# PERSPECTIVES on Science and Christian Faith

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In this issue . . .



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

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# Science and Religion in the University

The John A. Templeton Foundation initiative to support science and religion courses at institutions of higher learning has drawn a strong response from the Western Hemisphere, Europe, and the Near East for the 1994-5 round of competitive applications. Some 97 courses at the undergraduate and graduate levels will be supported at universities and colleges without religious affiliation as well as in Roman Catholic and Protestant schools and one Muslim institution. Both the teachers and their institutions receive financial incentives. The faculty members come from a wide diversity of backgrounds in the humanities as well as the social and natural sciences. The majority come from biblical studies and philosophy departments, departments more hospitable to the notion of religion than science departments. A teacher may often have degrees in both science and theology.

Participation in a recent workshop for 1994-5 course awardees has reinforced my appreciation for the special challenges faced by those offering courses in secular institutions. It has been suggested that the post-modern mood allows Christianity a niche in the academic marketplace, but some philosophy and science departments think otherwise. I would challenge our readership to consider contributing to this program — especially those who serve in non-church related institutions.

The diversity of teacher backgrounds and types of audiences has resulted in strikingly different course objectives and syllabi. We hope to bring condensed examples of these courses in subsequent issues. The Templeton Foundation and Science-Religion Course Director Robert Herrmann have provided a pathbreaking program. Readers are encouraged to write the Templeton Foundation, 12 Spillers Lane, Ipswich MA 01938 for information concerning the 1995-6 competition.

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## In This Issue

In our first paper, James F. Jekel develops a covenantal model to deal with the spiritual dimension of medical practice. Robert C. Newman then surveys various options available for dealing with the question of origins and notes advantages and problems with those options. He offers an "old-earth creation" alternative to the traditional models. Harry Cook discusses Stephen J. Gould's *Wonderful Life: the Burgess Shale and the Nature of History*. Gould emphasizes theories that describe the tempo and mode of evolution as an alternative to traditional linear theories of biological development. Cook joins Gould in arguing that the history of biology (science) is not only an account of the steady progression of theories toward the present but includes theories which have been discarded.

John E. Lothers, Jr. reports the results of a questionnaire on the views of biology teachers at Christian secondary schools and colleges. He expresses concern that evangelicals may inadvertently fall into the trap of deism. In a Communication, Raymond E. Grizzle asks proponents of "intelligent design" to move beyond "heavy" philosophical arguments for a theistic science to the traditional view that nature points beyond science to the Creator. He asks that they re-examine their views on methodological naturalism and their notion that there is no distinction between science and religion. Alex Philippidis considers the current state of "Big Bang" theory and attempts to reconcile the Big Bang with Genesis.

In Essay Reviews, James Peterson examines recent feminist works on ethics, science, and technology and J. W. Haas, Jr. reviews a collection of works on science and religion.

# Biblical Foundations for Health and Healing

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*Whether we acknowledge him or not, God is heavily involved in both healing and in promoting health. Acknowledging God's healing role and following biblical guidelines for healthful living should enhance both healing and health promotion. However, not even good nutrition, a clean environment, and healthful behavior will guarantee health. All of these, individually and together will help, but our health problems have their root in the world's (and too often in our own) sin and disarray, which come to us in a myriad of subtle ways.*

*There is no simple fix to sin and its effects. Ultimately health is the process of being reconciled to the Creator, to other human beings, and to the creation. Biblical health promotion involves making covenant-like commitments to God, to our fellow human beings, and to the creation. This requires embracing the creation as its* stewards; *embracing other persons, who are made in God's image, as our* neighbors; *and above all, embracing God Himself as our* redeemer.

## Do Physicians Heal?

Early in my medical career I became uncomfortable with the gratitude of patients, especially when it was expressed as, "Thank you, doctor, for healing me." I would protest by saying that physicians could only make conditions right for the body to do the healing, but we could not actually do the healing. When it seemed appropriate, I would add that it was the Lord who healed by working through the body's processes (sometimes in unusual ways). These convictions are best expressed by a sign at the Tenwek Mission Hospital in Kenya, which reads, "We treat; Jesus heals."[1]

My denial of healing power was as much a personal defense as a philosophical statement, but its truth is seen daily in the lives of acquired immunodeficiency syndrome (AIDS) patients. If there ever was a disease designed to humble the medical profession of this day, AIDS is it. When the God-given healing power of the body is destroyed, medicine can offer very little.

### Why Medicine's Healing is Incomplete

Everyone is familiar with the inability of medicine to prevent or to cure the common cold, although there are medications that can help with the symptoms, and there are effective treatments if complications develop. If there is a deficiency of various clotting factors, insulin, or a hormone (such as thyroid hormone, growth hormone, or anti-diuretic hormone), scientific medicine has substitutes available. These do not represent healing because the substitute must be given regularly, and the normal body capacity to produce and regulate the needed substance is not restored. Because of this, complications

*This is an edited version of a paper presented at a conference of the Paul Tournier Institute of the Christian Medical/Dental Society, at the Georgetown University Conference Center, Washington, D.C., Nov. 6-10, 1991.*

often develop that would not if the normal body mechanisms, including appropriate feedback mechanisms, were complete. The disease diabetes mellitus is an example of this. Cardiovascular, ocular, renal, and neurological complications develop in longstanding diabetes. If, in the future, genetic engineering develops a way to correct genetic defects and their expression in the individual, perhaps this could be considered "true" healing.

It is a general misconception to suppose that antibiotics, by themselves, produce complete healing, as AIDS has repeatedly shown. Without a sound immune system, antibiotics provide at best a respite from the offending organisms. Many antibiotics are only bacteriostatic and just slow the growth of microorganisms. Moreover, bacterial resistance develops even to bactericidal (bacteria-killing) antibiotics, and as we are finding out, microorganisms are finding a way to become resistant to antibiotics faster than we can produce new types.[2]

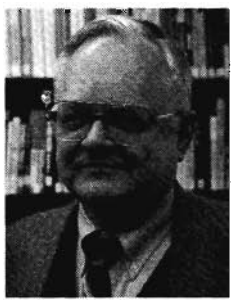
Even if an antibiotic is bactericidal and the microorganism is sensitive to it, the body must still repair the damaged tissues. Additional problems include the fact that the individual may have an allergy to the antibiotic, or the organism may be in a place where only low concentrations of the antibiotic can penetrate (e.g., bone, brain). Equally important, antibiotics often upset the natural flora of the body, producing superinfections with other organisms (such as fungi) that are resistant to the antibiotic and are kept in check only by the normal flora. Because of mutations, even bactericidal antibiotics probably do not kill all of the bacteria in an infection. (This is why antibiotic resistance develops even to bactericidal antibiotics.) The body still must destroy the residual bacteria, fungi, and other microbial agents. Only a few viruses are susceptible to antimicrobials, and our current armamentarium is weak against many protozoa.

If the body produces an excess of something, such as gastric acid, medications such as the H-2 antagonists can reduce the acid production of the stomach. It now appears many peptic ulcers can be cured by antibiotic treatment of *Helicobacter pylori* in the stomach, at least for a time. Alternatively, gastric surgery can remove acid-producing cells and change the acid-production feedback mechanisms. If the problem is not *H. pylori,* then the H-2 antagonists must be taken regularly (and thus do not represent true healing), and the body must heal any surgery and subsequently function normally. Permanent digestive problems often remain following gastric surgery. Hypersensitivity problems including allergies and autoimmune diseases often can be helped with desensitization or medications, but these represent control and not healing.

If certain hollow organs are inflamed (such as the appendix or gallbladder), they usually can be removed surgically. Nevertheless, the body must heal the surgical incisions and fight off residual infection. As always, if the body is unable to heal the incision or fight infection, the surgery does not lead to healing.

If there is a localized cancer, physicians can probably remove the cancer. Occasionally with diffuse cancers such as early Hodgkin's disease or acute lymphatic leukemia, the cancer may be destroyed with chemotherapy and/or radiation. Here, too, the body must heal the surgical incisions or survive the insults of the anti-cancer drugs and radiation. If, as it sometimes happens, the therapy also destroys the body's ability to fight infection by damaging the bone marrow, death is likely to result. Likewise, when cancer cells have spread via the blood or lymphatic circulation, usually medicine is helpless to destroy the tumor, and the most that medical science can offer is to treat the patient's symptoms.

Believing Christian and Jewish physicians should be quick to acknowledge their own limitations and be truly humble about their healing powers. This means they should consciously, even forcefully, acknowledge that they share the healing role with



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God (such as by acknowledging his role to patients and encouraging prayer for, or engaging in prayer for, patients).

## God's Role in the Promotion of Health

Within society, general health-enhancing activities of individuals, society, and clinicians — such as working for good nutrition, a healthy environment, and a health-supporting way of life — are usually called "health promotion." The more technical of these activities — such as giving immunizations—are usually referred to by the narrower concept of "disease prevention." In health promotion and disease prevention, fully as much as in disease treatment, the healer's role is adjunct to that of God. Those who seek to promote health and prevent disease, just as much as those who seek to treat patients with illness, are at most *co-promoters of health with God.* The God who created us and the world pronounced the creation "good."[3] He knows how we should live to strengthen and honor our bodies and to be in harmony with the material and spiritual forces he created.

### What is "Health"?

Most of the thoughtful definitions of "health" from scientists, among whom Rene Dubos is prominent, emphasize two things: our ability to *react adaptively* to those forces causing us stress, and our ability to *function to our satisfaction* in the society of which we are a part. Just as physicians seek to make conditions ideal for healing to take place in those who are ill, they should work to make conditions ideal for the promotion of health for everyone in their communities. This includes helping individuals and families adapt to the negative stressors in their lives so that they might remain healthy and function satisfactorily.

The *social dimension* is extremely important. If the environment of a community is so stressful that a person living in that community has difficulty remaining healthy, the community itself should be considered sick. Those societies are sick which cannot provide the basic needs of life: adequate pure food and clean water, clean air, soil that will grow crops, proper disposal of all forms of waste, and a physically and emotionally safe environment. Recent examples of sick societies due to violence and food deficiency include Somalia, the Sudan, Rwanda, and Colombia. (The latter due to the violence caused by the drug cartels.) Severe environmental pollution occurred following the Bophal chemical and the Chernobyl nuclear disasters. Behavioral disasters include civil wars, such as those in Bosnia, Rwanda, and Somalia, and the social disruption in many cities in the Western Hemisphere overwhelmed by the effects of illegal drug use.

Where the Bible does not guide the norms of behavior, anarchy will reign. Indeed, Proverbs 29:18 says, "Where there is no revelation, the people cast off restraint; but blessed is he who keeps the law"(NIV). Where people do not keep God's covenants, many will perish from the social anarchy that results. Directly or indirectly, anarchy — as violence, financial and political greed, and abuse of illegal drugs — may be the most important underlying cause of premature death throughout the world, despite what death certificates say.

### Biblical Words for Health

The biblical ideas of health may be summarized in the words that can be translated "health" or "healing" in the Bible. One word is the Hebrew word for "repair" (*rapha*), which comes from a root word meaning "to sew up." When bodies, lives, and relationships have been torn through sin, and we have been alienated from God, from our fellow human beings, and from the world in which we live, we need to be reconciled — to be "sewn back" into harmony (at-one-ment) with our physical, social, and spiritual home — and then kept safe.

Both the Hebrew and Greek words for "safety" (*yeshua* and *sotaria*, respectively) also mean "salvation." The Scriptures provide several pictures of God as a source of safety. For example, God is described as a rock in whose cleft his people (those who have been restored to fellowship with him) can dwell safely, and as a shepherd who guides his people into green pastures and beside still waters.

A third Hebrew word that may be translated "health" is *shalom*, which has the root meaning of "wholeness" or "soundness" and is often translated "peace." A related New Testament Greek word is *hugiase* (from which we get our word "hygiene") which, as an adjective, means "sound" or "whole." This wholeness, this soundness, indeed this peace, is the result of having been reconciled to our God, to others, and to the world in which we live.

### Health: Reconciliation on Three Levels

Several years ago after studying these words and their use in the Bible, I proposed a concept of health based on the idea of reconciliation:

> The word reconciliation, it is my hope, will convey sufficient and relatively unbiased meaning both to scientists and to theologians. The term implies restoration to harmony. Theologically the world is often found in the Scriptures. Medically speaking, it implies removal of bad stressors (which produce distress) and restoration to harmonious function.[4]

Reconciliation is a positive response to the torn and separated relationships between creature and Creator, between creature and creature, and between creature and the creation.

The New Testament word for "reconciliation" (*katallasso*) is based on the Greek word for "to change" or "to transform" (*allasso*), expanded by adding *kata*, which usually means "down," although it can mean "against," "across," or "throughout." In the New Testament, the word seems to mean "a mutual changing," that is, *both parties to a previous disagreement now have changed in a positive direction toward the other. This change has included new commitments* for both parties, and *submission* for at least one of the parties. The *Concise Greek-English Dictionary of the New Testament* defines *katallasso* as "(to) put (someone) into friendship with God; (to) reconcile (of husband and wife.)"[5]

This change involves acceptance by each party of the other, that is, a new relationship of commitment to — and a new behavior toward — each other. True reconciliation requires all three of these (acceptance, commitment, and behavior change), and one or even two of these alone is not sufficient. Relationships and mutual behaviors would not change if there were no change in attitude toward each other. Attitudes and acceptance would not change if there were no change in behavior and no commitment to the new relationship.

Thus the process of reconciliation is not merely changing a few behaviors, but rather making a fundamental change in relationships and commitments. Here the secular approach to health misses the essence of the biblical insights, by assuming that true health can come merely from changing our behavior (for example, regarding nutrition, exercise, health habits, and the environment). Such changes usually will be helpful, but they are not sufficient for the biblical idea of health.

The model of reconciliation described here holds that reconciliation is needed on three levels (see *Figure 1* below):

1. with the Creator,
2. with our fellow creatures (other human beings)[6]
3. with the creation.

**Reconciliation with the Creator** occurs within at least three dimensions: (1) the existence of moral *guilt* requires God's forgiveness (grace); (2) the *mean-*

| Reconciliation with: | Lack of Reconciliation Gives: (Dystress) | The Process of Reconciliation Gives: (Eustress) | Facilitators |
|---|---|---|---|
| A. The Creator | 1. Guilt: spiritual, personal<br>2. Meaninglessness, lostness<br>3. Spiritual aloneness | 1. Forgiveness (grace)<br>2. Life meaning and purpose<br>3. Knowledge of God's love | ← Theologians ↓ |
| B. Other Persons | 1. Aloneness<br>2. Anomie<br>3. Powerlessness, helplessness | 1. Fellowship with persons<br>2. Mediating structures<br>3. Mutual support | ↑ Social Workers<br>← Family<br>← Church ↓ |
| C. The Creation | 1. Malnutrition<br>2. Pollution<br>3. Unhealthful behavior<br>4. Anatomic & physiologic disruptions (alterations) | 1. Good nutrition<br>2. Clean environment<br>3. Healthful behavior<br>4. Biomedical interventions | ↑ Physicians<br>← Nurses |

*Figure 1.* An Applied Model for Practitioners of Whole-Person Medicine, Based on the Concept of Health as Reconciliation in Three Dimensions. (Originally published in *Whole Person Medicine*, D. F. Allen et al., Eds., InterVarsity Press: Downers Grove (1980), p. 146. Reprinted with permission of the Christian Medical & Dental Society.)

*inglessness* of life apart from God requires the recovery of meaning and purpose in life; and (3) the *spiritual aloneness* of sinful human beings requires a knowledge of God and a restoration to his love and fellowship.

Second, **reconciliation is needed with others** in at least three dimensions. (1) *Personal aloneness* reveals the need for fellowship with other persons. (2) *Anomie* — a word used to denote a sense of alienation from the society of which we are a part, particularly from the social "megastructures" such as big government or business — reveals our need to relate to our society in meaningful ways. People with anomie can be helped by identifying with a social group with which they share values.[7] (3) A feeling of *powerlessness* is eased by the development of mutually supportive relationships, which should come from participating in the life of Christ's church, and by the way "mediating structures" such as churches give a person a sense of being able to influence the "megastructures" of the society through their group.

Third, **reconciliation with the creation** includes good nutrition, a clean environment, healthful behavior, and biomedical interventions to assist when anatomic and physiologic disruptions occur. Epidemiology has done much in recent decades to clarify how much of our premature death and disease is related to our nutrition, our environment, and our behavior.

***True reconciliation requires ... acceptance, commitment, and behavior change, and one or even two of these alone is not sufficient.***

In nutrition, Dr. Dennis Burkitt spent many years doing research and education on the critical role that dietary fiber plays in good health. One motivation for his work on fiber was his cross-cultural research showing that many diseases common in the West are *rare* in the third world, or at least in that part of the third world where he was (Central Africa). These diseases included: coronary heart disease, gallstones, diverticulitis, appendicitis, hemorrhoids, varicose veins, hiatus hernia, colon cancer, breast cancer, and diabetes mellitus.[8] Without these diseases to treat, most U. S. hospitals and many U.S. physicians would have inadequate work to do. Yet these diseases may not be necessary; we bring them on ourselves, especially by our diets, which are too low in fiber and too high in fats and refined sugar.

***... the general principles of concern for nutrition, environment, and behavior found in [the Old Testment health] code are quite relevant today.***

Epidemiologists have estimated that at least 80% of U. S. cancers are caused by environmental, nutritional, and behavioral factors. In their book entitled *The Causes of Cancer*, two of the world's leading epidemiologists, Richard Doll and Richard Peto state:

> In the years since that report [a WHO expert committee report in 1964] was published, advances in knowledge have consolidated these opinions and few if any competent research workers now question its main conclusion. Individuals, indeed, have gone further and have substituted figures of 80 or even 90% as the proportion of potentially preventable cancers in place of the 1964 committee's cautious estimate of "the majority."[9]

Unfortunately, many people have interpreted the term "environmental factors" to mean only "man-made chemicals," which was not the intent of the WHO committee.

> [It] ... included, in addition to man-made or natural carcinogens, viral infections, nutritional deficiencies or excesses, reproductive activities and a variety of other factors determined wholly or partly by personal behavior.[9]

How do epidemiologists come to these conclusions? One way is by determining the "attributable risk percent," i.e., the percentage of new cancers that are due to one or another factor, based on the risk ratios or odds ratios found in epidemiologic studies. A second method is to take the age- and sex-specific cancer incidence rates from each country that has the *lowest* rates of a given cancer, and then apply those rates to the U. S. population. By either method, the U. S. has about five times as much cancer as if we had the same age and sex-specific rates as the best countries in the world, which may be the lowest achievable rates with current knowledge.

Our behavior, especially cigarette smoking, is one of the major contributors to disease. In 1987 it was

estimated that 87% of lung cancer deaths in the U.S., and about 95% among smokers, were attributable to cigarette smoking.[10] Many other body cancers, and most cases of chronic obstructive pulmonary disease (COPD), are due to cigarette smoking as well. Cigarettes kill more people, however, by coronary heart disease than by lung cancer. This is because the overall risk of heart attacks is so much greater than lung cancer that the net effect is more cigarette-related deaths from heart attacks.

Alcohol and drug abuse, drunk driving, homicide, suicide, and a sedentary, fast-food lifestyle are all behaviors which contribute to the fact that *most of our premature deaths (i.e., before 65 years), serious diseases, and serious injuries are preventable.* The God-given pattern for healthy living in Old Testament times is found in the Torah, especially Leviticus. Though the details of the Old Testament health code are less relevant to life in the industrialized world, the general principles of concern for nutrition, environment, and behavior found in that code are quite relevant today.[4] Although no pattern of living can remove the curse of death from us, there are biblical principles and many current guidelines that will usually promote human health and longevity.

## The Context and the Motive: God's Covenant

Although this model of reconciliation (see *Fig. 1*) was well received at the time, it still was inadequate. It was incomplete because it did not delineate *how* we were to achieve this desired reconciliation. No motivational framework was provided, nor was it placed in a context that showed how to proceed.

The biblical method of reconciliation is a covenant, which is a *treaty* establishing a new relationship between two parties who previously were at odds. It is an instrument that: (1) defines the process of reconciliation, and (2) guides the future relationships between the two parties. A covenant is the entering into, and remaining in, a relationship of mutual commitment and understanding, as shown by signs, seals, and behaviors which establish ongoing obligations.

If health can be understood as the process of reconciliation in three levels, then this reconciliation, in turn, results from human beings entering into a *covenantal relationship* with (1) the creation, (2) our fellow creatures, and (3) above all, the Creator. For this idea to have meaning and value, there must be an understanding of what is meant in the Scriptures to enter into and to maintain a covenantal relationship.

***If health can be understood as the process of reconciliation in three levels, then this reconciliation, in turn, results from human beings entering into a* covenantal relationship *with (1) the creation, (2) our fellow creatures, and (3) above all, the Creator.***

Biblical scholarship over the past 40 years, especially that of Mendenhall[11] and Kline,[12,13] has shown that the biblical covenants bear a striking similarity to the "suzerainty (vassal) treaties," or "treaties of the great King" common in the ancient Near East. According to Kline, the biblical (and suzerainty) treaties contained six standard sections. (1) First, they began with a *preamble*, which identified the "Great King" in terms designed to inspire awe and fear. (2) Next, there would be a *historical prologue*, including statements of how the King had been beneficent to the vassal. (3) Third, the *covenant obligations* would be defined. In this section, the vassal would acknowledge the power and goodness of the suzerain and vow to serve him and him alone, including bringing tribute. Kline states:

> ...the fundamental demand (in treaties of the great king) is always for thorough commitment to the suzerain to the exclusion of all alien alliances (pp. 14-15).[12]

In turn, the suzerain would promise protection and other benefits to the vassal. Then, (4) there would follow *rituals for solemnizing the treaty*, including the invocation of the gods of the great king and the vassal to be witnesses to the oaths taken. (5) *There would be a pronouncing of imprecations and benedictions:* imprecations if the vassal turns away from faithfulness, and, on the other hand, promises of benefits to be obtained by the vassal's obedience. (6) Last, there were stipulations for depositing *a copy of the treaty* with both the suzerain and the vassal.

Note that the suzerainty treaties were personal and had commitments, obligations, and rights on both sides. Kline argues convincingly that the Decalogue, for example, is written as a "treaty of the Great King." Referring to the Decalogue, he states:

> Such a covenant is a declaration of God's lordship, consecrating a people to himself in a sovereignly dictated order of life.[12]

Such, I argue, is the kind of relationship that we, as human beings, need to enter into with the creation, with our fellow creatures, and with the Creator, if we are to know the fullness of the biblical understanding of "health."

## A Covenant with Creation

Entering into a covenantal relationship with the creation means an awareness of the greatness and beneficence of God's created world, as well as a commitment to "serve" the earth,[14] acknowledging the creation's power to do us harm or good, and, in turn, seeking the creation's welfare. Health books by Christian evangelicals have emphasized rules we should follow if the creation is to benefit *us*, but usually they include little emphasis on the need for us to make a commitment to the welfare of the creation in which we live.

The result of our general lack of commitment to the welfare of the creation is that the human race is fouling its only nest, the earth, opposing the stewardship command of Gen. 2:15. Instead of "dressing and keeping" the creation, we are spoiling it. This must change through our covenantal commitment to the creation as stewards of the Creator.

What is the "commitment" the creation gives in return in this covenant? Ultimately it is God's commitment to be dependable and faithful in the way he oversees the laws of nature. Col. 1:17 implies that God in the second person of the Trinity is constantly keeping the world from falling apart. Heb. 1:3 implies that God in the second person of the Trinity keeps the world moving along. In Gen. 8:22 God promises never again to curse the ground because of man, and also promises regular seasons and productivity. A major question is whether *man*, by sinful behavior, is cursing the ground in a way God did not.

As with suzerainty treaties, the details of an Old Testament covenant were specifically written out for both parties, so that ignorance was no excuse. Frair has suggested that three dimensions of the human problem were ignorance, inertia, and irresponsibility.[15] Clearly, these problems are addressed by the O. T. covenant agreements, and DeWitt's suggestion that we need to progress from *awareness* to *appreciation* and then to *stewardship* appears to fit the covenant pattern well.[14]

## A Covenant with Other Creatures

A covenantal relationship with other creatures (human beings) surely implies that we must be as concerned with their welfare as with our own (the golden rule, Luke 6:31). We are witnessing a decline in the commitment of people to each other. People act as though commitments do not have to be kept when they are no longer convenient or to their personal benefit. We see this in sports contracts (for example, where players feel they have the "right" to renegotiate their contract if they are doing well but do not give the owner the right to renegotiate if they are doing poorly), and in marriage, where partners often feel they can dissolve the union if things are not going as well as they would like. The Psalms describe what is needed when they say that the person who shall abide in God's tabernacle (surely a good image for true health, among other things) includes the one who "... keeps his oath even when it hurts, ..." (Ps. 15:4, NIV). Health is generally better when people keep their commitments to one another.

The "golden rule," however, is not enough. What happens if others interpret the rule differently, or do not hold to it at all? From where comes forgiveness now? If we have been unjustly, irreversibly wronged by someone else, the gospel is needed to keep us from dehumanizing each other. First, we must always be aware that the one who wronged us is still made in the image of God (Gen. 1:26 ff). Moreover, though we may have been grievously wronged, we must remember, with King David, that *all sin is ultimately against God only*.[16] The anger, carelessness, or calculated evil directed against us by others is really, whether or not understood by the perpetrator, part of that person's rebellion against God, which is perpetrated against other people as God's image bearers. (Perhaps this is like defacing a picture of someone one hates; other people are God's "picture.") Therefore, because Christ was wounded for our transgressions and forgave us, we too must forgive them. Even in the Old Testament, Joseph saw that his sufferings were not cause for anger but were being used by God for good (Gen. 45:2-8, cf. Rom. 8:28).

Increasingly the social and interpersonal aspects of life are being appreciated as crucial to both mental and physical health. In the landmark Alameda County study, Berkman et al. showed that those who had good social support systems were more healthy than those who did not, and that being very religious also contributed to mental and physical health and longevity.[17]

Matthews et al. (1993) developed an annotated bibliography of 158 clinical studies in the medical literature relating to the relationship between religiosity or religious commitment and health. They found that religiosity or religious commitment was generally a positive factor. For example, they stated that of 146 studies which permitted such an analysis, "... 77% demonstrated a positive effect of religious variables, 25 (17%) were neutral or mixed, and only nine studies (6%) demonstrated negative effects from religious variables." Moreover the positive effects of the religious variables were "... found in every domain examined ..., including drug and alcohol use, psychologic symptoms, physical symptoms and general health outcomes, and psychosocial variables and well-being measures."[18]

## A Covenant with the Creator

In the Old Testament treaties, the vassal responded to the suzerain (and God's people responded to God) as the weaker party responding to the stronger. Often suzerain treaties were entered into under duress, because monarchs, no matter how minor (like ourselves), usually do not like to give up their autonomy and self-determination. Yet the covenant treaties often were very much to the benefit of the vassal. Although he and his nation would owe total allegiance and some tribute to the suzerain, the benefits in terms of peace and protection may have been considerable.

Scripture portrays us as people who are weak, needy, and yet rebellious against our creator and suzerain, God. Life confirms this analysis. When we yield our autonomy and accept Jehovah as our suzerain, giving him total allegiance, the implications are manifold for this life and the next. We know it is God in whom we "... live and move and have our being" (Acts 17:28). Life has meaning and purpose, both now and in the future, as we strive to fulfill our obligations to the Great King.

God's forgiveness is possible through what Christ did on the cross, so that we can know forgiveness, no matter how awful our sins. And through reconciliation with God in Christ, we are no longer alone. Life has meaning as we seek to bring glory to God through obedience in the church.

These three covenants (with the Creator, the creatures, and the creation) are not independent of each other. Our covenant with the Creator is the controlling covenant; our submission and commitment to him is the controlling submission. Our covenants with the creation and with our fellow creatures exist in the context of our covenant with the Creator. We make a commitment to the creation and to others to honor and obey the Creator. We are to be *stewards* of the creation on behalf of God. We have biblical obligations to care for and preserve the creation, whether or not that helps us as individuals.

Naboth was an example of selfless stewardship. He protected his vineyard when King Ahab wanted to buy it from him, and this cost Naboth his life.[19] He did this because he understood that his land was given by God to himself *and to his descendants.* We need a similar kind of selfless commitment to the creation we have been given, but this commitment, although perhaps costing us financially, should save some lives and help our descendants. We, too, are stewards of this globe but, in contrast to Naboth, there are no other places to which we could move, even if we should want to. Although concern for the environment does not characterize biblical Christian writing and speaking, there are some evidences of increasing concern in this area. For example, the June 1994 issue of this journal emphasized environmental stewardship. There Bube examined the question of whether other religious/philosophical traditions provide as adequate a basis for environmental stewardship as does the biblical Christian faith; he concluded that they do not.[20] The health of this planet and our descendants, if not our own, requires that we sacrifice some wealth and comfort now to achieve biblical stewardship of the earth. This must be our covenant with the creation.

Likewise, our covenant with other human beings can only be kept to the fullest if we have already made our covenant with the Creator, and see our covenant with other people in the context of the gospel. When forgiveness is difficult, only a knowledge of the gospel and gratitude to Christ can keep us from usurping God's exclusive right to vengeance.[21]

## Our Health and that of our Descendants

The vassal comes under the covenant's dual sanctions: the blessing and the curse. The lordship of the great king might be exercised as protection or destruction. Our failure to keep the covenants with creation, with other creatures, and with the Creator may threaten our own lives and health, and that of our neighbors; and it may threaten the future health of our children, grandchildren, and more distant progeny.

"The wages of sin is death" the Apostle Paul reminds us (Rom. 6:23; Gen. 2:17). We see that covenant promise of our suzerain, God, being kept. If we break the covenant with the creation, the curse is a future for our descendants clouded by desertification of fertile soil, starvation, ozone depletion, global warming, atmospheric change, and toxic buildup on a global scale. Christians should be at the forefront of promulgating and keeping the environmental covenant, even if that requires a temporary or permanent reduction in our profits and/or standard of living. The recently issued "An Evangelical Declaration on the Care of Creation" is a step in this direction.[22]

Likewise, failure to make and keep covenantal relationships with other human beings leads to the suzerain's curses — breakdowns of individual relationships, of families, and of large segments of society. Kline says:

> As long as the vassal remained a faithful tributary he might expect to enjoy a relationship of friendship and peace with his suzerain and to receive whatever measure of protection the latter could provide. If, however, the vassal would assert his independence or transfer his allegiance to a new lord he would have to reckon with the vengeance threatened in the treaty against such infidelity and indeed invoked by the vassal himself in his oath of allegiance.[13]

Many who ignore the covenant with the Creator may seem momentarily healthy, but earthly life is brief and then what? Eternal questions cannot be ignored. Moreover, even for individuals and families who try to keep these covenants, difficulties may arise: accidents, cancer, war/genocide, famine, or other illnesses or disasters. What about health then? Only if the covenant with the Creator is strong can we still affirm health, even in the face of disease, injury, and handicaps, such as that of Joni Eareckson. Joni became converted after a swimming accident left her quadriplegic, and has become an internationally known writer and painter (holding the brush in her teeth). We cannot worship "health" — we make no covenant with health. Only if we worship God and are reconciled in three dimensions through the keeping of covenants can we affirm health (reconciliation and wholeness) in the face of the brokenness of this sinful world. ✳

## Acknowledgment

I would like to thank one of the reviewers for his or her many thoughtful and helpful suggestions.

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[4]J. F. Jekel, "A Biblical Basis for Whole-Person Health Care: Theoretical and Practical Models in Health and Healing," in *Whole Person Medicine*, D. F. Allen et al., Eds., InterVarsity Press: Downers Grove (1980), pp. 121-151.

[5]B. M. Newman, Jr., *Concise Greek-English Dictionary of the New Testament*. United Bible Societies, 1949.

[6]Some people have asked me why the model does not include the idea of "reconciliation with oneself." As I understand the biblical concept of reconciliation, two independent persons or entities are required, and reconciliation is not a reflexive process. I have no problem with the need for *acceptance* of self (or at least one's self-image), but this seems to me to be quite different from reconciliation in the biblical sense.

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[12]M. G. Kline, *Treaty of the Great King*, William B. Eerdmans Publishing Company: Grand Rapids (1963) p. 17.

[13]M. G. Kline, *By Oath Consigned*. William B. Eerdmans Publishing Company: Grand Rapids (1968).

[14]C. B. DeWitt, "Christian Environmental Stewardship: Preparing the Way for Action." *Perspectives on Science and Christian Faith* 46:80-89 (1994) DeWitt has argued that Gen. 2:15 should be translated "... to serve and take loving care of it."

[15]W. Frair, "Ignorance, Inertia, and Irresponsibility." *Journal of the American Scientific Affiliation* 21, 43 (1969).

[16]Psalm 51:4.

[17]L. F. Berkman and L. Breslow, *Health and Ways of Living: The Alameda County Study*. Oxford University Press: New York (1983); and L. F. Berkman, and L. S. Syme, "Social networks, host resistance, and mortality: a nine year follow-up of Alameda County residents," *American Journal of Epidemiology* 109:186-204 (1979).

[18]D. A. Matthews, D. B. Larson, and C. P. Barry, *The Faith Factor: An Annotated Bibliography of Clinical Research on Spiritual Subjects*. Rockville, MD: National Institute for Healthcare Research, 1993.

[19]1 Kings 21.

[20]R. H. Bube, "Do Biblical Models Need to Be Replaced In Order to Deal Effectively with Environmental Issues?" *Perspectives on Science and Christian Faith* 46:90-97 (1994).

[21]Rom. 12:19, Deut. 32:35.

[22]"An Evangelical Declaration on the Care of Creation." *Perspectives on Science and Christian Faith* 47(2):110-111 (June 1995).


## Message to Perspective Authors

The large backlog of accepted articles and articles under review suggest that we list the subjects on the ASA ListServ and ASA Archive so that perspective authors can check to see if their topic has already been dealt with to reduce repetition and pursue themes that haven't been investigated in recent years.

# Wonderful Life: Burgess Shale and the History of Biology

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*Stephen J. Gould is a prominent evolutionary thinker and theoretician of biology. In a recent book,* Wonderful Life: The Burgess Shale and the Nature of History, *he describes the discovery and classification of important fossils from the Canadian Rockies. Subsequent re-classification by three paleontologists led Gould to re-examine the assumption of progress that underlies most phylogenetic theories. Evolution, Gould suggests, is not a linear progression toward present species, with the most successful at the top of a cone of increasing diversity (or toward a human apex). Rather, the history of life can be characterized as a tree or a bush, because not all branches reach the present: some animal types have become extinct due to exigent conditions. The history of biology resembles phylogenetic development postulated by Gould. Although not all biological theories persist to the present, the history of biology is nevertheless often presented as linear progress toward present views and theories. However, like an investigation of extinct animal types, an understanding of abandoned scientific theories can enlarge and enrich our contemporary view of science.*

My Canadian Rockies trail guide states: "The beauty of Emerald Lake was considered grand enough to adorn the back of the $10 bill for many years and it's certainly grand enough for a rewarding hike." Emerald Lake is in Yoho National Park, British Columbia, Canada, a park famous for this lake and for the Burgess Shale, located about 5 km from the town of Field and within view of Emerald Lake.[1]

Charles Doolittle Walcott discovered the Burgess Shale in 1909; he, together with aides and members of his family, returned to it during several summers to collect fossils, right up to 1917. Walcott was an influential scientist and Secretary of the Smithsonian Institution in Washington, D. C. The story of Walcott's collection, and its subsequent re-examination by three scientists is brilliantly retold by Stephen J. Gould in his book *Wonderful Life: The Burgess Shale and the Nature of History*.[2]

Gould's book, which has been well-received in the biological community, forms the basis of the first part of this article. In this book, and in other writings, Gould has attempted to formulate theories that describe the tempo and mode of evolution. These theories provide an alternative to the linear theories of biological development that have predominated for many years. To compare Gould's views with the history of biology reveals fascinating parallels. In this history, theories of linear development have also held sway. Here, too, there is an increasing realization that not all biological theories survive to the present.

## The Walcott Fossils Re-examined

Gould describes the initial classification of the Burgess fossils, stating: "Walcott proceeded to misinterpret these fossils in a comprehensive and thoroughly consistent manner arising from his conventional view of life: In short, he shoehorned every last Burgess animal into a modern group, viewing the fauna collectively as a set of primitive or ancestral versions of later, improved forms. Walcott's work

was not consistently challenged for more than fifty years."[3] Gould then recounts how Harry Whittington of Cambridge University, and two graduate students, Derek Briggs and Simon Conway Morris, re-examined the Burgess fossils. They decided that the way Walcott had classified the fossils was entirely wrong. Their work has been of great interest to animal systematists everywhere.

Much of Gould's book is dedicated to a description of the Burgess fossils. These fossils are postulated to be the result of the "Cambrian explosion," about 500 million years ago. The nature of the Cambrian explosion, one of Darwin's more vexing problems, has been discussed by many authors in numerous recent articles.[4] Some of the Burgess fossils are striking, unlike any invertebrates one is likely to encounter today. They are as foreign to living animals as dinosaurs are, but they are much more difficult to classify. At least dinosaurs can be recognized as reptiles!

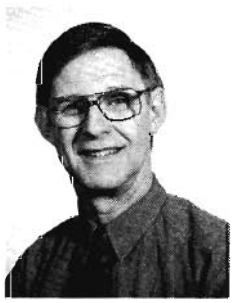
The names of the fossils are also striking: *Marella, Yohoia, Opabinia, Amiskwia,* and *Hallucigenia,* are some of the names given to organisms discovered in the Burgess shale (Fig. 1). The name *Hallucigenia* speaks for itself.[5] *Opabinia,* another remarkable animal, had five eyes and fed itself with a segmented, flexible, frontal appendage, much like a vacuum cleaner hose. When Whittington first described this creature at a British scientific conference, his illustration of *Opabinia* was greeted with laughter, which he did not know how to interpret. The conclusion reached by various scientists is that the Burgess Shale contains some 15 to 20 organisms so different one from the other, and so unlike anything now living, that each ought to rank as a separate phylum. Over fifteen new phyla; that is quite a find!

## Gould's Agenda

For many years Gould has had a double career in biology. In addition to his biological work, he has been the writer of successful columns in *Natural History*. Gould has written many influential books, some of which have included these columns.[6] *Wonderful Life,* which appeared in 1989, also displays Gould's considerable writing skills.

In one way, *Wonderful Life* is an unselfish book. Gould describes work on re-classification of fossils that he neither found nor re-classified. But there is method in his madness, for Gould is also known for his efforts to re-write some aspects of evolution theory. Faced with the fact that some invertebrate creatures appear in the fossil record, without change, in layer upon layer, Gould and Niles Eldredge suggested, in 1977, that "Stasis is data" and posited their theory of "punctuated equilibrium."[7] They characterized evolution as consisting of long periods of little change, punctuated by relatively short periods of rapid change. It goes beyond the scope of this article to evaluate the punctuated equilibrium theory; it can be said, however, that the central claims of punctuated equilibrium have largely been accepted by the paleontological community.

In *Wonderful Life,* Gould takes these theories one step further. The evolutionary process, he argues, cannot be characterized as a linear path that leads toward humankind as the inevitable goal. Standard iconography (i.e., depictions of evolutionary progress in animal groups) must be revised because it is based on an outdated view that presents evolution as the inevitable climb up a ladder that has the human species at its apex.[8] Nor do the products of the evolutionary process all persist until now, Gould goes on to say. Instead of a cone, the phylogenetic scheme should be presented as a bush, in which not all branches reach the present (Fig 2).[9] Gould suggests that survival of some biological organisms is determined by contingency ("luck," or conditions that happened to prevail at the time).[10] In all of this, Gould is attempting to re-write current theories of natural history. He is proposing a new model for the tempo and mode of evolution. While creation scientists have often presented this as a sign of the breakdown of evolution theory, Gould characterizes



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himself as an evolutionist, and he is very critical of the creationist movement.[11]

## Gould's Views and the History of Biology

In making the connection between fossils and the history of the discipline, the following passage, from Hays (1973), is helpful:

> In 1774, young men all over Europe began wearing blue coats, yellow waistcoats and boots. This was the result of a literary success, *The Sorrows of Young Werther*, which Goethe wrote at the age of twenty-five, when he was entirely a creature of undisciplined feeling. Werther worshiped nature, devoted himself to an orgy of sensibility, and finally, when frustrated in love, committed suicide.[12]

Johann Goethe wrote literature, but he also considered himself a biologist. His studies on plant morphology and on vision were well-known, especially at the time they were written. Today we would say that the work was largely theoretical and highly speculative. In fact, Hays suggests, "On the whole, Goethe's specific contributions to biology were wrong or else had been anticipated long before."[13] What are we to make of him? Some history of biology texts skip Goethe, and German romanticism altogether![14] Yet this influential school should be discussed and studied, much as are fossils in phyla that no longer have living representatives today.

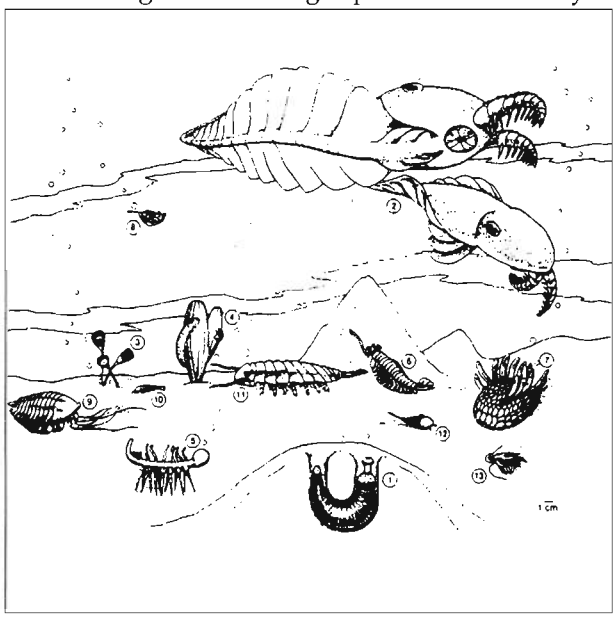

Fig. 1. The Burgess Shale contains a rich variety of organisms. Hallucigenia (5), Opabinia (6), and Yohoia (10) are mentioned in this article. (Reprinted with permission from C. L. Harris, *Concepts of Zoology*, HarperCollins College Publishers, 1992.)

In an article provocatively entitled "Should the History of Science be Rated X?" the author, Stephen G. Brush states:

> [A]nother issue now being debated by historians of science [is] the so-called Whig interpretation of history. This phrase was introduced about 40 years ago by historian Herbert Butterfield to characterize the habit of some English constitutional historians to see their subject as a progressive broadening of human rights, in which good "forward-looking" liberals were continually struggling with bad "backward-looking" conservatives. In the last few years, historians of science have applied the term to the accounts of scientific progress that tended to judge every scientist by the extent of his contribution toward the establishment of modern theories. Such an interpretation looks at the past in terms of present ideas and values, rather than trying to understand the complete context of problems with which the earlier scientist himself had to work.[15]

Butterfield, in a passage that must have interested Brush, states:

> [The] whole fabric of our history of science is lifeless and its whole shape is distorted if we seize upon this particular man in the fifteenth century who had an idea that strikes us as modern, now upon another man of the sixteenth century who had a hunch or an anticipation of some later theory—all as if one were making a catalogue of inventions or of maritime discoveries. It has proved almost more useful to learn something of the misfires

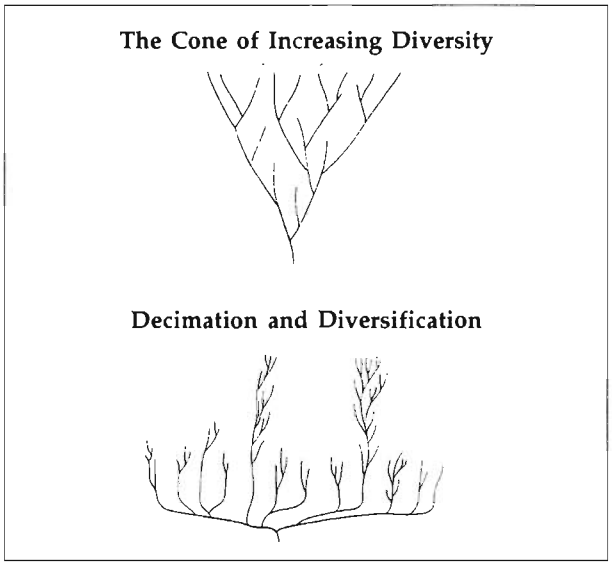


Fig. 2. The two depictions, suggested by Gould, of conventional phylogenetic iconography, and a more correct model of diversification and decimation. The latter, Gould feels, more properly represents the evidence suggested by the Burgess Shale. (Reprinted with permission from S. J. Gould, *Wonderful Life: The Burgess Shale and the Nature of History*, W.W. Norton & Company, NY, 1989.)

> and the mistaken hypotheses of early scientists, to examine the particular intellectual hurdles that seemed insurmountable at given periods, and even to pursue courses of scientific development which ran into a blind alley, but which still had their effect on the progress of science in general.[16]

Thus we can characterize the Whig interpretation of the history of science as the history of science as we perceive it today. This view has been characterized: "Our ancestors are climbing up a mountain on whose summit we now stand." One could also conclude that the Whig interpretation of history resembles the linear (Lamarckian) view of biological evolution. This view is, in turn, closely related to nineteenth century ideas of progress that were prevalent at the time of Lamarck.[17]

If Brush and Butterfield are correct, and I believe that they are, then Goethe is worth studying not only because his followers quickly jumped from speculative theorizing to detailed laboratory science.[18] Goethe and his time period are also of interest for their own sake. We can conclude that the history of science is not an account of the steady progression of theories toward the present but also includes theories that are no longer held. Like Gould and his fossils, we should not interpret the past only on the basis of the present. What is historically important will have to be deduced from the study of a given period or school of thought.

Gould suggested that some species have survived to the present because of exigency, that is, conditions that prevailed during the existence of the organism. While "luck" or other irrational factors do not determine survival of biological theories in the same way, non-logical factors can influence the survival or acceptance of such theories.[19]

While we question the nineteenth century's exultation of progress (a strain not absent from the present science establishment), we can recognize that there may be improvements in scientific theory over time. Progress is a loaded term, but if one stresses change without improvement, one would arrive at a purely historicistic or relativistic position, not a very acceptable alternative. Investigators examine nature; they are not free to postulate theories as they see fit, because these theories do have to be tested with further observations. At some time a theory can become problematic because it does not answer all questions satisfactorily, or does not explain all phenomena satisfactorily, and scientists seek to find theoretical replacements. It then becomes the historian's task to determine why some theories were held at one time, and why they were later rejected.

Thus, the growth of science can be likened to a version of the theory of evolution, where the developmental process is no longer seen as a steady progression towards the present. On the basis of new theories, and the Burgess fossil discoveries, the shape of the phylogenetic tree is postulated to be different, possessing branches of animal phyla that have no relationship to present-day animals.

In the theories of Thomas Kuhn, a philosopher often cited, scientific revolutions occur when one scientific theory replaces another.[20] This is reminiscent of how, in natural history, some life forms replace others. The Strong Programme, associated with the Edinburgh school and author David Bloor, goes one step further by suggesting that scientific theories reflect the social interests of those who promote them.[21] P. Bowler, in his book *The Mendelian Revolution*, has attempted to show this for theories of genetics.[22]

We may not be accustomed to the picture of science and scientists which emerges from our examination. Science is not a body of thought which grows, slowly but surely, until the present enterprise and body of opinion emerges. Science also contained theories that we no longer hold. And scientists are not the disembodied, objective, investigators they are sometimes made out to be. They pursued avenues of investigation that now strike us as odd or as dead ends, like fossils in the Burgess Shale. Opinions on how science grows vary widely in today's history of biology, and in the philosophy of science.

## Textbooks

Can textbooks in biological subdisciplines, such as genetics, microbiology, or comparative physiology, be expected to describe to students theories and views that are no longer held? While current theories will receive most attention, students should also obtain an understanding of the roots and context of the discipline. If this does not occur, biology students may get a more naively positivistic, linear view of the growth of the discipline than is desirable. The students' understanding of the development of biology can be enhanced by colleges and universities offering history of biology or history of science courses. At liberal arts institutions, particularly Christian ones, such courses also offer an opportunity to examine foundational issues in biology. It is regrettable that few suitable history of biology textbooks are available.

A related and often decried problem is the cursory way in which textbooks describe the development

of the disciplines. Cells, first named by Robert Hooke; genera and species, first mentioned by Aristotle, and microscopes, first used by van Leeuwenhoek, often complete the history of a discipline such as microbiology. As such, history consists of tracing the origin of a few key words and phrases that we still use today. Here, too, the post-secondary curriculum can do much to correct wrong impressions. One would hope that such short historical descriptions would become the fossil of an extinct species, replaced by a more succesful, living treatment of the subject. ✳

## Acknowledgements

I would like to thank Maria Cook for giving me Gould's book as a present, and Natalie Cook and my colleagues at The King's University College in Edmonton for helpful suggestions during the writing of this article. I also thank Keith B. Miller for relevant literature references.

## Notes

[1]Dodd, J., and Helgason, G., 1988. *The Canadian Rockies Access Guide*, (Edmonton, Canada: Lone Pine Publishing, 1988), p. 236, p. 12.

[2]Gould, Stephen J., *Wonderful Life: The Burgess Shale and the Nature of History*, (New York: W. W. Norton & Company, 1989).

[3]Gould, S.J., 1989, *Wonderful Life*, p. 24.

[4]See, for example, Kaveski, S. and Margulis, L., "The 'Sudden Explosion' of Animal Fossils About 600 Million Years Ago: Why?" *The American Biology Teacher*, 45(2) (1983), pp. 76-82; Knoll, A. H., "End of the Proterozoic Eon," *Scientific American*, Nov. 1991, pp. 64-73; Levinton, J. S., "The Big Bang of Evolution," *Scientific American*, Nov. 1992, pp. 84-91; Conway Morris, S., "The Fossil Record and the Early Evolution of the Metazoa" *Nature*, Jan. 21, 1993, pp. 219-225 and "Ediacaran-like Fossils in Cambrian Burgess Shale-type faunas of North America" *Palaeontology* 36 (1993) pp. 593-635; Jun-yuan, C., and Erdtman, B. D., "Lower Cambrian Fossil Lagerstatte from Chengjiang, Yunnan, China: Insights for Reconstructing Early Metazoan Life" in Simonetta, A. M. and Conway Morris, S. (eds.), *The Early Evolution of Metazoa and the Significance of Problematic Taxa*, (Cambridge: Cambridge University Press, 1991). Gould has discussed the Cambrian explosion in his chapter, "Is the Cambrian Explosion a Sigmoid Fraud?" in *Ever Since Darwin*, (New York: W. W. Norton & Company, 1973) pp. 126-133.

[5]See also: Beardsley, T., "Weird Wonders," *Scientific American*, June, 1992, pp. 30-34. Gould, S. J., in "The Reversal of *Hallucigenia*," *Natural History*, Jan. 92, pp. 12-20, discusses, and cites literature on whether *Hallucigenia* is described upside down in previous literature.

[6]The books based on articles in *Natural History* are: Gould, S. J., *Ever Since Darwin* (1973), *The Panda's Thumb* (1980), *Hen's Teeth and Horse's Toes* (1983), *The Flamingo's Smile* (1985), *An Urchin in the Storm* (1988), *Bully for Brontosaurus* (1991), *Eight Little Piggies* (1993), all published in New York by W. W. Norton & Company. Other books are: Gould, S. J., *Ontogeny and Phylogeny*, (Cambridge, MA: Belknap Press of Harvard University Press, 1977); *The Mismeasure of Man*, (New York: W. W. Norton & Company, 1981); *Time's Arrow, Time's Cycle*, (Cambridge MA: Harvard University Press, 1986). As far as I can ascertain from my slightly imperfect collection of ASA publications, no book of Gould's has been reviewed in *Perspectives* or the *ASA Journal*, which is surprising and regrettable.

[7]Gould, S. J., and Eldredge, N., "Punctuated Equilibria: the Tempo and Mode of Evolution Considered," *Paleobiology* 3 (1977), pp. 115-151.

[8]Such a linear view, based on Lamarckism, has been discussed in several of P. J. Bowler's books. See, e.g.: *The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades around 1900*, (Baltimore, MD: Johns Hopkins University Press,1983), ch.4; *Theories of Human Evolution: A Century of Debate, 1844-1944*, (Johns Hopkins University Press, 1986); *The Non-Darwinian Revolution: Reinterpreting a Historical Myth*, (Johns Hopkins U. Press, 1988); *Charles Darwin: the Man and his Influence*, (London: Basil Blackwell Inc., 1990), ch. 9. See also note 15.

[9]Gould, S. J. 1989, *Wonderful Life*, p. 46.

[10]L. M. Van Valen discussed contingency in a review of Gould's "*Wonderful Life*: How Far does Contingency Rule?" *Evolutionary Theory* 36, pp. 47-52.

[11]Gould, S. J., 1983, *Hen's Teeth*, p. 260.

[12]Hays, H. R., *Birds, Beasts, and Men*, (Baltimore, MD: Penguin Books Inc., 1973), p. 205. Despite its dated title, this book avoids some of the pitfalls described in the second half of this article, i.e. it describes theories and schools of thought that are no longer followed (e.g. German Romanticism), but that are of historical importance.

[13]Hays, H. R. 1973, *Birds, Beasts, and Men*, p. 207.

[14]See, e.g., Gardner, E. J., *History of Biology*, (Minneapolis, MN, Burgess Publ. Co., 3rd edition, 1972).

[15]Brush, S. G., "Should the History of Science be Rated X?" *Science* 183, March 22 (1974) pp. 1164-1172. For a different view see Harrison, E., "Whigs, Prigs and Historians of Science." *Nature* 329, Sept. 17, (1987) pp. 213-214.

[16]The quotation is from Butterfield, H., *The Origins of Modern Science*, (New York: The Free Press, Revised Edition, 1957) pp. 8-9. Butterfield's theories on the Whig interpretation of history are described in: Butterfield, H., *The Whig Interpretation of History*, (London: G. Bell & Sons, Ltd, 1950). Butterfield is a Christian historian, well worth reading. C. T. McIntyre has edited some previously unpublished articles of Butterfield in a more recent book, and has included a biographical description of Butterfield's life in the introduction: *Herbert Butterfield, Writings on Christianity and History*, C. T. McIntyre, Ed. (Oxford University Press, 1979).

[17]See note 9 for P. J. Bowler's books that deal with linear, teleological, Lamarckian views of evolution. In a recent book, Bowler relates this more explicitly to nineteenth century views of progress: Bowler, P. J., *The Invention of Progress: The Victorians and the Past*, (London: Basil Blackwell, 1989). See also Gould, S. J., 1977, *Ontogeny and Phylogeny*. A standard work on the idea of progress is Bury, J. B., *The Idea of Progress; an Inquiry into its Origin and Growth* (New York, Dover Publications, 1932); see also Cate, C., "How We Learned to Believe in Progress," *Horizon* 15 (3) (1973) pp. 105-111. For a Christian view on the topic see Wells, R. A., *History Through the Eyes of Faith* (San Francisco: Harper & Row Publishers, 1989), and Wilcox, D. L., "Three Models of Making: Prime Mover, Craftsman and King — Alternate Theistic Frameworks for Teaching Origins" *Perspectives on Science and the Christian Faith* 39(4), (1987) pp. 212-220.

[18]Consider, for example, the work of biologists described in Hays, H. R., 1973, *Birds, Beast, and Men*, Ch. 18.

[19]This is discussed in the article by S. G, Brush cited in 15.

[20]Kuhn, T. S., *The Structure of Scientific Revolutions*, (Chicago: The University of Chicago Press, 1962). For a review see H. Cook, *Journal of the American Scientific Affiliation*, March, 1973, pp. 34-38.

[21]Bloor, D., *Knowledge and Social Imagery*, (London: Routledge and Kegan Paul, 1976).

[22]Bowler, P. J., *The Mendelian Revolution: The Emergence of Hereditarian Concepts in Modern Science and Society*, (London: Athlone Press, 1989) pp. 16-18; see also his more recent book *Charles Darwin: The Man and his Influence*, (Oxford: Basil Blackwell, 1990).

# Scientific and Religious Aspects of the Origins Debate

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*The rise of evolution provoked a variety of religious responses, including atheism, theological liberalism, theistic evolution, and both young- and old-earth creationism. Here we survey some major scientific and theological problems for "blind watchmaker" evolution, theistic evolution, and young-earth creationism, opting for an old-earth alternative. Whether or not evangelicals agree with this suggestion, we should seek to emphasize our unity on matters of origins rather than concentrating on that which divides us, as the real chasm is between Christianity and secularism, and the scientific deficiencies of the latter are not widely known in society at large.*

How did it all begin? Since 1800, science and technology have advanced greatly. The answer often advertised today as "scientific" may be called the "Blind Watchmaker" solution:[1] all has arisen by purely natural processes; there is no guiding mind behind the universe; the only purposes (at least in this part of the universe) are human purposes; and the traditional religions are wishful thinking or harmful delusions.

This view has had a profound effect not only in science, but in literature, art, and music — and consequently in education, the media, politics, and finally history. Most of our modern problems have been aggravated by the spread of a belief in a blind watchmaker universe.

## The Rise of Evolution

This world view owes much of its influence to Charles Darwin, who provided scientific respectability for the idea that God is not necessary to explain how things came to be. Darwin did not invent this idea, and his belief in its truth only gradually grew on him.[2]

But Darwin showed that the diversity of living things in various places on earth today — chimpanzees in Africa, llamas in South America, kangaroos in Australia, and especially the very limited variety of life on remote ocean islands — does not fit the common idea that God created the same sorts of animals everywhere on earth.[3] And the progression of living things in the fossil record — no life in the earliest strata, simple life higher up, life becoming increasingly like modern kinds in more recent layers — seemed to conflict with the idea that God created all types of life at one time.[4]

In the generation before Darwin, geologists had found a rock record pointing to long ages of life on earth, opening up a perspective much more extensive than the few thousand years most thought the Bible allowed.[5]

Darwin's distinctive proposal, however, was an analogy familiar to most of his readers — selective breeding.[6] Just as farmers can produce great diversity among their plants and animals by choosing some features for further development, so — Darwin argued — nature did something similar. In each generation of living things, small variations were accidentally produced. But nature, having no mind

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or will to select these according to any plan, effectively favored those variations which produced more survivors. Darwin labeled his model, "natural selection," in distinction from the breeders' "artificial selection;" and, more popularly, it became known as the "survival of the fittest." The mindlessness of this process in the Darwinian view has been captured by Richard Dawkins's recent phrase, "the Blind Watchmaker."[7]

Darwin's proposal was quickly accepted in scientific circles despite considerable opposition. Within a generation, most biologists accepted some form of evolution, though many would not credit natural selection with all the changes. From biology, evolutionary ideas spread into other academic fields. By the beginning of this century, the idea that religion, too, could be explained by evolutionary processes was becoming popular. Even the Old Testament came to be viewed by many as evolving from primitive ideas and folktales ingeniously combined by editors, but now discovered and dissected by the patient detective work of literary scholars. This approach is now widely advocated in New Testament circles also.[8]

## Reactions in Christendom

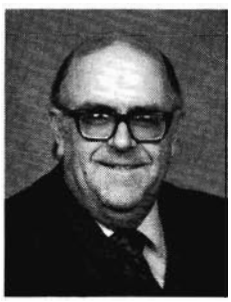
Religious responses to Darwin have been quite diverse, ranging from atheism to fundamentalism.

**Atheism.** Atheism did not get its start with evolution. The French Revolution had its share of atheists; there were some among the ancient Greeks, Indians, and Chinese; and the Bible indicates that even in David's time some thought there was no God.[9] Nevertheless, the impact of Darwin for atheism was immense on Christendom. Radical socialists lionized Darwin, so great was their appreciation for the help evolution provided in giving scientific credibility to atheism.[10] Many others found in evolution a reason for abandoning Christianity. The blind watchmaker version of evolution has been a powerful recruiter for atheism and agnosticism.

**Theological Liberalism.** The major Protestant departure from orthodox Christianity is partly due to evolution. As the theory grew to dominate secular culture, it was integrated into various forms of theological liberalism.[11] The truth of Scripture was rejected while Christianity was reinterpreted in various ways. These ideas spread in the mainline denominations from seminary and college to pulpit and pew, producing results ranging from atheism with its blind watchmaker evolution to milder forms of liberalism holding theistic evolution.[12] Similar phenomena occurred in Roman Catholicism and, to a lesser extent, in Eastern Orthodoxy.[13] Within evangelical Christendom, where (by definition) the Bible is accepted as a real revelation from God, reactions have been somewhat different.[14]

**Theistic Evolution.** A small minority of evangelicals (but typically many of those with scientific training) have felt that the biological and geological evidence for evolution is overwhelming. These evangelicals have adopted some form of theistic evolution, in which God worked providentially through natural laws and long ages to produce the diversity of living things we see today. Being evangelicals, the inspiration of Scripture is retained, though not always its inerrancy. Some of these evangelicals have taken Genesis 2 and 3 to be parables, denying there was a literal Adam and Eve and claiming a whole population of apes gradually evolved into humans. In this view, sin is a natural result of developing moral machinery and our making bad choices. We might call this view, "No-Adam theistic evolution."[15]

Other evangelicals take Genesis 2 and 3 more literally, believing that God remodeled a particular ape-man to become Adam by putting a soul within him, and made Eve from his side. The pair turned away from God as narrated in Scripture. We might call this view, "Adam theistic evolution."[16] Both views can also be found outside evangelicalism.



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**Old-Earth Creation.** A larger minority of evangelicals have felt that geological and astronomical evidence for an old earth and universe is overwhelming (and consistent with biblical teaching), but that there are serious scientific problems for any type of so-called macro-evolution — the natural development of all living things from one or a few simple life-forms. These evangelicals have a variety of ways of interpreting the Genesis account: some see a gap between Gen. 1:1 and 1:2,[17] others see gaps between the Genesis days,[18] and still others have the days lasting for ages.[19] Typically old-earth creationists see God intervening miraculously to create the universe and each basic kind of living thing (including humans). If providential guidance of natural processes would be unable to produce the desired results, then they believe that God could intervene miraculously at these needed points.

**Young-Earth Creation.** Most evangelicals, apparently, have felt that the Genesis account, simply interpreted, points to a creation only a few thousand years ago, in the space of six literal days.[20] The date of creation has been variously estimated, from six thousand to ten thousand years ago, with some suggesting even older values.[21] The amount of variation which has occurred since creation also is a point of difference. Some evangelicals hold that all species were created at the beginning; others that only the basic kinds were created, and that all the varieties of cats (for example, lions, pumas, house cats) have developed since creation or even since the Flood.[22]

*Today, many evangelicals see science and atheism as on the same side against Christianity...*

Obviously, young-earth creationists have viewed much of modern science with great suspicion, some even claiming that science began to go wrong with Copernicus when the earth was removed from the center of the universe.[23] Many young-earth creationists have developed various forms of creation-science. Most claim that the geologic strata can be explained by Noah's flood;[24] some claim that quantum physics and relativity theory are wrong;[25] and at least one claims that the whole universe is only a few light-years in diameter — billions of times smaller than scientists think.[26]

In less than two centuries, a profound change has occurred in the relationship between science and evangelical Christianity. Early in the 19th century, most orthodox Christians viewed science as on their side and atheists as profoundly anti-scientific (though atheists would have objected strongly to this). Today, many evangelicals see science and atheism as on the same side against Christianity, and atheists would heartily agree.

In this paper, we suggest this assessment is badly mistaken, partly because of errors by both scientists and theologians. In the following sections, let us look first at scientific problems for the blind watchmaker form of evolution — problems on which all varieties of evangelicals can probably agree. If these problems really exist, this information needs to be widely distributed, because it undermines the claims of secularists to be realists and raises serious questions about where secularism is taking society — questions which are also being raised from other quarters as people consider what has been happening to our culture in recent years.[27]

Second, let us look at problems shared by both the blind watchmaker and theistic forms of evolution — problems on which both young- and old-earth creationists can probably agree. If these problems were widely recognized, perhaps they could help theological liberals see the weakness of their own position and decrease the losses that continue to occur among evangelicals, where doubts raised about biblical reliability still draw many young students into various forms of theological liberalism.

Third, we will look at some problems facing young-earth creationism, problems on which nearly all geologists and astronomers agree. These problems are an enormous stumbling block for those trained in the sciences, keeping many such people from seriously considering the claims of Christ and the Bible.

Lastly, we will suggest that an old-earth creation alternative has substantial advantages over other views on origins, though it is not without its own problems.

## Problems for "Blind Watchmaker" Evolution

**Origin of life.** Darwin himself wrote little on the question of how life might have originated. He did speculate that perhaps the necessary organic material could have self-assembled in a warm pond somewhere.[28]

Another century of biochemistry has not gone much beyond this, except to call for a whole ocean

of organic "soup" formed by ultraviolet radiation and an atmosphere without oxygen. Even then, several warm ponds would have been necessary (each with different chemical environments and shielded from the sun) to concentrate the soup and form the various amino acids, sugars, and nucleic acids needed. These would later have to be carefully mixed in the right sequences, proportions, concentrations, and acidities to give the desired result.[29]

The problem is that even the simplest life is not simple. The more we study the origin of life, the more complex life seems to be. Carl Sagan calculated that the simplest form of bacteria has an information content equivalent to one hundred million pages of the *Encyclopaedia Britannica*.[30] For a Blind Watchmaker to build something of this sort purely by chance is like a tornado assembling an airplane from a junk yard![31]

Knowing this, evolutionists have speculated that the first life was far simpler than anything existing today — simple enough to have come together by chance. Such primeval life must then have evolved into the more complex life detectable in the fossil record, meanwhile eating up all traces of its ancestry.[32] Attempts to estimate the complexity of the simplest possible life-forms using computer simulations of self-reproducing automatons do not suggest that these would have formed by chance in a universe that is only some billions of years old and as large as ours is.[33] Yet imprints in rock strata have been found that look like fossils of simple algae. Some imprints seem older than three billion years, almost the time at which the earth would have cooled off enough to support life![34] This leaves little time for life to have developed on earth, so some have speculated that life was seeded on the earth from outside.[35] In a blind watchmaker scenario, God is not available for this task, which must be left to spores drifting through space or their descendants sending spaceships. Obviously this does not solve the problem of how that life got started elsewhere, for which the universe does not appear to have the probabilistic resources.[36]

**The Darwinian Mechanism.** Leaving aside this question, the main scientific attraction of Darwin's proposal was his concept of natural selection working upon existing varieties among living things to produce better and better organisms. This can be pictured so it appears to be obviously true, and several early readers of *Origin of Species* marveled that no one had noticed it before.

Clearly, much variety exists among living plants and animals — color, shape, wing-length, etc. In a particular environment, some of these variations are more likely to survive or prosper than others, and those with the favored variations will eventually come to dominate the population. Thus Darwin (and his followers) felt that it was inevitable that any group of plants or animals would improve in its ability to function in a given environment or become extinct. Since life in the fossil record was once much simpler than now, all this complexity must have developed naturally by the random formation of new varieties and the natural selection among these varieties of those best suited to survive. How could such a simple model be wrong? And if not, what do we need God for?

***The experience of plant and animal breeders has consistently shown that there are limits within which a plant or animal can be changed.***

Darwin's analogy to breeding might be faulty, however. It is not obvious that purposeless selection is analogous to purposeful; that non-intelligent selection is analogous to intelligent; nor that the former can produce limitless development just because the latter produces limited! The experience of plant and animal breeders has consistently shown that there are limits within which a plant or animal can be changed. Dogs have been bred over the centuries which are as small as cats or as large as ponies, but not as small as mice or as large as elephants. Perhaps this is a problem because the dog population does not contain the right mutations. Perhaps if we had thousands or millions of years instead of hundreds, or if we artificially induced more mutations, this could be overcome. Perhaps. But scientists have now worked for most of this century breeding bacteria and fruit flies, both of which have far shorter reproduction times and thus many more generations in just a few years. They have also greatly increased the speed of mutation by exposing their specimens to radiation. Yet even so, they have found no tendency for these organisms to keep changing indefinitely in a given direction, but found instead barriers beyond which change does not occur. There are fixed limits beyond which the specimens cannot function.[37]

The same is true in the fossil record. Although Darwinian theory would predict the gradual accumulation of small changes as the source of all large differences among living things, it has been known

since before Darwin's time that the major life-forms appear in the fossil record suddenly, without smooth transitions from previous forms. Darwin (and most evolutionists) have explained this as due to gaps in the fossil record rather than lack of actual transitions.[38] But as our knowledge of the fossil record has improved, these gaps have shown no tendency to go away.[39] Sudden appearance of new forms is characteristic of the fossil record.

*These features in the fossil record — sudden appearance and stability (or stasis) — are not what one would expect from mutation and natural selection.*

In the 1930s, a new version of evolution was developed (a synthesis with genetics, called the "new synthesis" or "Neo-Darwinism") in which all important changes took place in small isolated groups of a given organism.[40] Since these would be less likely to show up in the fossil record, this was supposed to account for sudden appearances. In the 1970s, another model was proposed (called "punctuated equilibria") to account for the fact that species of living things typically show little evidence of change over their history, not only showing up suddenly in the fossil record, but remaining about the same until the present or whenever they became extinct.[41] Although this latter model fits the fossil record better than the old Darwinism or the New Synthesis, it is hard to fit with genetic models of how evolution should work![42] These features in the fossil record — sudden appearance and stability (or stasis) — are not what one would expect from mutation and natural selection.

Attempts have been made to model mutation and natural selection by means of computer simulations.[43] For example, a few letters of the alphabet or a given sentence are subjected to random changes, either replacements or additions of other letters. Those results which spell English words or make sense in English are retained as survivors; the rest are viewed as becoming extinct. Here, too, the results are not favorable to the idea that Darwin's mechanism will explain the diversity of present-day life. Instead, mutation tends to destroy meaning in the information systems which serve as models for living things rather than creating new meanings for natural selection to work on.[44]

**Design in Inanimate Nature.** A third problem for the blind watchmaker model of evolution arises from the apparent evidence of design outside biology, which has become more obvious in recent years.[45] Physicists have noted that the four basic forces known to exist in nature are delicately balanced so that life can exist. If the value of the various constants that mark the strength of these forces were ever so slightly different from what they are, life would not exist anywhere in our universe. If gravity were slightly stronger or weaker, the universe would never have formed stars or planets. If the strong nuclear force were slightly stronger, there would be no hydrogen in the universe; if slightly weaker, nothing but hydrogen. Comparable problems arise if the values of the electromagnetic force and the weak interaction were different.[46]

The usual blind watchmaker reaction to these problems is to deny that any sort of design or Designer is involved here. It is admitted that if these (and many other) constants were not just right, there would be no life in the universe. If there were no life in the universe, then we would not be here to observe the universe! So any universe with observers must have such apparent design even if there is no Designer. This response is true, but only in the same sense that if your mother and father had never met, you would not be here either! It is no explanation in the scientific sense of providing an adequate cause for the phenomena observed.

In brief, the blind watchmaker version of evolution suffers from the problem of explaining the rise of organization: the inanimate universe looks much more orderly than one would antecedently expect; and the organized complexity and diversity of living things look more like life is the result of a Designer than that it happened by chance, even chance working within the constraints of natural selection.[47]

## Problems for Theistic Evolution

Let us turn to theistic evolution. But rather than beginning with its problems. let us note some of its advantages.

**Advantages over Blind Watchmaker Evolution.** Theistic forms of evolution solve a huge problem facing blind watchmaker evolution. In a theistic model, there is a Mind behind the universe, designing just the form of physical laws necessary to support life, so that a near-infinity of universes is not necessary to hit on one that has the right stuff. The Designer also can guide the course of physical events which actually take place in this universe so that

life can arise and diversify on a scale and within time periods that would be impossible in a universe without a Mind. This difference between blind watchmaker evolution and theistic evolution is like that between the time necessary for a typist to type "Now is the time for all good men to come to the aid of their party" and waiting for a chimpanzee to do the same![48] Theistic evolution thus solves the major problem that besets mindless universes in producing the kind of life that exists in our own universe.

**Shared problems with Blind Watchmaker Evolution.** Theistic evolution has its own problems, and not all these relate to interpreting Genesis. As we mentioned under blind watchmaker evolution, the fossil record is characterized by gaps between all the major biological types. It is as though each of the major kinds of plants and animals appeared on earth suddenly, rather than slowly developing from the organisms that were there already. This is not what one would expect if God were working only by guiding natural processes to produce the diversity of living things.

Perhaps God worked by producing quick transitions in the relevant plant or animal for each of these gaps. If we postulate that God introduced just the right (say) 75 mutations in a reptile so that its children would be birds,[49] we could easily negotiate any chasm in the fossil record. Such a model would be theistic all right, but would it be evolution? Jesus might easily have changed water into wine by introducing a mere 75 "mutations" in the water molecules, but this would be as much of a miracle as if he had annihilated some water molecules and created the relevant molecules for wine in their place. Such a model is better labeled a form of old-earth creationism rather than theistic evolution.

*The "shape" or "pattern" of the fossil record is wrong for both theistic and blind watchmaker evolution.*

Of course, when we speak of these new plants or animals appearing "suddenly" in the fossil record, we should not think the record is detailed enough to show that one day there were no birds and the next day there were. The transition time might be many thousands of years. But the lack of transitional fossils is still a serious problem for the idea that the change was merely a guided sequence of natural events, not to mention the problem of having all the intermediates be functional. To get (say) 75 mutations together in a population that is minuscule compared with the whole reptile population, and to do this repeatedly for each of the major gaps in the biological classification scheme, is divine intervention of such a sort as makes Peter's finding the coin in the fish's mouth seem trivial! No wonder blind watchmaker evolutionists consider theistic evolution a disguised form of creationism![50]

Besides this, the "shape" or "pattern" of the fossil record is wrong for both theistic and blind watchmaker evolution. According to both, evolution has progressed by small changes gradually producing big effects. In this sort of scheme, an organism ought first to diversify into various varieties, which then diverge into species, then into the higher biological subdivisions (genera, families, orders, classes and phyla), producing an expanding "cone" of diverse life. In fact, virtually all the phyla appear suddenly at the Cambrian "explosion," and all future diversity occurs within these basic body plans that showed up then.[51]

**Problems for Bible-believing theistic evolutionists.** Theistic evolutionists who do not accept Scripture do not bother trying to harmonize with it. (But neither do they have any warrant for calling upon its authority for knowledge about God and life.) But those theistic evolutionists who do accept Scripture as reliable revelation from the Creator must also deal with problems the Bible raises for their view.

For no-Adam theistic evolutionists, we must ask, "Are Genesis chapters 2-3 really only parables?" How do we know this? The author tells us nothing that would indicate this. What contextual clues indicate that this is the case? If our clues come from science rather than Scripture, what are these clues and how do they show us that it is theistic evolution rather than old-earth creation that is correct? How do we learn from either Scripture or science that there never was a historic Adam? If there never was such an Adam, then the fall of humanity must have taken place in a different way than pictured in the Genesis account. If this account is strongly parabolic, why are the accounts regarding God's solution to human sin not parabolic? Maybe the information about Jesus is not historical either.[52] You see the implications of this line of thinking. We should examine our reasons for going this way very carefully before we set out.

For Adam theistic evolutionists, we ask, "Was Adam really a remodeled ape-man?" If so, why did

the Genesis account not make this clearer? Surely, it would have been easy to say that Adam was made from another animal, even if the first readers had no specific word for an ape. Why does the author of Genesis 2 say that when God breathed into the nostrils of the first man, he became a living being? Though the phrase is sometimes used to speak of the human soul, in Genesis 1-2 it is used for non-human sea life and land life, including the animals named by Adam.[53] So according to Genesis 2, it was not until God breathed upon Adam that he became a living (or breathing) being, not the sort of description that suggests Adam was previously a living ape.

Theistic evolution thus faces some serious problems both scientifically and biblically.

## Problems for Young-Earth Creation

The major problems facing the view that God created everything just a few thousand years ago are largely scientific. They can be grouped in two categories: evidence that the earth and universe are much older than this, and problems facing the flood of Noah as an adequate explanation for the geologic strata.

**Evidence for an old earth.** The first of these, and one of the easiest to understand, is the evidence from astronomy that nearly all the visible universe is millions to billions of light-years away from us, and therefore the time necessary for light to reach us from the most distant parts of the universe is billions of years rather than thousands. If (1) these objects really are at the distances they appear to be; if (2) light really does travel at 186,000 miles per second; and if (3) the light rays really left the objects they image, then the universe (at least) is billions of years old. Young-earth creationists have attacked each of these assumptions, but their arguments in each case look like special pleading rather than trying to follow the evidence where it leads. For instance, if we attempt to cram all the stars, galaxies, and quasars into a volume of a few thousand light-years, we wind up with little, dinky stars that cannot hold themselves together or burn.[54] If we argue that the speed of light has changed drastically since creation, we find that all the people and air on earth would have floated away from the planet even as recently as the times of the early patriarchs.[55] If we argue that God created most of the light in the universe already nearly here, and that it never really left the objects it pictures, we involve God in the creation of an enormous amount of fictitious history.[56]

The actual number of fossils in the earth's geologic strata is also much too large to suggest a young earth. If we assume that most of these were laid down in a year by the flood, we wind up with a situation in which organisms must have lived in piles many feet deep early in earth's history![57]

The most common method scientists use to date ancient rocks and fossils depends on the fact that some atomic elements are unstable and tend to break up by ejecting pieces of their nuclei. These radioactive decay events are not individually predictable, but statistically they are very regular, with one-half of the mass of a given element decaying to its daughter product within an experimentally known time we call the half-life. Elements with very short half-lives (thousands or millions of years) are not found in nature except under circumstances where they appear to be the products of the decay of some heavier, longer-lived element. Ages for rocks found this way are (with the typical problems and exceptions found in all experimental work) regularly consistent with a geologic history of the earth measured in billions rather than thousands of years.[58]

Likewise, we find buried in the earth or exposed at its surface large masses of igneous rock which show themselves minerally to have once been in a molten state. The time necessary for the larger of such masses to cool to their present temperatures is much longer than a few thousand years.[59]

*Very strong evidence for an old earth is found in the correlation of several measurements which give independent, cumulative witness to the age of various geological formations.*

Very strong evidence for an old earth is found in the correlation of several measurements which give independent, cumulative witness to the age of various geological formations. For instance, geologists now believe the earth's crust is composed of many "thin" plates which move around on top of the mantle, producing volcanoes and earthquakes. These plates are moving at about one inch per year, and therefore would have moved only a fraction of a mile if the earth is just a few thousand years old, but some thousands of miles for an old earth. The shapes of various continents and details of their rock formations show us that these continents were

once together and have now moved thousands of miles apart. Young-earth creationists thus have to suppose that these continents were once moving miles per year to cover these distances, though direct measurements by satellites today give the one-inch result. The ages of radioactive decay in the igneous rock laid down where these plates are coming apart also fits the inch per year speed. So does the increasing depth of sediment found as one moves away from these rifts. And so do the direction and strength of magnetism left in the hardened igneous rocks so produced. The scriptural rule regarding the testimony of multiple witnesses should make Christians very cautious about dismissing this evidence.[60]

More could be said.[61] But in a quick sketch this should suffice to show that there really are serious problems with the claim that the earth is only a few thousand years old and that biased, anti-Christian scientists are just twisting the data to make the earth look older.

**Inadequacy of flood geology.** Flood geology is the name commonly given to the theory that nearly all the geologic strata were laid down in the one-year flood of Noah's time rather than over a period of millions or billions of years as most geologists claim.

If the earth really is young, there is the enormous problem of explaining why the earth is covered with miles of rock which give every appearance of being hardened from once-soft sediments. Where did all this sediment come from? Did God create it in place, with all its fossils, just to mislead those who would not believe his Word? Most Christians who have any familiarity with geology are uneasy with the idea that animal bones, fossil clamshells, and petrified wood never were living things. Flood geology is an attempt to explain these phenomena more naturally within a young-earth perspective. All these fossils really were living things, but they died and were deposited in the sediments caused by Noah's flood.

Although flood geology often looks impressive to those untrained in geology, a large amount of embarrassing data is available to show that it will not do what it promises — provide a natural explanation for the earth's rock layers.

For one thing, small but significant parts of these layers are made up of types of rock which are laid down by wind in desert areas rather than by water under the sea. It is hard to see how these types of formations could have occurred in the midst of a worldwide flood covering all the high hills, as flood geologists believe, particularly when such strata are found not just in the topmost layer of rock, where one might suppose some desert conditions as the waters receded, but also buried under even thousands of feet of strata that according to flood geology were laid on top no more than a few days later! The same could be said of river-type strata found throughout the geologic column.[62]

*If the earth really is young, there is the enormous problem of explaining why the earth is covered with miles of rock which give every appearance of being hardened from once-soft sediments.*

The presence of fine layering in certain strata is another problem. There are many places in the world where there are thousands or even millions of layers consisting of pairs (or triplets) of different types of rock, usually alternating clay-sand layers, or layers of different types of salts. These are easily explained in traditional geology as annual deposits in bodies of water, the clay-sand types as summer/winter deposits in temperate lakes and the salt types in tropical bays where seawater almost completely evaporated before new water washed in. But in flood geology, we have only one year to form such structures, even ignoring what is often thousands of feet of sediment both above and below such strata. In such a case, one must postulate carefully coordinated waves bringing in fine silt from one direction and sand from another and depositing it at the rate of one layer every few seconds over many square miles for a year![63]

Such layers are not just plain, featureless grains of salt, silt, or sand. In the tropical cases, one finds birds' nests, eggshells, feces, and tracks that indicate the area was inhabited by seabirds while the accumulation was going on, a pretty neat trick when the area was under hundreds of feet of water! In the clay-sand cases, one layer will usually have much more pollen and vegetable matter than the other, as we would expect for seasonal deposits on the bottom of a lake that freezes over in winter, but not in a huge flood in which tidal waves are envisioned as sloshing around great masses of sediment.

Not only do we have these features in the rock record, but we also have many examples which show that the lower layers of sediment had hardened into

rock before the upper layers were added, not the sort of thing one would expect if everything was done in a one-year flood. There are potholes with vertical sides, something that would never form in loose sediment, but quite common in river bottoms where hard pebbles grind holes in softer (but solid) rock. There are seashells planed off by erosion, suggesting that their lower parts were held firmly by solid rock while the upper parts were eroding, rather than sitting in loose sediment where they would merely have washed away.[64]

This, too, is not a complete list of the troubles faced by flood geology;[65] but it is enough to show that we cannot expect to help unbelieving geologists come to Christ by glibly repeating such speculation as though it were the teaching of the Bible.

## The Old-Earth Creation Alternative

We turn now to a third evangelical alternative for handling the biblical and scientific data relating to origins. Though not without problems of its own, I believe something of this sort has far more promise than either theistic evolution or young-earth creation for reconciling the data.

**Advantages.** The major advantage of old-earth creation is that it takes both the text of the Bible and the "text" of nature seriously, i.e., as inerrant and straightforward. This is in contrast to theistic evolution, which sees the account of the creation of humans in Genesis 2 as parabolic (fictitious history), and in contrast to young-earth creation which sees light from distant astronomical objects as telling us what they would have been doing if they had existed so long ago, also fictitious history.

The Bible provides us with warrant to see both Scripture and nature as God's revelation. Theologians speak of nature as God's "general revelation" and of Scripture as his "special revelation," basing their views on Psalm 19 ("The heavens declare the glory of God ...") and Romans 1:20 and context (God's divine nature clearly seen through what has been made). Both revelations are inerrant in the sense that God cannot lie. This does not mean that fallible human interpreters cannot draw wrong conclusions from either, nor that at any point in history we will know enough to be able to harmonize them correctly in all matters. It does mean that harmonization is ultimately the right strategy, allowing for the range of speech figures which the Bible can be shown to use elsewhere, and for the fact that humans (including theologians and scientists) often jump to conclusions from inadequate data.

**Problems.** Any model which opts for harmonization is going to look like compromise and needless complication to purists on either side who take their data "straight" and think their opponents are ignorant or wicked. Harmonization, in fact, does typically produce more complicated models than those constructed to be the simplest possible, fitting only Scripture or only nature. We should not be surprised at this. The same thing happens in biblical interpretation when we attempt to harmonize parallel passages, or in science when we try to reconcile data from two different disciplines. The Gospel accounts of the birth of Jesus, for instance, each contain significant material not mentioned in the other. Both Matthew and Luke have Jesus born of a virgin in Bethlehem, but Matthew recounts the visit of the Magi and the flight to Egypt, whereas Luke narrates the dedication at the temple and the return to Nazareth. Liberal theologians delight to point out the "contradictions" here, but all are easily harmonized as long as one does not require that either account be read in the simplest way possible.[66]

Another problem young-earth creationists have with old-earth models is that such models have death before the fall of Adam and Eve. Not human death, but plant and animal death, as the fossil record is certainly a record of dead plants and animals. "This cannot be," they say, "for it was in Adam that death entered the world." The passage usually cited, however, Rom. 5:12-21, only specifically speaks of death coming upon humankind. It is not obvious that Paul intends for us to understand that plants and animals originally had eternal life. This has not been the traditional understanding, but neither has tradition always been right.

## Conclusions

**Priorities among evangelicals.** It would be great if Christians could come to an agreement on origins (particularly if it were the way God actually did it), thus presenting a united front to the world we are trying to reach. But given the diversity of opinion among evangelicals on how to relate the biblical and scientific data, it is unlikely this will happen. Certainly, the history of Christianity in solving disagreements over baptism, worship, church government, future things, pacifism, Bible versions, and tongues does not provide much encouragement here. I fear that this disagreement, like those, will be with us until the Lord returns.

Even so, it is desirable that we keep our eyes on the chief business for which Christ established his

church: to make disciples for Jesus and to teach them obedience to his commands. We need to handle the origins question, like these others, in a way that attracts people to the Gospel rather than repelling them. But unbelievers can be repelled not only by divisions between Christians, but also by the belief that Christianity is merely wishful thinking and not intellectually honest.

*We need to handle the origins question ... in a way that attracts people to the Gospel rather than repelling them.*

In this regard, we need to do what we can to end the control militant secularists have over the agenda regarding public discussion of origins. To hear most media presentations, one would think that all Bible-believers are snake-handlers, and that only some sort of blind watchmaker evolution can be seriously considered science. We need to become sufficiently familiar with the evidence and questions at issue so that we can at least recommend scientifically sound materials to those in our circles of influence. For example, we need to help others see that science already has tools by which to recognize the presence of a mind, and is not therefore at a total loss to detect the activity of God in nature.[67]

Those Christians who are convinced that the Bible teaches a young earth will want to defend this in serving the Lord. Those of us who are convinced that this is not how God created, and that young-earth creationism is a formidable stumbling block to many in coming to Christ, will want people to realize that this is not the only Christian alternative. All of us should recognize that we may be wrong in our views of origins and our interpretations of nature and Scripture, and we should be open to evaluate both our own arguments and those of others. We must not let our presuppositions so control us that we are not open to the actual evidence regarding origins.

One of Satan's best tactics in opposing the truth is confusion. We must not let him get away with this by shifting back and forth on meanings of "evolution" and getting Christians to spend most of their efforts attacking each other. Christians could agree on countering the Blind Watchmaker approach, and we ought to devote a considerable fraction of our efforts in this direction, for the sake of believers and unbelievers alike. ✳

## Acknowledgment

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[6]Darwin, *Origin of Species*, ch. 1.

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[9]G. A. Jones, "Atheism," *The Encyclopedia of Religion* (New York: Macmillan, 1987) 1:479-490; Psalm 14:1.

[10]Desmond and Moore, *Tormented Evolutionist*, pp. 538-543, 601-602, 626-628, 643-645.

[11]Adolf von Harnack, *What is Christianity?* (1900; reprint New York: Harper and Row, 1957); J. Gresham Machen, *Christianity and Liberalism* (Grand Rapids: Eerdmans, 1923); William Hordern, *A Layman's Guide to Protestant Theology*, rev. ed. (New York: Macmillan, 1962).

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[13]Alec R. Vidler, *The Modernist Movement in the Roman Church* (Cambridge: University Press, 1934); Thomas M. Loome, *Liberal Catholicism, Reform Catholicism, Modernism* (Mainz: Grünewald-Matthias, 1979); see also the four articles on evolution and evolutionism in the *New Catholic Encyclopedia* (1967), 5:671-696; Nicolas Zernov, *Eastern Christendom* (London: Weidenfeld and Nicolson, 1961), pp. 203-204; Sergius Bulgakov, *The Orthodox Church* (New York: Morehouse, 1935), p. 100; Athenagoras Kokkinakis, *An Interorthodox Theological Debate* (Leighton Buzzard, Beds., UK: Faith Press, 1973), pp. 92-98.

[14]See, e.g., the different views espoused in Ronald Youngblood, ed., *Genesis Debate* 2nd ed. (Grand Rapids: Baker, 1990); also the bibliography by Tom McIver, *Anti-Evolution* (Jefferson, NC: McFarland, 1988; reprint Baltimore: Johns Hopkins, 1992), though not all of the authors listed here are evangelical.

[15]My terminology; see, Richard H. Bube, "Biblical Evolutionism?" *Journal of the American Scientific Affiliation 23 (1971): 140-144.* Howard Van Till's concept of "functional integrity" seems to imply this sort of human evolution; see his remarks in *The Fourth*

*Day* (Grand Rapids: Eerdmans, 1986), ch. 12, pp. 249-271; "God and Evolution: An Exchange," *First Things* (June/July 1993): 32-41; and the remarks of John Stek and Van Till in *Portraits of Creation* (Grand Rapids: Eerdmans, 1990), pp. 261, 272-277.

[16]Also my terminology; e.g., David L. Dye, *Faith and the Physical World* (Grand Rapids: Eerdmans, 1966), 136-150; James M. Houston, "The Origin of Man," *Journal of the American Scientific Affiliation* 34 (1982): 1-5.

[17]Arthur C. Custance, *Without Form and Void* (Grand Rapids: Zondervan, 1974); J. Vernon McGee, *Genesis: Volume I* (Pasadena, CA: Through the Bible Books, 1980); John R. Schroeder, *Answers from Genesis* (Pasadena, CA: Ambassador College, 1973); A. G. Tilney, *Without Form and Void* (Hayling Isl., Hants., U.K.: Evolution Protest Movement, 1970); Don Wardell, *God Created* (Winona Lake, IN: privately publ., 1984); notes on Genesis 1 in old *Scofield Reference Bible* (New York: Oxford, 1917), pp. 3-6.

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[20]According to James Moore, "The Creationist Cosmos of Protestant Fundamentalism" in *Fundamentalisms and Society*, ed. by Martin E. Marty and R. Scott Appleby (Chicago: University of Chicago, 1993), p. 46, about one quarter of the U. S. population believes in young-earth creation. According to *Religion in America* (1990), about 31% believe the Bible is God's word and to be taken literally, about 55% believe it is without error (both on p. 50) and about 33% claim to be "born again" (p. 41). It would thus appear that among evangelicals, the young-earth position is dominant.

[21]For various views in the young-earth camp regarding the age of the earth, see Ronald L. Numbers, *The Creationists* (New York: Knopf, 1992): 6000-7000 yrs, Lammerts (pp. 224, 235); 9-10,000 yrs, Morris (p. 235); c 13,000 yrs, Cook (p. 313); Byron Nelson held to about 100,000 years in 1940, but by 1948 had suggested the earth might be as old as a million years (pp. 115-116). Seventh-Day Adventists have typically held to a young earth (or solar system) but sometimes allowed for an old universe (pp. 134-136, 203).

[22]For various views among young-earth creationists regarding the amount of change in living things since creation, see Numbers, *The Creationists: Basic Fixity of Species:* Byron Nelson (p. 109), L. Allen Higley (p. 114), George M. Price (pp. 114, 127, with some waffling, pp. 83-85); considerable development since creation or since Flood: Dudley J. Whitney (p. 109), Harold W. Clark (pp. 114, 124), Frank L. Marsh (pp. 129-133), H. Douglas Dean (p. 235: God created only 7 or 8 basic types), Henry M. Morris (p. 235). Walter E. Lammerts (pp. 220, 235) holds to absolute fixity except that God rearranged some DNA after the Flood to adapt animals to new environments.

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[25]Josemaria Gonzalez Barredo, *The Subquantum Ultramathematical Definition of Distance, Space and Time* (Washington, DC: MIAS Press, 1984); Thomas G. Barnes, *Physics of the Future* (El Cajon, CA: Institute for Creation Research, 1983); Charles W. Lucas, Jr., *Soli Deo Gloria* (Temple Hills, MD: Church Computer Services, 1985). Not all who reject relativity or quantum mechanics are Bible-believers, however; see Petr Beckmann, *Einstein Plus Two* (Boulder, CO: Golem, 1987).

[26]Harold Camping, "What is the Size of the Universe?" (Oakland, CA: Family Radio, 1981).

[27]E.g., Francis A. Schaeffer, *How Should We Then Live?* (Westchester, IL: Crossway, 1983); Allan Bloom, *The Closing of the American Mind* (New York: Simon and Schuster, 1987); Karl Minninger, *Whatever Became of Sin?* (New York: Bantam, 1988); Herbert Schlossberg, *Idols for Destruction* (Nashville: Thomas Nelson, 1983); Charles M. Colson and Jack Eckerd, *Why America Doesn't Work* (Dallas: Word, 1991).

[28]Francis Darwin, *Life and Letters of Charles Darwin* (New York: Appelton, 1901), 2:202-203 note.

[29]See the (intentionally) humorous remarks by evolutionist Robert Shapiro, *Origins: A Skeptics Guide to the Creation of Life on Earth* (New York: Summit, 1986); also Charles B. Thaxton, Walter L. Bradley and Roger L. Olsen, *The Mystery of Life's Origin: Reassessing Current Theories* (New York: Philosophical Library, 1984; reprint Dallas, TX: Lewis & Stanley, 1993).

[30]Carl Sagan, "Life," *Encyclopaedia Britannica* (1993), 22:966. The whole article (pp. 964-981) gives a nice survey of modern neo-Darwinian evolution, theorizing on the origin of life, and prospects of finding life elsewhere in the universe, from a blind watchmaker point of view.

[31]"Hoyle on Evolution," *Nature* (12 Nov 1981): 105.

[32]Sagan, "Life," pp. 965, 972, 973-974. See also Peter J. Bowler, *Evolution: the History of an Idea* (Berkeley, CA: University of California Press, 1984), p. 302.

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[37]Wendell R. Bird, *The Origin of Species Revisited: The Theories of Evolution and of Abrupt Appearance*, 2 vols. (New York: Philosophical Library, 1986, 1989), 1:84-89, 155-178.

[38]Gaps in fossil record: Darwin, *Origin of Species*, ch. 10; George Gaylord Simpson, *The Major Features of Evolution* (New York: Simon and Schuster, 1953), pp. 360: "In spite of these examples [splitting and gradual divergence in a few genera, subfamilies and families], it remains true, as every paleontologist knows, that most new species, genera, and families, and that nearly all new categories above the level of families appear in the [fossil] record suddenly and are not led up to by known, gradual, completely continuous transitional sequences."; Steven J. Gould, *Natural History* 86, no. 5 (1977): 14: "The extreme rarity of transitional fossils in the fossil record persists as the trade secret of paleontology."; Steven M. Stanley, *Macroevolution: Patterns and Process* (San Francisco: Freeman, 1979), p. 82: "...despite the detailed study of the Pleistocene mammals of Europe, not a single valid example is known of phyletic (gradual) transition from one genus to another."

[39]David Raup, "Conflicts Between Darwin and Paleontology," *Field Museum Bulletin* 30, no. 1 (1979): 25: "Well, here we are now, about 120 years after Darwin ... ironically, we have even fewer examples of evolutionary transitions than we had in Darwin's time. By this I mean that some of the classic cases ... have had to be discarded or modified."

[40]Bowler, *Evolution*, pp. 296-300; Julian S. Huxley, *Evolution: the Modern Synthesis*, new ed. (London: Chatto and Windus, 1963); Theodosius Dobzhansky, et al., *Evolution* (San Francisco: Freeman, 1977); George Gaylord Simpson, *Tempo and Mode in Evolution* (New York: Columbia University, 1944).

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[43]Dawkins, *Blind Watchmaker*, discusses some computer programs which allegedly simulate evolution, but these are fraught with problems; see next note.

[44]See Murray Eden, "Inadequacies of Neo-Darwinian Evolution as a Scientific Theory," in Paul S. Moorhead and Martin M. Kaplan, eds., *Mathematical Challenges to the Neo-Darwinian Interpretation of Evolution* (1967; reprint New York: Alan R. Liss, 1985), p. 11; Robert C. Newman, "Computer Simulations of Evolution" (Diskette of computer programs; Hatfield, PA: IBRI, 1990).

[45]P. C. W. Davies, *The Accidental Universe* (New York: Cambridge, 1982); John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle* (New York: Oxford, 1986).

[46]See detailed discussion in Hugh Ross, *The Creator and the Cosmos: How the Greatest Scientific Discoveries of the Century Reveal God* (Colorado Springs: Navpress, 1993).

[47]Some books sketching problems for blind watchmaker evolution: Hayward, *Creation and Evolution*, Part I, "The Genuine Scientific Objections to Darwinism;" Percival Davis and Dean H. Kenyon, *Of Pandas and People: The Central Question of Biological Origins* 2nd ed. (Dallas: Haughton, 1993); Howard J. Van Till, Davis A. Young, and Clarence Menninga, *Science Held Hostage* (Downers Grove, IL: Inter-Varsity, 1988), Part III, "Science Held Hostage by Naturalism;" Bird, *The Origin of Species Revisited*.

[48]Though no professional typist, I just typed the sentence mentioned in ten seconds. To calculate the expectation time for this task to be performed by a chimp, we will assume that the chimp is trained to type at 3 characters per second on a special monkey-proof typewriter (or word processor, if you wish). We will set the keyboard to do all caps, so he/she will not need to hit the shift key simultaneously with the first letter to get started. There are 67 characters in the sentence, counting spaces and the period at the end. If we assume a simplified keyboard of all 26 letters of the English alphabet, plus space and six punctuation marks (.,;:?!), we have 33 distinct characters on the keyboard, to which we will assign a key for each. The number of possible ways of typing 67 characters on this special typewriter will be 33 for each of the 67 characters, or 33 times itself 67 times = $33^{67}$ = $5.5 \times 10^{101}$. This is a very large number! Typing at the rate of 3 characters per second, the chimp would be expected to have our desired sentence somewhere in his/her output in $5.5 \times 10^{101}$ / 3 seconds = $5.9 \times 10^{93}$ years. About $3 \times 10^{83}$ chimps could be expected to do the job in the 20 billion year history of the universe, but physicists estimate that there are only about $10^{80}$ elementary particles in the whole place.

[49]This number, 75 mutations, is surely much too small, perhaps by several orders of magnitude. Ambrose [quoted in Bird, *Origin of Species Revisited*, 1:88], says there may be 30-40 genes involved in a single wing structure of the fruit fly.

[50]E.g., William J. Benetta, ed., "Scientists Decry a Slick New Packaging of Creationism," *Science Teacher* 54 (May 1987): 36-43.

[51]See Arthur L. Battson, III, *On the Origin of Stasis by Means of Natural Processes* (Colorado Springs: Access Research Network, 1993), with extensive references, particularly the key paper by Roger Lewin, "A Lopsided Look at Evolution," *Science* 241 (15 July 88): 291-293. The critical thinking skills exercise in the latest edition of Price, Wiester and Hearn, *Teaching Science in a Climate of Controversy* (4th printing, revised [Ipswich, MA: American Scientific Affiliation, 1993], pp. 49ff) illustrates this problem well.

[52]Funk, Hoover and the Jesus Seminar, *The Five Gospels*, head strongly in this direction.

[53]Gen 1:20, 21 (sea life); 1:24, 30 (land life); 2:7 (man); 2:19 (animals named by man); 9:4 (not to be eaten with their blood); 9:5 (such animals not to kill humans); 9:10 (covenant re/flood made with them, too).

[54]Robert C. Newman, "The Evidence of Cosmology," in J. W. Montgomery, ed. *Evidence for Faith: Deciding the God Question* (Dallas: Probe/Word, 1991), pp. 73-74; "Light Travel-time: Evidence for an Old Universe," tract (Hatfield, PA: IBRI, 1993).

[55]This is discussed in much greater detail in Robert C. Newman, "An Ancient Historical Test of the Setterfield-Norman Hypothesis," *Creation Research Society Quarterly* 28 (Sept 91): 77-78.

[56] Newman, "The Evidence of Cosmology," pp. 79-81; "Light Travel-Time."

[57] Hayward, *Creation and Evolution*, pp. 125-126; Daniel E. Wonderly, *Neglect of Geologic Data: Sedimentary Strata Compared with Young-Earth Creationist Writings* (Hatfield, PA: IBRI, 1987), ch. 2.

[58]Don L. Eicher, *Geologic Time* (Englewood Cliffs, NJ: Prentice-Hall, 1968); Edwin A. Olson, et al., "Geochronology," in *Encyclopaedia Britannica* (1993): 19:748-876. Olson is an evangelical and Professor of Earth Science at Whitworth College, Spokane, WA.

[59] Young, *Creation and the Flood*, pp. 177-185; Hayward, *Creation and Evolution*, p. 93.

[60]Young, *Creation and the Flood*, pp. 198-210.

[61]Hayward, *Creation and Evolution;* Newman and Eckelmann, *Genesis One and the Origin of the Earth;* Dan Wonderly, *God's Time-Records in Ancient Sediments: Evidence of Long Time Spans in Earth's History* (Flint, MI: Crystal Press, 1977; order from IBRI, POB 423, Hatfield, PA 19440); Wonderly, *Neglect of Geologic Data;* Young, *Creation and the Flood;* Young, *Christianity and the Age of the Earth.*

[62]See Wonderly, *God's Time-Records*, fig. 26 (dune sands), pp. 194, 230-231; *Wonderly, Neglect of Geologic Data*, chs. 1, 4; see also Young, *Christianity and the Age of the Earth*, index entries under "desert sedimentation" and "river sedimentation."

[63]See Wonderly, *God's Time-Records*, chs. 4-6; Wonderly, *Neglect of Geologic Data*, chs. 2-3; Hayward, *Creation and Evolution*, pp. 87-93.

[64]Wonderly, *God's Time-Records*, pp. 142-145; Wonderly, *Neglect of Geologic Data*, ch. 1, esp. fig. 3.

[65]Hayward, *Creation and Evolution;* Wonderly, *God's Time-Records and Neglect of Geologic Data;* Young, *Creation and the Flood.*

[66] Robert C. Newman, "Synoptic Harmonization: Some Principles from History and from the Book of Acts," *IBRI Research Report* 35 (1987).

[67]See, e.g., Davis and Kenyon, *Of Pandas and People.*

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# Biology Teachers' Views on Evolution, Possible Distinctions of Theistic Views

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*A questionnaire study indicates little inclination toward deistic evolution among biology teachers at Christian academic institutions. There is nevertheless a need to distinguish more clearly between a theistic position and the currently prevailing nontheistic theory of origins. The tendency of nontheistic scientists to use the theory of evolution as a basis for the assertion that there is no God could then be addressed more effectively. Deistic and atheistic components of the current theory should be challenged. Pure chance, or molecules which spontaneously organize themselves without divine control, for example, are not compatible with a theistic view.*

The first stage of this study was to assess, via questionnaires, the views of Christian biology teachers on creation and evolution. The hope was to find a common Christian perspective from which to operate. Next the paper seeks to identify some ways in which a theistic model should differ from a deistic one or the currently accepted atheistic model. Hopefully, we could then agree as to what elements of the currently accepted (atheistic) model need to be questioned by Christians. If a clearly distinctive theistic view were taught, then it would be less vulnerable to being extrapolated to evolutionism (evolutionary naturalism). A deistic model, however, is probably more of a threat to Christian students than an atheistic one because they would be more likely to unknowingly embrace a deistic view.

## Questionnaire results

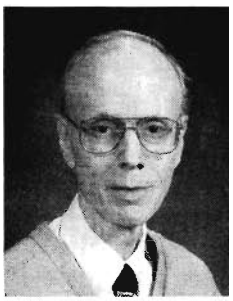
Several years ago while attending a conference of Christian biology teachers at which evolution and other topics were discussed, I became interested in doing this study. Some of the more outspoken participants seemed satisfied with the currently accepted view on the evolution issue, which is not favorable for theism. It appeared that they were accepting this view and seeing it as God's method for creation, perhaps intending to accommodate themselves to a complementarism approach. (See question 2 of the questionnaire in the appendix.)

An attempt to fit the current nontheistic model into a theistic perspective could be considered a compatibilist strategy (Hasker, 239, 243), which does not recognize any fundamental tension between the assumptions of a discipline and those of the Christian faith. A transformationist finds the discipline to be lacking in insights and perspectives that are vital to a Christian. Therefore, a transformationist strategy is needed in this case.

Questionnaires were sent to biology teachers at Christian Schools International high schools and Christian College Coalition colleges. They were returned from about 55% of 80 colleges and 47% of 98 high schools. (The percentage of colleges is not exact because the college of a few respondents was uncertain). It is difficult to give a rate of return for the total number of college questionnaires for the following reasons. A varying number of questionnaires (one, two, or three), based on the enrollment, was sent to the colleges, and recipients were encouraged to make additional copies if needed. Secondly, there was a question in which faculty members could indicate whether their position was representative of those of the other biology faculty

members at their college. In many cases, only one questionnaire was returned per college, and the respondent indicated that her/his position was representative of the other faculty members. Thus some faculty members may have been allowing others to respond for them. Abbreviated questions with a summary of responses follow. For complete questions and a more detailed description of college responses in the "other" categories see the full questionnaire in the appendix.

| | Responses of Biology Faculty Members | |
|---|---|---|
| | College | High School |
| Total questionnaires returned | 73 | 46 |
| 1. Evolution by: | | |
| a. (1) processes inherent in the universe | 3 | 0 |
| (2) processes set up in the beginning: change via pure chance | 2 | 0 |
| (3) built-in properties of matter | 1 | 1 |
| (4) divine control | 14 | 5 |
| b. Discontinuous creation of taxonomic groups | | |
| (1) progressive creationism | 18 | 12 |
| (2) long periods between literal days | 1 | 1 |
| (3) gap theory | 2 | 1 |
| (4) young earth with appearance of age | 3 | 2 |
| (5) young earth, flood geology | 12 | 13 |
| c. Other | 17 including 7 who chose both a(4) and b(1) plus 7 others who chose 2 responses | 11 including 4 who chose both a(4) and b(1) plus 5 others who chose 2 responses |
| 2. Models for relating scripture and science | | |
| a. Substitutionism | 5 | 3 |
| b. Concordism | 16 | 12 |
| c. Complementarism | 44 | 25 |
| d. Compartmentalism | 0 | 0 |
| e. Other | 8 | 6 |
| 3. Increased complexity via | | |
| a. Matter created with capacity to organize itself | 7 | 0 |
| b. Random process, made possible because of an enormous amount of time | 4 | 0 |
| c. Divinely directed process (non random) | 22 | 16 |
| d. Creation of life abruptly by divine action | 30 | 29 |
| e. Other | 10 | 1 |
| 4. Relevance and role of early chapters of Genesis | | |
| a. Based on ancient Chaldean creation myth | 0 | 0 |
| b. Serve a theological function only | 14 | 6 |
| c. Events are true but not intended to explain creation | 13 | 6 |
| d. Framework relevant to creation but not description | 21 | 5 |
| e. Intended to tell how God created | 20 | 22 |
| f. Other | 5 | 7 |



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| | Responses of Biology Faculty Members | |
|---|---|---|
| | College | High School |
| Total questionnaires returned | 73 | 46 |
| 5. Origin of humans | | |
| a. Evolved from animal ancestor by random process | 2 | 0 |
| b. Evolved from animal ancestor by divine control of natural processes | 5 | 0 |
| c. Physical part by descent from animal ancestor; Human nature divinely imparted | 21 | 9 |
| d. Specially created from matter (but animals not) | 1 | 6 |
| e. All organisms specially created | 33 | 26 |
| f. Other | 11 | 5 |
| 6. View of inspiration of Scripture | | |
| a. Illumination or universal Christian inspiration | 4 | 4 |
| b. Inspired concepts | 11 | 3 |
| c. Partial inspiration | 0 | 0 |
| d. Plenary verbal inspiration | 55 | 39 |
| e. Verbal dictation | 0 | 0 |
| f. Other | 3 | 0 |
| 7. Number of years you have taught biology | | |
| College: 1-21 years: 28; 22-38 years: 27; no response: 18 | | |
| High School: 1-10 years: 23; 11-30 years: 20; no response: 3. (See question 7 comments.) | | |

*Question 1 comments. Percentage of various views. Comparison of views of college and high school biology teachers.* Responses were classified as follows: "a(1)" as atheistic or deistic, "a(2)" and "a(3)" as deistic, "a(4)" as a theistic evolutionary choice that deals with chance in such a way that the view is clearly not deistic, and "b" (1 through 5) as discontinuous theistic models. Responses "a(1)," "a(2)," and "a(3)" express the currently prevalent view among scientists except that the Creator would not be mentioned. Based on this classification about 9% of the total number of questionnaires returned from the colleges showed a preference for a deistic evolutionary view, about 20% for a theistic evolutionary view, and about 56% for some form of more abrupt or discontinuous creation of basic types of organisms. The remaining 15% seemed ambivalent between theistic evolution and a more abrupt creation model. Corresponding figures for the high school teachers were 2% deistic evolution, 11% theistic evolution, 67% some form of more abrupt creation of basic types, and 20% ambivalent between theistic evolution and a more abrupt model.

A chi square test for independence analysis of the proportion believing in evolution vs. more abrupt creation in college and high school respondents indicated the high school teachers were more likely than the college teachers to prefer a more abrupt or discontinuous creation (significant at the 5% level).

*Question 3 comments. Consistency of responses.* Answer "a" contains a prevalent assumption among nontheistic biologists — that matter organizes itself. Answer "b" is another expression of a prevalent nontheistic viewpoint. All college respondents who chose "3.a" or "3.b" (13 people) picked responses "1.a"(1 through 4) except one who picked "1.b(1)" and said the created groups were phyla rather than families and higher. Response "3.a" could be classified as deistic evolution and "3.b" as deistic or atheistic. Of the college teachers, 15% chose one or the other of these two responses. None of the high school teachers chose "3.a" or "3.b."

*Question 4 comments. Intention of Genesis 1 and 2, comparison of views of college and high school biology teachers.* A chi square test for independence was used to compare the number of respondents from colleges vs. high schools who indicated that the early chapters of Genesis were intended to tell how God brought about creation vs. those who indicated the chapters were not so intended. This test showed that the college teachers were less likely than the high school teachers to believe the chapters were so intended (significant at the 1% level).

*Question 5 comments. Consistency of responses.* All of the three college respondents who chose "5.a," a deistic view, also selected "3.b" and "1.a"(1, 2, or 4). None of the high school teachers chose "5.a." Response "5.c" is a common theistic evolution view.

*Question 6 comments. Connection between respondent's view of the inspiration of Scripture and other responses.* Most of the college respondents who chose "6.a" or "6.b" selected "4.b" or "4.d" and "1.a(4)."

Two of them chose "1.a(2);" one, "1.b(1);" one, "1.b(5);" one, "1.c;" and three, a combination of "1.b(1)" and one of the choices from "1.a." Four of the seven high school respondents who chose "6.a" or "6.b" selected "4.b" or "4.d," and three preferred "4.e." Their responses to Question 1 were divided among "1.a(4)," "1.b(1)," and "1.b(5)."

*Question 7. Number of years of teaching.* College faculty members were divided into two groups, those who have had 22 or more years of experience and those who have had less than 22 years experience, giving equal sized groups. Comparison of the two groups showed that the faculty members with fewer years experience seemed no more or less likely than the more experienced ones to favor deistic views. Dividing high school respondents into those who have had 11 or more years of experience and those who have had 10 years or less gave two groups of about equal size. Comparison of these two groups showed no difference in their tendency to favor a deistic view.

According to the response to this survey, there is substantial support for some sort of theistic model over a deistic one. Next we will identify critical ways in which a theistic model differs from a deistic or atheistic one.

## Some Differences between a Theistic View and the Accepted (Atheistic) View or a Deistic View

One critical distinction between a theistic view and the currently accepted model or a deistic one is whether or not change can be attributed to pure chance. Another is whether change is due to molecules having been made with a built-in tendency to become more complex (allowing for divine control only in the original design of the molecules).

Abraham Kuyper spoke of "... a cosmos which does not fall a prey to the freaks of chance, but exists and develops ... according to a firm order aiming at one fixed plan" (Kuyper, 115). An alternative view expressed in a paper presented at the 1990 American Scientific Affiliation (ASA) Annual Meeting (Adams) proposed evolution via a type of chance which is controlled by the Creator, which Donald MacKay calls "scientific chance" — where there is no human knowledge of a causal connection between events (MacKay 1974, 48). These two views have been expressed as the clockwork determinacy of classical physics vs. the new chance statistical determinacy of modern physics. The concept of a universe developing according to a fixed order has been criticized as being somewhat deistic in that the Creator could set up the processes in the beginning and then allow them to run on their own, perhaps intervening at key events. However, the other view, that of origin by chance, seems closer to the prevalent view of evolution based on pure chance and presumed self-organizing properties of molecules, which is at best deistic and, in the minds of most of its proponents, totally without divine participation. It is, therefore, appropriate for us to examine some views of origin by chance. The currently accepted view should be a matter of concern for Christians because it has been used as a basis for the idea of a universe without God (evolutionism). The following quotes are examples. "The cosmos is all that is or ever was or ever will be" (Sagan, 4), " ... except for purely mechanistic ones, no organizing or purposive principles exist in the world. There are no gods and no designing forces" (Provine, 506), and from Nobel laureate Jacques Monod speaking of mutations:

> We call these events accidental; we say that they are random occurrences. And since they constitute the only possible source of modifications in the genetic text itself the *sole* repository of the organism's hereditary structures, it necessarily follows that chance *alone* is at the source of every innovation, of all creation in the biosphere. Pure chance, absolutely free but blind, at the very root of the stupendous edifice of evolution: this central concept of modern biology is no longer one among other possible or even conceivable hypotheses. It is today the *sole* conceivable hypothesis, the only one that squares with observed and tested fact (Monod, 112-113).

Moreover Monod said, "Man at last knows that he is alone in the universe's unfeeling immensity out of which he emerged only by chance" (Monod, 180). According to Monod, randomness in a process rules out the possibility of purpose (Bartholomew, 75).

***According to the response to this survey, there is substantial support for some sort of theistic model over a deistic one.***

An additional reason for concern about the currently accepted evolutionary view is the major effect it has had on modern thought. Nontheistic evolution has had an impact on every discipline (including theology, as expressed in the idea of Darwin and others that every immoral act, rather than being a

sin, is merely a lapse into the animal behavior of our ancestors). Therefore it is important to determine whether or not there is sufficient basis for challenging the current nontheistic consensus on evolutionary origin.

*The currently accepted view [of origin by chance] should be a matter of concern for Christians because it has been used as a basis for the idea of a universe without God (evolutionism).*

A theistic evolutionary view, incorporating what appears to be chance (MacKay's scientific chance), can be expressed as in question 1.a(4) of the questionnaire (see appendix), that is, evolution from an original cell with divine control as the Creator operated through scientific chance so that what may seem to be chance to the human observer is not chance from God's perspective. Donald MacKay said, "The things that appear random to us in our ignorance are part of a vast plan in the mind of God in which every minutest detail has been (or is being) worked out by God" (Bartholomew, 24). According to MacKay, "events which are called 'random' or 'chance' are no less dependent on the creative word of the Author ... than any other. If those events don't happen unless the Creator gives them their being, then He is sovereign over them" (MacKay 1991, 229).

William Pollard wrote, "For only in a world in which the laws of nature govern events in accordance with the casting of dice can the Biblical view of a world whose history is responsive to God's will prevail" (Pollard, 97). "The typical situation in science is one in which several alternatives are open in each natural process" (Pollard, 67). One of these possibilities is then selected 'by chance.' It is God who actually decides which choice is to be made (Bartholomew, 32). Another option, presented by Rust, is

> Either he determines the outcome of each elementary event individually, or he manages them collectively ... not caring about individual events as such. ... In any case, science has no way of finding out what causes individual elementary events. The claim that there is 'nothing but chance' behind mutations is non-scientific (Rust, 88-89).

Some biblical passages have been cited as support for the view that God uses chance to accomplish his purpose. These passages include II Chron. 18:33, where an archer drew a bow at random and struck the king of Israel between the joints of his armor; Jonah 1:7, where Jonah is identified as the one responsible for the storm by drawing of lots; Prov. 16:33, "The lot is cast into the lap but its every decision is from the Lord;" and Acts 1:26, where lots were cast to choose Judas's successor.

Bartholomew gave an example in which a situation that looks random and chaotic is a combination of events which are not themselves random. In an area served by a single telephone exchange,

> all of the subscribers put calls through the exchange at precisely regular intervals but the intervals vary from one subscriber to another ... the arrival of calls at the exchange is thus a deterministic process but, viewing the process at the exchange over relatively short intervals, the flow of calls would appear random (Bartholomew, 71).

But Bartholomew argued that this view denies that chance is real (Bartholomew, 111).

*God is just as much in control of events happening by "natural law" as of those due to "miracles."*

According to Howard Van Till "There is ... no natural process that falls outside of the Creator's domain of action. What we call a natural process is not something that stands outside of his control; it is, rather, a display of his governance, a manifestation of his sovereignty." If we say "that Creation requires divine action but natural processes do not, then we have slipped into the pit of deism"(Van Till 1986, 223-224). According to Van Till, "This emphasis on the primacy of divine action should not, however, be interpreted as implying that God deterministically causes every event that occurs in his Creation. This Creation is no mere puppet, and its Creator is not some sort of divine puppeteer ..."(Van Till 1986, 265). Moreover, Van Till has said that the Creation has "functional integrity" and is not controlled by a God who comes down to its level to create by fiat. "Does the created world have deficiencies that require God's intervention?" (Van Till 1990). That deism is not implied by functional integrity is expressed by the following statement:

> Although we must acknowledge that our development of the doctrine of Creation's functional integrity has emphasized the absence of gaps in the developmental economy of the created world, we

> must also note that the concept of Creation's gapless economy does not in any way entail the requirement that the creation is either independent of God or closed to interaction with him. Functional integrity is *not* equivalent to absolute autonomy. To recognize the functional integrity of the Creation does not entail reducing the Creator either to the remote God of deism or to the unnecessary God of atheism (Van Till 1993, 393).

## Pure Chance

Bartholomew argued that God used pure chance "to ensure the variety, resilience and freedom necessary to achieve his purposes"(Bartholomew, 14). He offered a common objection to the idea of a god who controls everything in the universe. The objection relates to the problem of suffering in a world made by an omnipotent, loving god. If God is loving and not responsible for suffering, then, as the reasoning goes, he doesn't control everything and he probably didn't control creation. "Earthquake and famine and all manner of natural disasters are difficult to reconcile with one who cares for each individual and wills only their good. The force of this criticism is weakened somewhat if it is not necessary to see every single occurrence as the deliberate act of God" (Bartholomew, 100).

> The world view we have adopted allows us to maintain at one and the same time that God determines the end and the lawfulness of the macrouniverse and that there is indeterminism on the micro-scale. We do not then have to attribute the ravages of a bacterium or the eruption of a volcano to his deliberate purpose. At the risk of labouring the obvious, we repeat that the problem of evil would be almost insuperable in a deterministic world since then God would be directly responsible for everything, though even then it might be possible to argue that there was no better way. Our view, however, allows a genuinely creative role to man as the fellow-labourer and fellow-sufferer with God (Bartholomew, 157).

## Problems with Divine Control by Pure Chance

When one applies Bartholomew's ideas of a God of pure chance consistently (which Bartholomew does), some serious theological problems develop. Is such a world "sufficiently under control to do justice to God's omnipotence? ... If there is an element of unpredictability it has to be allowed that things may not turn out as God intended..."(Bartholomew, 100). Bartholomew argues that though the case for a purposeful God would be weakened if he could have contemplated creating a vast universe which might have failed to produce life, God could nevertheless try the experiment sufficiently often to succeed. Additional problems with a God of chance are seen in the following quote.

> Even allowing that creation was certain to produce life in due course there were still risks to be faced. Suppose a giant meteorite had collided with the earth and wiped out God's handiwork in a moment? Or if, within the span of evolutionary history, biochemical events had taken a different course at some critical juncture. Suppose ... that Jesus had contracted a fatal attack of smallpox in his teens. ... If the view of creation that we have been advocating is anywhere near correct, all of these, and many other, possibilities are real and potentially crippling for the divine plan (Bartholomew, 101).

Attempting to incorporate pure chance into a creation model (as Bartholomew has done in the above examples) is incompatible with Christian theology. A God who is not fully omnipotent and omniscient and who leaves creation to chance is not the God presented in the Scriptures (Mt. 10:29; Acts 15:18; Eph. 1:11, 3:11; Heb. 6:17). Pollard attempts, perhaps with questionable success, to resolve the problem of chance on the one hand vs. destiny, grace, and purpose on the other, by saying, "Thus although we seem to be unable to discover any rational way in which both of these realities could possibly be true at the same time, we must nevertheless affirm them both together" (Pollard, 123).

## A Theistic View

At the very least, the distinction should be clearly made that the variation leading to evolutionary change was not by pure chance, nor by inherent properties of autonomous molecules. Variation, if by chance, was brought about by a type of chance (scientific chance) which permits control by the Creator. Since the evidence for monophyletic macroevolution is not conclusive — for example, gaps in the fossil record and protein structure data (Denton, 157-198, 274-307) — some sort of creation model, such as progressive creationism, is a viable option. The protein structure data show, among other things, that the magnitude of difference in hemoglobin between jawless fish and fish with jaws is as great as it is between jawless fish and mammals. For the data to support the proposed evolutionary sequence of jawless fish to fish with jaws to amphibians to reptiles to mammals, the longer evolutionary sequence between jawless fish and mammal (compared with jawless fish to fish with jaws) ought to be accompanied by greater difference in protein structures.

One possible view (the progressive creationism view) might be that God created certain basic types and then superintended limited development and diversification of those types, all by some process other than pure chance. This need not be rejected on the basis of the "God of the gaps" problem nor by the argument that progressive creationism is deism (based on the assumption that God does not control the natural process occurring between creation events). God is just as much in control of events happening by "natural law" as of those due to "miracles." Many of those who raise the "God of the gaps" problem believe in a God-controlled evolutionary process. If evidence should accumulate to convincingly support gradual development of all groups of species, the progressive creationism model could be adapted entirely to the type of control occurring between the creation events (or the type postulated in a theistic evolution view). Thus, if theistic evolution is not subject to the charge of deism then neither is progressive creationism. Plantinga points out that "God of the gaps" thought is essentially an apologetic enterprise and therefore not relevant to this situation. One who takes part in this thinking

> argues for the existence of God by pointing to phenomena science can't currently explain, suggesting that the only explanation is to be found in the activity of a divine being. From a theistic perspective, of course, this leaves a great deal to be desired. ... [T]his procedure suggests that God is a gap plugger, that his activity in the natural world is limited to plugging gaps in a few areas of the natural world while in the rest of nature everything goes on entirely independent of him and his activity. But the theist does not, of course, think of God as a mere gap plugger; God is crucially active in every transaction in nature, from the smallest most insignificant event to the largest cataclysmic event. ... [T]heists have agreed that in any natural transaction, God conserves the transactors in existence; were he to withdraw this conserving activity the created universe would vanish like a computer image when you pull the plug (Plantinga, 86-87).

Rust addressed the "God of the gaps" problem as follows:

> God's activity is not restricted to events not explainable by science ... God is continually active in his created universe. His being the Creator cannot easily be separated from his being the Sustainer. Anything happening according to "*natural law*" is just as much God's doing as those of his "*miracles*" lacking ordinary causation (Rust, 89).

## Conclusion

Though a complementarian approach to creation may be desirable and is preferred by a majority of those responding to the questionnaire (question 2), a strict separation of the theological and scientific realms has not been maintained by proponents of the accepted atheistic evolutionary model. There are components of the accepted model which encroach into the theological realm and conflict with the view of a creator who controls the process. If natural causes are extended into areas where they cannot be confirmed, i.e., the question of whether God has controlled the process of creation, complementarism has been violated. Theists should then be at liberty to challenge that encroachment. The view that evolution occurred by pure chance denies any role for a creator. It is not consistent with a theistic view but with an atheistic model or, at best, a deistic one (if God constructed that type of system in the beginning). The view that molecules organize themselves (have built-in properties causing them to become more complex) is likewise consistent with an atheistic view (or a deistic one, if God constructed that type of system in the beginning). If distinctions such as these are not made (if the accepted view is adopted as God's method of creation), students might see no reason to question inferences they constantly encounter that the current evolutionary model eliminates the need for a creator. They could drift into deism and then be vulnerable to evolutionism. A transformationist strategy is needed here.

✳

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# Appendix

## Copy of the Questionnaire Showing Totals of Responses from College Biology Teachers

Numbers of responses for each option, together with %, are given in brackets [ ] after each option in the questionnaire. The total number of college questionnaires returned was 73.

**1. Pick one preferred model of origin from the following list a(1) through b(5).**

a. Evolution of a living cell from simple chemicals followed by evolution of all taxonomic groups from that original cell ...

a.(1) *in accordance with processes inherent in the universe.* **[3 = 4.1%]**

a.(2) *in accordance with processes set up in the beginning by the Creator* — random mutation (without plan or direction), recombination, natural selection and genetic drift. The increase in complexity occurred as a result of pure chance (purposeless, no causal connection between events). **[2 = 2.7%]**

a.(3) *as in "a.(2)" in accordance with processes (random mutation, recombination, selection, genetic drift) set up in the beginning by the Creator* but with built-in properties in matter such that it had to evolve toward greater complexity. **[1 = 1.4%]**

a.(4) *as in "a.(2)" in accordance with the processes set up by the creator but with divine control* as the Creator operated through scientific chance so that what may seem to be chance to the human observer is not chance from God's perspective. **[14 = 19.2%]**

b. Models which involved abrupt creation of taxonomic groups by divine action for which we do not know the mechanism.

b.(1) *Progressive creationism.* God created basic kinds of organisms (usually taxonomic families and higher) in different or overlapping ages consistent with the standard geological column. The basic kinds then developed into a variety of forms over time via microevolution. God has continuously exercised control although in different ways after creation. **[18 = 24.7%]**

b.(2) *Creation of basic kinds of organisms as in "b.(1)" but with the creation events themselves (though separated by long periods of time) limited to 24-hour days.* God has continued to be in control (providence). **[1 = 1.4%]**

b.(3) *Gap (reconstruction) theory with re-creation occurring in literal creation days.* The fossil record is primarily a record of the life preceding the gap and re-creation. God has continued to be in control. **[2 = 2.7%]**

b.(4) *Literal creation days, young earth created with appearance of age.* The organisms and the earth, including its crust, were created in a mature state. God has continued to be in control. **[3 = 4.1%]**

b.(5) *Literal creation days, young earth, flood geology.* Most of the fossil-bearing strata were produced by the Genesis flood. God has continued to be in control. **[12 = 16.4%]**

c. *Other.* **[17 = 23.3%]** including seven, who chose both a(4) & b(1); two, a(3) & b(1); one, a(1) & a(2); one, a(2) & b(1); plus three other combinations (and three not in any category).

**2. Models for relating scripture and science.**

a. *Substitutionism.* The Bible contains scientific truth which is more trustworthy than conventional science and should thus be substituted for conventional science where there is perceived to be disagreement. **[5 = 6.8%]**

b. *Concordism.* The Bible contains important information about nature which, though incomplete, can supplement information obtained by empirical methods, and the two sources harmonize. **[16 = 21.9%]**

c. *Complementarism.* The Bible and scientific knowledge (both incomplete) offer different kinds of explanations concerning the creation. They have different purposes but they complement each other. **[44 = 60.3%]**

d. *Compartmentalism.* Science and religion deal with entirely different realms. There is no common ground that would permit integration. **[0]**

e. *Other.* **[8 =11.0%]** including two both a & c and two a, b, c, & d.

**3. The low likelihood of more complex molecules, and eventually cell parts and cells, arising on primordial earth, seemingly without direction, from simple chemicals can best be explained by:**

a. *matter having been created with an inherent capacity to organize itself* (become more complex). [7 = 9.6%]

b. *random process (no plan or direction)* with an enormous amount of time available, which can make the very unlikely easily possible. [4 = 5.5%]

c. *divinely directed process*, making it non-random. [22 = 30.1%]

d. *creation of life abruptly by divine action.* [30 = 41.1%]

e. *Other.* [10 = 13.7%] including two, a and/or c; and two, c and d.

**4. Relevance and Role of Genesis. The early chapters of Genesis:**

a. *are based on ancient Chaldean creation myth* and are therefore not of any use for reconstructing primordial history. [0]

b. *serve a theological function*, such as forming a prologue to the Covenant between Yahweh and Israel, but are not of value for reconstructing primordial history. [14 = 19.2%]

c. *are not intended to communicate how God brought about creation of the world and the various life forms*, though the events are historically true. [13 = 17.8%]

d. *contain a framework which is relevant to creation*, but not specific empirical description. [21 = 28.8%]

e. *are useful and intended to communicate how God brought about creation of the world and the various life forms.* [20 = 27.4%]

f. *Other.* [5 = 6.8%] three, both c & d; one, both b & d; and one, other.

**5. Origin of humans. Humans** ...

a. *evolved from an animal ancestor by random mutation, recombination, selection, genetic drift.* [2 = 2.7%]

b. *evolved from an animal ancestor by divine control of natural processes.* [5 = 6.8%]

c. *have a physical component which evolved from an animal ancestor by natural processes.* Human nature (immaterial component) was specially created by God and introduced into the evolved hominid body. [21 = 28.8%]

d. *were specially created directly from matter by God,* but animals and plants were produced by divinely directed natural processes. [1 = 1.4%]

e. *and the various distinct groups of other organisms were all specially created directly from matter by God.* [33 = 45.2%]

f. *Other.* [11 = 15.1%] including one, both b & d; two, both b & c; two, c or d; and one, both a & c.

**6. View of Inspiration of Scripture**

a. *Illumination or universal Christian inspiration.* (The writers of the Bible were inspired in the same sense in which Christians of all ages have been inspired.) [4 = 5.5%]

b. *Inspired concepts.* (God gave thoughts to the writers and permitted them, years afterwards in some cases, to express these thoughts in their own words as they might remember them.) [11 = 15.1%]

c. *Partial inspiration.* (The Bible is inspired in some places but not others, such as doctrinal but not historical passages or prophetic but not other passages or that Bible writers were inspired occasionally but not always.) [0]

d. *Plenary verbal inspiration.* (Every part of the Bible is inspired and equally inspired. Writers, using their own style, were directed in their choice of subject matter and words. The Bible was inerrant in the original writing.) [55 = 75.3%]

e. *Verbal dictation.* (Every word of Scripture in the original languages was dictated by God to the writers just as a professional person would dictate to his/her stenographer. The writer was a passive agent.) [0]

f. *Other.* [3 = 4.1%] two, both b & d; and one, other.

**7. Number of years you have taught biology____**

# Communications

# A Few Suggestions for the Proponents of Intelligent Design

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Several recent publications, including papers in *Perspectives on Science and Christian Faith*,[1] have dealt with the concepts of intelligent design (ID),[2] methodological naturalism (MN),[3] and related topics. Arguments (for God's existence) from design, especially in the Judeo-Christian tradition, have a long history. Many psalms remind us that the wonders of creation point to their Creator. The apostle Paul argues that "... God's invisible qualities — his eternal power and divine nature — have been clearly seen, being understood from what has been made ..." (Romans 1:20). Natural theology, which was built on the premise that nature revealed much about its Creator, occupied a prominent position in academic circles for centuries. Recent work by scientists has also pointed in the direction of a Creator.[4] All of us in the ASA must be proponents of design, at least in so far as we see the evidence of God in the world we study. However, compared to traditional arguments from design, there is one crucial difference for me in the current push for ID — the attempt to make design a part of science. In contrast, I view traditional arguments from design as pointing beyond science to our Creator. This difference is at the core of why I remain unconvinced of the overall merits of the movement.

Arguments for ID are typically lengthy, philosophically heavy, and deal with a variety of topics. So far, the ID literature contains much with which I agree. However, I remain skeptical because the vast majority of ID arguments seem to be only peripherally related to my major objections. By this communication, I hope to distill these objections to three major areas, and I will discuss them in the context of some suggestions.

## A personal testimony

The primary suggestion I offer to proponents of ID is to disconnect explicitly and emphatically your argument from arguments for eliminating MN as a restriction on science. Stop arguing for a "theistic science."[5] If this is done, you will then stand more directly in line with what I believe is a powerful and still influential tradition of using the characteristics of creation to point beyond science and toward the Creator. I see design in nearly everything I study as a scientist, but I see this design as coming from a realm beyond science. For me, MN has been a kind of guidepost that has allowed me to sort through the plethora of writings on creation, evolution, and related topics, and arrive at a position where I have begun to work on a satisfying integration of my faith and science. Let me explain.

When I began to explore the relationship between science (particularly biology, which is my major area of study) and theology, I quickly encountered the writings of "young-earth creationists" who insisted there were only two options for interpreting the biotic world: (their brand of) creationism and evolutionism. These creationists and some atheistic scientists further insisted that the two positions were mutually exclusive, thus requiring a conflict ap-

proach to science/theology interactions. As a biologist, this meant I needed to find problems with evolution that were serious enough to warrant its abandonment. Fortunately, this really only meant I would have to read, analyze, and learn all the objections to evolution being raised by several individuals, who had apparently dedicated their lives to attacking it. The job seemed easy. Even if difficult times came along, I could always fall back on the notion that creationism would undoubtedly win in the end because it was clearly God's position. Several things happened along the way, however, to upset my plan.

The most important thing was that I encountered some alternative viewpoints on the relationship between science and theology that made a lot of sense, some of which are at least touched upon in Bernard Ramm's (1954) well-known book, *The Christian View of Science and Scripture*. Ramm's book is a bit dated now, but it is still useful as a survey of much of the early literature on science/theology interactions and as a concise statement of one very influential view of what science is and how it can be related to theology:

> Both science and theology deal with the same universe. The goal of science is to understand what is included in the concept of Nature, and the goal of theology is to understand what is included under the concept of God. The emphasis in science is on the visible universe, and in theology the emphasis is on the invisible universe, *but it is one universe*. If it is one universe then the visible and the invisible interpenetrate epistemologically and metaphysically (p. 28).

Ramm's view of science and theology suggests some general domains for each, indicating that science mainly deals with the natural world and theology mainly deals with God. Perhaps more importantly, however, it asserts that the boundaries between the domains of science and theology will not be neat, suggesting that there may be problems with determining explicit boundaries. Later, Ramm makes the important point that God is the ultimate cause of the universe, and all other causes discovered by humans are to be viewed as secondary (p. 192). Ramm's view provides the basis for a dualistic view of nature with respect to explanatory causes. It also supports the development of concepts like complementarity and levels of explanation. It is just such a view that led me out of what I now consider the quagmire of "creation science." I saw that evolutionary theory was a theory of science and it need not be set against belief in a Creator. It provided evidence against one interpretation of the early chapters of Genesis, but it did not provide any evidence against the existence of God. I felt as if my science—and my theology—had been freed so that both could be explored in a satisfying and effective way.

My message in all this is that I continue to cling to MN because it has been so useful. So far, the ID literature with which I am familiar has offered the same confusion I found in the creation-science literature, except it is packaged in some new terminology. Because arguments to eliminate MN from science are really what concern me the most, I will turn to two related areas in the ID literature where I find the arguments particularly unconvincing. I do this to further elaborate on how MN has been helpful to me, and because I doubt anybody in the ID movement will heed my first suggestion — to disconnect his or her argument from arguments for eliminating MN as a restriction on science. At this point, most ID proponents have far too much invested in what I feel are revisionist arguments for modern science which center on eliminating MN.

## Some history of MN

My second suggestion to proponents of ID is to stop stating or implying that MN is just an "arbitrary" restriction on modern science.[6] It is not an arbitrary restriction in any sense of ordinary usage of the word. Methodological naturalism is, in fact, a central part of the practice of science that has completely emerged across all disciplines in the last 100 or so years. It has been a major force within the scientific community generally for centuries.[7] The history of MN is complex and intertwined with a variety of philosophical and social issues. It has been developing at least since the 1500s, when Francis Bacon and Galileo Galilei were struggling with a science that was deeply intertwined with theology. It persists as perhaps the distinguishing characteristic of what many consider to be a general definition of science. For example, in his introduction to the philosophy of science, Del Ratzsch[8] discusses this restriction as one way science is usually defined today. Paul de Vries has provided an insightful assessment of MN as a central component of modern science from a theological perspective.[9] Several recent papers in *PSCF* have dealt with MN as a core concept of modern science.[10] And in all my training in science, there was never any mention of even the possibility that anything other than natural causes should be included in scientific explanations. Therefore, I was more than a little surprised to read the following statement by J. P. Moreland:

> Theistic science has been recognized as science by philosophers and scientists throughout much of the history of science. Thus the burden of proof

is on anyone who would revise this tradition ...[11]

I agree that theistic science has been recognized as science throughout much of the history of science, but this recognition for approximately the last 100 years has only come from fringe groups. I suggest to Moreland that he needs to do more work on the modern history of science, including research on how science is taught today in undergraduate and graduate programs. If he still thinks theistic science has any standing at all in modern science, he should simply read a few science textbooks looking for God as a causal explanation. Moreland is among the revisionists, not the other way around.

## MN and demarcation arguments

The final suggestion I make to proponents of ID is simply to admit that science and religion are different in at least some respects, then decide how they are different. One disturbing aspect of the ID literature is page after page of discussion indicating there is really no difference between science and other disciplines; the articles by Moreland and Meyer in the March 1994 issue of *PSCF* are examples (see note 1). I do not question the contention by both Meyer and Moreland that many philosophers long ago abandoned attempts at distinguishing science from non-science. However, I maintain that it would be difficult indeed to find anyone (other than some philosophers?) who thinks science and religion are the same thing. I begin with quotes from Moreland and Meyer to further explain my objections.

Moreland argues in favor of a view he says is prevalent among philosophers: "... there is no adequate line of demarcation between science and non-science/pseudoscience, no set of necessary and sufficient conditions for something to count as scientific" (p. 4). He continues later: "The plain fact is that historians and philosophers are almost universally agreed that there is no adequate definition of science ... no line of demarcation between science and non-science or pseudo-science ... " (p. 23). Meyer concurs: "Philosophers of science have generally lost patience with attempts to discredit theories as 'unscientific' by using philosophical or methodological litmus tests. Such so-called 'demarcation criteria' — criteria that purport to distinguish true science from pseudo-science, metaphysics and religion — have inevitably fallen prey to death by a thousand counter examples" (p. 14).

If these statements are taken in a straightforward manner, then all modern dictionaries need to be revised. If, however, they refer mainly to assessment of the relative merits or certainty of some scientific theories to another form of knowledge, then I could accept them in part. I talked with Steve Meyer, and he assures me that there are differences between science and religion; in the quote here he was mainly referring to attempts at determining where the two overlap (personal communication, 12 May 1994). In other words, he feels the problem is largely one of determining boundary conditions. I concur. This is the problem Ramm (1954, p. 28) was referring to in the above quote. It will always be difficult to define in detail the relationship between science and religion, particularly their boundaries, but surely we can agree the two are different. I suggest that proponents of ID begin with this assumption and turn to determining what makes science and religion different rather than continuing to wring their hands over how similar they are. I further suggest that if they do this, they will find MN at the core of the differences between the two disciplines.

## Closing remarks

I have primarily argued here against one major component of the ID movement: the re-introduction of God as a causal explanation into science. My position is based on a high respect for both science and theology in their present forms. I just do not see the problems with a naturalistic science that so many proponents of ID bemoan. In contrast, I think a careful look at the history of science/religion interactions will show that MN is the most important concept to be developed thus far. It has allowed both to flourish without undue control by the other. I believe that if the ID movement successfully resulted in the theistic science some envision, we would be well on our way backwards in time to the old confrontational, either/or debates fought by Galileo and others. The overall result would be no different from that of some kinds of creationism (e.g., "young-earth creationism") where one is forced to accept either a naturalistic explanation or God. I much prefer a dualistic approach where the natural mechanisms described by science are at least potentially accepted along with the supernatural descriptions of theology. I see the most productive work ahead of us to be determining how the two disciplines in their present forms should interact. There may be some "ultimate theory" developed someday that incorporates all disciplines. The road that leads to such a theory is not clear to me but I do not think most proponents of ID are even moving in the right direction. If I am mistaken, I sincerely hope they will (again) take some time to try to help me see the errors in my ways. ✳

## Acknowledgments

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## Notes

[1]Hasker, W., 1992, "Evolution and Alvin Plantinga," *PSCF*, 44(3):150-162; Murphy, N., 1993, "Phillip Johnson on Trial: A Critique of His Critique of Darwin," *PSCF*, 45(1):26-36; Moreland, J.P., 1994a, "Conceptual Problems and the Scientific Status of Creation Science," *PSCF*, 46(1):2-13; Moreland, J.P., 1994b, "Response to Meyer and Bube," *PSCF* 46(1):22-25; Meyer, S. C., 1994, "The Use and Abuse of Philosophy of Science: A Response to Moreland," *PSCF* 46(1):14-18; Bube, R. H., 1994, "Is Creation Science an Oxymoron? A response to Moreland," *PSCF* 46(1):19-21.

[2]ID refers to a movement that is partially defined by the title of a recent book edited by J. P. Moreland (1994): *The Creation Hypothesis, Scientific Evidence for an Intelligent Designer*, InterVarsity Press. According to the back cover, this book aims to "...offer the foundation for a new paradigm of scientific thinking." ID was first popularized in a volume entitled, *Of Pandas and People* by P. Davis and D. H. Kenyon, published in 1989 by Haughton Publishing Company, Dallas, Texas. Most ID proponents explicitly aim to construct a theistic science, whereby God (but see note 5) can be invoked as a causal explanation in science.

[3]I define MN as the restriction of scientific explanations to natural causes. I explicitly do not use the term to give legitimacy to Scientism and related views, whereby science is declared to be the only valid explanation of something. Nor do I define it as the restriction of science to information provided by nature. In other words, I do not eliminate theology or the Bible as possible sources of information to be used in carrying out scientific investigations, but any scientific explanations that result from such investigations must not include — or imply — supernatural causes.

[4]E.g. Templeton, J. M. and. R. L. Herrmann, 1989, *The God Who Would be Known: Revelations of the Divine in Contemporary Science*, Harper & Row; Van Till, H. J., et al. 1990, *Portraits of Creation: Biblical and Scientific Perspectives on the World's Formation*, Eerdmans.

[5]I am aware that some ID proponents emphatically deny they necessarily refer to God by their arguments but I think they are only deceiving themselves if they think those outside the ID movement feel the same way. For example, see *The Wall Street Journal*, Monday, November 14, 1994 for an article on the ID movement and subtitled, "Who Did the Designing, It Doesn't Say; Critics See Disguised Creationism, 'Agent' Who Hath No Name."

[6]E.g. Meyer, S.C. 1994. "The Methodological Equivalence of Design & Descent: Can There Be a Scientific 'theory of Creation.'" pp. 67-112 in: Moreland, J.P. 1994 (ed.) (note 2), p. 70.

[7]Barbour, Ian G., 1966, *Issues in Science and Religion*, Harper & Row; Klaaren, Eugene M., 1977, *Religious Origins of Modern Science*, Eerdmans; Hummel, Charles E., 1986, *The Galileo Connection*, InterVarsity Press; Barbour, Ian G. 1990, *Religion in an Age of Science*, Harper & Row.

[8]Ratzsch, Del, 1986, *Philosophy of Science: The Natural Sciences in Christian Perspective*, InterVarsity Press, p. 14.

[9]de Vries, Paul, 1986, "Naturalism in the Natural Sciences: A Christian Perspective," *Christian Scholar's Review* 15(4):388-396.

[10]See papers in note 1 by Bube, Hasker, and Murphy.

[11]Moreland, J. P. 1994. "Theistic Science and Methodological Naturalism." in: Moreland, J.P. 1994 (ed.) (note 2), p. 51.

## Books Received and Available for Review

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

Jeffrey H. Boyd, *Soul Psychology: How to Understand Your Soul in Light of the Mental Health Movement*, Soul Research Institute, 1994

Ashby Camp, *The Myth of Natural Origins: How Science Points to Divine Creation*, Ktisis Publications, 1994

Denis Edwards, *Jesus and the Wisdom of God: An Ecological Theology*, Orbis, 1995

Roger Forster & Paul Marston, *Christianity, Evidence and Truth*, Monarch Publications, 1995

Vicky Genia, *Counseling and Psychotherapy of Religious Clients*, Greenwood, 1995

John Gribbin, *In the Beginning: The Birth of the Living Universe*, Little, Brown, 1993

Fred Heeren, *Show Me God: What the Message from Space Is Telling Us About God*, Searchlight Publications, 1995

Jean Holm & John Bowker (Eds.), *Attitudes to Nature*, Pinter Pubs. Ltd., 1994

James Lattis, *Between Copernicus and Galileo*, Chicago University Press, 1995

Shaughan Lavine, *Understanding the Infinite*, Harvard, 1994

Ervin Lazlo, *The Choice: Evolution or Extinction?* Putnam, 1994

George Marcus, (Ed.), *Technoscientific Imaginaries: Conversations, Profiles, and Memoirs*, Chicago University Press, 1995

Elaine Morgan, *The Descent of the Child: Human Evolution from a New Perspective*, Oxford, 1995

John Polkinghorne, *Serious Talk: Science and Religion in Dialogue*, Trinity Press, 1995

Evelyn Reed, *Sexism and Science*, Pathfinder, 1993

Egbert Schuurman, *Perspective on Technology and Culture*, Dordt College Press, 1995

Albert Sippert, *Evolution is Not Scientific: 32 Reasons Why*, SPC, 1995

Wladimir Vukanovic, *Science and Faith*, Light and Life, 1995

J. D. Weaver, *In the Beginning God: Modern Science and the Christian Doctrine of Creation*, Smyth & Helvig, 1995

Colin Weightman, *Theology in a Polanyian Universe: The Theology of Thomas Torrance*, Peter Lang, 1994

James Williams, *The Bible, Violence, and the Sacred*, Trinity International, 1995

# Cosmic Controversy: The Big Bang and Genesis 1

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The name "Big Bang" lives, at least for now. In 1993, astronomer Timothy Ferris issued a challenge to rename the event believed by a consensus of scientists to explain the creation of the universe. Ferris and other astronomy enthusiasts, including television personality Hugh Downs, believed that "Big Bang" trivialized cosmic creation by suggesting that a bomb-like explosion took place. Some 12,800 people in 40 countries accepted the challenge, but a panel of three judges found none of the proposed names to its liking, and left well enough alone.[1]

The name may not be all that is wrong with the Big Bang. Scientists who interpret the biblical account of cosmic creation in Genesis 1 literally dismiss the Big Bang as evolutionary, even when advanced as a tool of a Creator God.[2] Some secular scientists have called the theory empirically unprovable.[3] Defending the Big Bang theory are a consensus of cosmologists and some theologians, who see it as a work of the Almighty.[4]

This paper will explore the development of the Big Bang theory as an explanation for the creation of the universe. The Big Bang will be contrasted with Genesis 1, and criticisms will be presented from biblical theist and secular scientists. An opinion will be offered on reconciling the Big Bang and the Bible.

## Big Bang and the Birth of the Universe

The Big Bang theory holds that between 10 and 20 billion years ago, the universe burst and expanded rapidly from a submicroscopic "cosmic egg" containing all matter and energy to a cosmic fireball at least 10 billion degrees Kelvin.[5] This fireball grew into an expanding dense cloud of charged particles spewing matter outward in all directions, cooling off as it emitted heat and light. About 300,000 years after the burst, the fireball cooled to 3000 degrees Kelvin, enough to form subatomic particles, then entire atoms of gases. Over time, gravity compressed the gases into galaxies, stars, planets, and the black void ("dark matter") that comprise the modern universe.[6]

In 1993, a team of astrophysicists reported that the dark matter — 90 percent of the universe and long thought to be uniformly slow-moving ("cold") — likely consists of a two-to-one ratio of cold and light-speed "hot" particles. The team concluded the combination better explains the variety of structures and their sizes in the universe.[7]

The Big Bang theory was introduced separately by Russian physicist Alexander A. Friedmann in 1922 and Belgian astronomer Georges Lemaitre in 1927. The theory emerged during a decade where cosmology flourished, spurred by Einstein's 1916 introduction of his theory of general relativity. The Big Bang theory also built upon the work of Vesto Melvin Slipher, who in 1913 discovered that galaxies seemed to be moving away from the earth, and the work of American astronomer Edwin P. Hubble, who concluded that the universe is expanding.[8]

The "Big Bang" received its name in 1950 from one of its most vocal opponents, British astronomer Sir Fred Hoyle, who used the phrase during a BBC radio lecture to ridicule the theory and promote his own alternative "steady-state" theory. Hoyle and two colleagues theorized in 1946 that the universe creates matter constantly and steadily from nothing to fill space created in the cosmos when galaxies drift apart. According to the steady-state theory, the universe has always existed and has always

*This communication was written as a required paper for "Foundations of Natural Science," a course at Regent University, in Virginia Beach, VA while the author was a graduate student.*

looked the same though it has been in a constant state of flux. One source suggests that Hoyle and his colleagues developed this theory after watching a ghost movie in which the last scene was the same as the first.[9]

In June 1993, Hoyle and two colleagues tried to restore the credibility of the steady-state theory, which has lost favor among cosmologists over the past four decades,[10] by modifying it. The modified theory attributes the creation of matter to galactic emissions of energy and subatomic particles discovered in the years since state-theory was first introduced. The original steady-state theory had several problems, such as its inability to explain how galaxies were formed. However, the theory primarily lost most of its credibility with scientists after it failed to predict and could not explain the cosmic microwave background radiation discovered in 1965 by scientists at Bell Telephone Laboratories. A few years later most cosmologists adopted the Big Bang theory or ceased publishing in the field.[11]

The radiation — postulated by George Gamow, Ralph Alpher and Robert Herman when they theorized the presence of the cosmic fireball in 1948 — offered Big Bang cosmologists the first empirical evidence supporting the theory. The radiation is a low frequency detectable throughout the universe in all directions, and is believed to be a remnant of the heat and light emitted by the cosmic fireball.[12] Bell scientists Arno A. Penzias and Robert W. Wilson won the 1978 Nobel Prize in Physics for their accidental discovery; they were trying to eliminate microwave noise picked up by the horn-shaped antenna they were using to measure radio waves from the outer parts of the Milky Way.[13]

Minute temperature variations in the cosmic microwave background were expected to be found once scientific instruments were precise enough to measure them. But a generation of tests found its texture to be uniformly smooth until 1992, three years after NASA launched the Cosmic Background Explorer (COBE) Satellite. Measuring microwave radiation from the cosmic background believed to have existed only 300,000 years after the theorized Big Bang, the satellite recorded temperature fluctuations of about 30 millionths of a degree Kelvin. A team of scientists confirmed the temperature data in 1992.[14] The temperature fluctuations came from differences in the density of cosmic matter and energy, resembling "broad wrinkles in the fabric of space."[15] They offered evidence for the Big Bang, especially one version which held that the universe expanded by more than a trillion trillion trillion trillionfold in its first thousand billionth billionth billionth of a second to produce uneven ripples — the inflationary cosmos theorized in 1980 by cosmologist Alan H. Guth.[16] Scientists made headlines worldwide by hailing the discovery of temperature fluctuations with uncharacteristicly bold language. "We are viewing the birth of the universe," declared Joseph Silk, an astronomer and longtime Big Bang advocate.[17] George Smoot, leader of the research team, likened the discovery to a divine encounter: "If you're religious, it's like looking at God."[18]

## Genesis 1 and the Birth of the Universe

While Smoot and some scientists have spoken of a deity in discussing the Big Bang, even they have not gone so far as to attribute cosmic creation to the God of Israel, focal point of the Judeo-Christian Bible. Biblical theists believe in a God who is sovereign over his creation, beginning with the universe. The Big Bang theory was developed within a scientific community that for more than a century has eschewed biblical theism in favor of wholly material explanations for natural phenomena.[19]

Biblical theism begins its explanation of the universe with the Bible's first words: "In the beginning God created the heavens and the earth"(Gen. 1:1). In its original Hebrew the verse used the word *bara*, which signifies divine activity, but never human activity.[20] "The heavens" denotes the entire material universe beyond the limits of earth.[21] On the first day of Divine creation, light is brought into the cosmic darkness through God's spoken word (Gen. 1:3). Three days later, the sun, the moon and the stars were created within the heavens, visible in the expanse of the sky (Gen. 1:14-18).

The creationist argument in Genesis 1 is reinforced in subsequent Bible passages. God is referred to as "Creator of heaven and earth"(Gen. 14:22). The word "Creator" can also be translated from the Hebrew as Possessor.[22] The heavens declare the glory of God (Psalms 19:1) as they were created "by the Word of the Lord"(Psalms 33:6).

The New Testament continues this reasoning, defining the Word as being of one essence with the Lord God (John 1:1) and as made flesh in his son Jesus Christ (John 1:14), who by nature is one with God (John 10:30; Phil. 2:5-6). Thus by Christ, says Paul in his letter to the church at Colosse, "all things were created that are in heaven and that are in earth, visible and invisible"(Col. 1:16). The heavens, says Paul, are the works of God's hands (Heb. 1:10).

Yet Scripture does not rule out the possibility of cosmic expansion. Four times in the book of Isaiah,

God is called the One who stretched out the heavens "like a canopy, and spreads them out like a tent" (Isa. 40:22, 42:5, 44:24, 51:13; Psalm 104.2). In creating the universe, God "pitched a tent for the sun"(Psalm 19:4).

## Biblical Theists and The Big Bang

Scientists and theologians who believe in biblical theism are divided over the Big Bang. Some base their arguments on science, others on Scripture and still others on both.

A key dividing line among biblical theists is their view on the age of the universe. "Old-earth" advocates say the universe could have been created billions of years ago as in the Big Bang theory, but insist that the creator is the God of Israel described in the Bible.[23] "Young-earth" advocates (creationists) believe the universe was created between 6,000 and 10,000 years ago, in the timespan of six 24-hour days cited by Genesis 1, rendering impossible a Big Bang billions of years ago.[24]

Another point of contention is the methodology of creation. Some biblical theists, like theologian Bernard Ramm and aerospace professor Roy E. Peacock, argue that creation employed a continuous process, allowing for a highly orderly universe to emerge over time from a cosmic void.[25] This approach allows for the possibility that recently discovered scientific processes may indeed be evidences of a continuing creation, such as the apparent cosmic expansion that led scientists to theorize the Big Bang. French theologian Henri Blocher believes the Big Bang could have been used by God to achieve his goal of cosmic creation: "Must we tie God to one single method of action?"[26] Other biblical theists, however, believe that creation took place instantaneously through the literal series of Divine commands related in Genesis 1. Proponents of this view, called fiat creationists, base their argument on scriptural passages attributing creation to God's spoken word (Psalms 33:9; Psalms 148:5). They also contend that creation ended after the six days of Genesis 1.[27]

A third conflict exists over the science of Big Bang. Most old-earth adherents agree with the scientific consensus axioms on which the theory is based — that the cosmos is expanding, that galaxies are moving further away, that the universe expanded rapidly in its first fraction of a second and that a cosmic microwave background exists.[28] Creationists have disputed these contentions,[29] and have based their arguments on research conducted outside the scientific mainstream.

Creationists also contend that the Big Bang fails as science because it contradicts three scientific principles:[30] (1) The empirical provability of all scientific tenets (nobody was around to record Big Bang data); (2) Einstein's relativity theory (the universe was static, with no beginning, he theorized); and (3) The second law of thermodynamics, which holds that disorder and chaos increase over time in closed systems such as machines. Creationists contend the Big Bang universe is a closed system because of their belief that the Big Bang is grounded in theories of evolution, which predict that all phenomena occur without a creator.[31]

Old-earth advocates, like physicist Alan Hayward, reply by contending the earth is not a closed system since it receives energy from the sun.[32] Others have suggested to creationists that God could have violated his laws of matter to create the universe.[33] In his later years, Einstein acknowledged a mathematic error (division by zero) in his cosmological constant that counteracted cosmic expansion; he subsequently theorized the universe could have had a beginning.[34] Discoveries such as receding galaxies and the cosmic microwave background offer empirical evidence for the Big Bang.[35]

A fourth conflict between biblical theists exists over the proper interpretation of scriptural text. Creationists often posit that the Bible was written by authors inspired of God and is inerrant; thus Scripture should be interpreted literally.[36] Led by theologians such as American Benjamin B. Warfield, evangelical Christians in this century rallied around biblical inerrancy as an alternative to scientific evolution and the liberal theologies that emerged in mainline Protestant denominations.[37]

Creationists argue that any change in the heavens and earth after the creation Day Six of Genesis 1 would contradict the first words of Genesis 2: "Thus the heavens and the earth were completed in all their vast array." Some, like Henry M. Morris, have even likened proponents of a continually, developing universe to the scoffers Peter warns will doubt Jesus' return to earth during the last days.[38]

Creationists and old-earth adherents do agree on one important point — that God predates his created order (Psalm 90:2). That differentiates them from the consensus of secular scientists who posit that no creator existed before the "cosmic egg."[39]

Criticism of Big Bang has not been limited to biblical theists and steady-staters like Sir Fred Hoyle. Secular scientist Eric Lerner has objected to the theory's assumption of creation *ex nihilo* because it is

a doctrine of biblical theism, "a profoundly pessimistic and authoritarian world view." [40] Lerner also suggests that the Big Bang has underestimated the age of the world, which he contends is 80 to 100 billion years old.[41] Lerner supports as a scientific alternative to Big Bang cosmology the "plasma cosmology" theory pioneered by Hannes Alfven, a Swedish Nobel laureate. Alfven has contended that the universe has always existed and is governed by laws of electricity and magnetism as well as gravity.[42] Alfven's plasma theory has also been promoted by creationists as a valid scientific alternative to the Big Bang.[43]

## Can The Big Bang Be Reconciled with Genesis 1?

Unlike Lerner, many theologians view Big Bang's creation *ex nihilo* tenet as the key to reconciling cosmology with theology, since *ex nihilo* creation is also espoused by fundamentalist Christians and other advocates of a literal creationism.[44] The Rev. Frederic B. Burnham, director of Trinity Institute, a New York-based religious center for advanced studies in science, believes that in seeming to prove Big Bang, the COBE satellite findings also appeared to support scriptural contentions that: (1) A transcendent God acted outside of time and space and created matter, and (2) the universe has a beginning and an end.[45] Some scientists have sought to reconcile the Big Bang with Genesis 1. Astronomer Robert Jastrow has maintained that the Big Bang "leads to a biblical view of the origin of the world,"[46] to the discomfort of secular scientists.[47]

Nathan Aviezer of Bar-Ilan University in Israel calls the Big Bang theory "in striking agreement" with scriptural creation.[48] He calls the cosmic microwave background the remnant of light decoupled from the cosmic fireball, a decoupling he says proves the truth of Genesis 1:4, where God separated light from darkness. Aviezer also contends the inflationary universe postulated by Guth and others is evidence of the cosmic chaos depicted in Genesis 1:2.[49]

Aviezer, Burnham, Hayward, and others who agree with them run a great risk in using a scientific theory — however valid to a consensus of scientists—to "prove" biblical truth. The danger is that new evidence can just as easily disprove the Big Bang, or divorce it from the creation account related by Scripture. Unlike many theologians and old-earth scientists, creationists have realized that potential danger and have shied away from yoking themselves to contemporary science, even when presented in terms of "God" as with the COBE data.[50]

It can be concluded that Big Bang and Genesis 1 cannot truly be reconciled. The two do not offer different explanations for the same phenomenon, but answer different questions. Big Bang attempts to explain *how* the universe was created. Genesis 1 attempts to explain *who* created it. Charles E. Hummel has noted that Genesis 1 was not intended to teach the method or date of creation.[51] Owen Gingerich, a biblical theist astronomer, has ruled out a reconciliation between science and theology since both disciplines assess their truths through different methods.[52]

Even biblical theists can agree with Isaac Asimov, the late science-fiction writer and atheist: "Any real comparison between what the Bible says and what astronomers think shows us instantly that the two have virtually nothing in common."[53]

But unlike Asimov, scientists should not rule out the possibility that biblical truths about the universe can be proven. Within the past three and one-half years, scientists have found new archaeological evidence to corroborate several Old Testament biblical events — the destruction of Jericho by Joshua and the Israelites,[54] the existence of Baal,[55] the parting of the Red Sea,[56] and the victory of King Asa of Judah and King Ben-Hadad of Damascus over King Baasha of Israel.[57] There is no reason to believe a similar scientific corroboration of the creation of the universe could not or should not occur. ✳

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# Essay Reviews

# Feminism, Ethics, Science, and Technology

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While women are half of the human race, they have not been half of the scientific community. Have insights been missed because of their relative absence? A prolific genre of feminist literature has sought to answer that question among others, and has deeply influenced many of our academic communities. Feminism is a diverse movement united solely by a commitment to work against the oppression of women and, more generally, against any domination of some persons over others. What that means in theory and practice has been described in at least three strikingly different lines of argument that lead the discussion. I will call these perspectives "equity feminism," "different voice feminism," and "radical feminism."

## Equity Feminism

Historically, the first major feminist movement emphasized respect and equality for all persons regardless of gender. Sometimes called "equity feminism," this movement still calls for equal access to political power and professions such as scientific research. With equal opportunity, encouragement, and reward, individual women will make contributions as important as those of their male counterparts. No one should be excluded or discouraged from excelling wherever their particular interests and talents lead them. Christina Hoff Sommers's *Who Stole Feminism? How Women have Betrayed Women* (New York: Simon & Schuster, 1994) is currently the most influential book from this perspective.

## Different Voice Feminism

A second major movement within feminism shifts the argument from equal access to an analysis of human culture. In this view, men and women have developed different perspectives and values because they have had different experiences. Carol Gilligan's book, *In A Different Voice: Psychological Theory and Women's Development* (Cambridge, MA: Harvard University Press, 1982, 1993), led the movement to chronicle such distinctions and to consider them positive ones for the doing of ethics. From this perspective, more women in science and in ethics would change the conduct, content, and application of science. The large scale involvement of women would probably heighten qualities such as subjectivity, intuition, holism, and harmony.

In *Speaking from the Heart: A Feminist Perspective on Ethics* (Rowman & Littlefield, Lanham, MD, 1992), Rita Manning is writing primarily of ethics, but exemplifies this perspective. She centers a feminist contribution to ethics and human endeavors such as science in the nurturing of relationships. Individuals are not isolated in a series of equal relationships with strangers, rather the moral life takes place within a web of roles and commitments deeply evident to women. The best life in this context is an "ethics of care." We each live within a context of special responsibilities, not just as individuals faced with strangers and public responsibilities. One should by character and disposition consistently recognize and respond to the needs of those one is

related to. For Manning, this care for related others is required by the "spiritual awareness" that "all things are interconnected. All is relationship." She has been particularly influenced by the woman's spirituality movement led by authors such as Starhawk, *The Spiral Dance: A Rebirth of the Religion of the Great Goddess* (San Francisco: HarperCollins, 1989) and *The Fifth Sacred Thing* (New York: Bantam Books, 1993), and by the classic statement of an ethics of care, Nel Noddings's *Caring: A Feminine Approach to Ethics and Moral Education* (Berkeley and Los Angeles, University of California Press, 1984).

Manning recognizes that an ethics of care alone offers little specific guidance on how to respond to or how to balance competing needs. It also can be parochial. What about the concerns and needs of those outside one's immediate circle of relationships? Is her assumption correct that her personal experience has led to an inherently feminine ethic? It is true that American culture tends to expect women to fill nurturing roles and commitments, yet Manning's own survey data of how males and females respond to ethical cases shows substantially more overlap than difference when responses are sorted by gender. It is noteworthy that in many Asian countries the dominant male ethic is to focus on supporting one's immediate circle of relationships; an attitude that Manning assumes is feminine. The book is helpful in reminding us that most of the moral life takes place with family and friends, not strangers, yet it is not clear that this ethic of care is an inherently feminine one as she suggests.

## Radical Feminism

A third major group, radical feminists, sees a trap for women in any ethic that builds upon perceived unique aspects of feminine experience and perspective. Susan Sherwin argues in *No Longer Patient: Feminist Ethics and Health Care* (Temple University Press, Philadelphia, 1992) that "the nurturing and caring at which women excel are, among other things, the survival skills of an oppressed group that lives in close contact with its oppressors" (p. 50). For Sherwin, women must be set free from male oppression to do or be anything they want to be. Freedom from restraint is the central goal.

She writes, for example, that the male dominated medical establishment has limited women's freedom by assuming heterosexuality. "IVF is usually unavailable to single women, lesbian women, or women who are not securely placed in the middle class or beyond ... The selection criteria serve as one more instrument to establish the superior power and privilege of favored groups in society" (p. 127). In fact for Sherwin,

> A principal function of establishing sex differences is to structure dominance relations ... All feminists must support lesbians in their sexual choices and recognize that the sexual freedom of every woman is tied to the sexual freedom of lesbians; that is, physical love of men cannot be a free choice for women unless lesbianism is a genuine option as well. ... underlying all forms of the oppression of women in patriarchal cultures — physical, economic, political, legal, emotional, ideological — are the assumptions of the institution of heterosexuality or heterosexism: specifically, the assumptions that men own and have the right to control the bodies, labor, and minds of women (p. 209).

"Heterosexuality is a way of living that normalizes the dominance of one person and the subordination of another. ... Heterosexuality, at least as we know it, is at the root of women's oppression" (p. 212). The foundational charge that heterosexuality is synonymous with "heterosexism," one gender oppressing the other, is simply assumed in the book, not argued.

While not focusing on heterosexuality as the foundation of male oppression, Judy Wajcman also labels herself a radical feminist in *Feminism Confronts Technology* (The Pennsylvania State University Press, University Park, PA, 1991). "The belief in the unchanging nature of women, and their association with procreation, nurturance, warmth and creativity, lies at the very heart of traditional and oppressive conceptions of womanhood" (p. 9). Wajcman argues that these characteristics are parceled out differently to masculine and feminine stereotypes from one culture to another. Therefore, there must not be innate distinctions between males and females. The ever-changing culture, which can be shaped to better ends, draws the lines of distinction between the sexes. Technology should not be sex stereotyped as an activity of men. It should be equally available to women. If it becomes so, it will be less the means of exploitation and domination over nature and women that she presently sees.

While the assertion that current technology exploits and dominates women is stated repeatedly, the given examples are not always persuasive. The strongest one she offers may be that physicians, who have usually been men, have come to dominate the birth process by emphasizing the routine intervention of technologies such as caesarian section and episiotomy. Wajcman argues that it is not sufficient even to have an equal number of female physicians now because our culture emphasizes physician con-

trol of the woman's birth process, whether the physician is a man or a woman. Wajcman is quite right that control has been increased. Whether that is more a matter of exploitation or service is not addressed.

All of the above authors recognize that culture deeply influences our perception and choices, especially when we are not aware of its shaping power. They also agree that women should be treated as the equals that they are, but they do not agree on what it is to be human, let alone man or woman, and so reflect some of the broad diversity in the feminist movement. For each, at the least, women should be welcomed in the sciences and technology. For equity feminism, their increased presence will make a difference for the better by augmenting individual freedom and the talent available to the endeavor; for different voice feminism, by offering a unique perspective; and for radical feminism, by checking the use of science and technology against underrepresented groups.

For further reflection on feminist perspectives, Margaret Farley's essay in *Prospects for a Common Morality*, edited by Gene Outka and John P. Reeder, Jr. (Princeton University Press, Princeton, 1993), ends with notes that cite much of the important literature in feminist ethics through 1993. ✳

# The Shadowed Valley

*by David Wilcox*

The eye of faith can travel down
the mountain vistas of the whole,

Still chasing changing shadows down
the steep abyss of cell and mole.

The hand that shaped the Pleiades,
that lights the evening's bonfire blaze,

Sets smaller blazes; pinpoint lights,
the jewels of atom — and of soul.

No one can slip the artist's hand
by shrinking down beyond his gaze,

For at the foot, on quarkling plain,
the painter plans and shapes his goals.

# Flesh for *The Creationists'* Bones

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***Creationism in Twentieth-Century America*** by Ronald L. Numbers, General Ed. Hamden, CT: Garland Publishing, 1995. 10 Vols. $812.00 or by the volume.

American Protestants have offered a wide spectrum of response to evolution since Darwin's *Origin of the Species* (1859). In this century, opposition to evolution has been a characteristic part of the evangelical/fundamentalist rejection of liberal Christianity, liberal politics, and liberal economics. A litmus test for participation in church life or teaching in most evangelical secondary schools and many institutions of higher learning still includes the right answer to "Do you believe in evolution?" While opposition to evolution may be a natural part of the stock of beliefs of Christians who follow televangelists, preachers, and Christian apologists who feast on an easy target, it also is part of the beliefs of many highly educated evangelicals who find it impossible to integrate what seems to be a particularly offensive part of naturalistic science into their theistic world view. Yet, I suspect that most evangelicals in the natural sciences hold some nuanced form of theistic evolution.

Critics of evolution have argued their case from biblical, biological, and geological grounds. What has been known as "Mosaic geology" has long held a place in the discussion, waxing and waning in importance according to the fashions of the day. This view of earth history has seen a renaissance since the early 1960s through the advocacy of the Creation Research Society and fellow travelers who have co-opted the first plank of theism for their own use. It should be noted that many evangelicals unhappy with evolution do not hold a "young earth" position or advocate the teaching of "Creation Science" in the public schools.

Numbers's award winning *The Creationists* (1992) offered a valuable entré into the world of the anti-evolutionist. This series of works provides the flesh for creationists' bones. Here we have a liberal sampling of the literature of 20th century American anti-evolutionism gathered from the dusty archives of Bible institutes, seminaries, college libraries, and personal collections. Each volume provides biographical sketches of the authors of the works and sets forth the context in which the reprinted works were produced.

***Vol. 1. Antievolutionism before World War I*** by Ronald N. Numbers, Ed. 1995. xvii + 403 pages, introductions. $72.00.

This volume includes Alexander Patterson's *The Other Side of Evolution* (1903) and the English translation of German Eberhard Dennert's *At the Deathbed of Darwinism* (1904) plus Luther T. Townsend's *Collapse of Evolution* (1905) and George Frederick Wright's article, "The Passing of Evolution" from Volume VII of *The Fundamentals* (1910-15). Clerics Patterson (Presbyterian) and Townsend (Methodist Episcopal) sought to draw (liberal) Christians back from adherence to evolution on grounds based on the growing anti-Darwinian scientific discussion in Europe, which sharply contrasted with the almost unanimous acceptance of evolution in North America. Dennert detailed the flaws that German scientists found in natural selection while maintaining an overall acceptance of evolution. Wright, a Congregational clergyman, had taken up the study of geology and had become a close friend to Asa Gray, an eminent Harvard botanist. At first, he shared Gray's vision of a "Christianized Darwinism" but later became a spokesman for conservative Christianity and a skeptic of the power of natural selection. For Numbers, this period represents a grudging willingness by con-

servatives to consider evolution but at the same time a growing awareness of the fallibility of natural selection. The real enemy was seen as "higher criticism."

***Vol. 2. Creation-Evolution Debates*** by Ronald N. Numbers, Ed. 1995. xiv + 505 pages, introductions. $95.00.

Debates have played a key role in antievolution history beginning with the mythic acrimonious 1860 Oxford exchange between Bishop Samuel Wilberforce and Thomas Huxley. More recently, in the 1970s, more than one hundred debates involved the staff of the Institute for Creation Research, and the 1990s featured debates by Phillip Johnson and William Provine. Some debates arise as spur-of-the-moment events, others are formal affairs staged before large (sometimes unruly) audiences, still others take place on the pages of periodicals and books. Some debates were carried out with courtesy and respect; others degenerated into name-calling.

Numbers has reprinted the texts of eight important debates of the mid-1920s and 30s. In a debate carried out on the pages of the *New York Times* (1925), William Jennings Bryan took on paleontologist Harry Fairfield Osborn and biologist Edwin Grant Conklin, Jr. Both of the scientists had deep Christian commitment. The evolution-versus-creation debate (1924) between New York Calvary Baptist Church's John Roach Straton and Charles Francis Potter, pastor of West Side Unitarian Church, was broadcast over the radio. George McCready Price, leading fundamentalist "scientific" authority of the day debated ex-Franciscan priest Joseph McCabe before a hostile audience in Queen's Hall, London, England (1925). The outgunned Price never entered the lists again. One debate featured two leading creationists, William Bell Riley and Harry Rimmer, controverting on the "days" of Genesis 1. Another debate between flood-geologist D. J. Whitney and prep-school teacher Edwin Tenney Brewster (1937) took place in the pages of the *Truth Seeker*, a magazine for freethinkers. Unshakable assurance in the validity of one's argument remains an essential element of the debater's arsenal.

***Vol. 3. The Antievolution Works of Arthur I. Brown*** by Ronald N. Numbers, Ed. 1995. xii + 208 pages, introductions. $55.00.

American-born Arthur I. Brown, M.D. (1875-1947), from Vancouver, played a major role as a critic of evolution in the 1920s and 1930s. He left a lucrative surgical practice in 1925 to devote his time to lecturing on science and the Bible. Brown argued against evolution on scientific and scriptural grounds. Enormously popular in the U. S. with his national fundamentalist audiences, he was seen by his adversaries as well educated, gracious, and a master of the lecture stage. As most of his contemporaries during the early part of the century, he accepted the notion of an ancient earth. The six short examples of Brown's writing focus on a plethora of examples of alleged deficiencies in evolutionist arguments and copious quotes from scientist skeptics of Darwinism. Scripture is used only in general terms but with the repeated affirmation that it is in complete compliance with scientific fact (even thousands of years before the facts were discovered).

***Vol. 4. The Antievolution Pamphlets of William Bell Riley*** by William Vance Trollinger, Ed. 1995. xxii + 221 pages, introductions. $55.00.

William Bell Riley (1861-1947) epitomizes the values brought to a cause — here antievolution — by a leading fundamentalist cleric, who in defending the faith lashes out in less than consistent terms against an enemy whose ideas were incomprehensible to him. In one instance, he debated North Carolina State College biologist Z. P. Metcalf. Metcalf offered a scholarly presentation of the evidence supporting the scientific evidence for evolution. Riley's rejoinder, egged on by the crowd which "yelled and whistled, clapped their hands, and pounded the floor with their feet," offered an off-the-cuff series of one-liners, "anecdotes, and cryptic indictments." Typical of his strategy was his pointing to a book with pictures of pre-historic men and commenting, "Come up here after the debate and look at these pictures, and I am sure you will see somebody who looks just like them when you get downtown."

Riley's World Christian Fundamentals Association fought the higher criticism which fueled the modernism which was invading the main line denominations of North America. He saw evolution as the centerpiece of his battle against apostasy. His organization organized efforts to outlaw the teaching of evolution in the public schools. He denounced an international Jewish-Bolshevik-Darwinist conspiracy even to the point of applauding Adolf Hitler's efforts "to foil the Jew's nefarious plot." Bell later turned against Hitler in his pamphlet *Hitlerism; or, The Philosophy of Evolution in Action.* This and eight other Riley pamphlets are reprinted in the volume.

***Vol. 5. The Creationist Writings of Byron C. Nelson*** by Paul Nelson, Ed. 1995. xxvi + 505 pages, introductions. $100.00.

Bryon Christopher Nelson (1893-1972) grew up in Madison, Wisconsin and Washington, D. C., where his father was a member of the House of Representatives. Following army service, he graduated from the Luther Theological Seminary in St. Paul, Minnesota. After a term as a Lutheran pastor, he moved east to gain a Th.M. at Princeton Seminary while serving at the Danish Lutheran Church in Perth Amboy, New Jersey. He became interested in the evolution question and took courses in biology at Rutgers University. He came down on the antievolutionary side, publishing *After Its Kind: The First and Last Word on Evolution* (1927). Four years later, he published *The Deluge Story in Stone: A History of the Flood Theory of Geology*, adopting the position of Seventh-Day Adventist George McCreedy Price. He, and others, joined Price in 1935 to form the short-lived Religion and Science Association. Nelson would later argue that Adolph Hitler justified the notion of the "master race" on evolutionary principles. This volume reflects his scholarly interest in geological phenomena and archaeology.

***Vol. 6. The Antievolution Pamphlets of Harry Rimmer*** by Edward B. Davis, Ed. 1995. xxxiv + 482 pages, introductions. $84.00.

Davis has done exceptional work in evaluating Rimmer's life and influence and in detailing the publishing history of the antievolution pamphlets reprinted in this work. Rimmer (1890-1952), raised in a troubled west coast family and lacking significant formal education, took the advice of a friend to "read science." Converted at a street meeting by a student who later became a medical missionary, Rimmer would look to "the sidewalk evangelist with an interest in science as the model for his own life." His work with the YMCA placed him in contact with college students who were increasingly faced with anti-Christianity in their classrooms. Davis argues that Rimmer's first target was the biblical critics rather than evolutionists but this changed by the early 20s when he, and other conservatives saw evolution as "a principal cause of unbelief in the Bible and the gospel message it conveyed." Rimmer's books (300,000 at one publisher) and heavy national speaking schedule at Bible conferences, churches, and colleges made him a leading force in conservative Christianity. His claims to scientific expertise and willingness to argue with scientists attracted those who lacked scientific background. However, the emergence of scientifically literate evangelicals after WWII would drastically reduce his influence. Davis duly notes the debt that recent creationists such as Henry Morris owe to Rimmer, yet ironically "with its strict requirements that members have post-graduate degrees in science, the Creation Research Society would bar the door to the one man, who more than anyone else, showed how to be 'a scientific creationist.'" Sixteen pamphlets are reprinted.

***Vol. 7. Selected Works of George McCready Price*** by Ronald L. Numbers, Ed. 1995. xvii + 489 pages, introductions. $75.00.

Price (1870-1963), dubbed "the principal scientific authority of the Fundamentalists," was nurtured in Seventh Day Adventism. Largely self-educated in science, he attended the Adventist Battle Creek College for two years and later completed a teacher training course. The B.A. and M.A. degrees often appearing after his name were honorary. At one point a physician friend sought to convert him to evolution, but his reading of prophetess Ellen G. White's writings was instrumental in his decision to lead to a life dedicated to fighting evolution. His antievolution case rested primarily on geology with "flood geology" as the cornerstone. As was the case with most of the writers in this series, he quoted heavily from scientists who were not sure about the mechanism of evolutionary change. Interestingly, Numbers notes that privately "Price endorsed the common Adventist belief that Satan himself, the great primal hybridizer, was the real instigator of all the mixing and crossing of the races of mankind, and also the mixer of thousands of kinds of plants and animals which God designed should remain separate." Ridiculed by his enemies as a scientific fraud, he was embraced by conservative Christians as one "come to the kingdom for such a time as this." While his influence peaked from 1915-1935, it remained as an undercurrent in fundamentalism to emerge as the foundation of "modern creationism" in the 1960s. Three books and a pamphlet are reprinted.

***Vol. 8. The Early Writings of Harold W. Clark and Frank Lewis Marsh*** by Ronald L. Numbers, Ed. 1995. xxiii + 531 pages, introductions. $93.00.

This work offers the writings of two students of Price who gained graduate degrees in science at reputable institutions. Harold W. Clark (1891-1986) learned flood geology under Price and replaced him

on the faculty of Pacific Union College in 1922. His first book, *Back to Creationism* (1929), followed Price's line and was praised by his mentor. Soon after he began a series of studies of glaciation in the western mountains, which, coupled with his graduate studies at the University of California and observations of the cores of deep oil wells in Texas, caused him to change his mind about the meaning of the fossil record and to adopt limited evolution while maintaining a recent creation and a universal flood. He sought to steer "a middle course between the Scylla of the evolutionists and the Charybdis of the many diluvialists whose zeal exceeds their information." This created a split with Price who unsuccessfully sought to have him condemned by Adventist clergy.

Frank Lewis Marsh (1899-1992), who studied geology under Price at Emmanuel Missionary College in the late 20s, gained an M.S. in zoology at Northwestern University and a Ph.D. in botany at the University of Nebraska in 1940. He, too, espoused a recent creation and a universal flood but accepted the evolution of post-Edenic species. His *Fundamental Biology* (1941) incorporated the Seventh Day Adventist perspective that the world was the stage for "a cosmic struggle between the Creator and Satan." Later works avoided such references in order to gain a hearing from the scientific community. The eminent geneticist Theodosius Dobzhansky reviewed his *Evolution, Creation and Science* (1944) in the *American Naturalist*, noting that Marsh had written a "sensibly argued defense of special creation." Tellingly, for that or any day, Dobzhansky observed that "in rejecting macro evolution, Marsh's book taught the valuable lesson that no evidence is powerful enough to force acceptance of a conclusion that is emotionally [*sic* religiously] distasteful." Marsh drew Price's ire and had an uneven acceptance in Seventh Day Adventist circles. Ironically, he joined with nine other non-Adventists in 1963 to form the Creation Research Society serving on its board of directors until 1969, when he resigned because of the practice of holding board meetings on Saturdays.

Three long works, Clark's *Back to Creationism* and *The New Diluvialism*, and Marsh's *Fundamental Biology* are reprinted as representative of creationism's early credentialed scientists.

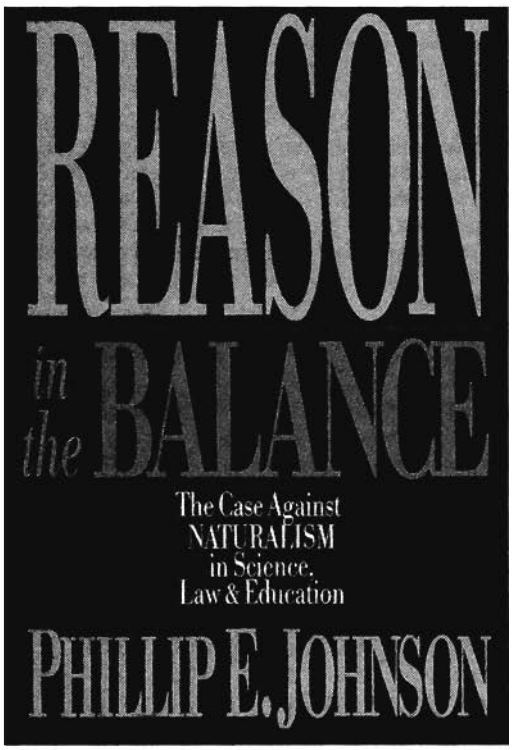
***Vol. 9. Early Creationist Journals*** by Ronald L. Numbers, Ed. 1995. xvi + 629 pages, introductions. $100.00.

*The Creationist* (1935-8), *The Bulletin of Deluge Geology and Related Sciences* (1941-2), *The Bulletin of Creation, the Deluge and Related Science* (1943-5), and *The Forum for the Correlation of Science and the Bible* (1946-8) represent short-lived efforts by antievolutionists to propagate their gospel. Internecine wrangling over interpretations of scripture and science and power struggles by the participants proved fatal.

***Vol. 10. Creation and Evolution in the Early American Scientific Affiliation*** by Mark A. Kalthoff, Ed. 1995. xxxix + 468 pages, introductions. $83.00.

Kalthoff is currently completing a doctoral dissertation on the history of the ASA. He has deftly chosen 40 articles from the *Journal of the American Scientific Affiliation* and other short pieces from ASA publications in the period 1942-1961, which reflect the attitudes of the period and the inexorable breakaway of the "young earth" wing to form their own organization. The period following World War II saw a renaissance of evangelical scholarship in the sciences. Evangelicals gained Ph.D.s in large numbers in the various science disciplines and joined mainstream science culture in the university and industry. Many of these have served as officers of the organization and contributed to its publications. Few young-earth creationists have been part of the ASA since the 1960s. Kalthoff offers an important discussion of the early days of the ASA in setting forth the context in which the institution began and matured in the first two decades.

We are indebted to Numbers and his colleagues for a rich lode of resources examining the evangelical/fundamentalist interaction with evolution during the first six decades of the century. This collection belongs in the library of any institution which is concerned with the views of conservative Christians in the twentieth century. ✳

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**Phillip E. Johnson** *has taught law for over 20 years at the University of California at Berkeley. A graduate of Harvard and the University of Chicago, he was a law clerk for Chief Justice Earl Warren of the U.S. Supreme Court.*


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# Book Reviews

**THE EVOLUTION CONTROVERSY IN AMERICA** by George E. Webb. Lexington, KY: University of Kentucky Press, 1994. 297 pages, index. Hardcover; $34.95.

George E. Webb is professor of history at Tennessee Technological University in Cookeville, Tennessee, where his teaching responsibilities include lecturing in the history of American science. *The Evolution Controversy in America* recounts the tumultuous conflicts that have characterized America's reaction to the Darwinian revolution, and, in particular, their impact upon science instruction in public education.

Chapters 1 and 2 trace the reception of Darwinism in late nineteenth century America. Cursory treatment is given to the emergence of neo-Lamarkian and neo-Darwinian schools of thought, the reaction to contemporary developments in scientific methodology by persons deeply committed to Baconian inductivism and Scottish common sense realism, the impact of evolutionary theory upon American religious life, and the attempts made by several social philosophers to use evolutionary concepts as the foundation for their theories of societal development and civic responsibility. The treatment of the reception of Darwinism by orthodox Christianity is very incomplete (pp. 15-23 and 47-52). For a more detailed treatment of the subject, readers should consult George M. Marsden's *Fundamentalism and American Culture*, and Ronald Numbers' *The Creationists*.

The remainder of the book gives primary attention to the controversies surrounding science instruction in public education. At the center of the conflict is, on the one hand, the increasing number of science teachers and parents committed to the teaching of evolutionary biology in public schools, and, on the other, the corresponding reaction of fundamentalist Christians to what they view as a materialistic and atheistic world view. Of crucial importance to this narrative is the development of the creation science movement (to which the writer is entirely unsympathetic) as a vehicle to give scholarly support to antievolutionists. As the twentieth century develops so do the tactics taken by opponents of evolution, which range from early attempts to exclude evolutionary theory from public education to more recent attempts to gain "equal time" or "balanced treatment" for evolution and creation science.

Webb chronicles a number of these battles as they are fought in local school boards, legislative assemblies, and the courts. The precedents set in recent Supreme Court decisions such as *Everson v. Board of Education* and *Lemon v. Kurtzman* are given some attention as are varying interpretations of the First Amendment establishment clause (pp. 201-106). Of crucial concern to the author is the negative affect that the controversy has had on the quality of American scientific education.

I made a number of interesting observations while reading this. Readers of *PSCF* will be interested in the author's comments on the ASA (pp. 157-158). Many readers will be unconvinced that the original intent of the framers of the Bill of Rights was for a broad interpretation of the establishment clause (pp. 205-206). Another source of concern is the lack of critical scrutiny given the Supreme Court's incorporation doctrine (p. 205). It may be argued that the incorporation doctrine and its subsequent application to the establishment clause have had precisely the opposite effect of that intended by the Constitution's framers, namely, that it has led to an enormous expansion in the scope of the federal powers (especially through its judiciary), a threat the framers greatly feared. The constitutional basis available to the federal court system in adjudicating disputes concerning the teaching of evolutionary biology and creation science in the public school systems needs much more careful approval than is given by Webb. The history of evolutionary science in American public education is the story of parents who are concerned about the effects of education upon the moral and spiritual well being of their children. A discussion of the concept *in loco parentis* as it relates to the public schools and present concepts of academic freedom is desperately needed. Despite the merits of creation science, the real or imagined threats that many parents perceive concerning evolutionary biology must be weighed carefully. The desire for more careful instruction in evolutionary biology must not be allowed to suppress these very vital parental concerns. When biology teachers use their positions to evaluate the nature and accuracy of biblical literature, or seek to use their evolutionary views as a foundation for pronouncements in the field of ethics, they have left the field of expertise for which they were hired and have invited upon themselves the just criticism of concerned parents. I found this book informative, and a helpful introduction to controversies surrounding the teaching of evolution and creation science in public schools.

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

**THE SOUL OF SCIENCE: Christian Faith and Natural Philosophy** by Nancy R. Pearcey and Charles B. Thaxton. Wheaton, IL: Crossway Books, 1994. 298 pages. Paperback; $10.99.

*The Soul of Science* is an excellent historical review of philosophical ideas associated with the growth of science. Authors Pearcey and Thaxton want to "reintroduce Christians to a part of our rich intellectual heritage," but their book will be instructive also to unbelieving scientists not

turned off by its subtitle. What we have here is not so much a Christian apologetic as a compact education accessible to all comers.

Believers or not, most scientists are poorly trained in philosophy. Of the history of science we tend to know a few names and landmark discoveries from our own discipline. *The Soul of Science* gives all of us an opportunity to "bone up," a beneficent boost to believers bombarded by skeptical, cynical, agnostic, or atheistic opinions.

This reviewer gained insights from each of the book's four parts: "The New History of Science," "The First Scientific Revolution," "The Rise and Fall of Mathematics," and "The Second Scientific Revolution." When any complex history is condensed so readably, one expects a certain amount of oversimplification, yet I found nothing to quibble about on any point familiar to me. Extensive endnotes make clear that the authors could write with such confidence because they have read widely in the major sources and weighed all sides of disputed ideas. Acknowledgments name some two dozen experts in science, history, and philosophy who helped them get things right.

*The Soul of Science* identifies three broad philosophical approaches — Aristotelian, neo-Platonic, and mechanistic — tracing them throughout the development of science. Individual scientists, such as Newton, may have straddled more than one tradition, but exemplars of each can be highlighted in various periods and branches of science. In chapter five, "The Belated Revolution in Biology," John Ray, Linnaeus, and Cuvier are cited as examples of scientists influenced primarily by Aristotelian thought, Buffon and Lamarck by neo-Platonism. Charles Darwin is, of course, everyone's exemplar of the mechanistic tradition in biology.

Clearly in the mechanistic tradition myself, but not much "worldviewer," I anticipated that in the last chapter, "A Chemical Code," I might get my philosophical comeuppance. In their final analysis, however, the authors argue that the DNA revolution "confirms the central insights of each of the three worldview traditions." Mechanists have been right to study living matter without recourse to "metaphysical entities, mysterious substances, or psychic sensitivities." On the other hand, the neo-Platonist conviction that life is not finally reducible to physics and chemistry alone has also been right; we now know that information-bearing molecules exhibit organization not accounted for by purely material forces.

Aristotelian insistence on "an inner intelligible pattern or plan" has also been confirmed — by messages encoded in DNA molecules. Creationists, say the authors, "take that insight a step further, arguing that an intelligent pattern is evidence of an intelligent source." Having cleared away the underbrush, the authors do not go on to expound an "argument from design." They do insist that the contemporary argument rest not on gaps but on "the *growth* of our knowledge" in biology.

Christians in science fall into one or the other category, though mechanism prevails as the dominant ethos of today's scientists. An older "nonmaterialistic form of mechanism" remains alive, held by some theistic evolutionists. Physicist Howard Van Till is cited as a Christian exemplar. Scientific creationists are said to have revived the Christian Aristotelian tradition, with more liberal Christian writers such as Ian Barbour and Teilhard de Chardin retaining neo-Platonic ideals.

Science writer Nancy Pearcey is a contributing editor for the Pascal Centre for Advanced Studies in Science and Faith in Ontario. Physical chemist Charles Thaxton, co-author of *The Mystery of Life's Origin*, is a Christian witness to academia, now based in Czechoslovakia.

*The Soul of Science* would be a great value at twice the price, so buy at least two copies and keep one or more circulating among your colleagues. It is also available as item BKJA0 at $7.50 per copy plus $1 s&h from BreakPoint, radio ministry of Prison Fellowship (P. O. Box 17500, Washington, DC 20041-0500), for which Nancy Pearcey is now executive editor and producer. The toll-free number for credit-card orders is 1-800-995-8777.

*Reviewed by Walter R. Hearn, Professor of Science and Christianity, New College Berkeley, 762 Arlington Ave., Berkeley, CA 94707.*

**EVIDENCE OF PURPOSE: Scientists Discover the Creator** by John Marks Templeton, Ed. New York, NY: Continuum, 1994. 212 pages. Hardcover; $24.50.

In this volume, global investment guru John Templeton, familiar to ASA members as the co-author, with Robert Herrmann, of *The God Who Would Be Known*, continues his exploration of issues at the juncture between science and religion. In pursuit of his goal "to bring a new scientific perspective to the age-old question of purpose," Templeton has compiled a collection of ten stimulating essays contributed by a distinguished group of scientists that includes Owen Gingerich, Russell Stannard, Paul Davies, Walter Hearn, Robert John Russell, Arthur Peacocke, John Polkinghorne, John Eccles, Daniel Osmond, and David Wilcox.

Although representing a broad spectrum of theological and philosophical views, these science-religion authorities are all persuaded that the universe bears abundant evidence of design and purpose. Gingerich claims that belief in "deliberate design is an almost intuitive response" and alludes to our sense of the "astonishing cosmic order" in the universe. Hearn notes that our own existence as purposeful actors constitutes evidence of purpose in the universe. Attention is predictably directed toward the anthropic principle and the recognition of the incredibly fine-tuned nature of fundamental constants. "If we have eyes to see it," says Polkinghorne, "the anthropic principle will speak to us of the signs of God's purpose present in the remarkable potentiality with which our universe has been endowed in the basic ground of its physical process."

Davies, noting the success of science in explaining the universe, asks how we can explain science. For him, the "astonishing fact that science works" and that mathematics "works so stunningly well" when applied to the physical world bears evidence of guiding purpose undergirding the universe.

Negatively, the writers dispute assertions that science requires the rejection of a purposeful universe. Several of the writers stress that pronouncements about the ultimacy of purpose or chance transcend the legitimate boundaries of scientific inquiry, a fact that scientific opponents of a purposeful universe have failed to recognize. Gingerich maintains that "random opportunism (as opposed to design) has been raised to such a level of scientific orthodoxy that some of our contemporaries forget that this is just a tactic of science, an assumption, and not a guaranteed principle of reality." Osmond thinks that many scientists are thoroughly unaware of philosophical arguments regarding the existence of a purposing, designing creator. They have, he claims, never examined the "enormous body of historical, textual, legal, and experiential evidence" for Christian belief. He suggests that "belief in Chance says more about the ignorance of the one who believes than about how we got here. Science alone cannot answer all questions at all levels." As a counter to the claim that belief in purpose and design are incompatible with sound science, Gingerich presents Johannes Kepler as an example of a very creative scientist who used belief in purpose as an incentive to produce scientific work of exceptionally high quality.

Although Christian scientists will find much that is useful in the book, one may question if the essays will convince the skeptic. As several of the contributors observe, design arguments derived from current scientific understanding cannot be considered compelling proof for the existence of God, as the debate over the anthropic principle illustrates. As Gingerich suggests, "arguments from design are in the eyes of the beholder." Christians need to be extremely cautious about using current science to argue for purpose and design. Robert John Russell notes that when theologians of the past turned from religious to scientific data for their primary evidence, the result led "to deism, and, eventually to the rise of atheism as a modern phenomenon." And for Christians who think that modern science has established the existence of God, Russell rightly warns us that design arguments beg the question "whether the 'Designer' one gets is worth the effort" and whether such a designer has any real relationship to the Triune God of Scripture.

The book is recommended for those who enjoy the philosophical dimensions of science. There is sufficient insight here for philosophically astute Christian scientists to sharpen their thinking about purpose and design. I suggest, however, that belief in purpose and design is not established at the conclusion of scientific investigation but at its beginning.

*Reviewed by Davis A. Young, Professor of Geology, Calvin College, Grand Rapids, MI 49546.*

**BEYOND RELATIVISM: Science and Human Values** by Roger D. Masters. Dartmouth College: University Press of New England, 1993. 248 pages, index and 77 pages of annotated references. Hardcover.

The thesis of the book is that science has been divorced from values. The author's intention is to "assess this new naturalism, in which science and reason provide the foundation for standards of morality, justice, and sound public policy" (p. 10). The book is in three roughly equal parts: "The Nature of Science," "The Nature of Facts and Values," and "From Fact to Value."

Throughout the book, Masters delivers a call to return to the ancient Greek focus on form rather than reduction to smaller separate problems. "For ancients in the Socratic tradition, as in Euclidean geometry, it is possible to distinguish accurately among 'natural kinds,' and therefore to know — in principle if not always in practice — the nature of a thing" (p. 41). Masters presents chaos theory as another example of the need to focus on form rather than algebraic relationships. By identifying deviations from scientific prediction in neural activity, population genetics, modern physics, chemistry, and cell biology, Masters indicates that a return to form is necessary. The impression is given that science should shed the presumed wisdom of the past twenty centuries and revert to a focus on form.

As a prelude to an attack on relativism, "The Nature of Facts and Values" examines three ways of obtaining knowledge. The first is intuition that contains an element of truth, according to Masters, but is plagued because "humans seek to construct [scientific] explanations or interpretations of their own behavior which can justify it" (p. 55). Masters then shows by example how intuition can lead to knowledge but is dangerous as the sole source of knowledge. Second is empirical verification, which is common to most scientists. Third is pattern matching, which differs from intuition in that the knowledge is scientific, but cannot be reduced to a hypothesis or algorithm for example; recognition of an animal as belonging to one species. Masters links pattern matching with form.

Masters then begins to counter relativism with demonstrations of nonverbal communication among people and animals. Arguing from a variety of sources, he shows that communication is innate and therefore not relative, though nurture and nature are inextricably linked.

Part three of the book, "From Fact to Value," illustrates that "modern scientific knowledge cannot establish the 'ends' or purposes for judging human life" (p. 106). The philosophies of Locke, Kant, and Hume are said to have led to a divorce between scientific knowledge and value judgment. Masters then shows that Locke's theory of knowledge is not congruent with research from neuroscience, and similarly that Kantian metaphysics is inconsistent with recent results from artificial intelligence. Masters concludes that the "desirability of science is either an ungrounded value or derived from the fact that modern physical science is a success ... [neither of which are] an adequate theoretical justification" (p. 114).

The final chapter of the book is a conclusion in which Masters identifies the limitations of science and the need to bring values and a human dimension to science. Masters' answer is to return to "Greek thinkers [who] agreed that nature is the standard for judging human life" with some departure "from their usual or proper condition" (pp. 149-150). "The core of naturalistic values can be stated...[as] those one would choose for a friend...These standards of right and wrong are not rigid...But prudence is needed to balance these different assessments, and some individuals will be more prudent than others" (pp. 154-156).

The book is welcomed for the thorough reply to relativism, particularly through the unique dialogue of philosophy and experimental science. Masters' style does not make light reading and often the ideas are introduced in an implicit manner, making the book rather difficult to digest. Sometimes the arguments are difficult to follow because of the sentence construction and the use of clauses.

The call to return to a more holistic way of approaching science is welcomed, but ASA readers may not agree with Masters' conclusion that "modern science needs to be complemented by, if not subordinated to, the methods and assumptions of ancient science" (p. 46). The end of the essay leaves the impression that Masters has contributed a valuable criticism of "scientific man" but has little idea of how to impart values to science. Perhaps his return to Greek thought has some validity, but the conclusion did not present this as a viable option, at least to this reviewer.

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

**GALILEO, COURTIER: The Practice of Science in the Culture of Absolutism** by Mario Biagioli. Chicago, Illinois: The University of Chicago Press, 1993. xiv, 402 pages, illustrations, references, index. Hardcover; $29.95.

Mario Biagioli is associate professor in the Department of History at the University of California, Los Angeles. In this book, he argues that Galileo's courtly role was integral to his science and career. He wants to present a thesis which sees no sharp distinction between science and society, and sees the court as having a beneficial effect on the development of science. He provides evidence that court culture of early 17th century absolute rulers legitimated the new science by recognizing its practitioners and boosting the status of the new discipline. He also describes the self-fashioning of Galileo to promote himself from a lower socioprofessional rank of mathematician to the grand duke's philosopher and mathematician.

According to Biagioli, this book is neither a biography nor a social history of Galileo's career. He admits that Galileo's work on mechanics cannot be fitted into a courtier's framework, and that court culture was not the only force available to legitimate the new science and cosmology. Biagioli limits this study to the period from Galileo's invention of the telescope and becoming "Philosopher and Chief Mathematician of the Grant Duke of Tuscany" (1609) to his trial before the Vatican court (1633). By 1610, Galileo was already 46 years old and passed his most creative scientific career.

In Chapter One, "Galileo's Self-fashioning," the author describes the background of the patronage system. In this culture, the future for the client was precarious, and he had to retreat to the starting point if his patron died. Chapter Two, "Discoveries and Etiquette," explores Galileo's successful move to court. Chapter Three, "Anatomy of a Court Dispute," continues the analysis of Galileo's scientific activities at the Medici court in Florence, especially about a dispute on buoyancy of bodies in water. Chapter Four, "The Anthropology of Incommensurability," shows that the Copernican theory can shed new light on the Kuhnian view of incommensurability between scientific paradigms. The Intermezzo, "Rome Theatrum Mundi," depicts the cultural and academic environment of Rome and its relationship to the papal court. Chapter Five, "Courtly Comets," offers a contextual analysis of the disputes over the interpretation of the comets of 1618 between Galileo and Jesuit mathematician, Orazio Grassi. Chapter Six, "Framing Galileo's Trial," analyzes the peculiar patronage dynamics and generation cycles of the Roman court, and suggests that the fall of Galileo in the papal court of Urban VIII in 1633 was the result of a clash between the dynamics and tensions of baroque court culture as well as the outcome of a clash between Thomistic theology and modern cosmology. The Epilogue, "From Patronage to Academies: A Hypothesis," argues that an understanding of the process of the court offers important insights about the evolution of the later scientific manners and institutions.

This book provides an interesting interpretation of the Galileo affair in its social and political context. It depicts the scientific discovery as a human event, with flesh, blood, and emotion. Galileo is viewed as a courtier, as well as a scientist seeking for truth. Readers of *Perspectives*, who believe in "The heavens declare the glory of God, and the firmament shows his handiwork," can rejoice in the fact that truth always prevails despite human weakness and frailty. To Christians the task of approaching the unreachable goal of complete knowledge is very fascinating.

*Reviewed by T. Timothy Chen, National Cancer Institute, Bethesda, MD 20892.*

**A DEFENSE OF GALILEO, THE MATHEMATICIAN FROM FLORENCE** by Thomas Campanella. Translated with an introduction and notes by Richard J. Blackwell. Notre Dame, IN: University of Notre Dame Press, 1994. 157 pages, bibliography. Hardcover; $27.95.

The preface mentions that this book was an important book in the Galileo case. However, the English-speaking world paid little or no attention to the book. Campanella wrote the manuscript in 1616 while in prison and it was

published in 1622. Grant McColley's translation of 1937 is thought to be inaccurate.

Blackwell gives us the historical context in the introduction. Campanella had a photographic memory. He quoted many books from memory, often giving chapter and page. Blackwell checked these quotations. If necessary, he corrected them in the notes at the end of the book.

The book is of interest to historians, who are interested in the Church court case against Galileo. Others can use the book as an example of a debate between the established church (faith), and the new interest in astronomy and other physical sciences. In some respects this debate is still going on, even if most people now believe that the earth circles the sun. In our time many still use a reasoning based on Greek thinking to try to smooth perceived difficulties in the Bible. The arguments may change, but not the basics.

The Roman Catholic Church judged the Galileo case, but the theologians in the reformation churches were arguing in the same way. During that time, the Calvinists condemned the Armenians. Their reasoning was not Aristotelian because many were followers of Petrus Ramus. Still, they took propositions out of the Bible and, by logical reasoning, came to reject opponents. They forgot that as humans our logic is imperfect. Have we passed that stage? I do not think so.

*Reviewed by Jan de Koning, Instructor of Mathematics, Box 168, St. Michael's College (University of Toronto), 81 St. Mary Street, Toronto, Ont., M5S 1J4, Canada.*

**IS GOD THE ONLY REALITY?** by John Marks Templeton and Robert Herrmann. New York, NY: Continuum, 1994. 190 pages, references and index. Hardcover; $22.95.

John Marks Templeton, the founder of the Templeton Prize for Progress in Religion, has been described by the New York Times Magazine as "the dean of global investing" and by the late Norman Vincent Peale as the "greatest layman of the Christian Church of our time." Robert L. Herrmann is well known to ASAers as our former executive director and a professor of chemistry at Gordon College. Another book written by these men is *The God Who Would Be Known.*

The expressed goal of this book is to demonstrate how "science points to a deeper meaning of the universe." It reviews some of the latest findings in physics, cosmology, the origins of life, evolution, and anthropology. In each case, we find a greater than expected complexity and less than hoped for simplification of our understanding. In some cases, we find that non-linear systems that are far from equilibrium exhibit an amazing tendency toward self-organization, without apparent limits in their creativity. These are seen to point toward the existence of God and, in at least one case, reflect the character of God. At the conclusion of the book is a call for a more open exchange between science and theology.

If I have any quibble with the book it is this: I normally look to the theology of my faith to help me understand the world I live in. Only after that do I see how the world around me confirms my faith. In a similar way, a flower is an amazing statement about properties of and relationships between its constituent molecules, biological structure, and environment. You could not predict the existence of a flower from looking at the factors which support its existence, but the flower's existence adds to the appreciation of the things which went into it. This book focuses on science, knowledge about the creation, and points out the possible clues to the Creator. Since the book abounds in examples where a higher level of complexity in nature (a flower) could not have been foreseen and understood in terms of the things that support its existence (molecules, cell structures, etc.), I conclude that its authors had a reason for writing the book as they did. I think it is meant to lead a person who normally sees the world in terms of science or naturalism to consider the possibility of yet a higher order of reality.

Since Templeton and Herrmann cover some of the most recent thinking about new findings in science, I found the book useful in bringing my understanding of fields far from my usual scientific disciplines up-to-date and for counteracting claims by some scientists that the self-organizing tendencies we see in nature are proof there is no God. I would recommend the book on that basis alone. However, you may well want to share the book with a colleague who is seeking God but thinks science and nature are the only realities. It is not overtly evangelistic but seems meant to open opportunities for frank discussions about the creator God and the Christian faith.

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**CREATIO EX NIHILO: The Doctrine of "Creation Out of Nothing" in Early Christian Thought** by Gerhard May. Translated by A. S. Worrall. Edinburgh: T&T Clark, 1994. xvi, 197 pages, index. Hardcover.

Ian Barbour, the noted philosopher of science, once asserted that creation out of nothing (*creatio ex nihilo*) is not a biblical concept; it was a "post-biblical development" to defend God's goodness and absolute sovereignty over the world against prevalent gnostic ideas. Thus, while the well-accepted Big Bang theory points us to a Creator and demands the creation of matter, allegedly the Bible doesn't demand this — only that the cosmos somehow depends on God.

Gerhard May, professor of theology at the Johannes Gutenberg Universitat in Mainz, subtly reinforces this idea in his book, which explores the context of the formulation

of *creatio ex nihilo* in early Christianity. May's main thesis—correct in my view — is that the doctrine of creation did not become a matter of debate for Christian theologians until its confrontation with gnosticism and Middle Platonism in the latter part of the second century. Gnostics generally had a negative view of the world, believing it to be the result of a disturbance of the original divine plan by the fall of some Aeon at the bottom of the emanation ladder. Around the middle of the second century, the Christian gnostic Basilides (who believed Jesus was a mere man on whom the heavenly light descended at his baptism) was the first to formulate that God created matter (although in seed form) by a single act of creation (although he played no further role in creation). Then, independent of Basilides' influence, the Christian church came to formulate the doctrine of creation out of nothing in reaction to gnostic emanationism and Platonic pre-existent matter, and to defend the unity and absolute sovereignty of God.

With Tatian, we have the "first Christian theologian known to us who expressly advanced the proposition that matter was produced by God" (p. 150); shortly thereafter, Theophilus of Antioch asserted it more forcefully: "God has created everything out of nothing into being." With Ireneaus, the doctrine of *creatio ex nihilo* was well established.

May's book is in many ways a fine work of scholarship (freely using Latin and Greek primary sources and a wealth of documentation) and gives an excellent history of the formalization of the doctrine of *creatio ex nihilo*. However, I should add that this book can be misleading in two related ways: (1) it asserts that the clear biblical evidence for *creatio ex nihilo* is lacking and (2) it at times implies that since creation out of nothing is a *post*-biblical development, it is *not* biblical in any strict sense.

Regarding the first caveat, May believes that the biblical evidence for creation out of nothing is "not demanded by the text of the Bible," (p. 24) such as Romans 4:17 or Hebrews 11:3. Early on, in fact, the best-educated Christian theologians/philosophers like Justin and Clement of Alexandria seemed to believe that God created from pre-existing matter (e.g., Genesis 1:2). Justin, in fact, claimed that Plato got this ideas on creation from Moses' writings.

We should be careful, however, about attributing ambiguity to the biblical text simply because certain theologians did not overcome a strong Platonist influence on their thinking. F. F. Bruce has written that "the idea of imposing form on pre-existent matter is Greek rather than Hebrew in origin." Genesis 1:1, Old Testament scholar Walter Eichrodt has argued, speaks of "the absolute beginning of the created world;" he considers the doctrine of *creatio ex nihilo* "incontestable." May virtually ignores a key text, Hebrews 11:3, which "denies that the creative universe originated from primal material or anything observable," according to commentator William Lane. In fact, this passage was probably a subtle *response* to Platonic cosmology. A few other passages implying that the totality of creation has had its ontological origination in God are Psalm 33:6, 9; Proverbs 8:22-26; Isaiah 44:6; John 1:3; Colossians 1:16, 20; and Revelation 4:11.

Furthermore, May also completely ignores the implications of *creatio ex nihilo* found in various relevant extra-biblical sources: *Joseph and Aseneth* ("Lord God of the ages, who created all [things] and gave [them] life ... who brought the invisible [things] out into the light ..."); the Dead Sea Scrolls ("From the God of Knowledge comes all that is and shall be. Before ever they existed He established their whole design ..." [1 OS 3.15]); 2 Enoch ("I commanded ... that visible things should come down from invisible" [25:lff; also 26:1]); 2 Baruch ("O thou ... that hast fixed the firmament by thy word ... that hast called from the beginning of the world that which did not yet exist" [21:4]; 2 Maccabees ("God made [the sky and the earth] out of nothing" [7:28]. Although May disagrees, this passage, according to church historian Jaroslav Pelikan, explicitly states for the first time that God created creation out of nothing).

Second, May's subtle implication that *creatio ex nihilo* is merely a theological formulation rather than a biblical one is also troubling. It seems that in many ways, May's argument parallels the historical development of the doctrines of the Trinity and the hypostatic union of Christ—biblically-based doctrines that needed critical development in light of threatening heresy. Many major Christian doctrines have been forged in the fires of heresy and controversy. So we should not be surprised by the same phenomenon taking place with regard to the doctrine of creation.

With these two major caveats in mind, I believe that May's recently-translated book furnishes us with a fine scholarly survey of the development of *creatio ex nihilo*.

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**COPING WITH CONTROVERSY: Conflict, Censorship & Freedom within Christian Circles** by D. Gareth Jones. Dunedin, New Zealand:Vision Publications, 1994. 198 pages. Paperback; $12.00.

Jones, Professor of Anatomy and Structural Biology at the University of Otago in New Zealand, turns his hand in this book to an exposition of biblical principles applicable to Christians involved in areas of conflict and censorship on secondary or peripheral issues of the Christian faith (sometimes called *adiaphora).* Since those involved with the interaction of science and Christian faith often find themselves in situations such as those considered in the book (Jones writes out of personal experience with the responses to and treatment of his book, *Brave New People),* it is an appropriate book for readers of *Perspectives* to be aware of and to profit from in similar circumstances.

Jones asks the fundamental question:

> How do we cope with those Christians with whom we disagree over the role of women in society and in the church, the legitimacy or otherwise of the use of conventional or nuclear weapons as deterrents, economic policies and attitudes toward the poor, the status of the human embryo and fetus, the age of the earth and the role of evolutionary explanations in biology and geology, the necessity or otherwise of tongue speaking or healing as a manifestation of God's blessing, and many other aspects of prophecy, church government, and church affairs (p. iii)?

The response is usually a divisive one: "the easiest path is that of separation and isolation."

The central purpose of this book is to argue against this response as disastrous, "fragmenting the body of Christ and destroying the unity that should be ours in him." Jones does not, in this book, consider the details of the specific issues that give rise to challenges such as this, but instead focuses on the biblical patterns and guidelines for response in general. He is concerned not with the rightness or wrongness of specific attitudes toward any issue, but rather "the ways in which we treat each other within the body of Christ."

He is careful to avoid self-righteousness or dogmatism, and states instead that

> What is crucial is that a conservative stance tends to view any moderately conservative position as liberal, whereas a liberal stance views all moderately liberal positions as conservative. Whenever this approach is adopted confrontation is inevitable (p. 29).

He suggests that neither of the two extreme types of response to many issues, legalism at one end of the spectrum and libertarianism at the other, is an appropriate general response. "I reject this 'either-or' answer; for me, the two approaches, and the two sets of theological truths, are complementary, and both are essential in order to function as a Christian in a secular society" (p. 34).

In the major part of the book, Jones deals with a variety of critical situations and draws guidelines for Christian response from some 90 biblical passages. The topics considered include judging others, forgiveness (God's and ours), unity in the Body of Christ, humility, quarrels and dissension, judgment and rebuke, and being salt and light. Under the heading of living with controversy, he considers the scope of Evangelicalism, public polemic and serious debate, pressure groups, the dangers of dogmatism, freedom of expression, censorship, and mutual interdependence. Under the heading of "Where Should Lines Be Drawn?" he considers "central or peripheral?", single-issue divisions, "Am I making matters too complex?", and knowing where to draw lines.

Finally, in a discussion of "Dilemmas in the Workplace and Beyond," he considers dilemmas between 8:30 am and 5:00 pm, towards a Christian response: the prophet and the servant, when we suffer unjustly, making oneself vulnerable, and in praise of dissent.

The message of the book can be summed up in the value of vulnerability and controlled dissent. Concerning the first, he writes, "Every specific recommendation I've put forward leads to vulnerability — whether this be dialogue, openness, mutual interdependence, accountability, servanthood, refusing to question the motives of our opponents, and praying for those who criticize us. ... it is the *sine qua non* of the Christian life." (p. 188) Concerning the second, he writes, "Throughout this book, I have argued that dissent can be a positive virtue. ... I've strictly limited my discussion to dissent over peripheral beliefs, and not over central tenets of the gospel itself. ... We need to learn that *authoritarianism and suppression are worse than dissent*" (pp. 190, 191).

This is a valuable book for the development of a Christian awareness of the kinds of issues and the responses they generate, which characterize much of living in the modern world. Unfortunately, it is often only a minority position, but with concern and understanding perhaps we can contribute to a change in that.

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

**THE ORIGIN OF THE UNIVERSE AND THE ORIGIN OF RELIGION** by Fred Hoyle. Wakefield, RI: Moyer Bell, 1993. 91 pages. Paperback; $9.95.

"Whenever the word 'origin' is used," Sir Fred Hoyle urges, "disbelieve everything you are told, even if it is I who am telling it"(p. 18). Such a statement does not bode well for the convincingness of a book devoted to the topic of origins. However, Hoyle does seem to thrive on presenting controversial and creative ideas. His book is essentially the transcript of a lecture, which is followed by the brief comments of various respondents. It is thematically divided into two parts, as suggested by the title, but the "origin of the universe" actually refers to the earth's pre-history. (It has no index, footnotes, or bibliography.)

As one reads some of Hoyle's previous works, one is struck by his apparently deliberate attempt to avoid belief in God (such as his positing the steady-state theory of the universe and the continual creation of matter back or an "evolution from space"). This book only adds to that impression. Hoyle's central thesis is that periodic cometary impact with the earth could well have been responsible for the rise of religion and myths as well as a host of other notable phenomena: "The whole of history and civilization has been caused by the arrival of a periodic giant comet in an Earth-crossing orbit some 15,000 years ago" (p. 31).

Hoyle attributes the disappearance of the various ice ages, the extinction of herds of wooly mammoths within moments, and the discovery of smelting to occasional cometary collisions with the earth: something like a comet

could turn the cold ocean into a warm one (p. 29); wooly mammoths perished due to the sudden melting of permafrost, causing them to become immersed in icy water, which refroze within a matter of hours (p. 40); the origin of smelting could best be explained by the heating of veins of metallic ores from a cometary impact, which nomadic tribes began attempting to duplicate (pp. 35-36). Hoyle admits he could be wrong about his cometary hypothesis, but such a phenomenon seems to explain these data.

Hoyle, however, runs into problems with his reductionistic statements about religion. It was a comet that struck Sodom and Gommorah, and it was an earthquake that caused Jericho's walls to fall (p. 40) — not some miraculous act of God. But Hoyle overlooks the fact that it is not the means (a comet or an earthquake) that are significant, but rather the *timing* of these events, which would indicate their having been divinely engineered.

"The bad periods [of human civilization] generated religions," Hoyle claims (p. 48) — bad periods being the times when "no human leader could stand against the power of natural events" (p. 50). The dissolution of a large comet six or seven thousand years ago generated the belief of gods at war (such as Zeus with his lightning bolts), which challenged the power of absolute rulers. The notion of a pantheon of gods eventually led to the return to the dominance of one god like Jehovah, "an angry god" (p. 52). Then, thanks to St. Paul, Christianity sprang up — with all its mythical accretions (p. 53).

Besides merely conjecturing, Hoyle commits the genetic fallacy by attributing the *truth* of religion to its *origin*, but this says nothing at all about whether God exists or not. One respondent noted Hoyle's obvious "prejudice against the Christian tradition as an intellectual tradition" (p. 78), and another pointed out that the "Old Testament God" is slow to anger and plenteous in mercy; not only does he judge, but he saves the nations and punishes the sins of Israel (p. 76). Furthermore, Hoyle says *nothing* at all about the emergence of religions in Asia (pp. 74-75). Did comets give rise to them *too*? He is also unaware of the impossibility of the emergence of myth ("Christianity") within just one generation, as Greco-Roman historian A. N. Sherwin-White has argued.

Although Hoyle acknowledges that science has at times imprisoned itself (pp. 59, 61), he is incorrect to presuppose that science and religion clash (pp. 58-59). As John Polkinghorne has argued, the clash is merely an *historical* one, not a necessary or logical one. He also does not acknowledge the great debt that modern science owes Christianity—a point which Stanley Jaki forcefully argues in *The Savior of Science*.

Speaking from his own experience as a youth in the church, Hoyle came to believe that Christians embraced the contradictions of "Christian miracles" as well as those of "behaviour and psychology" (p. 42); Hoyle wanted a life free from contradiction, which affects clear thinking. Yet Hoyle himself seems unwilling to admit to the universe's theistic implications: "How such a structured world came into being remains unexplained" (p. 18); "There are very many aspects of the universe where you have either to say there have been monstrous coincidences ... or, alternatively, there is a purposive scenario to which the universe conforms" (p. 83). Disappointingly, Hoyle says nothing about the *universe's* actual origin — a phenomenon which resounds with theistic implications — and also opts for the dubious and conjectural Anthropic principle (p. 31).

Hoyle's book is provocative and creative, and his ideas about the impact of comets on the earth's atmosphere are not necessarily far-fetched. His discussion of religion's origins, however, tend to be wildly speculative, unhistorical, and unsubstantiated.

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**SCIENCE IN THE NEW AGE: The Paranormal and its Defenders and Debunkers, and American Culture** by David J. Hess. Madison, WI: The University of Wisconsin Press, 1993. 176 pages, appendix, notes, bibliography, index. Hardcover; $42.50; Paperback; $17.95.

This is not a book about science and Christianity or even about science and religion. Hess, an Associate Professor of Cultural Anthropology in the Department of Science and Technology Studies at the Rensselaer Polytechnic Institute, makes this clear when he writes:

> In a society that is increasingly characterized by a diversity of ethnic and gender perspectives, the white male Judeo-Christian God not to mention most of the biblical narrative appears less and less as the universal truth and more and more as the gendered story of a segment of a particular cultural tradition (pp. 175, 176).

The book is written for professionals in a particular segment of academic studies. In the words of the author: "I write primarily for other scholars situated at the intersection of disciplines known as 'cultural studies': anthropology, literary studies, cultural history, the sociology of knowledge, and other related fields" (p. x). In brief, it is not a major concern or even desire of the author to penetrate and reveal "the truth," but rather to understand, empathize with, and reflect on the ideas and backgrounds of those who may think differently from one another. "I do not presume," he writes, "to judge one or the other view point as the most 'truthful': instead my fragmented and contradictory experiences have led to a personal position of reflexive skepticism that is a skepticism that is skepticism of its own skepticism" (p. xi).

The author focuses on three groups of advocates: the New Age at one extreme, skeptics at the other extreme, and those involved in the paranormal in between. He seeks to show the similarities in general outlook that embrace all three groups, as each is caught up in the defense of the "Self" against the attacks of the "Other."

The favorable comments on the book jacket also help to clarify the structure and focus of the work. Reviewer Gary Downey of Virginia Tech writes:

> Hess helps us realize that, by reconstructing scientific knowledge in new contexts, we all do science. From this perspective, a book on New Age science is no longer a book about pseudoscience or the peripheries of the scientific community. It is a book about how people construct discourses about science to make it meaningful in their lives.

As much as anything else the book unintentionally illustrates the pitfalls in forsaking experience-honored definitions of authentic science. At a certain point, the author bemoans the observation that all three of the communities he has chosen to describe take as "their representation of 'science'...'natural science.' ... Rarely does 'science' ever include or mean the social sciences or humanities" (p. 158). By the "human sciences" he means "anthropology, history, sociology, literary/cultural studies, feminist studies, and science and technology studies." If we work with as weak and indefinite a definition of science as this, we might as well forsake at the beginning any claim that science has the power to guide us into an insight into the nature of objective truth. We find ourselves ensnared in the intellectual exercise recommended by the author in another place: "Instead of attempting to settle truth claims, they (Collins and Pinch) view and represent their work as 'that of the participant observer building up the background for good sociological fieldwork.'"

I am sure that the properly equipped and oriented reader could gain considerable useful information and insights from this book as an anthropological study of three modes of thought in modern society. Readers of *Perspectives*, however, will not find it a useful source of insights about the interaction between authentic science and authentic Christian theology.

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**NOT A CHANCE** by R. C. Sproul. Grand Rapids, MI: Baker Books. 1994. 214 pages, bibliography, index. Hardcover; $15.99.

Sproul is Professor of Theology at Reformed Theological Seminary in Orlando, Florida. Many (myself included) know him through his extensive audio and video cassette ministry. He has a well-deserved reputation as an outstanding educator and Christian apologist, not only at the seminary level but also for the laity through his tape ministry. He is the author of many books, including one entitled *Classical Apologetics*, which he wrote with John Gerstner and Arthur Lindsley.

*Not A Chance* is an apologetic book aimed at showing the rationality of belief in a Creator/God. Sproul interacts with many great thinkers of the past and present in his effort to demonstrate the reasonableness of God's existence. His main opponent is the modern scientist who affirms that the universe came into being through chance. He demonstrates the absurdity of attributing causality to chance by showing that "chance" cannot create or do anything since it lacks being. Chance refers to mathematical probabilities. It is "a formal word with no material content," and thus incapable of action. Both in the book and in his lectures on this theme Sproul likes to say, "What are the chances that chance can do anything? Not a chance" (p. 6).

Sproul makes use of the cosmological argument in seeking to demonstrate the reasonableness of theism. He reduces it to a simple but helpful form, arguing that if anything exists now, something exists necessarily. Something, somewhere, has the power of being within itself: He helps us to see clearly our choices before us. Either the universe came into being from nothing (this, for Sproul, is a logical absurdity), or matter and energy are eternal and have the power of being within themselves, or God exists and he is an eternal being who has the power of being within himself. There seem to be no other viable options, and of course for Sproul the existence of the eternal God is the most rational option.

Sproul is not a scientist and his scientific discussions are at a more popular level. I believe clergy and laity who struggle with the issue of origins would have their thinking clarified by this book.

While I am a great admirer of Sproul and therefore reluctant to criticize him, I raise two theological concerns. First, when Christians try to "prove" God's existence through reason, I believe a fundamental error is committed. In order for reason to prove God, it would have to be equal to or superior to God. Reason can and must be used in our human effort to understand the material world, and it is useful to reinforce faith in God established on another ground — namely, revelation. However, once you grant to fallible human reason the power to "prove" God, since reason is admitted to be fallible by all, how can you argue against the person who responds by saying, "It is well and good that your human reason leads you to God. Mine does not."? The reality of God does not ultimately rest on the flimsy base of human reason.

Furthermore, the Christian is not seeking to move others to belief in "god in general," but in God the Father revealed in Jesus Christ. One might be persuaded by the cosmological argument but then conclude, "God is Allah, or Vishnu, or Thor." Reason alone cannot extricate us from this trap. I don't see how we can escape the fact that Christianity rests on revelation. Revelation is not inimical to reason but unaided reason lacks the power to "discover" God. While I realize Sproul would agree concerning the central importance of revelation in establishing the Christian truth claims, yet in his book he is arguing from reason to God with little mention of revelation. It seems to me in a book which seeks to persuade the reader to affirm the reality of God, something should have been said about the fact that our faith rests in the God who reveals himself in Christ, and who then becomes for us the ground of reason and science.

I do think this would be an excellent book to place in the hands of a college student who is being taught that reason and science are king of the hill. Sproul does a good job of humbling those who give too much credence to the powers of the human mind.

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**NATURE'S WEB: Rethinking Our Place On Earth** by Peter Marshall. Paragon House, June 1994. 513 pages, references and index. Hardcover; $29.95.

Peter Marshall, who has a doctorate in the history of ideas, has taught philosophy and literature at several British universities. His previous books include *William Goodwin, Journey Through Tanzania Into Cuba, Cuba Libre: Breaking the Chains?, William Blake: Visionary Anarchist, and Demanding the Impossible: A History of Anarchism.* He lives in Gwynned, Wales.

I cannot recommend this book to readers of *Perspectives* as either scientific or Christian. It is a review of the philosophy of ecological and environmental ethics written by a person having largely Taoist beliefs.

Written in four sections, its style is to explain a religion or philosophy that has some bearing on environmental issues and then point out those aspects of its beliefs which are either helpful or unhelpful to ecological thinking.

The first section deals with religions. We find out right away that pantheism and animism are conducive to ecological thinking because they promote a holistic and harmonious viewpoint where man is embedded in nature, whereas monotheism is not because of its anthropocentric, sexist, and speciesist viewpoints. Similarly, anarchism, as a Taoist ideal, is to be preferred over hierarchical social structures because it is unfitting that one being should dominate another.

The book's second section traces the histories of a number of philosophies while its third, entitled "Green Visions," emphasizes fairly recent thinking about evolution, utopian visions, chaos, Gaia, etc. Throughout the middle of the book, I had the feeling that Marshall was hauling out a lot of trendy environmental thinking which he was going to try to synthesize into some absurd philosophy, but I was wrong. Marshall consistently judges each of the beliefs from his Taoist viewpoint and is quite frank about the failure of particular beliefs which one might have otherwise expected him to endorse.

A couple of avant-garde environmental ethics discussed in the fourth section come under the same scrutiny as the rest. In the final chapter, Marshall discussed his own version of an ecological utopia (ecotopia) which again draws heavily on his Taoist beliefs. His ecotopia is communal but allows for individualistic behavior. Group decisions, when really necessary, are arrived at democratically. Individuals are invited, but not coerced, to follow the decisions of the group. The same respect for the rights of the individual extends naturally to other entities which make up the environment.

Marshall puts the blame for the ecological crisis on "institutionalization of domination and hierarchy and the authoritarian mentality which sustains it" rather than on "inappropriate technology, overpopulation or industrial growth." Given that, I can see why he rejects monotheism since it assumes a hierarchy of at least two at the outset. What is interesting is that C. S. Lewis in his space trilogy has a remarkably similar vision of a utopian society: Malacandra, where three intelligent non-human corporeal species live peaceably, respectful of each other and their environment, in a world of diminishing resources. The differences are that Lewis' utopian society is theocratic and unaffected by the Fall.

While I wouldn't recommend this book for its scientific or Christian insights, I could recommend it to anyone who would like to peer into the mind of the environmental movement. Read it with an understanding of Marshall's own mindset and you should find the book informative, well written, and not too threatening.

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**THE BROKEN DICE, AND OTHER MATHEMATICAL TALES OF CHANCE** by Ivar Ekeland. Chicago and London: University of Chicago Press, 1993. 193 pages. Originally published as *Au hasard,* Paris: Editions du Seuil, 1991. Translated by Carol Volk.

Ivar Ekeland wrote this book to show his readers the richness of the many faces of chance. He begins by showing chance to be fundamental to our conception of the universe. It is the one certain thing (!) because "in quantum mechanics, to measure means to draw at random." Of course, this leads to a question about who is doing the drawing. It also leads to a consideration of fate: are the events we observe determined? Even if we assume they are not, we are not left without some kind of discernible pattern: "We can't get away from determinism. Chase it out the door, by postulating total incoherence, and it comes back through the window, in the guise of statistical laws."

These patterns are, in fact, discerned in the universe, not imposed upon it. Mathematicians "have more a sense of penetrating nature's secrets, of drawing eternal truths from the conglomeration of incomprehensible matter, than of crafting humble, homemade objects." This observation is consistent with the experience of many: there does seem to be a "givenness" to the abstractions with which we deal.

Yet we find that these patterns are not enough to let us reliably predict or anticipate many things about our lives. If there is someone who does the quantum mechanical drawing, "we are engaged in a game against a Player whose greatest feat is in dissimulating not only his strategy but his existence and what he expects of us." Even in our analysis of systems we understand — have models for — we are unable to isolate subsystems that effect particular events and thus we may leave out important factors in our analysis. So we see apparently chaotic behavior, with high degrees of sensitivity to small perturbations that might appear meaningless to observers.

Often we are driven to statistical models to make sense of what happens around us. These cannot prove anything, but can give criteria for falsification. By assuming that events with "too slight a probability" do not happen, we can live and make decisions in an uncertain world. "Until now, experience hasn't proven us wrong, but who knows what the future may bring." This seems a reasonable and even necessary view. But how do we hold this very realistic belief in tension with an openness to a broader reality than we now conceive of — an openness to our assessment of probabilities being incorrect? How should we think, for example, about the resurrection of Jesus? What event could have a slighter probability than the resurrection from death and continuous subsequent life of one man? Could any evidence be accepted as convincing for events of *a priori* "too slight a probability?" If observers in the past cannot be trusted by us, could we be trusted by those who come after us? Or could it be that there is some patterning in the universe that derives from a creative mind behind it, which provides the explanation for some of what we observe?

In his conclusion, Ekeland sees ultimate reality as retreating the closer we come to it, but affirms a desire to see a unifying principle that goes beyond chance. "Then beauty will be our guide." At first this might seem a large step beyond a dependence on chance. But it is an unsatisfying affirmation of an undefined principle. What is beauty? How will we make judgments about it? Why do we believe it to be a good metric?

This book can be recommended as a stimulus for meditating about the patterns observable in the world in which the creator has placed us. It is a tribute both to the author and to the translator. But those who affirm the statement of faith of the American Scientific Affiliation cannot be satisfied with the path of "ascent" that Ekeland takes to integrate the raw data of experience into a model to use as a basis for living.

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**HEALTH AND MEDICINE IN THE EVANGELICAL TRADITION: Not by Might nor Power** by Leonard I. Sweet. Valley Forge, PA: Trinity Press International, 1994. 242 pages, index. Hardcover; $20.00.

The book would be more accurately titled, *Health and Medicine in 19th Century Wesleyan Preaching*. In that it succeeds quite well. The author states in his preface that "this book is really a greeting card to my ancestors in the form of a report card on how well I have mastered what they have taught me." As such Sweet refers regularly to his own upbringing, the preachers in his ancestry, and his own Methodist tradition. In fact the text is best described as an exposition of anecdotes and quotations from Wesleyan preachers in the 19th century on topics related to physical health. Even the style of organization and description is sermonic in its cadence. Such interest and style fits with Sweet's work as the publisher of a journal for preachers and as chancellor of a United Methodist seminary.

The book's strength in 19th century Wesleyan preaching is its weakness in meeting the apparent claim of the title. It is not a comprehensive or rigorous introduction to the thought of evangelicals on health. The frequent statements that evangelicals believe or read or use reflect a particular time and subgroup — not the movement as a whole nor sometimes even the majority. For example, Sweet states that evangelicals often cry in worship. Certainly some do, but I am skeptical whether that is an identifying feature of the wider movement.

There are many points of interest. It can be useful to know that the health and wealth gospel was a problematic influence in the 1800s, not just a recent invention. Some may be surprised to find that a dance was held in honor of Jonathan Edward's ordination or that a major issue for churches in the 1800s was how to address the new germ theory while saving the meaning of the common communion cup.

Evangelicals have a wide and rich history to their tapestry. Sweet offers an evocative window into the past preaching on health found in one important strand.

*Reviewed by James C. Peterson, C. C. Dickson Chair of Ethics, Wingate College, Wingate, NC 28174.*

**EVERYBODY DOES IT! CRIME BY THE PUBLIC** by Thomas Gabor. Toronto: University of Toronto Press, 1994. 378 pages.

Although it is comfortable to think that some persons are criminals ("them") and others are not ("us"), this study argues that criminality is prevalent: the majority of citizens tend to break rules when they feel there is a fair amount of support for doing so. A large body of literature and research is summarized in support of the argument that rather than most crime being carried out by the criminal

stereotypically described to the public by the media, most citizens can be dishonest under the appropriate circumstances. If we will all break the law, then it is important to focus on why we have this potential, and what circumstances or conditions lead to the realization of it.

The author further argues that dishonesty can be contagious, so forms of dishonesty at the borderline of the criminal are pertinent to the discussion of crimes by the public. In particular, it is important for society that its leaders have high standards of conduct. The failure of leaders in many spheres, and the scandals associated with these failures, are important in shaping the thinking of the larger social group about crime and morality. We cannot expect our human leaders to have a superhuman morality, but continuous exposure to scandals can lead citizens to believe that deception, power, and political influence, rather than morality, are the key ingredients to achieving status and material success.

The book includes discussion of corporate crime, theft, violence, sexual crimes, and other categories. The author may go further than some readers would want to go with him, though, with his identification of some examples of widespread behavior that should be avoided, including corporal punishment of children and the use of animals in laboratory experiments.

The author goes on to develop a predictive model. In this model, the degree of readiness to commit crime is combined with situational or instigating factors which give rise to a decision to commit a crime. The model can be used to predict in which situations crimes are most likely to occur, in order that these situations might be changed to make them less conducive to crime.

One of the important approaches suggested is to involve citizens in plans for crime prevention and in accountability mechanisms, rather than relying on professional enforcers who are often perceived as adversaries at a distance.

The goal of the book is laudable, and both the main argument and the goal are certainly consistent with traditional Christian teaching about the sinful propensity in persons, although that teaching is given an extremely brief discussion and dismissal in the book. In fact, for those who believe with the Apostle Paul that we all have sinned, and that we continue to struggle with the problem of sin, the main argument cannot be a surprise. All people have the potential to commit crime or sin, under appropriate circumstances, and need to avoid the circumstances that are particularly tempting. A sober recognition that "everybody does it" can help society in dealing with crime even if, as is the case with the author of this book on the one hand and readers of this journal on the other, we do not all see the problem in the same terms. Those of us who see the problem in specifically Christian terms will want to go further, as the church has always done, in dealing with the moral realities and the root causes of immoral or criminal behavior.

*Reviewed by David T. Barnard; Department of Computing and Information Science, Queen's University, Kingston.*

**SCIENCE, TECHNOLOGY, AND RELIGIOUS IDEAS** by Mark H. Shale and George W. Shields, Eds. Lanham, MD: University Press of America, 1994. 244 pages. Paperback; $24.00.

The Institute for Liberal Studies at Kentucky State University sponsors an annual conference on "Science, Technology, and Religious Ideas." The editors have selected nine papers from three conferences, with emphasis on plenary speakers and members of their own faculty. The official theme in 1990 was "The Nature of Science, Technology, and Religion," in 1991, "Recent Physics and the Design Argument," and in 1992, "The History of Science-Religion Interaction." The last forty-eight pages of the book comprise a list of abstract proposals for other papers that were presented at the conferences as well. The abstract titles range from "Philosophy and the Techno-thriller" to "The Ethical Implications of the Common Heritage Principle for the Commercialization of Outer Space."

The book's essays and abstracts are so varied in method, interest, depth, and success that little can be said that would be true of the anthology in general. Where the collection could be of most use would be in orienting future participants to the kinds of topics and approaches that have been pursued at the conference before. I am glad to see such a gathering taking place at an intersection of interest to ASAers, and found among the abstracts, authors such as our own John W. Haas, Jr. and William B. Hurlbut. They (and I suspect other ASA members as well) could pass on first hand evaluation of the conference dialogue for those considering taking part in the future.

*Reviewed by James C. Peterson, C. C. Dickson Chair of Ethics, Wingate College, Wingate, NC 28174.*

**WHY SHOULD ANYONE BELIEVE *ANYTHING AT ALL?*** by James W. Sire. Downers Grove, Ill.: InterVarsity Press, 1994. 239 pages. Paperback.

Growing out of a college lecture entitled "Is Christianity Rational?," Sire's latest book takes the reader through an examination of why and how people believe in general, to why people believe in Christianity. From the title question, "Why should anyone believe *anything at all?*" to the closing sentence of the book, "Come and see," Sire hopes that the reader will not only have good reasons to believe, but also find the best thing — or rather, person — in which to believe.

He divides the book into two parts: Part I, "Why Should Anyone Believe Anything?" and Part II, "Why Should Anyone Believe Christianity?" Writing in a conversational prose that belies the sophistication of his analysis, Sire uses the universal question that man poses about the world— belief or unbelief? — to point to an answer to the specific question that *God* poses to man — "Who do you say that I am?" Culling from his experience as an

evangelical campus lecturer, Sire orders the chapters so as to lead the reader through a series of notions, or first approximations, of how people adopt their beliefs. Through successive refutations, clarifications, and affirmations of various reasons people give for their beliefs, he develops a layman's epistemology for belief: to wit, "any argument for our beliefs should (1) be based on the best evidence, (2) be validly argued, and (3) refute the strongest objections that can be made." This prepares the reader for Sire's real concern, presented in Part II: the gospel as "*the* one thing needful," i.e., the one thing in which a person should believe.

Part I, six chapters prefaced by epigrams comprising the responses of college students to the question posed in the title of the book, examines various reasons people give for their beliefs. Sire distinguishes social influences, i.e., parents, friends, or society, from individual considerations, i.e., personal experience and information individuals reflect upon to form their beliefs. He also examines religious reasons (e.g., authoritative divines and texts and spiritual experience) and philosophical reasons (e.g., reason and logic) for belief, concluding that personal — even religious — experience is not enough to establish a reasonable basis for belief. Instead, "the fittingness of all the data and reasonable arguments that confront us should...carry the most weight." For Sire, "truth is the real issue" (recall Pilate's last question to Jesus). He asks, "Why should anyone believe anything at all? — when the 'anything' is a fundamental notion — is not a question to be answered lightly. Too much is at stake."

Part II (nine chapters) addresses the reasonableness of biblical faith by proposing that "the identity of Jesus, the historicity of the Gospels, the foundation for morality, the possibility of miracles and the actuality of at least one (the resurrection of Jesus), and the experience of Christian believers" can be best explained by Christian faith. True to his evangelical purpose (and no small virtue of his book), Sire incudes "the experience of Christian believers" as a legitimate part of the search for belief. Part II asks, "Why Should Anyone Believe in Christianity?" Sire answers that Christianity offers the "best explanation" of "some of the most basic issues," and therefore deserves serious consideration by the non-believing reader.

Since Jesus *ecce homo* — is the answer to the book's real question (Why believe in Christianity?), Sire examines the reliability of the New Testament accounts of Jesus' life to establish their credibility. The chapters deal with the reliability of the texts, their authors' "memories" and "motivations," their translations, miraculous accounts, and apparent contradictions. Sire then presents in the central chapter of the book (entitled "Jesus the Reason") "the outlines of a portrait of Jesus." This begs a discussion of the life and purpose of Jesus detailed in the balance of the book. Of the remaining chapters, chapter 11 (the central chapter of Part II) highlights the resurrection of Jesus as "at the top of the list of reasons for accepting Christianity as true;" it dispels alternate explanations of the disappearance of Jesus and offers reasons for believing in the resurrection. The historical fact of the resurrection of Jesus serves as the answer Sire gives for any sound belief: it "gives the best explanation for the tough issues of life."

As senior editor of InterVarsity Press, the publishing arm of InterVarsity Christian Fellowship, Sire has ample experience writing for an evangelical college audience (*The Universe Next Door*, now in its second edition, defended "Christian theism" against the claims of other world view "-isms"). His latest work addresses the concerns of college students of all persuasions in a manner that is neither pedantic nor condescending — quite a feat given the abstruseness of his topic. Sire presents a number of scholarly assessments of "belief" in a manner that is quite readable and generally persuasive. ASA members interested in exploring a philosophical apologetics of the faith will find the variety of scholars and sources cited make for an engaging and challenging read. Those desiring additional information on a specific issue raised, be it epistemology or the authenticity of the New Testament, will find that the footnotes and bibliography point them in the right direction. Moreover, his didactic presentation of the gospel in the context of a philosophical discussion of belief versus unbelief treats the reader seriously but sympathetically. In the final chapter, entitled "The Challenge of Belief," Sire does just that, challenging the reader to consider the claims of Christianity as a reasonable basis for thinking and living.

One point of contention: This reader finds Sire's defense of Christian ethics as based upon a "presupposition" — which Francis Schaeffer aptly defined as "a belief or theory which is *assumed* before the next step in logic is developed" (emphasis mine) — comes closer to nihilism than realism (despite claims to the contrary). His error follows from an insufficient exploration of the "fact-value" distinction, which he presents earlier in the same chapter. His rejection of the power of human reason in concert with the senses to grasp reality qua reality, a rejection hinted at in the preface ("We are both finite and fallen, and our mental equipment is flawed") and insufficiently defended in chapter 12 ("The Rationality of the Christian Faith"), poses problems for a book devoted to a *rational* defense of Christianity. This quibble notwithstanding, Sire's overall project provides sufficient grist for the skeptic and Christian in their respective search for reasonable belief.

As the American university has fallen captive to moral relativists (both in thought and character), Sire has seized the timely subject of "believing" as a logical starting point for getting non-believing college students to consider the claims of Christianity. He informs the Christian college student — who faces perhaps the most trying environment of his spiritual life (if attending a secular university) — and the non-Christian roommate — who will borrow the book when he's not looking — through a carefully reasoned, evangelical discussion that should lead any reader to a more honest and credible approach to a life of believing.

*Reviewed by Lucas E. Morel, Assistant Professor of Political Science and History, John Brown University, Siloam Springs, AR 72761.*

**FUZZY THINKING: The New Science of Fuzzy Logic** by Bart Kosko. New York, NY: Hyperion, 1993. xvii, 318 pages, glossary, bibliography, index. Paperback; U.S. $12.95; Can. $15.95.

Kosko wrote several articles on fuzzy sets and two textbooks: *Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence* and *Neural Networks for Signal Processing*, both Prentice Hall, 1992. The book under review is autobiographical, though Kosko is still young. He tells about his research, his difficulties, how he got his ideas, and the people he met. When I read that marketing may have been involved when Zadeh chose the name "fuzzy sets," I thought that Kosko does a good job of marketing himself (p. 148). In the Preface we read:

> This book is my statement of the fuzzy world view. ...The point was to show the fuzzy world view in the mind and in the flesh. To do that you have to have lived the field and fought the fights. You have to have doubted the God of science and felt a little of Her wrath.

That world view made him write on page 142: "Better to rule in hell than serve in heaven."

Kosko felt attracted to Eastern ways of thinking because they do not accept the law of the excluded middle. He does, however, mention "westerners" like Kleene and Lukasiewicz, who propagated multivalued logic. Even before Lukasiewicz wrote his book in 1910, Brouwer wrote his objections against the law of the excluded middle in Dutch in 1907, and in English in the Bulletin of the American Mathematical Society in 1913. Brouwer is considered to have started the Intuitionism school. Heyting wrote a formal treatment of Intuitionism in 1955: *Intuitionism, An Introduction*, republished in 1971. E. W. Beth writes, *The Foundations of Mathematics, A Study in the Philosophy of Science*, Harper Torch, 1966, p. 413:

> One of the most spectacular features in Brouwer's Intuitionism is, of course, his rejection of the unrestricted application of the principle of the excluded third in mathematical reasoning.

Although Kosko mentions Kleene and Lukasiewicz, he does not mention them in his bibliography. Neither is the book, *Philosophical Problems of Many-Valued Logic* by A. A. Zinov'ev in his bibliography. Kosko lists Nicholas Rescher's book *Many-Valued Logic* but misspells his name as Resher. Peirce's name is misspelled as Pierce in the text, and Lukasiewicz as Lucasiewicz.

In 1932 D. H. Th. Vollenhoven published, in Dutch, *De Noodzakelijkheid eener Christelijke Logica* (The Necessity of a Christian Logic). He showed how the law of the excluded middle was based on ancient, pagan Greek philosophy. Vollenhoven objected to the law because it is only applicable under certain conditions. Mathematics and logic are different disciplines. Mathematics uses logic, but is not based on logic, nor logic on mathematics. Vollenhoven based this conviction on his Christian principles. Not accepting the law of the excluded middle is certainly not based on Eastern religions. My mathematics professor Koksma used the same example as Kosko in a public lecture in 1948: "not warm" does not equal "cold" (see *Interfacultaire Colleges*, published by the Free University in Amsterdam).

Kosko's faith is clearly anti-Christian. On page 253 Kosko tells us that he signed up to be frozen. He hopes to live again several hundreds years from now — man-made eternal life. He writes about cryonics on page 288:

> In the 1980's the rise of nanotechnology showed how cryonics might work. Thaw a dead brain and then rebuild it a molecule at a time with tiny nano-robots or nanobots. As of 1993 there were over 30 patients in cryonic suspension. Most have only suspended their brains. The idea is that if nanotechnology can repair freezing damage and rejuvenate the dead brain, it can grow a lean young body from the head stump too.

Kosko's rejection of alternate scientific views is not very gentle. His is the optimism of Eternal Man who can engineer everything.

In his propaganda for the fuzzy set-theory, I think he contradicts himself. For example, when he talks about an adaptive fuzzy system, he claims that no human expert has to tell what the rules are. That is not even true for the human brain, since errors are made as long as we are still living under the effects of the Fall. Any machine has to be given rules on how to find rules and relationships. Kosko probably exaggerates the controversies between the artificial intelligence people and the "neural-network" scientists.

Despite my criticism I recommend reading the book. The book is easy to read as an introduction to multivalued logic. Secondly, it is an example of modern man trying to save himself from eternal destruction.

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**KEEP THE FIRE: Approaching Your Senior Years with Perspective and Passion** by Don Anderson. Sisters, OR: Questar Publishers, 1994. 288 pages. Paperback.

This is a book for those who want their senior years to be full of health, passion, financial stability, joy, and service. These are some of the topics in this 14 chapter discussion of what it means to be a senior adult and how to live through this potentially most successful part of life. The book is full of trenchant quotes, insightful anecdotes, and relevant scriptures. The author knows whereof he speaks since he is now experiencing some of the joys and trials he describes. It is an easy, even entertaining read, and it will inspire and motivate. Written by a Christian for Christians, this book will be mind-opening for anyone old enough to think about getting older.

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

# Letter

## Misunderstanding the Conflict Between Science and Christianity

With few exceptions, the consensus among appropriately qualified life scientists is that all living things have originated from simple beginnings through evolutionary processes. Others, such as Clark (1994) and Settanni (1992) before him, taking inspiration from Thomas Kuhn, think that the main reason for this consensus is not the force of the evidence but the presuppositions of the scientists. Clark believes that this leads to conflict between science and Christianity and in particular between naturalistic evolution and biblical creation.

Now Kuhn alerted philosophers to the influence of extrascientific factors such as social climate on scientific theories. This was a valuable service. There is no question now that such factors do shape scientific theories. The question is over specifics and extent. Many philosophers feel that Kuhn exaggerated the importance of these factors. Indeed criticism of Kuhn's ideas has been a favorite pastime for a generation of philosophers of science (Ruse 1989:62). Feyerebend (1981:160) finds no period of normal science in the history of thought. Ruse (1989:62) finds that the Darwinian and Geological revolutions were not Kuhnian in important respects.

Kuhn gave us important insights, but Clark takes them too far. He writes: "history plainly records that Darwin's theory of evolution was not a discovery made from observing nature, but a preconceived and prevalent idea (philosophy?) brought to his observations of nature." Earlier Clark said science is "inextricably ... *interdependent* upon ... philosophical presuppositions" (emphasis mine). Now he claims a one-way street from presuppositions to science. He is in error, not knowing Darwin nor his willingness to alter his preconceptions in the face of the evidence.

Naturalistic evolution does not begin to describe Darwin's presuppositions. While Darwin was ambivalent about religion, there can be little doubt that his science was positively influenced by natural theology (see Durant 1985). Darwin admitted being quite orthodox while on board the Beagle and recounts being laughed at by several of the officers for quoting the Bible (Darwin 1902:58). If Darwin began with evolutionary leanings, he also began with creationist ones. Towards the end of the Beagle voyage we find him trying to accommodate the biogeographical data to a creation by postulating more than one Creator. He backtracks after marveling at how the Lion-Ant is contrived:

> "The one hand [of the Creator] has surely worked throughout the universe" (Barlow 1934:383). This example shows that Darwin was not aware of the full evolutionary significance of his observations and that he was able to consider modifying theistic (not naturalistic) presuppositions in light of the data. I think this is enough show that Clark's one way street from evolutionary naturalism to Darwin's observations does not fit the evidence.

Clark asks "Can an unreserved belief in naturalism exert a blinding effect upon a scientist as he interprets the physical world he observes?" One could also ask "Can an unreserved rejection of evolution exert a blinding effect on a person as he interprets what scientists have said?" Consider how Clark handles the writings of the paleontologist Raup:

> Raup believes that it is not true "that the fossil record supplies virtually incontrovertible evidence for the truth of the theory of evolution." At least that is what Raup is made out to believe. This is surprising since his article is in a collection written with the express purpose of confronting creationism. If this was not enough, Raup says at the outset "As I will show here, the rocks and the fossils say YES to evolution" (emphasis his).

With all these clues to Raup's intent how could Clark have missed it? First, Clark mistook difficulties for Darwinian gradualism as difficulties for evolution (he saw what he wanted to see). There is a *relative lack* not *absence* of transitional forms in the fossil record. Second, he missed the two pages (pp. 156-158) Raup devoted to showing why this lack is not a problem for evolution (Clark did not see what he did not want to see). Perhaps Clark is afflicted with the blindness he "sees" in others.

We all have preconceptions. Must we be blinded by them? No. Look.

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Founded in 1941 out of a concern for the relationship between science and Christian faith, the American Scientific Affiliation is an association of men and women who have made a personal commitment of themselves and their lives to Jesus Christ as Lord and Savior, and who have made a personal commitment of themselves and their lives to a scientific description of the world. The purpose of the Affiliation is to explore any and every area relating Christian faith and science. *Perspectives* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community.



## Canadian Scientific & Christian Affiliation

A closely affiliated organization, the Canadian Scientific and Christian Affiliation, was formed in 1973 with a distinctively Canadian orientation. The CSCA and the ASA share publications (*Perspectives on Science and Christian Faith* and the *ASA/CSCA Newsletter*). The CSCA subscribes to the same statement of faith as the ASA, and has the same general structure; however, it has its own governing body with a separate annual meeting in Canada.



## Local Sections

of the ASA and the CSCA have been organized to hold meetings and provide an interchange of ideas at the regional level. Membership application forms, publications, and other information may be obtained by writing to: American Scientific Affiliation, P.O. Box 668, Ipswich, MA 01938-0668, USA or Canadian Scientific & Christian Affiliation, P.O. Box 386, Fergus, ONT N1M 3E2, CANADA.

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