evolution herein are understood to include the full range of scientific models from the adaptive change of species populations to the diversification of life on Earth from its common origin, but to exclude the idea of autonomous nature assumed in the "Blind Watchmaker" hypothesis.



Article

Some Problems for Theistic Evolution

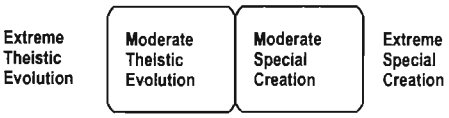
The first problem [for theistic evolution] is that of the relative scarcity of fossils that can reasonably be considered intermediate or transitional between the major categories of the biological classification system.

Some varieties of theistic evolution would include diversity on the matters of (1) whether original life was created miraculously or providentially, (2) whether there were one or more distinct forms of original life, and (3) whether there really was an original pair of humans, Adam and Eve.

By contrast, we can then suggest a parallel definition of special creation as follows:

> **Special creation** is a view of origins in which God used miraculous intervention as the prime or only means for producing the diversity of living things on earth.

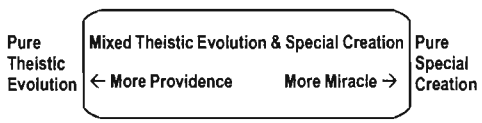
Whether or not one likes these definitions, they permit us to view theistic origin models as a kind of spectrum as illustrated below, with the extreme views using only the one means and the moderate views using the relevant means as the prime means. Most views held by various Christians will fall somewhere between the two extremes.



Another approach would be to define theistic evolution and special creation so that they are not mutually exclusive. For instance:

> **Theistic evolution** is a view of origins in which God used providential means such as mutation and natural selection as a means for producing the diversity of living things on earth.
>
> **Special creation** is a view of origins in which God used miraculous intervention as a means for producing the diversity of living things on earth.

In this case, the extreme positions would be "pure theistic evolution" and "pure special creation" and the intermediate positions would involve a mixture of the two means as illustrated below.



Scientific Problems for Theistic Evolution

Let us begin with scientific problems that face theistic evolution. Being a theist myself, I do not find any insuperable problem with the idea that God might be behind the various phenomena studied under evolution. Here I will not attempt to deal with problems which atheists would bring against the view. These are often (but not always) the same as those an atheist would urge against theism in general, and they are largely philosophical and theological in nature. Instead, I want to look at items we could call scientific that are problematic for one or another of the various forms of theistic evolution over against forms of special creation. Or, using our alternative definitions, problems for more providential forms of theistic evolution over against more miraculous ones.

Transitional Fossils

The first problem is that of the relative scarcity of fossils that can reasonably be considered intermediate or transitional between the major categories of the biological classification system.

In any model in which there has been the sort of change over time that we call descent through common ancestry, one would expect numerous transitions between the earlier forms of living things and the currently existing ones. Darwin's original model proposed that the changes which occur are very small, necessitating many intermediate steps between organisms which are even moderately different. Employing the idea of natural selection, Darwin suggested that the intermediates would eventually be eliminated through competition with their descendants (and surviving ancestor-forms), so that by later times, large gaps would have developed among the various kinds of living organisms. However, the fossil ensemble itself, being a record of this history of life, should be nearly continuous through time.

Darwin knew that the fossil sequence was not continuous. His solution to this problem was to suggest that the fossil record is very fragmentary. There is obviously some sense in which this is true. At least for land-based life, only a tiny fraction of the organisms which once lived get preserved

by fossilization. On the other hand, marine life, particularly those sorts having hard body parts not soluble in water, would presumably leave a pretty complete record. In any case, the actual fossils that do survive do not appear to be an imperfect record of the sort of gradual process Darwin envisioned.

Gould and Eldridge proposed a version of evolution they call punctuated equilibrium. ... This model, however, could work well as a form of theistic evolution. It does fit the fossil record. A mind guiding the process could easily produce results one would never expect in a mindless universe.

This actual fossil record was apparently one of the reasons driving a shift from the original model of Darwin—in which all populations are slowly evolving—to the view found in neo-Darwinism, that really significant changes take place only in small, isolated population groups. Here the isolation can help avoid a new mutation being swamped by the old version. The small size of the population makes it more likely that a statistical fluke may help an innovation gain ascendancy in the population. The real problem comes when one considers a change that will take many mutations to accomplish. The chance of getting a second (third, fourth, ...) good mutation in this small population is nil compared to getting it in the original large population, so one must wait until the small population has grown and spread to become really big before there is any real chance of taking the next step. For the higher categories in the biological classification scheme, the separations between categories are hundreds or thousands of mutations, so we should have hundreds or thousands of large intermediate populations which are nearly as capable of leaving fossils as their ancestors and descendants. This we do not see, and it is a scientific problem for all forms of gradualistic evolution—whether theistic or not.

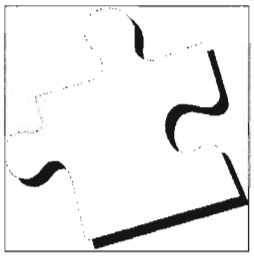
Partly as a result of this problem, Gould and Eldridge proposed a version of evolution they call punctuated equilibrium. In this model, the transition from one form to another is quite rapid—"punctuated"—to account for the sudden appearance of new forms in the fossil record. Among these new forms, the ones which survive to produce evidence in the fossil record are those in equilibrium (internally and externally) so that they do not tend to change, producing the observed phenomenon called "stasis."

The problem facing the punctuated equilibrium view is similar to that facing evolution by large mutations—the chance of getting something functional is astronomically minuscule. This model, however, could work well as a form of theistic evolution. It does fit the fossil record. A mind guiding the process could easily produce results one would never expect in a mindless universe. I commend this alternative to those who are theistic evolutionists, though I am not inclined to call it theistic evolution myself. In any case, this is something that easily should be distinguishable empirically (statistically) from atheistic evolution, and the arguments of Gould and Eldridge (and earlier, Goldschmidt) suggest that it is.

For versions of theistic evolution that have God using random processes, the problem remains. The only way of crossing from one viable form to another (that are, say, ten mutations apart) is by means of a random walk. A random walk is a process by which an object moves through space randomly, taking steps of either fixed or variable length in random directions. The illustration popularized by George Gamow is that of a drunk trying to find his way home.[14] Starting from a convenient lamppost, he takes a step in a random direction. His next step is in another random direction. The question is, how far from the lamppost would the drunk be expected to be after N steps? If the average (or root mean square) length of the drunk's step is L, then his expected distance from the lamppost will be D = LxSQRT(N). This same result holds for movement in any number of dimensions, for distances are still measured using an extension of Pythagoras' theorem.

Let us assume for simplicity that all the mutations are the same length L. To cross a distance equivalent to the length of 10 mutations, D = 10L. Then SQRT(N) = 10 and N = 100, so it will take 100 mutation steps on average to move this distance. One can immediately see that it takes much longer to cross a gap by random walk than by a guided walk.

Applying random walk to evolutionary changes, the space in which the movement takes place is not the drunk's two-dimensional sidewalk nor our physical three-dimensional space, but some multi-dimensional phase space of functional characteristics. In a one-dimensional space, movement is along a straight line, so that after 100 random steps, one is on average about 10 steps from the start, but this may be either in the right direction or the wrong direction for the needed transition. Thus there is only one chance in two that 100 steps will cross the gap. For a two-dimensional phase space, the problem is much worse—in fact, insuperable, if we imagine the target is a point. Expanding the target to a circle (say, one mutation is radius), there is less than one chance in thirty that 100 steps will take us to the right destination. For a three-dimensional phase space, the chance drops to less than one chance in four hundred, and thereafter the chances



Article

Some Problems for Theistic Evolution

decrease approximately by a power of ten for each added dimension. Random walk is not a very efficient way to get from one place to another! More to the point, it must leave an enormous number of transitional fossils behind. These we do not see in the fossil record.

This phenomenon of irreducible complexity is explained more easily, it seems to me, by a sudden intervention to assemble such structures, or by the sort of guided providence that would ... show up empirically under thorough investigation.

Irreducible Complexity

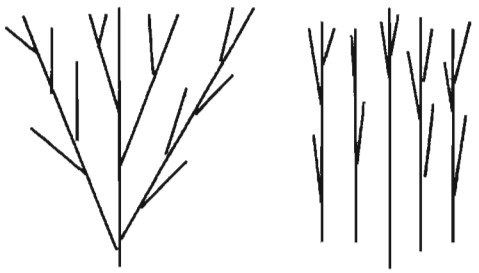
Michael Behe, in his book *Darwin's Black Box*, has popularized the phrase "irreducible complexity."[15] By this he means that living things contain numerous organs, structures, processes, and reactions which have component parts that appear to be useless unless all are present together. If one part is missing, the function is gone.

Behe's illustration is the traditional mousetrap, which consists of a wooden platform to hold the parts, the hammer to get the mouse, the spring to drive the hammer, the arm to hold back the hammer, the trigger to release the arm and hammer, and various staples to attach the parts to the platform. If any of these parts is missing, the device will not catch mice. Some sort of bait (cheese, bacon, peanut butter) is also desirable if one wishes to catch mice without waiting for them to blunder into the trigger by chance, but this is not absolutely necessary and so is not a part of the mouse trap's *irreducible* complexity.

Behe suggests that a similar phenomenon is found in living organisms. He gives as examples the rotary motor that drives the flagellum in the *E. coli* bacterium, the chemical processes that initiate vision and blood clotting, and the intracell transport system. Behe's point is that such systems apparently have no survival value until the whole has been assembled, and thus a series of coordinated mutations are needed to produce any such structures, the sort of thing that random processes are notoriously unlikely to provide. It is, of course, possible to claim that each needed intermediate step *must* have some survival value, we just do not know what it is. That is possible. It is also a form of the "God of the gaps" argument. It is equally possible that all junk DNA has some function which we have not found yet, or that all vestigial organs have some current function so that they are not really vestigial. We shall return to this question later when we discuss the "God of the gaps." In any case, this phenomenon of irreducible complexity is explained more easily, it seems to me, by a sudden intervention to assemble such structures, or by the sort of guided providence that would (again) show up empirically under thorough investigation. Thus, irreducible complexity points to a more likely explanation by some sort of old-earth creationism or a theistic evolution that leaves tracks.

Shape of the Fossil Record

A third type of scientific problem for theistic evolution is what we might call the "shape" of the fossil record. Darwinian evolution (and the neo-Darwinian and punctuated equilibrium versions also) builds diversity progressively. One begins with small diversity, and large diversity arises late in the process. Thus an original life form consists of a single type, which over time gradually diversifies until its various varieties become distinct species, some of these species diverge enough to become separate genera, some of the genera diversify to families, and so on, up to the level of phyla. The result should be that the various phyla are the last categories to be formed in the history of life. Without getting into nitpicking over the exact definition of the various levels in the biological classification system, in the Darwinian scheme, life should form a sort of single tree.



Darwinian Prediction | Fossil Record

As a matter of fact, the fossil record pictures life as something like a large series of bushes, with the major body plans for the animals all being formed in the brief period known as the Cambrian Explosion. This, again, looks much more like some sort of intervention (or at least rapid, guided evolution) than it does like a slow, random process of small mutations.

Natural Law and Mediation

What is natural law? Nobody knows, at least no one down here on earth. For atheists (secular humanists, naturalists, materialists), it must be some sort of structure that allows the universe to have organization, but the existence of which is finally inexplicable. For theists, two suggestions have been made: (1) It is the way God normally acts, and has no real separate existence of its own; and (2) It is some sort of created structure, to which God has given certain capabilities.

Do Christians know which of these theistic alternatives is correct? I do not think so. How would we decide? I know of no way from within the universe that we could do any experiment to make a choice between the two. The answer is thus going to be obtained from some sort of philosophical or theological argument, from some biblical hints, or from eschatological verification. My own inclination is that (2) is correct. Actually, it does not matter for our concern. The Bible and theology (and philosophy) still distinguish between God's providential activity and his miraculous activity, whether God's providential actions are mediated through a created natural law structure or not. The Bible uses the distinctive Greek terms *dunamis, thauma, semeion,* and *teras* in the New Testament, and similar terms in Old Testament Hebrew to designate miraculous events. They are thus seen as "powerful, amazing, significant" or "wondrous" over against normal events which, while under God's control, do not carry their significance on their sleeve, so to speak.

Much of our debate between old-earth creation and theistic evolution (and even among the various versions of theistic evolution) revolves around the question of distinguishing providential from miraculous events; and more particularly, of inferring the one or the other for events at which no human observer was present. Though perhaps not all miracles could be characterized by discontinuity, this seems to me to be one rather distinctive marker that separates most providential events from most miraculous ones. Though God turns water into wine every summer, to do so in a few moments in a stone jar without the aid of a grapevine is pretty discontinuous in some sense.

Now science studies the structures and events in nature in an attempt to discover natural laws which govern these phenomena. Natural events will presumably operate continuously on some scale, so that a scientist tends to fill all gaps with interpolations which are as smooth as possible. But actual observations are discontinuous, a series of discrete dips into the stream of nature. How do we tell when we have correctly or incorrectly filled a gap in the data, whether by postulating the correct continuity or the actual miracle which has occurred, or by mistakenly postulating a continuity (or a wrong continuity) or a miracle when none has occurred?

Every human being is constantly filling gaps in his or her experience, either with natural explanations or with miracles—with a God of the gaps or with a natural law of the gaps. Only those who postulate that miracles do not occur can be sure that a natural law explanation is the right one. And only those who deny natural phenomena can be certain that a miracle is the right explanation, though I seriously doubt anyone holds this view.

I believe we are correct in seeing miracles as much rarer phenomena than providential events. It does not follow that the right methodology (a la Hume) is to go with providence in every case. Nor, I think, should we flip a coin, or spin a pointer whose dial is weighted to what we think is the relative likelihood of providence and miracle. Instead we look for clues that point to the one or the other, or (more likely) treat providence as the default explanation in the absence of markers for the miraculous. What are these markers for the miraculous? I think the biblical terms for miracle give us some insight. Events which are sufficiently powerful, amazing, significant or wondrous are presumably miraculous. The stinger is "sufficiently." How powerful, amazing, significant, or wondrous need an event be to qualify? The work of Bill Dembski and Mike Behe is helpful here.[16] If the event is powerful, amazing, significant or wondrous enough that a miraculous intervention looks like a better explanation than does a natural phenomenon, then that is the way we should go. Our methodology should be *inference to the best explanation* rather than simply using a fixed rule to plug gaps.

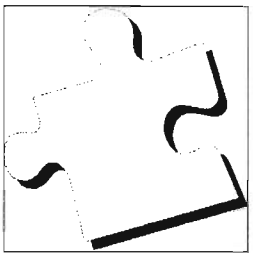
Theological Problems for Theistic Evolution

We turn now to theological problems facing theistic evolution, under which we include exegetical and hermeneutical problems.

Exegesis of Genesis 1: The Origin of Living Things

It seems to me that Genesis 1 (understood from an old-earth perspective) presents no problems for some sort of theistic evolution of living things. The land produces vegetation, the waters teem with living creatures, the birds fly in the sky, the land produces living creatures—all in response to God's command—without any indication of how quickly they respond or whether any mediation was employed. Obviously, if Genesis 1 is understood from a young-earth perspective, it presents a formidable problem for theistic evolution.

The King James translation "after their kind" has regularly been taken to indicate fixity of species (or at least of created kind). But the word "after" in this context is probably an archaic English usage, meaning "according to," as indicated by the use of the phrase elsewhere in the Bible. In any case, the corresponding Hebrew phrase *l*^{e}*min* has no temporal connotation. Thus God made the various kinds of plants and animals, but the Bible says nothing about whether they *reproduce* after their kind.



Article

Some Problems for Theistic Evolution

Exegesis of Genesis 2: The Origin of Humans

The situation is different in Genesis 2. On the face of it, the chapter narrates the creation of Adam by a miraculous rather than a providential process. Adam is "formed" from "the dust of the ground," God "breathed into his nostrils the breath of life," and as a result "the man became a living being."

The idea proposed by some theistic evolutionists – that God made man by putting a human soul into an ape – has often been argued from the traditional King James translation of nephesh hayah *as living soul.*

The idea proposed by some theistic evolutionists—that God made man by putting a human soul into an ape—has often been argued from the traditional King James translation of *nephesh hayah* as living soul. So God put a living soul into this creature he had made and he thus became human. But this interpretation is not favored by the use of this phrase in the previous chapter, where it is applied to the other animals and is translated variously as "living creature," "living thing," or "breath of life." It seems that *nephesh* represents a breathing being, and *hayah* is the usual adjective for "living," so that Adam becomes a living, breathing being. The implication is that Adam was not alive before this happened, even though his body had already been formed.

The creation of Eve in Genesis 2 is clearly narrated as subsequent to that of Adam, after he had named the animals and come to realize that he had no mate like they did. God puts Adam to sleep, takes one of his ribs (or a part of his side), and makes the woman from that, a sort of clone with some significant differences. Again, the natural reading indicates an interventionist rather than providential event.

Exegesis of Genesis 3: The Fall of Humans

The fall of humankind into sin in Genesis 3 likewise seems problematic for at least some versions of theistic evolution. The event is narrated as though it were a specific historical event, involving two human individuals who make specific successive choices to disobey God—the woman following the (implied) advice of the serpent, and the man accepting the fruit offered by his wife. The event is followed by real consequences for the snake, the woman and the man, which are apparently to be passed on to their descendants.

The Theology of Genesis 2 and 3

I see no problems in Genesis 2 and 3 for those versions of theistic evolution in which Adam and Eve are separate special creations not descended from any pre-existing life. I would probably call these views old-earth creation myself, but defer to the label which their proponents wish to use. For other versions in which Adam is descended from apes but is still a real special creation, the only problem is the remark in Gen 2:7 about Adam becoming a living being. This has been handled by Glenn Morton in a satisfactory (though quirky) way by suggesting that Adam was a non-viable mutation of an ape that consequently died but God brought to life again.[17] All of these views come under the category I call "Adam-type" theistic evolution. I see no large exegetical or theological problems here.

On the other hand, I do see serious problems with "no Adam" theistic evolution. In these versions, there never is a single pair who are the first humans. Instead a whole population of anthropoid apes gradually develops into humans over the course of many thousands of years. In such a case, the narratives of Genesis 2 and 3 cannot be historical, in contradiction to the natural reading of the many references to Adam, Eve, and the Fall that occur elsewhere in Scripture. Rather, the accounts in Genesis are mythical or parabolic in some sense—a simplified way of conveying some information to the original readers which we must now recast in light of modern scientific findings. This approach seems to involve greatly reshaping the nature of the fall of humankind into sin and rebellion, with consequent influence on the nature of redemption and the atoning work of Christ. These are theological problems with a vengeance.

The Hermeneutics of Genesis 2 and 3

Next let us consider hermeneutical questions. What is the genre of Genesis 2 and 3? For the various forms of special creation (whether young or old earth), these chapters are fairly straightforward historical narratives, which thus form a continuum with the remaining chapters of Genesis. They doubtless contain figurative language. Presumably there is anthropomorphism here and there, probably "formed" (2:7), "breathed" (2:7), "planted" (2:8), perhaps even "said" and "saw" (through-

out chapter 1) and "rested" (2:2). There is, after all, really quite a lot about God we do not know.

For the various forms of "Adam-type" theistic evolution, these chapters are likewise historical narratives, but "formed from the dust" (2:7) is taken as a condensed and concrete expression for a long process of evolution.

The term "myth" has a wide range of meaning, but common to all of these is the idea that the event narrated never actually happened. Bible believers are rightly unhappy with this characterization of biblical narratives, though examples in Scripture have been suggested that might fall into this category. I will expand more below when we discuss parable or allegory. One perennial problem is that ancient pagan religions made extensive use of myth, and both Christians and Jews wished to distance themselves from the idolatry and immoralities of these religions. A major recent problem is that liberal versions of Christianity which employ the category of myth as a genre found in the Bible regularly wind up (de)mythologizing significant teachings of Scripture, as do Rudolf Bultmann, for example, and the more recent Jesus Seminar.

A major recent problem is that liberal versions of Christianity which employ the category of myth as a genre found in the Bible regularly wind up (de)mythologizing significant teachings of Scripture, as do Rudolf Bultmann, for example, and the more recent Jesus Seminar.

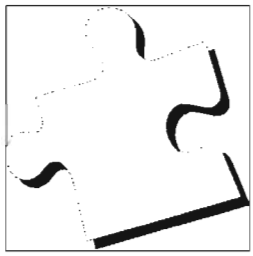
There is probably little sense in trying to distinguish parable from allegory in Scripture. The distinction is a standard one in modern literature, but the Hebrew term *mashal* and its Greek translation *parabole* included both. So, is there any narrative in Scripture that looks something like what no-Adam theistic evolutionists envision for Genesis 2 and 3? Yes, there is something similar in Ezekiel 16. Let us have a look at it.

The passage is a parable or allegory for the relation between Jerusalem and God. Jerusalem's history is parabolically narrated as the story of a girl from her birth through much of her adulthood. God is pictured as a man who adopts and marries her. Some of the significant features of the narrative are:

- The child's parents are mentioned (16:3, 44–45).
- She is abandoned at birth (16:4–5).
- God rescues her, allowing her to survive to maturity (16:6–8).
- She is adopted by God, married to him and cleaned up (16:8–9).
- God gives her many gifts of the sort appropriate for a wealthy woman (16:10–13).
- Her fame, due to her beauty and wealth, spreads far and wide (16:14).
- She begins to trust in her beauty and wealth, turning from her husband to become a prostitute, lavishing his gifts on others and killing her own children (16:15–34).
- Therefore, God is going to bring disaster on her, using her former lovers to bring judgment, shame and poverty, but this will not be fatal nor final (16:35–43).
- Jerusalem is like her mother, who despised her husband and children, and like her sisters, though she herself is the worst of the lot (16:44–59).
- But one day, God will remember his covenant with her, and restore her, and make her sisters to be her daughters (16:60–63).

What warrant do we have to think the genre of Genesis 2–3 is that of Ezekiel 16? On the positive side, we see an example of a narrative that both resembles and is also quite different from the reality it is intended to picture. That is what no-Adam theistic evolutionists claim for Genesis 2–3 over against what really happened in the origin and rebellion of humankind. In both Ezekiel and Genesis, an individual is used to represent a collective identity, Jerusalem or humankind. We do not know enough of the history of Jerusalem to know how to relate many of these features, but we know that (1) Jerusalem existed for centuries between its birth and its adoption by God to be the capital city of Israel; (2) After it became Israelite, it grew to be very wealthy in the time of David and Solomon, and its inhabitants began to play up to the pagan nations around them and to adopt their idolatrous practices; (3) By the time of Ezekiel, Jerusalem was in real trouble from the Babylonians; and (4) Afterwards, Jerusalem was conquered, devastated, and abandoned, only to be rebuilt in a much more humble style long afterwards. Some of the items seem to be predictions to be fulfilled at the end of the age. Both Ezekiel and Genesis use striking figures in the story to represent something different in the reality. In Ezekiel, the rescue of an abandoned child and her subsequent marriage is used to picture God's protection of pre-Israelite Jerusalem and his subsequent taking of the city to be his capital. In Genesis, the molding of clay and breathing into it is a vivid picture for God's guiding evolution to develop apes into humans. Much more of this sort of comparison could be developed, but I will let proponents of this view do it themselves.

Negatively, there are indicators in Ezekiel 16 that it is a parabolic narrative, indicators of the sort we do not find in Genesis. For instance, Ezek. 16:2–3 says: "Son of man, confront *Jerusalem* with her detestable practices, and say, "This is what the sovereign LORD says to *Jerusalem*: *Your*



Van Till ... emphasizes that everything needed to produce all of the diversity in creation (including the unique human abilities) is somehow built into the created structure of particles and laws at the beginning, operating under the purely providential guidance of God.

ancestry and birth were in the land of the Canaanites; *your* father was an Amorite and *your* mother a Hittite." So the girl is labeled unmistakably as a city. Her father and mother are ethnic groups. Her sisters are other cities. Clearly we are in an allegory or parable.

In Genesis, we could take the names of Adam and Eve as allegorical, but there are no explicit indicators that we should do so. We do have the man called *Adam*, which could be a generic name, though it is not the common noun for man, *Ish*, but rather (apparently) a play on the fact that he was made from the ground, *adamah*. The woman is called "woman," *Ishah*, from her creation in 2:22 until she is named *Eve* (*havah*) in 3:20, apparently a play on the word "living" *hay*. These could be allegorical names, but because we are looking at the origin of the race and the first male and female in it, we should not expect them to have the sort of distinctive names needed when there are many humans on earth. So the account might be an allegory or it might not, but there are no explicit markers of allegory.

The Ezekiel narrative shifts back and forth between literal features of Jerusalem and figurative features of the story. The original readers are assumed to be able to handle this because they know a good deal about the history of the city. In Genesis, by contrast, we do not know the "real story" until it is discovered by modern anthropologists, so the readers would be pretty much in the dark until know.

Could Ezekiel 16 be a model for the genre of Genesis 2–3? I think it could, but the warrant for reading it as such would have to come almost totally from general revelation in nature. I do not think the scientific case for a gapless evolution is strong enough to warrant our making the paradigm shift.

Fully Gifted Creation

In recent years, Howard Van Till has proposed a version of pure theistic evolution (according to my chart, see p. 120) which he labels "fully gifted creation."[18] Van Till has chosen this name for his view because he emphasizes that everything needed to produce all of the diversity in creation (including the unique human abilities) is somehow built into the created structure of particles and laws at the beginning, operating under the purely providential guidance of God. This diversity is not imposed by supernatural, miraculous intervention at various points along the way.

It seems to me this view should be testable. Do we have good reason to believe that nature contains the information necessary to construct the complex structures we see in living things, especially in humans? Where is it? In the DNA? But would it not also be in the DNA of primitive organisms as well? Could it be hidden in some invisible law structure? It does not look to me as though chaos theory, for example, is going to generate the type of structure needed. Will mutation and natural selection generate the information? My experience with computer modeling (and Behe's experience with irreducible complexity) does not incline me to think so.[19] I would say that, at present, we do not have evidence that nature contains the type of information necessary for these structures, nor that they were inserted providentially (i.e., gradually) by God. Thus Van Till's view is currently a natural law of the gaps model, but of a theistic rather than atheistic sort.

If Van Till is an orthodox Christian, he does not deny the historicity of the miracles narrated in the biblical account. In this sense, Van Till does not have a deistic world view, though some have accused him of it. Yet he does restrict miracles to salvation history, removing them from the events of creation.[20] This is certainly a possible option, though (given that the Bible does have miracles) it seems somewhat arbitrary. One reason for choosing this option is that creation is then fully gifted, rather than incomplete, which certainly sounds like it gives God more credit for what he has done than would postulating an incomplete creation in which God needs to intervene again and again.

This reminds me of a statement by Fred Hoyle in his book *Galaxies, Nuclei and Quasars* written in the 1960s. In explaining why he preferred his steady-state cosmology over the various varieties of the big-bang model, Hoyle noted that the cosmological models he preferred were those in which all the necessary features were built in from the beginning and arose naturally from the laws, rather than having to have special adjustments as his old post-war automobile did to keep it running.[21]

No doubt if we picture God as a watchmaker and the universe as his watch, we would think his creation much more elegant if it kept time without his having to open the back every few days to make adjustments! But suppose God's creation is a violin he made on which to perform a concerto, and that God's interventions are crucial parts of his playing the music, like a series of pizzicatos in the midst of regular bowing. We do not fault Stradivarius for not being a watchmaker.

Let us suppose with Van Till that God's miracles are restricted to salvation history. When did salvation history begin? With the fall of Adam and Eve? But Satan is clearly fallen before then, and so presumably are the wicked angels. In fact, the creation account contains not a peep about the creation of angels, a fact so glaring that the author of the ancient Jewish pseudepigraphal book Jubilees felt constrained to put it in (on the first day).[22] My own guess (partly based on the remark in Heb. 9:11 about the heavenly tabernacle not being a part of this creation) is that Satan was already fallen before God created our universe, and that our creation is a part of God's salvation work.

Whether or not creation is a part of salvation history, Job 38:7 suggests that the angels were present at the creation of the earth. Perhaps the miracles in creation were intended for their benefit. Or they may have even been intended for us moderns, who would begin to see scientific evidence for miraculous intervention in creation in the twentieth century, at a time when the historical reliability of the other biblical narratives containing miracles had come under attack.

By the way, it does not seem to me that any of the current Christian views of creation have done much with the question of whether and how the angels may have been involved in God's creative work. This is nothing that secular science is going to want to investigate, but Christians surely should give the matter some thought.

Mind-Body Problem

Somewhat related to the matter of creation models is the mind-body problem. Space forbids any extensive discussion of this matter, but a few questions are in order. How does the mind relate to the body? Is the mind merely some sort of signal moving around in the hardware of the brain? Or is the mind/soul/spirit some sort of ghost in the machine? Is the brain, as Sir John Eccles suggested, a machine that only a spirit can operate?[23] Is the theory that reduces the mind to a signal the real science and the other theory only theology? If the mind is merely some epiphenomenon that arises only when the brain is complex enough, what happens to it when the brain dies? It seems to me that there are serious problems here regarding the biblical teaching of personal immortality, postmortem survival, and the intermediate state (existence of the person between death and resurrection). The choice between a monistic and a dualistic view of human nature seems to me to have serious theological consequences which Christian monists have not solved.[24]

It seems that the mind-body interaction is, to some extent, a model for the interaction of God with nature. Just as our unseen mind controls the events of our visible body, so the unseen God controls visible nature.

The mind-body interaction is also a paradigm for intelligent design. As I see it, the intelligent design approach affirms that intelligence is not reducible to either natural law or random (chaotic, chance) phenomena. Unlike chance, intelligence is not meaningless, but is characterized by purpose and goal. Unlike law, an intelligence can initiate actions, and these actions are often ones which cannot be predicted.

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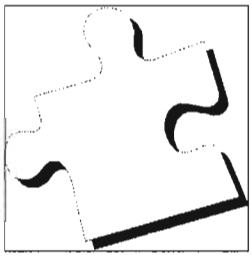

Article

Some Problems for Theistic Evolution

There are, of course, features in the mind-body interaction which do not correspond to those in God-nature, but that is merely to say that we humans are made in the image of God but are not gods ourselves.

As the unseen mind is (in some limited sense) transcendent over the body, so God is (without limit) transcendent over nature. There are, of course, features in the mind-body interaction which do not correspond to those in God-nature, but that is merely to say that we humans are made in the image of God but are not gods ourselves.

Summary: Some Problems for Theistic Evolution

As our discussion has suggested, there are a number of varieties of theistic evolution. These varieties have various problems.

Under scientific problems, we suggest the following. Transitional fossils are a problem for all versions of theistic evolution except those with rapid, guided transitions between the major biological categories. Irreducible complexity is problematic also, except (again) for versions which provide for rapid, guided transitions into these new structures characterized by such complexity. Theistic evolutionists tend to fill gaps with natural law (divine providence) rather than miracle (divine intervention). This is acceptable as a default position. Some criteria need to be developed as to when this default position should be abandoned in particular cases.

Among theological problems, we suggest the following. The account of human origins in Genesis 2, taken as a historical account rather than as a myth or allegory, is a severe problem for all no-Adam versions of theistic evolution, and a lesser problem for most versions of theistic evolution which have a nonhuman ancestor for Adam. The account of the origin of human sin and death in Genesis 3, taken as a historical account rather than as a myth or allegory, is a severe problem for all no-Adam versions of theistic evolution. The warrant for reading Genesis 2 and 3 as a myth or allegory comes from outside Scripture, allegedly from the gapless nature of evolution. This is an example of "God of the gaps" thinking in which natural law is the gap plugger. We should not mistake research agendas for empirical results. "One who puts on his armor should not boast like one who takes it off" (1 Kings 20:11). The desire to have a non-interventionist origin of humanity leads naturally to a monistic view of human nature, raising severe problems for post-mortem survival, a doctrine clearly taught in Scripture. ✦

Notes

[1]Robert C. Newman, "Creationism," in *Encyclopedia of Fundamentalism*, ed. Brenda E. Brasher (New York: Routledge, 2001). ASA Statement on Creation: www.asa3.org/ASA/topics/Evolution/commission_on_creation.html#Commission%20on%20Creation.

[2]Keith Stewart Thomson, "The Meanings of Evolution," *American Scientist* 70 (Sept–Oct 1982): 529–31.

[3]Ibid., 529.

[4]Ibid.

[5]E.g., Dudley J. Whitney, Harold W. Clark, Frank Lewis Marsh, H. Douglas Dean, mentioned in Ronald L. Numbers, *The Creationists* (New York: Knopf, 1992), 109, 124, 131–2, 234.

[6]Thomson, "Meanings of Evolution," 529.

[7]Ibid.

[8]Ibid.

[9]Ibid.

[10]Ibid. My numbers added in brackets.

[11]E.g., Fred Hoyle and Chandra Wickramasinghe, *Evolution from Space* (New York: Simon and Schuster, 1981), chaps. 3-4; Francis Crick, *Life Itself: Its Origin and Nature* (New York: Simon and Schuster, 1981), chap. 13.

[12]E.g., G. A. Kerkut, *Implications of Evolution* (London: Pergamon, 1960), chap. 2.

[13]Thomson, "Meanings of Evolution," 530.

[14]George Gamow, *One Two Three ... Infinity* (New York: Viking, 1962), 199–202.

[15]Michael Behe, *Darwin's Black Box* (New York: Free Press, 1996).

[16]William A. Dembski, *Intelligent Design* (Downers Grove, IL: InterVarsity, 1999), chaps. 5–6; Behe, *Darwin's Black Box*, chaps. 9–10.

[17]Glenn R. Morton, *Foundation, Fall and Flood: A Harmonization of Genesis and Science* (published by author, 16075 Longvista Dr., Dallas, TX 75248, 1995), 247.

[18]Howard Van Till, "The Fully Gifted Creation," in *Three Views on Creation and Evolution*, ed. J. P. Moreland and John Mark Reynolds (Grand Rapids: Zondervan, 1999), 161–218, esp. pp. 184–90.

[19]Robert C. Newman, "Self-Reproducing Automata and the Origin of Life," *Perspectives on Science and Christian Faith* 40 (March 1988): 24–31; "Artificial Life and Cellular Automata" in *Mere Creation: Science, Faith & Intelligent Design*, ed. William A. Dembski (Downers Grove, IL: InterVarsity, 1998), 427–45.

[20]Van Till, "Fully Gifted Creation," p. 187, defines miracle as "an extraordinary act of God performed in the presence of human observers for some specific revelatory or redemptive purpose."

[21]Fred Hoyle, *Galaxies, Nuclei and Quasars* (New York: Harper and Row, 1965), 96.

[22]See Jubilees 2:2 on the creation of angels on the first day.

[23]See John C. Eccles, *How the Self Controls Its Brain* (Berlin, etc.: Springer-Verlag, 1994); Karl R. Popper and John C. Eccles, *The Self and Its Brain* (London: Routledge & Kegan Paul, 1983).

[24]See John W. Cooper, *Body, Soul, and Life Everlasting: Biblical Anthropology and the Monism-Dualism Debate* (Grand Rapids, MI: Eerdmans, 1989) for an excellent discussion of these matters.

Book Reviews

ENVIRONMENT

THE BLANK SLATE: The Modern Denial of Human Nature by Steven Pinker. New York: Viking, 2002. xvi + 509 pages, appendix, notes, references, index. Hardcover; $27.95. ISBN: 0670031518.

In his newest tome, psycholinguist, Pulitzer Prize nominee, and Massachusetts Institute of Technology professor Steven Pinker has taken up the sword against Environmentalism and dealt it a blow from which it is not likely to recover. Approaching his subject matter from both philosophical and empirical pathways, Pinker's aim is to dismantle Environmentalism's main premises: John Locke's Blank Slate theory, Dryden and Rousseau's Noble Savage notion, and Descartes' idea of a Ghost in the Machine. He contends that as much as both academicians and the popular press tout these politically-correct philosophies, they hold little empirical support and people should no longer regard them as valid approaches to understanding humanity.

Pinker's main theme is that human beings are not born with a *tabula rasa*, malleable to the whims and wills of the environment. Instead, people come into this world with a host of predispositions, characteristics, and traits already formed. The environment does not shape the person; the person shapes the environment. Pinker knows his ideas are counter-intuitive and highly controversial, so consequently he backs up his suppositions with a wealth of data from cognitive science, genetics, and evolutionary biology. Almost as if he can foresee objections to his ideas, Pinker systematically breaks down and refutes arguments against his stances before they can even arise.

The book has five parts (six if you count his concluding chapter). The first is devoted to explaining the history and systems of the Environmental theories, and why studies in the cognitive, biological, and genetic sciences have given good cause to refute the Environmental notions. The second section is devoted to explaining the politics surrounding the Environmental theories, why they became so popular in the first place, and why they remain dogma in most universities despite their lack of supportive evidence. Pinker uses the third section to alleviate any fears that might be associated with replacing an Environmental explanation of human nature with a more a materialistic one, and compliments this section with the forth, which aims to show why any moral stance that makes itself contingent on a Blank Slate philosophy is doomed. In his fifth section, Pinker writes of how malfeasantly Environmentalism has crept into current "hot" topics (e.g., politics, violence, gender, children, the arts) and how only through an accurate knowledge of the role and function of biology and genetics can people begin to repair the damage.

Pinker's book presents no new data, but does an excellent job assimilating a large portion of what others have written. It is obvious that he is quite knowledgeable about genetics, biology, and psychology, and his erudition shines throughout the entire book. Even though he has written his book for the laity, he meticulously cites references that support his arguments, which should satisfy any scholar reading the text. He approaches his content from a strong evolutionary perspective, a point-of-view that both fits his analyses well and makes for interesting reading.

To the book's detriment, he takes a few unnecessary swipes at Christianity, believing all who adhere to its tenets are blind, sycophantic disciples of the Religious Right. Moreover, it becomes obvious throughout the book that Pinker has his favorite topics and sometimes spends a little too long on his soapbox preaching about them. Fortunately, his attacks on Christianity are few and his soapbox rantings are infrequent enough that they do not take away too much from the cogency of the book.

Overall, Pinker has done an excellent job in his latest literary work. His argument for the potency of genetics and biology (and against the influence of the environment) is logical, well documented, thorough, and convincing. While those working in the biological or social sciences might especially find this tome of interest, almost anyone with a penchant for understanding human nature should find the book appealing. Pinker travels a path many in academia might fear to trod, but his journey is highly insightful and any who read this tome will be more enlightened because of it.

Reviewed by A. Alexander Beaujean, Assessment and Consultation Clinic, 205 Lewis Hall, University of Missouri, Columbia, MO 65211.

YOU'VE BEEN HAD: How the Media and Environmentalists Turned America into a Nation of Hypochondriacs by Melvin A. Benarde. Piscataway, NJ: Rutgers University Press, 2002. 308 pages, index; notes. Hardcover; $28.00. ISBN: 0813530504.

This is an important book for ASA members, most of whom probably have an "environmentalist" bias while few have the "pro-technology" bias as I do. Benarde has impeccable environmentalist credentials, e.g., former director of the Environmental Studies Institute at Drexel University and author of nine books like *Our Precarious Habitat* and *Global Warning/Global Warming*. He is the latest in a series of environmentalists since 1990 who have written exposés and criticisms of excesses and myths promulgated by the environmentalist movement. The most prominent is Bjorn Lomborg whose book *The Skeptical Environmentalist* has provoked widespread condemnations by doctrinaire environmentalists but has been lauded by pro-technology scientists.

In a press release accompanying the release of *You've Been Had*, Benarde says he expects a similar attack on himself, because, he says, both Lomborg and he "show that environmentalists have overstated their case-if they ever had a case." He says that case was the myth that "technology in the form of a military/industrial complex is the noxious cause of high death and illness rates"(p. 262). Some pro-technologists, however, notably Julian Simon, have shown over and over again that "things are getting better"—longer life spans, lower infant mortality, more wealth, higher standard of living, and so forth. Further-

more, environmental catastrophes related to pollution and toxic waste predicted by many, e.g., as reported in George Gallup, Jr., *Forecast 2000* (New York: William Morrow Co., 1984) have not happened.

Now, Benarde, in reviewing an array of environmental issues, tends to side with the optimistic technologists. Thus, for example, in addressing the subject of "Genetically Modified Foods" his review includes statements like: "Once again the Luddites are at the gates." "Are gene-altered plants the 'Frankenstein Foods' they have been labeled by environmentalists or are they the foods of the future?" "Following established practice, environmentalists and their handmaidens, the media, failed to provide the public with a full measure of issues surrounding these new foods." In a similar manner, he attacks classical views of doctrinaire environmentalists on the pesticide-cancer myth, hazardous waste ("Toxic waste"), food irradiation, Three Mile Island, Love Canal and the dioxin myths from the Agent Orange and Times Beach stories.

Benarde, however, maintains strong concerns about several environmental problems. The first is global warming followed by tobacco and air pollution, particularly as related to fine particulates from auto exhaust. These concerns all become connected in discussion of new energy sources to replace fossil fuels. Benarde retains an environmentalist's zeal in a tutorial on global warming—beginning with an early (1801–1882) prediction by Marsh that "the earth can be modified by human activity." The basic causes of global warming, can be classified, according to Benarde, into three categories: (1) use of fossil fuels, (2) the production of cement and (3) land use issues, e.g., deforestation.

Benarde's solution for global warming comes as a surprise—namely nuclear power. He reviews the history of nuclear phobia and the role of the media in distorting the Three Mile Island incident. He credits Tyler, of the *New York Times*, however, for a balanced reporting of the Chernobyl crisis. He states that environmentalists believe "wind, solar, hydro and tidal power are the natural and only ways to achieve the energy needs" today. He rejects "their impractical message" and believes nuclear power is one answer to global warming. He reviews with some detail the science of ionizing radiation hazards and often cites risk comparison for perspective, e.g., that exposure to ionizing radiation, cosmic rays, while on airplanes, far exceeds most earthbound exposures, whether environmental or occupational. He decries (p. 205) the fact that the media failed to publicize a $10 million epidemiological study which found no significant elevated health effects in workers subjected to high levels of ionizing radiation exposure. But in that case the investigator seems not to have promoted publication. He thus contributed to "publication bias" ("effects" are reported but not "no effects").

Before the end of the book, Benarde presents a mild criticism of creationism, which is probably milder than that of many in ASA. He closes with a grand plan for introducing "scientific literacy" into society beginning with proactive steps by key university professors to initiate a radical change in educational philosophy and curricula. This grand plan is laudable and I hope it comes about and that ASA can play a role in it.

Reviewed by John M. Osepchuk, Full Spectrum Consulting, 248 Deacon Haynes Road, Concord, MA 01742.

THE ART OF THE COMMONPLACE: The Agrarian Essays of Wendell Berry by Norman Wirzba, ed. New York: Counterpoint Press, 2002. xx + 330 pages. Hardcover; $26.00. ISBN: 1582431469.

Because I find Wendell Berry's poetry to be beautiful and thoughtful, I was attracted to the possibility of reviewing a book of his essays. His poems embed a commitment to Christian belief amid the grittiness of daily life. These essays elaborate that orientation more explicitly and explore his ideas at greater length. The introductory material by Norman Wirzba provides a helpful guide to Berry's thought.

The book is organized into five parts: A Geobiography, Understanding Our Cultural Crisis, The Agrarian Basis for an Authentic Culture, Agrarian Economics, and Agrarian Religion. Berry's thinking is grounded in his family history and the place in which his family has lived (hence a geobiography). On this grounding, the essays broaden out to address various aspects of the present condition, always returning to the importance to Berry of the land. "I am talking about the idea that as many as possible should share in the ownership of the land and thus be bound to it by economic interest, by the investment of love and work, by family loyalty, by memory and tradition."

These reflections are also firmly based on a commitment to Christianity, and tied to Berry's reading of the Bible. "The soul, in its loneliness, hopes only for 'salvation.' And yet what is the burden of the Bible if not a sense of the mutuality of influence, rising out of an essential unity, among soul and body and community and world? These are all the works of God, and it is therefore the work of virtue to make or restore harmony among them." These ideas form the backdrop for considerations of racism as violations of community, of economic globalism and of technological development, much of which makes Berry uncomfortable.

The underlying ideas of the importance of the land, and of the essential unity of the created order, including both the animate and the inanimate and especially humanity, are easy to affirm. Some of Berry's specific conclusions about the importance of agrarian practice are perhaps not as easily scalable to a planet populated by the billions who will live on it during our children's generation. This book is both stimulating and challenging.

Reviewed by David T. Barnard, University of Regina, Regina, Canada.

ORIGINS & COSMOLOGY

EVOLUTION AND MORMONISM by Trent D. Stephens, D. Jeffrey Meldrum with Forrest D. Peterson. Salt Lake City, UT: Signature Books, 2001. 238 pages. Paperback; $19.95. ISBN: 1560851422.

The book's thirteen chapters have an eleven-page bibliography and a few illustrations relating to biological evolution. Here is the main point from each chapter: (1) the universe is billions of years old, follows natural laws, and was created by God for mortal existence; (2) Mormon leaders say leave the theology to theologians and science to sci-

entists; (3) many Mormons think biological evolution false but science and Mormon theology cannot conflict; (4) Mormon leaders' 1909 statement did not reject evolution; (5) science is based on facts; religion on faith; (6) fossil evidence and DNA data support evolution and Neo-Darwinism but some evolution is directed by God; (7) DNA evidence links all life forms, but God created human's physical and spiritual natures on different time lines; (8) Joseph Smith said God created humanity's spirituality before physicality; (9) organic evolution is the honest result of scientists explaining the evidence; (10) oldest fossil bacteria in rocks are 3.5 million years old; (11) Genesis is compatible with evolution; (12) evolution may be partly random and partly non-random; (13) biological evolution is one step in the process of eternal progression from humans to gods.

The book's main point is to present modern biological evolution as established fact and to make Mormon theology compatible with it. In the past, Mormons opposed evolution. The book weaves evolution with Mormon belief that God was once a man and that he evolved into God. (But if God created the universe, where did he live as a man before creation?)

The book's main strength is its excellent portrayal of biological evolution. Its main weakness is not clarifying the numerous contradictions between Mormon theology and science. For instance, DNA analysis is used to show physical man's relationship to other primates, but the authors are silent on the use of DNA to show that North American Indians are descended from East Asians and not from Hebrews, as Mormon theology demands. Also, modern dating methods show that American Indians came here 12,000 or more years ago, not 600 BC, as stated in the Book of Mormon. The Book of Mormon states that honey bees, various animals, and seeds of crop plants were brought to the new world by the Hebrews in 600 BC from Jerusalem. Yet none of these were found here until post-Columbian times.

The book's three authors have ties with the Mormon tradition. Stephens, professor of anatomy and embryology at Idaho State University, has coauthored ten books and is a Mormon bishop. Meldrum, associate professor of anatomy and anthropology at Idaho State University, is co-editor of a series of books on paleontology and a Mormon priesthood instructor. Peterson, a writer and movie producer, is an elder and teacher of Mormon doctrine. Although the book is written primarily for Mormons, ASA members may find it useful to study the unbiblical, polytheistic theology of the Mormon Church.

Reviewed by Melvin N. Westwood, Professor Emeritus, Oregon State University, Corvallis, OR 97331.

PATTERNS IN THE VOID: Why Nothing Is Important by Sten F. Odenwald. Boulder, Colorado: Westview Press, 2002. 270 pages. Hardcover; $27.00. ISBN: 0813339383.

An astronomer at Raytheon, Odenwald has published over 50 popular and scientific articles. His previous books include *The 23rd Cycle* and *The Astronomy Café*. He also writes a regular online column at www.theastronomycafe.net.

This book is about the immense areas of vacuum that comprise everything that exists, from deep space to atoms. The subtitle is intentionally provocative. The book does *not* claim that there is not anything that is important. It rather claims that nothingness (the void) is important. It was from the void that the universe sprang into existence, and the overwhelming majority of the universe is still comprised of void rather than matter. This book is about the author's scientific struggle to make sense of existence and find some meaning to it all, especially in consideration of the void. It was not that long ago that science believed that space was not really empty but rather consisted of an ether. Although we now know that space is empty, it still "contains" things such as gravity, electromagnetic forces, and virtual particles that flash into and out of existence.

This book touches on the anthropic principle at several points. For example, life could exist only in a universe with four space-time dimensions. Also, the generation of matter and antimatter at the beginning of the universe resulted in only one particle of matter for every 30 million pairs of particles that annihilated and became light. "We can measure the likelihood of the miracle that is matter, and we find it is almost literally one in a million" (p. 226).

The author's physics-based explanations and speculations are often difficult for a layperson to follow, but mixed in with his technical explanations are some fascinating and poignant personal meditations about what existence and death means for him and those he loves. He also discusses the creation stories of various religious traditions, noting that they all state that the universe was created out of nothing, or out of darkness. However, he does not view any religious creation stories as valid in the same sense that science is valid. "Scientific and religious descriptions of Creation are not the opposite sides of the same coin but complementary views that reinforce the essential mystery of existence" (p. 219).

At the end of the book the author tries in vain to find the meaning of life, existence, consciousness, and death. He admits that his science has "fully prepared him to meet the Void in all of its technical splendor, but it has failed miserably to provide me with the inner emotional strength needed to face death and darkness." This book is recommended for those readers who are well versed in physics or astronomy.

Reviewed by Dan Simon, Assistant Professor of Electrical Engineering, Cleveland State University, Cleveland, OH 44115.

SCIENCE AND CREATION: An Introduction to Some Tough Issues by Wayne Frair. St. Joseph, MO: Creation Research Society Books, 2002. 77 pages. Paperback; $6.00. ISBN: 0940384256.

BIOLOGY AND CREATION: An Introduction Regarding Life and its Origins by Wayne Frair. St. Joseph, MO: Creation Research Society Books, 2002. 84 pages. Paperback; $6.00. ISBN: 0940384272.

These books are the third and fourth "in a series of introductory readers." The intended audience is not specified. Because of their brevity and level of dealing with the subject matter, I guess that they are designed for church

members wanting to know a little about the issues. There are glossaries, indexes, notes (nine pages in *Biology and Creation*, less in *Science and Creation*) suggestions for further reading and a list of "Creationist Periodicals," not including this journal. Most of the books listed for further study are written by young-earth creationists, but Behe's *Darwin's Black Box* and Phillip Johnson's *The Wedge of Truth* are included.

These books advocate young-earth creationism, although an attempt was evidently made to present other views fairly. That attempt did not fully succeed. In *Biology and Creation*, ASA member Frair states that "the term 'young-universe' or 'young-earth' is used for these proponents because they affirm that the universe was created about six to ten thousand years ago" (p. 50). However, like so many other writers, Frair uses *creationist* inappropriately. He implies that those who may believe that the universe was supernaturally created several millions or billions of years ago are *not* creationists. In *Science and Creation*, he writes "The word creation may be utilized in a broad general sense, but as used here it excludes theistic evolution, which is the view that God created living things by the process of evolution" (pp. 56–7).

Science and Creation introduces what science is, and devotes more pages on the relationship between science and theology. It points out that Christianity set the stage for the development of science, and that Christianity "Favors Good Science." The book explains that God is supernatural, not natural, and deals briefly with miracles. It closes with a brief history of creation-evolution thinking. Intelligent Design is referred to occasionally.

Frair explains the first law of thermodynamics as indicating that energy/matter cannot have come from nothing. I was, therefore, surprised that he did not go on to say that, if the first law has always been true, then the second law cannot have always been true. If both had been true, the universe would be in a state of total entropy, which implies that there was some definite beginning to the universe, which would be expected if God had created it. I was also surprised to discover that Frair referred to Hebrews 11 without mentioning Hebrews 11:3.

Biology and Creation explains such topics as exobiology, the origin of cells, convergence, Intelligent Design, and the Anthropic Principle. Frair writes that believers should not oppose scientific research, even research into the topic of pre-biotic evolution, unless there are ethical or moral problems with the research. He also says that "I am not suggesting that the evidence of God can be proved scientifically. Nobody can do this. Neither can anyone prove that God does not exist" (p. 33).

Frair writes that "When the parent-offspring relations (genealogies) particularly in the Old Testament are studied, a scholar can place time of the original creation at about six thousand years ago" (p. 51). Evidently Frair does not accept the view that the genealogies were intended to show continuity and not to establish timing.Both books are easy to read and free from technical errors. Neophyte readers will come away with a superficial understanding of the issues and be led to believe that Christians are, and should be, united in believing that the earth is but a few thousand years old.

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

HEALTH & MEDICINE

MAD IN AMERICA: Bad Science, Bad Medicine, and the Enduring Mistreatment of the Mentally Ill by Robert Whitaker. Cambridge, MA: Perseus Books, 2001. 334 pages, tables, notes, bibliography, index. Hardcover; $27.00. ISBN: 0738203858.

The first moral-treatment asylum opened in America in 1817. It took until the early 1800s for Americans to embrace the idea that "the ultimate source of recovery lay in themselves, and not in the external powers of medicine." Medical journalist Robert Whitaker uncovers the secret underside of the psychiatric establishment in this thought-provoking book. It is his premise that American psychiatry has excelled throughout the nation's history, but doctors and drug manufacturers have profited far more than psychiatric patients.

Whitaker's articles on the mentally ill and the drug industry have won several awards, including the George Polk Award for medical writing and the National Association of Science Writers' Award for best magazine article. He was named a finalist for the Pulitzer Prize for a Boston Globe series he co-wrote in 1998.

Whitaker's research has shown that the schizophrenics in the U.S. are less likely to recover than in a Third World country where the recovery rate, or ability for one to regain sanity, is surprisingly exponentially more likely than in America. As stated by the author, "the medical failure [in America] is a profound one." Millions of Americans suffer from mental handicaps but too many end up in prison, homeless, or shuttling in and out of psychiatric hospitals.

In a quest to understand the therapeutic failures of the actions taken since the seventeenth century to the present, Whitaker analyzes in a disturbing exposé the cruel and corrupt business of treating mental illness in America. In *Mad in America: Bad Science, Bad Medicine, and the Enduring Treatment of the Mentally Ill* Whitaker concludes, "modern mistreatments for the severely ill are just old medicine in new bottles ..." He traces the history of experiments, theories, and nonsensical remedies to "cure" the mentally insane.

Whitaker summarizes cruel and unusual physical treatments including ice-water immersion, bloodletting, electroshock, lobotomy, and drug therapy. He relates how physicians have struggled to match medical practice with "cost for care" in an attempt to heal the psychologically sick. Another conclusion Whitaker makes is that mental illness has become profitable. It is good business for drug companies to make bad medicine in treating schizophrenia, a compelling indictment against the relationship between modern medical businesses and the American Psychiatric Association.

The story starts on a positive note, with the establishment of proper medical wards for the insane in Pennsylvania Hospital, around 1800. The "medical approach" was followed by a period of "moral treatment" between the 1840s and the 1880s when patients were treated with compassion and respect. However, overcrowding of psychiatric wards and lack of dedicated personnel led to the

restoration of the medical model resulting in widespread inhumane treatments including prohibition of marriage among the insane and compulsory sterilization. By the 1930s prefrontal lobotomy had become the norm.

One might think that the advent of anti-psychotic drugs in the 1950s would have marked the beginning of a positive approach to therapy. However, Whitaker's conclusion is that neuroleptic drugs make patients worse, rather than better and he proves this by repeatedly comparing treated and untreated patients from different institutions, with differences in referral patterns and severity of illness.

Mad in America reveals a great deal about the society that attempts to "cure" the patients, for the treatments for the severely mentally ill quite accurately reflect the societal values of the day. Whitaker faults the skewed studies employed by drug companies in the 1980s and 1990s as an attempt to prove the "effectiveness" of a drug all the while ignoring dangerous side effects. The archaic treatments of the past and the ineffective ones of the present are telling. Whitaker has presented a book well worth a look. In short, it is a dose of reality and makes one wonder about the state of the nation's mental health system.

Reviewed by Dominic J. Caraccilo, Lieutenant Colonel, US Army, Vicenza, Italy.

PHILOSOPHY & THEOLOGY

BY THE WATERS OF NATURALISM: Theology Perplexed Among the Sciences by Andrew P. Porter. Eugene, OR: Wipf and Stock Publishers, 2001. 137 pages. Paperback; $17.00. ISBN: 1579107702.

Porter is an adjunct instructor at the Graduate Theological Union in Berkeley, California. He is also a consultant in physics at the Lawrence Livermore National Laboratory. He has earned one doctoral degree in computational physics and another in philosophical theology and hermeneutics. His theological interests include the philosophy of religion as well as the differences between history and naturalism.

It is the latter of these two interests that is the primary focus of this book. In the first two chapters, Porter briefly discusses the attempt by some theologians to defend religion in an age of science with ideas from recent developments in physics. He cites one early example of this approach from William Pollard's 1958 book, *Chance and Providence*, in which Pollard suggested that "quantum uncertainty supplies just the indeterminacy that is needed to give God room to act." Porter then argues that this "God of the gaps" approach is a futile attempt to locate acts of God within the inner workings of the natural world. He summarizes his argument by stating: "to locate God within nature on nature's terms is to compromise the transcendence of God, to turn biblical religion into yet another variety of nature worship" (p. 8). After discussing why naturalistic ideas are not very helpful in making sense of biblical religion, Porter goes on to explain in chapters three through nine why it is better to search for "acts of God" from within the context of human history.

While Porter's criticisms of naturalistic religion are well argued, he fails to adequately interact with more recent publications in the field of science and religion. Out of the thirty-five sources listed in the "for further reading" section at the end of the book, only a few of them have anything to do with the relationship between science and religion. One of these citations is the 1958 book by Pollard, while the only two recent sources are a 1997 article by Robert John Russell, and the 1995 *Chaos and Complexity* edited by Russell, Nancey Murphy, and Arthur Peacocke. Although Porter states in his acknowledgment page that he is indebted to the writings of Russell and Peacocke for the key ideas in his book, there is little, if any, interaction with their publications. The ideas of physicist-theologians John Polkinghorne, Ian Barbour, and other recent contributors to the field of science and religion are also missing from Porter's book. The only other book of this genre that is cited, and the one that appears to have had the greatest impact upon Porter's thinking, is the 1949 *The Myth of the Eternal Return* by Mircea Eliade.

While many theologians would agree with Porter that is better to base one's religious beliefs on history rather than nature, the type of history described and defended in this book is first-person history rather than third-person history. According to Porter, third-person history is "external" history in which the one telling the story (the historian) is mainly interested in getting the facts straight. In third-person history, time is quantitative, a matter of dates and sequences. In contrast, first-person history is "internal" history which describes "what the events meant for the people who experienced them and for the people who identify with those historical actors after the fact, now, in the present" (p. 49). While third-person history is "they" history, first-person history is "we" history which often uses figurative language to show how things felt or what they meant in the lives of people then and now. First-person history, like modern-day movies and advertisements, uses special effects in ways that audiences can apply them to their own lives without being troubled by the fact that these are nonliteral, subjective interpretations of past events. The biblical accounts of past events are, according to Porter, primarily examples of first-person, "internal" histories.

It is clear from Porter's writing and resources that his view of the Bible is heavily influenced by liberal theology, biblical criticism, Kantian philosophy, and historical relativism. He clearly states that his own ideas have been molded by the writings of Ernst Troeltsch, Richard Neibuhr, and Edward Craig Hobbs. He argues that the real watershed in the history of religions is the Exodus event which transformed nature religion into a religion that was shaped and formed by history. He goes on to explain how the Gospel stories are a parody of the Exodus, with Jesus as the new Israel. However, in both cases, the stories are to be understood as examples of first-person history in which the subjective interpretations of the storytellers are of much greater value than the historicity of the events themselves. These events have been turned into advertisements for faith, but the faith that is called for is faith in an invented religion that has little, if any connection to actual, historical events.

While liberal theologians may find this book to be entertaining and enlightening, those who take the historic-

ity of the biblical narratives seriously will not find much that is helpful and should probably by-pass it altogether.

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

RELIGION & CHRISTIAN FAITH

PAUL: The Founder of Christianity by Gerd Ludemann. Amherst, NY: Prometheus Books, 2002. 292 pages. Paperback; $22.00. ISBN: 1591020212.

Ludemann thinks Paul was Christianity's founder and most successful missionary. The author explores this view, espoused by many previous writers, with "painstaking historical research." Paul created Christianity's theology by combining Hebrew and Greek ideas which resulted in a belief system quite different from the one preached by Jesus, according to the author. His view is "my historical thesis" and my "assertion." He seeks "to present Paul as impartially as possible, and strictly on the basis of the sources critically tested." In addition, he wants "to present Paul with the utmost empathy." Ludemann is professor of history of early Christianity at the University of Gottingen, Germany.

Ludemann's research has led him to some conclusions questioned by evangelicals, namely: (1) "James criticizes Paul's doctrine that salvation comes by faith alone ..."; (2) "Paul's religious claims about God and his plan belong in a museum and cannot be accepted by modern man in the light of today's knowledge"; (3) Paul's experience on the road to Damascus pushed him "into the world of hallucination ..."; (4) "... it is impossible to believe as Paul did that Jesus rose bodily from the dead." To Ludemann, the doctrine of Jesus' resurrection is a "canard."

Why read Ludemann's book? One, he introduces many illuminating but unfamiliar ancient texts translated into English. Two, he provides informative quotes from many scholars and includes a succinct bibliography for further study. Three, he interacts with many biblical texts and gives a reasoned argument for his position. Fourth, he provides a contemporary, readable, and widely-held view. To refute his perspective calls for a sturdy evangelical apologetic.

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

SOCIAL SCIENCE

FOR A CHRISTIAN AMERICA: A History of the Religious Right by Ruth Murray Brown. Amherst, NY: Prometheus Books, 2002. 309 pages, index, resources, notes. Hardcover; $28.00. ISBN: 1573929735.

Brown passed away in May 2002, just before this book was published. A professor of political science and sociology at Rose State College, Brown spent twenty-five years in researching the history of the Christian Right. This included in-depth interviews with key figures such as Phyllis Schlafly, Jerry Falwell, Pat Robertson, James Dobson, Tim LaHaye, and Beverly LaHaye.

The Religious Right began, argues Brown, with a grassroots movement which rallied to defeat the Equal Rights Amendment in the 1970s. By the end of the century, the movement became a formidable cultural and political force. Henry Morris and the Institute for Creation Research are part of the story, but other parts, such as abortion, public school prayer, and homosexuality, play a much larger part.

Part I describes the early years of the Religious Right, with emphasis on Schlafly and the Eagle Forum. Part II is concerned chiefly about how the other players (Falwell, Dobson, the LaHayes) became part of the coalition. Part III is about the issues that define it. The book concludes with Brown's assessment of the movement, and how she expects it to play out in the early twenty-first century. Whatever happens to the present organizations, she writes: "... the Christian conservative movement still has its base in the growing membership of the conservative churches ... [it will] continue to be a significant interest group ..." (p. 282). She continues with a discussion of how this movement, through its schools, media, and institutions, is contending for the very soul of America. How successful it will be is a question she did not address.

It is apparent that Brown did not approve of the values and goals of the people she interviewed and subsequently analyzed. But despite this, unlike many books and articles on the movement, which tend to either praise or condemn, her book appears to be objective, balanced, and fair. Readers from both sides of the political/religious spectrum will find it to be an insightful look into the events, personalities, and issues of the last third of the twentieth century. It is well written, readable, and scholarly. I recommend it highly.

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

INTUITION: Its Powers and Perils by David G. Myers. New Haven, CT: Yale University Press, 2002. 322 pages. Hardcover; $24.95. ISBN 0300095317.

David Myers, a renowned psychologist, has been a member of the American Scientific Affiliation since 1975. He is Werkman professor of psychology at Hope College in Michigan. His books include popular texts in social psychology and introductory psychology. In addition, he has produced scientific books on such topics as happiness, affluence, hearing loss, and hope.

Intuition receives strong recommendations from two presidents of the American Psychological Association and the chairman of Gallup Research. Its main point is that humans have two kinds of memory or attitude: "One is above the surface, in our moment to moment awareness; the other is below, operating the autopilot that guides us through most of life" (p. 51).

Myers' mission is to make what science reveals about intuition relevant to daily life. He thinks "... psychological science reveals some astounding powers and notable perils of unchecked intuition ... creative yet critical thinkers

will appreciate both." Although science often inhibits us from thinking we know something we actually do not, it cannot provide meaning to life. This allows for spiritual intelligence which may produce "epistemological modesty" and aid in daily living.

Myers gives illustrations to support both the bane and blessing of intuition. The bane involves showing readers that confidence in their knowledge is often misplaced. For instance, most people think Reno is east of Los Angeles, Rome south of New York, and Atlanta east of Detroit; they are not. The blessing involves being able to do hundreds of things like walking, driving, and talking without thinking much about them.

Myers' thirteen chapters investigate a variety of intuitive tendencies including social, sports, investment, clinical, interviewer, risk, gamblers' and psychic. Fifty-six pages of notes and thirteen pages of indices are helpful for further study.

This is a superb book – informative, absorbing, insightful – and I highly recommend it. While full of results based on scientific research, it is nevertheless faith friendly. Its information will enable the reader to better grasp reality and move in the direction of much needed empirical intuition.

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

Letters

Thomas Aquinas and RFEP

On the surface, the notion of a Robust Formational Economy Principle (RFEP), proposed by Howard Van Till (*PSCF* 54 [2002]: 232–9) appears to be compatible both with the scientific enterprise and Christian faith. It is essentially an agnostic position; one that makes a minimalist and negative claim about divine action (it is not necessary for God to act in a certain way), and avoids conflict with the working assumptions of scientific investigation. In other words, it is a friendly, non-threatening, comfortable position to take.

Such a view, however, serves neither science nor Christianity. It says nothing new to the majority of scientists who hold to either philosophical naturalism (or in Van Till's terminology, "maximal naturalism") or methodological naturalism. Neither does it offer much to Christians, who are all called to be "salt" and "light" to the world. How can it? A perspective of indifference to the question of divine action, other than placing a limit on God's ability to act in a certain way ("form-conferring intervention") is at best, interesting but without implications for personal response, apologetics, and evangelism.

Perhaps, a better alternative to RFEP is not ID, which posits the "form-conferring intervention" that RFEP denies, but a return to a more ancient understanding of creation and change as argued by Thomas Aquinas.[1]

Both Van Till and Aquinas would agree that any account of the physical world in the natural sciences is *not* inherently incomplete, contrary to ID and those who search for divine agency in the indeterminism of chaos theory or quantum theory. Aquinas, however, did not stop at that point. For him, although there are real and "amply equipped" natural causes (what he referred to as secondary causes), God is the complete and ultimate cause of the physical world. The secondary causes apply only to the world of changing things. Anything that changes requires an underlying material reality. Creating, however, is an action peculiar to God alone. To create is not to act on some already existing material, but to cause something to come into existence and to preserve its state of existence. To create, therefore, is to give existence. Anything separated from the cause of its existence would cease to exist. For Aquinas, God's act of creation is a constant, ongoing, and intimate event. Creation, however, is not mingled with the secondary operations of nature, but is presupposed by these operations. Interestingly, Aquinas saw no problems with an eternal universe because such a universe, would nevertheless, depend on God for its existence. In fact, there can be no conflict between creation and any scientific theory, because the former deals with creation and the primary cause, while the latter deals with change in preexisting material and secondary causes. The radical dependence of all things upon God as the cause of being is fully compatible with the scientific discovery of causes in nature. So, even though God is the immediate cause of all existing things, the material in the natural world is its own true cause of effects.

In what way is this Thomistic view superior to RFEP? First, it does not attempt to limit divine agency to certain modes and not others. God can and has acted in direct ways in the natural order (i.e., "form-conferring interventions") by bypassing secondary causes so that he himself produces either their natural effects, or possibly even effects beyond their power (what we would call miracles). That is not to say that nature is lacking in the power to bring about certain natural structures, but it is to say that the Author of nature has the power to override secondary causes if he so chooses. Second, a proper understanding of the Thomistic view (which my brief account of it in this letter is wholly inadequate in imparting) allows for Christians to maintain the historicity of unusual (or supernatural) biblical events, rather than resort to "new" interpretations. Thus, in spite of nature's completeness, there are certain events that nature was never meant to accomplish (s.a. creation, salvation, endowment of God's image upon humankind) and were never within nature's powers. RFEP would simply deny their historicity, or force natural scientific explanations upon them. Third, it is explicitly and uniquely Christian in its form, employing the concept of creation out of nothing and inextricably binding it with the God of Christianity. For Aquinas, creation is God's way of sharing and reproducing His inherent goodness. Fourth, because it is explicitly Christian, it opposes philosophical naturalism, and demands personal responses from Christians. We, as creatures, are true causes in our own right, and our actions have real consequences in the world. We understand how we *should* act because we now have an account (albeit incomplete given our inherent limitations) of how and why God acts. RFEP simply avoids the question of divine agency.

In spite of my criticisms of RFEP, to be fair, it offers a helpful starting point for discussion, as we have already seen. What we need to remember is that it is just that.

Note

[1]*Summa theologiae* I, q. 45–7 and I, q. 103–5.

Adrian Teo
ASA Member
Department of Psychology
Whitworth College
Spokane, WA 99251

Response to Discher and Van Till Dialogue

Since Mark Discher seems to have generated all of the negative comment in the Discher-Van Till dialogue (Letters, March 2003), I thought in the interest of balance, I might offer three criticisms of Howard Van Till's thesis:

1. Given his own theological predisposition to believe the universe as it really is, is most probably the universe as imagined by RFEP (Robust Formational Economy Principle) advocates, and his acknowledged inability to prove that or to disprove ID (Intelligent Design), Van Till's RFEP seems as opened as ID to the charge of being folk science.

2. Van Till by his own admission believes that God exists, created the universe, and can act within it. Therefore he has no theological justification for denying that God could be involved in occasional episodic acts of special creation. Indeed, one could argue that many of Jesus' miracles were precisely such acts and that in doing them, Jesus was drawing our attention to the creative capacity of the divine word as revealed in the first chapter of Genesis.

3. RFEP comes perilously close to deism. This is not to say that Van Til is a deist, but it is to say that his reasons for not being a deist tend to undermine RFEP.

I found the exchange between Discher and Van Till quite enlightening. In my judgment, the argument went to Discher.

Ben M. Carter
ASA Member
Marbletree Apartments, Apt. #2030
4077 North Beltline
Irving, TX 75038
Cartersalma@aol.com

On Super-Intelligent Design

The December 2002 issue of *PSCF* highlighted various approaches to divine design, including Van Till's advanced RFEP (Robust Formational Economy Principle) along with more standard Intelligent Design (ID). This same special issue also included a remarkably prescient and highly relevant observation by Moorad Alexanian made while commenting upon Thorson's wider reflections concerning naturalism (*PSCF* 54: 287–8). In this, Alexanian exposes questions that may be "truly beyond the reaches of science no matter how it is defined" (p. 287).

The salient "ontological problem" which Alexanian addresses is absolutely crucial for those of us who support intelligent design as long as it is not *anthropocentrically* construed. Following Alexanian, we may suppose the existence of a Creator, "conscious and intelligent to an infinitely higher degree" (p. 288), presumably quite transcending human capacities of rational understanding and so even science. He postulates that this idea may constitute the "underlying rationale for advocates of intelligent design to infer an Intelligent Design" (p. 288). Unfortunately the general impetus for ID seems to be rather more complex and unnecessarily subject to *anthropomorphic* considerations.

Most standard discussions of ID entail, if unwittingly so, a *hidden* proviso akin to the Protagorean motto whereby *man is the measure of all things*. In order to even qualify, a *properly intelligent* design ought presumably to be accessible through human reason and scientific understanding at least in principle. However, Scripture often reminds us that God's ways are not our ways. So it would be quite presumptuous, even idolatrous, to postulate conformity between God's capacities and human expectations. Even if God wished to provide us with the blue print and explanation about intelligently designing and sustaining His creation, we could not grasp this message. Human capacities *are not infinite*, Alexanian's most telling point!

Perhaps Super-Intelligent Design (SID) might better fit the infinite capacity of God's own "toolbox" ranging well beyond potential scientific acumen. This wider scope could include various natural processes and chance events often designated "acausal," stochastic, or random. For if intelligent design were construed less *anthropocentrically*, it *could* accommodate natural processes and events that transcend our capacity for complete understanding. Now, a creator God must possess intelligence characteristic of conscious beings, Alexanian stresses, though *extending far beyond our human capacities* even "to an infinitely higher degree" (p. 288). An *adequate* assessment of intelligent design would therefore at least have to *incorporate*, rather than *exclude*, natural processes that transcend complete scientific comprehension. Accordingly, there is really no a priori justification for trying to "eliminate chance" in the style that some mainline proponents of *restrictive* ID unnecessarily choose.

In conclusion, intelligent design as such is not the central issue but rather its *range, scope, and degree*. Most Christian believers recognize that God is able to create and sustain the universe by whatever means he deems appropriate. Humans ought not to pretend to be privy to his ways or to adjudicate what constitutes legitimate modes of design. If we truly acknowledge that God's ways cannot be fully accessible to human understanding, it would behoove us to employ apophatic theology rather than relying upon humanistic Protagorean prescriptions. A humble God-centered view of these matters, appropriately reflecting a child-like modesty, would openly concede his "infinitely higher degree" of intelligence (p. 288), being receptive to hints of that veiled Super-Intelligent Design so deeply embedded all throughout creation.

Thaddeus J. Trenn
CSCA Member
University of Toronto
t.trenn@utoronto.ca

Letters

Beyond the Hills of Concordism and Creation Science

The interchange between Art Hill and Carol Hill (*PSCF* Letters, March 2003) over the extent of Noah's flood illustrates the continuing inability of either concordism or creation science to resolve the conflict between Scripture and modern science. Carol rightly recognizes that words change meanings over time, so their meanings must be understood in terms of the times in which they were written. Accordingly, she is correct that the word "earth" in the Old Testament does not refer to our modern understanding of the earth as a spherical planet.

In addition, it is abundantly clear from the existence of the ancient ice sheet on Greenland, the lack of Holocene rocks in northern Mesopotamia (except along the rivers), the overlapping unbroken occupation of numerous cities in the ancient Near East, as well from the ancient existence of various peoples around the globe that no global flood has occurred in the last 10,000 years and more. This is not a conclusion from "uniformitarianism," as Art suggests, for glaciology, geology, and archaeology all accept the fact that catastrophic events have occurred. Nor is there any place in biblical Christianity for suppressing scientific light in favor of a commitment to a private interpretation of the scientific data. Modern science is the fruit of God's delegated rule of the earth to *all* mankind (Gen. 1:26–28). Both unbelievers by common grace and believers are capable of finding scientific truth (cf. Matt. 16:3). We cannot suppress *any* light and claim to be followers of Him who is the Light.

As Carol Hill and a number of archaeologists have so well shown, there is only one flood which has any close-fitting archaeological and historical correlation with the flood of Noah: the Mesopotamian flood of c. 2900 BC which left its evidence simultaneously in the tells of Shuruppak, Kish, and Uruk.

At the same time, some of Art Hill's arguments remain unrefuted. It is incredible that a Mesopotamian flood would have killed off all of the birds that lived in Mesopotamia (Gen. 7:21, 23). It is likewise contrary to the tenor of Genesis 9 that a flood covering only Mesopotamia is in view, much less the flood of 2900 BC which was a riverine flood and apparently only seriously affected southern Mesopotamia.

What neither author mentions is that contextually the "whole earth" of Gen. 8:9 that was flooded is the same "whole earth" which the three sons of Noah later populated (Gen. 9:19); and that "whole earth" is delineated in Genesis 10. In modern terms, it extends from around Sardinia to Afghanistan and from the Black Sea to the Gulf of Aden. The "whole earth" of Gen. 8:9 is thus the entire earth as it was then conceived, namely, the greater Near East.

Further, a good number of Old Testament scholars agree that when the "whole earth" was flooded in the time of Noah, it went back to being as completely flooded as it was in Gen. 1:2 (e.g., Hamilton, Mathews, Waltke, Wenham). And the anthropological universality of the Flood has been seen by virtually all Old Testament commentators from the beginnings of the Church to the present day.

For the above reasons and others, I do not believe concordism's long-standing attempt to read Scripture as describing a merely local flood covering no more than Mesopotamia or the Black Sea is any closer to the biblical data than creation science is to the scientific data. The Bible describes a Flood that completely covered the greater Near East, which would necessitate a global flood. This is true even though there was no global flood.

I think it is time, therefore, to lay aside the assumption that God's revelations in Scripture could only be given in terms of his omniscient knowledge of history and science and not be accommodated to the cultural understanding of the times. It is time to recognize that this assumption is rooted more in human reason than in biblical revelation. Nowhere in Scripture does God say or imply with logical necessity that divine inspiration guarantees the scientific and historical accuracy of biblical historical accounts. Indeed, nearly every historical book in the Bible implies by a reference to outside sources (e.g., Josh. 10–13, 1 Kings 14:19; Luke 1:1–4) and an absence of any claim to direct divine revelation such as is found in the prophets, that its history qua history was derived from purely human sources.

As to science, a close study of Scripture reveals that the science in the Bible from Genesis to Revelation has been accommodated to the science of the times. The Church in the time of Galileo was correct when it saw in Scripture a geocentric universe with a literally moving sun (Eccl. 1:5). The Church's mistake did not lie in its exegesis, but in its assumption that the cosmology employed in Scripture is a part of the divine revelation rather than an accommodation to the science of the times. It was the dawning awareness of the fact that Scripture is scientifically accommodated which led Calvin to say, "The Holy Spirit had no intention to teach astronomy" and that if one wanted to learn astronomy, one should go not to the Bible but to the astronomers (John Calvin, *Commentaries VI, Psalms 93–150* (reprinted, Grand Rapids: Baker, 1979), 184 (on Ps. 136); Calvin, *First Book of Moses called Genesis*, 1:79).

In the case of the biblical Flood, the return of the earth to the conditions of Gen. 1:2 is integrally related to the cosmology of the times, and the underlying Mesopotamian tradition of a flood that destroyed all humankind shines through as the historical source of the biblical account. (No other flood story is even remotely as close.) Genesis 1–11 is a unit which follows Mesopotamian traditions, literary models, and motifs from beginning to end.

It may have been through the patriarchs, who came from Mesopotamia, that the Mesopotamian flood tradition first came to be accepted in Israel as an integral part of *their* prehistory of mankind. Its theological purification may well have begun in patriarchal times. In any case, it is the superior theology of Genesis 1–11 which contrasts with the beliefs of the times, not the history and science. The theological revelation in these chapters is accommodated to the already ingrained prehistorical traditions present in Israel at the time that God revealed himself to them. And this very accommodation is an implicit revelation that God has spoken in Scripture not first of all as a rationalistic philosopher-theologian, but as a Father to his little children, as a tutor (Gal. 3:24), accommodating his theological lessons to the mentality and preconceptions of his young children,

aware that in time they will learn better of both history and science.

Paul H. Seely
ASA Member
1544 SE 34th Avenue
Portland, OR 97214
phseely@aol.com

Why We Exist

Freeman Dyson, the famous astrophysicist, writes: "Life resides in organization rather than in substance, and it makes sense to imagine life detached from flesh and blood and embodied in networks of super conducting circuitry."[1] From this we can postulate that a life form of superior intelligence evolved slowly in the cosmos, over eons and eons, from the gradual accumulation and self-organization of energy; and that this energy arose in the cosmos through the same random quantum mechanism as used by cosmologists to provide the energy need for the Big Bang, to create an "accidental universe." We can also postulate that the cosmos has always existed and still exists as that space or space time into which our universe is now expanding.

We can further postulate that the energy of the life form was slowly decaying, as all energy does, so that at some point this loss of energy exceeded the gain of energy being acquired from the cosmos so that the life form was either slowly dying, or becoming static in some way, so that the situation had become desperate for the life form.

We can postulate too that the planning for, and the creation of a universe as a survival plan is such a monstrous task that it could only be undertaken as an act of desperation, for survival itself. We can postulate such a survival plan must permit the life form to acquire new and fresh energy, an energy that was not being recycled from somewhere else.

We can postulate then that the life form evolved a Plan to create a universe the fundamental constants of nature and the laws of physics fixed in advance so that a universe had to evolve whereby intelligent life would emerge on countless planets throughout the universe and whereby the dominant intelligent life form on such planets had the mission and opportunity to develop a source of fresh energy which became accessible at some point to the life form; and that the life form then creates such universe through some inflationary big bang scenario.

We can also postulate that this fresh energy can be generated in the mind and brain of a dominant intelligent planetary life form through the exercise of free will, an act which is absolutely vital to the Plan; and that free will is so important to humanity that it has been handed down in allegorical form through the story of Adam and Eve, where Eve exercised her free will through the taking of the apple; and that this fresh energy increases with free will thoughts and actions which are good and decreases with those that are evil, which may be why the teachings of Moses, Jesus, and Mohammed are dedicated to encouraging that moral system which would promote the development of fresh energy; and that this fresh energy passes directly on death to the energy field of the creative life form; and this may be why Jesus could tell his disciples with confidence as he was taken away to be crucified, as reported by John, "On that day you will understand that I am IN my Father and you IN me and I IN you." It may be that here Jesus was trying to tell them, before anyone had ever heard of anything called "energy," that the Father was a pool of living, sentient energy, and that He, Jesus, was in this pool, and that they would be in this pool too!

And finally, we can postulate that we know this fresh energy as the soul, and the creative life form as God, and that this then is the Destiny of Humanity, our reason for existence, to develop a soul which can merge with God and flow throughout the cosmos as a living sentient field, supporting this and other universes unto eternity.

Note

[1]Freeman Dyson, *Infinite in All Directions* (New York: Harper and Row, 1988), 107.

R. C. Quittenton
S-152, C-39
Bowser, BC Canada V0R 1G0
islandq@shaw.ca

Altruism as Evidence for Intelligent Design

Some biochemical processes are believed to be irreducibly complex, and the molecular components cannot be broken down into simpler molecules without the system falling apart. This complexity has been presented as evidence for intelligent design in living systems.[1]

The intelligent design hypothesis has been challenged on the grounds that the structures of living things are not in fact irreducibly complex, but have a built in redundancy.[2] Furthermore, it has been shown that irreducibly complex and functionally indivisible structures can be accessible by some Darwinian pathways, and there is fossil and biochemical evidence that some of these pathways have been traveled in the past.[3] Moreover, once complex biochemical systems have been selected for, natural selection would act to maintain these structures, since any slight deviation from a complex and inter-related process would have severe selective disadvantages.

Some altruistic interactions on the other hand not only can not be accessed through any known Darwinian selection pathway, but natural selection would be unable to maintain such systems. In a previous paper,[4] I reviewed three examples of altruism which would not be maintainable under any known mechanism of natural selection. My examples have been challenged by David Lahti[5] who concludes that these are all cases where Darwinian mechanisms would act to preserve altruism.

My first example concerned the reciprocal altruism of cleaner fish and the predators they clean. In this case, the predator is acting altruistically by not eating the cleaner when it has finished cleaning, and in some cases the predator may risk its life by ensuring the safety of the cleaners before itself escaping from larger predators.[6] Lahti states that this is an example of simultaneous mutualism, which is demonstrably false. The altruism here is not merely between the cleaner and the predator. Experimental evi-

dence shows that the cleaners are shared among the predators,[7] so other predators would be hard done by if the cleaners were all eaten. The predator therefore sacrifices short-term gain to preserve the population of cleaners for the good of all.

My second example concerned ants that keep useful caterpillars in their nests for their nectar, but continue to look after the pupa until the butterfly has flown away. Some species of ants eat the pupa if it is injured, so they do gain nutritional benefit from the pupa. The ants are therefore sacrificing their own fitness when they refrain from eating healthy pupae.[8] Lahti points out that the interaction between the ants and the emerging butterflies is not actually altruistic since the ants rely on the butterfly to provide a good crop of caterpillars in the next generation. The beneficiaries of the ants' altruism however are not just the caterpillars, but other ant colonies in the area, which will also benefit from the higher numbers of caterpillars.

In both the examples given, one could expect "cheat" individuals or colonies to evolve which would eat the cleaners or the pupae. These would multiply at the expense of their altruistic competitors and overrun the area. In the long term the species as a whole would suffer, but Darwinian evolution (like some human economic systems) is concerned with short-term gain and does not look ahead.

In my third example, I referred to plants which produce estrogen mimics. These chemicals act upon the hormonal system of grazers such as sheep and reduce their fecundity. Lahti states that this is not altruistic because the plant benefits from not being eaten. This would only hold true however for plant defenses that immediately deter grazers and not for slow acting toxins. Again, it would be expected that Darwinian selection, being concerned only with short-term gain, would not produce plants capable of producing long term contraceptives that would benefit the species at the expense of the individual.

Advocates of intelligent theory freely admit that it tells us nothing about the identity or personality of the designer, who could be the God of the Bible, a lesser deity, a demon or even an extraterrestrial.[9] The presence of altruism however extends the intelligent design theory in that it tells us something more about the Designer.

One of the strongest arguments against the existence of God is the problem of evil, and as we learn more about living things and their interactions, this argument has been expanded to include the nonhuman world. The presence of predation, parasitism and ruthless competition in the living world has been cited as reasons to doubt the claims of Christianity.[10]

The problem of evil is a valid objection to the goodness of God, but to my mind can be countered by an equally powerful "problem of good." Those who doubt the goodness of God need to explain the seeming reality of transcendent moral laws in humans.[11] The problem of good, like the problem of evil, can be extended from the human world to the natural, where we find examples of altruistic and co-operative interactions in the living world. Unlike the case with human morality, there is no need to postulate the existence of a transcendent moral imperative, which other living things choose to keep. The fact that at least some altruistic interactions cannot be supported by Darwinian mechanisms alone does however lend further support for the "problem of good."

It is possible that further evidence may turn up that will explain all altruistic interactions in Darwinian terms, but those who use this as an argument to dismiss design are simply begging the question by assuming Darwinism to be true. Until further evidence comes to light we should be content to base our inferences on known observations and not speculation. Based on the information we have on altruistic systems, I suggest that intelligent design is the most parsimonious inference.

Notes

[1]M. J. Behe, *Darwin's Black Box* (New York: Touchstone, 1996); and W. A. Dembski, *The Design Inference: Eliminating Chance Through Small Probabilities* (Cambridge: Cambridge University Press, 2000).

[2]D. W. Ussery, "A Biochemist's Response to the Biochemical Challenge to Evolution," *Bios* 70 (1999): 40-45; and N. Shanks and K. H. Joplin, "Redundant Complexity: A Critical analysis of Intelligent Design in Biochemistry," *Philosophy of Science* 66 (1999): 268–82.

[3]R. H. Thornhill and D. W. Ussery, "A Classification of Possible Routes of Darwinian Evolution," *Journal of Theoretical Biology* 203 (2000): 111–6.

[4]M. C. Morris, "God's Design Plan in Nature—A Fresh Look at Altruism," *Perspectives on Science and Christian Faith* 52 (2000): 55–7.

[5]D. Lahti, "Evolutionary Theory Misunderstood," *Perspectives on Science and Christian Faith* 52 (2000): 215–7.

[6]A. Grutter, "Cleaner Fish Really Do Clean," *Nature* 398 (1999): 672–3; and R. L. Trivers, "The Evolution of Reciprocal Altruism," *The Quarterly Review of Biology* 46 (1971): 35–57.

[7]Trivers, "The Evolution of Reciprocal Altruism."

[8]S. Yamaguchi, "Butterflies, which Inhabit with Ants," *Konchu to Shizen* 35 (2000): 2–7 (in Japanese).

[9]Behe, *Darwin's Black Box*; and Dembski, *The Design Inference*.

[10]R. Dawkins, *River Out of Eden* (Phoenix: Basic Books, 1996).

[11]C. S. Lewis explains this complex point simply in his *Mere Christianity*. For a more recent discussion, see D. Lahti,"Parting with Illusion in Evolutionary Ethics," *Biology and Philosophy* (in press).

Michael C. Morris
Environmental Studies
Victoria University of Wellington
PO Box 600
Wellington, New Zealand

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American Scientific Affiliation
55 Market Street, Suite 202
PO Box 668
Ipswich, MA 01938-0668

Phone: (978) 356-5656
FAX: (978) 356-4375
E-mail: asa@asa3.org
Web site: www.asa3.org

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