EDITORIAL

DOES RELIGION ALWAYS LOSE?

A common debating tactic, and a successful one in the eyes of many, is to say that whenever religion and science have a dispute about some question of fact, religion always loses.[1] The implication is that religion should never make any factual claims, and it is even implied that religion has no contact with reality. Supporting evidence for this claim is said to include the physics of Galileo, the geology of Hutton and Lyell, the biology of Darwin, and the psychology of Freud and others. Religion, especially supernatural religion, has always lost in the past, and it will always lose in the future. We should either abandon it or at least adopt a liberal version that makes no testable claims.

There are several problems with the above scenario. First, strictly speaking, the disputes were not really between science and religion; there were scientists on the "religion" side, and theologians on the "science" side. It would be more proper to make the claim that the argument was between naturalistic and supernaturalistic philosophies.

If so, the Galileo affair does not really belong with the other examples. The Galileo affair resulted from the reaction of the Catholic Church, which had just been rocked by the Protestant Reformation, to the cosmology of Copernicus. The only issues which might impact the conflict between naturalistic and supernaturalistic philosophy were whether incidental details in the Bible were to be treated as ontologically (really) accurate, or merely phenomenologically (only describing appearances) accurate, and the authority of the Catholic Church. As far as I know, it does not even involve the authority of the Pope speaking ex cathedra, as I know of no such pronouncement of the Pope on the Galileo affair.

It could be (and has been) argued that the other "advances" listed above were not really advances. Certainly a creationist will not find them very persuasive. But there is a more basic flaw in the argument. Specifically, there are important counterexamples to the argument. Religion does not always lose.

We need to rephrase the above statement to give it more empirical content, because we can never be completely certain that science has a particular theory. Even if a theory appears to be well ahead of another, it is always possible that more evidence will tip the scales in favor of the currently out-of-favor theory. Thus a believer in naturalism could always

claim that in a given subject where a supernaturalist explanation fits best with the known facts, more facts will tip the scales. Just wait a while; your supernatural explanation will turn out to be wrong or unnecessary. Of course, a supernaturalist could argue in a similar manner. And both statements are basically faith statements. The only evidence we can have for them is that the same process has occurred in other areas of knowledge in the past.

So we will rephrase the proposition more carefully. Scientific and historical hypotheses arising from and/or compatible with supernaturalistic philosophy sometimes have considerably more empirical support than hypotheses arising from and/or compatible with naturalistic philosophy. Perhaps more importantly, this support has, in some cases increased with time.

In the domain of history, one counterexample to the "religion always loses" argument is the reliability of the chronology of the books of Kings and Chronicles in the Bible. For a long time, skeptics believed a "Biblical" chronology did not exist, and that what confused pieces of chronology did exist were totally incompatible with the "real", secular chronology. After Thiele,[2] the chronology of Kings and Chronicles was (and is) seen not only as coherent, but able to serve as a corrective to secular chronology.[3] A Biblical approach has won, or at least has shown itself to be much better at explaining the data. Religion did not lose in this case, and it appears unlikely to lose in the future here.

Another counterexample is the book of Daniel, where skeptics originally confidently stated that Belshazzar never existed, that the chronology was hopelessly confused, and that since the entire book was fiction, there was no point in looking for the characters in history. With time, that view of history has been forced to change. Belshazzar not only existed, but also turned out to be the crown prince (also king in Hebrew parlance), able only to offer the third rulership in the kingdom. The chronology of Nebuchadnezzar taking captives from Jerusalem turns out to have been precisely correct. Perhaps most interesting, the names of Daniel[4] and his three friends[5] have been found in Babylonian documents. This does not mean that every statement in the book of Daniel has been confirmed. The identity of Darius the Mede is still in doubt (although we have not eliminated all candidates). But the case for the historicity of Daniel is clearly better than it was in the past. Religion is winning here.

These cases are from history. Can the same be said of science? If one is a Seventh-day Adventist, it can. For over a century, Adventists defended,

on the basis of what they believed to be inspiration, the view that tobacco was an insidious but deadly poison. At the time this view was not shared by the scientific community, but over the last 50 years the evidence has become overwhelming that the hypothesis originally associated with religion was correct. Religion did not lose here. The same comments, although not quite as vigorously, can be made about vegetarianism.

But it could be countered that these supernaturalist positions were sectarian, and in any case did not deal a major blow to naturalism. Are there any cases more directly relevant to the creation-evolution controversy?

It turns out there are. The first example is in cosmology. The question at issue was whether the universe extended backwards in time indefinitely or if there was a finite limit to the age of the universe. The former was strongly favored by most scientists, often with an explicit anti-supernatural bias expressed as the reason for their preference.[6] This bias formed a major part of the objection to Big Bang cosmology. If the universe had a beginning, it at least suggested that it might require a Creator. The desire to protect an eternal universe was so great that in attempting to do so, Einstein made what he later called his "greatest mistake", introducing a cosmological constant into the equation for the universe to keep it roughly static. However, the weight of evidence now is solidly behind the concept that the universe did have a beginning. Religion is not losing here.

Another example is the existence of vestigial organs. Vestigial organs have been used as an argument against design, and therefore against a designer, since Darwin. In the classical exposition, Wiedersheim[7] listed over 150 structures that he considered vestigial. He was careful to note that some of them, such as the thyroid and adrenal glands, probably had some function, in which case they might not be truly vestigial, and that this could be the case with other organs. But some of his followers were not so cautious, and it was not uncommon for such organs as the thymus, the pituitary, and the appendix to be written off as completely useless. This lack of caution was necessary if vestigial organs were to be used against believers in design, because if there was some function that could be attributed to them, then their existence in a designed organism would not count as evidence against a designer.[8] However, this lack of caution was ill-advised, as further investigation has found a reasonable function for all these structures, destroying, sometimes dramatically, the argument against design. It could be argued that in this case anti-supernaturalist prejudice actually was detrimental to science, tending to cause scientists

not to investigate possible functions for a structure because the prejudice was that it had no function.

It could be further argued that anti-supernatural prejudice actually killed people. Although the spleen was not on Wiedersheim's list, when I went to medical school it was commonly written off as a practically useless organ that we would be better off not having, as it tended to bleed when it got injured. Its only use was to show that humans and dogs, for example (where it stores blood for autotransfusion in case of bleeding), shared a common ancestor. As a result, when it did get injured, it was commonly removed, without any attempt to preserve its function. It was only later that it became apparent that not having a spleen predisposed one to overwhelming pneumococcal infections. Surgical practice today is to preserve splenic function whenever possible, either by repairing the spleen, or failing that, by leaving small bits in the abdomen and hoping that they attach themselves.

History repeated itself with the "junk DNA" controversy. When DNA was discovered, many evolutionists predicted that there were vast quantities of totally useless DNA in the genome of various organisms including humans. As noted by Standish,[9] they were perhaps ignoring evolutionary theory in their anti-supernaturalist bias. But the point remains that supernaturalists generally made a better prediction about the extent of "junk DNA", and that in this case an anti-supernaturalist bias actually hindered research (the reverse of what is usually claimed).

This brings up an important point. One of the reasons "science" (naturalism) claims not to lose is that it incorporates findings which were originally thought to favor "religion" (supernaturalism). Thus the temporality of the universe, and some other ideas such as the harmfulness of tobacco, are simply incorporated into the naturalistic model, and the modern believer in naturalism often may not be aware of the religious overtones to the previous controversies. The topic is viewed as simply another example of the steady advance of science.

The same could have been true for religion. For example, most theologians have incorporated a heliocentric view of the solar system into their theology. But the believers in naturalism will not let them forget that at one time the majority of Christians (not all; note Philip Melancthon) disagreed with the heliocentric theory, and the Catholic Church disagreed strongly enough that it forced Galileo to recant and banned his books, an action it has been forced to repudiate. The Church was in error here. But if one can hold modern Christianity accountable for the mistakes of the

majority of its predecessors, one can also hold naturalism accountable for the mistakes of the majority of its predecessors.

This brings us to a final point. The argument that "religion always loses" is used to avoid having to deal with some subject where supernaturalism is apparently winning at present, and where if it wins, naturalism is dead. Naturalism can survive the historicity of the numbers in Kings and Chronicles, or the toxicity of tobacco, or even (as deism) the Big Bang. Naturalism cannot survive without a naturalistic explanation for the origin of life. And yet there is not such an explanation, not even a remotely plausible one. The more we know, the worse it looks.

Naturalism implicitly recognizes this. The best evidence for this is the insistence on the monophyletic origin of life. In the face of the Cambrian explosion and different genetic codes for some organisms (e.g., Paramecium), naturalists continue to insist that all organisms on Earth share a common ancestor. If they really believed that life were that easy to start, they would simply accept the hypothesis that it started a number of different times. The fact that they insist on the monophyletic origin of life is testimony that they implicitly recognize that it is extremely difficult to get life started even once, let alone multiple times.

But believers in naturalism are absolutely committed to a naturalistic origin for life. Some idea of the strength of the commitment can be gathered from a passage in an excellent (and still accurate) book by Robert Shapiro entitled *Origins: A Skeptic's Guide to the Creation of Life on Earth*.[10] In it he points out the flaws of the various theories, finally opting for a theory of short non-modern peptides as the least problematic. But on p 130 he displays his own viewpoint:

> *Some future day may yet arrive when all reasonable chemical experiments run to discover a probable origin for life have failed unequivocally. Further, new geological evidence may indicate a sudden appearance of life on the earth. Finally, we may have explored the universe and found no trace of life, or processes leading to life, elsewhere. In such a case, some scientists might choose to turn to religion for an answer. Others, however, myself included, would attempt to sort out the surviving less probable scientific explanations in the hope of selecting one that was still more likely than the remainder.*

So naturalism requires a defense against the obvious. And the best defense is, "We have never lost yet. You always do if you wait long enough." In the case of the origin of life, it appears that naturalism would have lost a long time ago if its adherents had not refused to recognize the

loss. The major problem with the "religion always loses" defense is that it is not true. Even in hindsight it is not true without distorting the record, and from a prospective point of view (the only point of view from which we can currently view the future), it is certainly not true. It should be recognized as what it is, a faith statement disagreeing with the apparent lessons of history. Religion does not always lose.

Paul A Giem

ENDNOTES

1. See, for example: (a) Yandell KE. 1986. Protestant theology and natural science in the twentieth century. In: Lindberg DC, Numbers RL, editors. God and Nature: Historical Essays on the Encounter between Christianity and Science, p 448-471. Berkeley and London: University of California Press; (b) White AD. A history of the warfare of science with theology in Christendom. 2 vols. NY: Dover Press.
2. Thiele E. 1983. The mysterious numbers of the Hebrew Kings. 3rd ed. Grand Rapids, MI: Zondervan Publishing House.
3. Strand KA. 1996. Thiele's biblical chronology as a corrective for extrabiblical dates. Andrews University Seminary Studies 34:295-317.
4. Shea W. 1988. Bel(te)shazzar meets Belshazzar. Andrews University Seminary Studies 26:67-81.
5. Shea W. 1982. Extra-biblical texts and the convocation on the Plain of Dura. Andrews University Seminary Studies 20:29-57.
6. Robert Jastrow (1978. God and the astronomers. NY: W. W. Norton and Co.) notes the phenomenon. Although the supernaturalists were not always on one side, or the naturalists on the other, as noted by Helge Kragh (1999. Cosmology and controversy. Princeton, NJ: Princeton University Press, p 251-268), there was still a tendency to line up on the side most compatible with one's evaluation of theism.
7. Bernard H, Bernard M, translators. 1895. The structure of man: an index to his past history. Howes GB, editor. London: MacMilllan and Co.
8. For an anti-supernaturalist argument to succeed, it is important for the structure under consideration to have no function. It is not enough simply for it to have minimal and easily compensated function. Otherwise, such structures as little fingers or toes could be considered unnecessary, as there are very few functions that cannot be performed equally well by humans who have lost their little fingers and toes, and yet it seems unreasonable to claim that they could not have been designed.

   The attractiveness of such an argument is such that it is still not completely dead. It surfaces, for example, in: Miller KR. 1999. Finding Darwin's God. NY: Cliff Street Books, p 100-101.
9. Standish TG. 2002. Rushing to judgment: functionality in noncoding or "junk" DNA. Origins 53:7-20.
10. Shapiro R. 1986. Origins: a skeptic's guide to the creation of life on Earth. NY: Summit Books.

REACTIONS

Readers are invited to submit their reactions to the articles in our journal. Please address contributions to: ORIGINS, Geoscience Research Institute, 11060 Campus St., Loma Linda, California 92350 USA.

Re: Lugenbeal: Ancestral Dissonance (ORIGINS 3:52-55).

Revisiting scenes from my early life, I recently came across Mr Lugenbeal's review of Charles Oxnard's book on human evolution.[1] The review is much taken up with the role of multivariate analysis in palaeontological research, and refers to contributions by "Lang and Bronowski." I happen to be the former, and thereby the subject of a couple of typos: I'm Long, not Lang. This can be confirmed by viewing the 1951[2] and 1953[3] papers in the journal *Nature*, through which, coupled with an article in *The American Journal of Physical Anthropology*,[4] Bronowski and I launched multivariate analysis in the field of palaeontological research.

Our papers were triggered by the long-running dispute between Solly Zuckerman's Birmingham school and Le Gros Clark and others on the origins of certain African fossils. As Mr Lugenbeal says, Solly was a vociferous advocate. He had harsh and personal things to say about the parts played by Le Gros Clark and Bronowski in a battle over statistical evidence, but his remarks appeared in his autobiography[5] long after the latter were alive and able to defend themselves, and have since had wide circulation, not least via the Web. As the sole survivor of the four main protagonists in the battle, perhaps a few comments from me would help to restore the balance.

The argument between Zuckerman and Le Gros Clark was in full swing when Solly played the statistics card. He selected a set of dimensions on the milk canine tooth which he judged would bring out the differences between humans and the anthropoid apes, and measured these dimensions on numbers of teeth from each of the four species, to characterise their populations. He then carried out statistical significance tests, and announced that the fossil dimensions didn't differ from those of the apes. Le Gros Clark refused to accept this, and wanted to reply in kind. He had examined the Kromdraii and Taungs' teeth and decided that they looked human, not at all like those of apes. He selected a set of four dimensions of his own which he thought would confirm this. No statistician himself, he turned to Bronowski for help. Now "Bruno" understood very well the logic and power of statistical methods, and was a

persuasive advocate of their use, but he was not himself a practising mathematical statistician. However he had a personal assistant, myself, who was. It was immediately clear to me that Zuckerman's statistical analysis was quite primitive, being based on significance testing of each of the several individual dimensions on each tooth, with no allowance for the correlation between dimensions. (If one dimension happens to be large, then so, probably, will be others, so that his sets of significance tests were not internally independent, their multiplicity merely adding confusion to the argument.) The correct method for the task was clearly multivariate analysis, which, thanks to its development by the Indian statisticians Mahalanobis, Rao and others, was just then starting to come into prominence as a basic statistical technique. We obtained from Le Gros Clark what was needed for such an analysis of *his* sets of measurements. The results, set out in our 1951 paper, confirmed that the two fossils were indistinguishable from Le Gros Clark's human group, and that by no means could they have come from any of his chimpanzee, gorilla and orangutan groups.

The question remained, why Zuckerman's statistics, crude as they were, had led to so different a conclusion. We did not have to wait long for the answer. The opposition soon confessed that they had bungled their analysis, forgetting to divide by the square root of 2 at a critical point. The then-editor of *Nature* wrote us saying with some amusement that this seemed to end the matter, and that no further comment was called for. In his autobiography, Solly tried to play down the mistake, saying that it didn't really matter, and moreover that his statistical adviser Frank Yates had made "strictures" concerning our paper. Personally, I never did understand why Yates, a distinguished statistician in his own right, had sanctioned Solly's method, nor why he hadn't uncovered the arithmetical blunder until our paper appeared. As to "strictures", none ever came to my notice; the only criticism I ever saw was a plea that multivariate analysis was unnecessary, that univariate methods were good enough. Anyway, nothing further about our work was heard from that side, either immediately afterwards or following the appearance of our more extended paper, two years later. (Nor, it is hardly necessary to add, did any further statistical analyses on the subject appear from Birmingham during that time.)

Returning to Mr Lugenbeal's article, may I venture a small — may I be excused the word — "stricture"? His elegant article is fascinating on many aspects of the long-running dispute, but it does rather invest multivariate analysis with a forbidding aura of abstruseness, complexity — "necessitating a computer" — and logical subtlety, even dubiety. It could discourage the uninitiated. Well, I gave up the profession of mathematical statistics and any active interest in palaeontology nearly fifty years ago, but I have not forgotten one thing: our

1951 and 1953 multivariate analyses didn't need a computer. They were carried out with the Monroe electric calculating machine of the day, a wholly nonelectronic device that would now only be found in a museum. The most it was capable of was accumulating sums of squares and cross-products. And during our 1953 collaboration this elementary machine proved quite adequate for a two-dimensional projection graph of the teeth populations. (We never bothered to publish this; I produced it purely for Le Gros Clark's benefit, as a demonstration of the illuminating things multivariate analysis could do. Was it perhaps the first application of multivariate graphics in palaeontology?)

On the score of logic, as I see it the only subtlety involved in multivariate analysis is that of the significance test, and this is no more than the staple test of everyday univariate statistics. Logically, the advance from univariate to multivariate analysis seems simply to parallel the advance, in school algebra, from "x = ax + b" to simultaneous equations. I'd be interested to hear if the computer has altered this in any fundamental way.

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Endnotes

1. Lugenbeal EN. 1976. Ancestral dissonance: literature review. Origins 3:52-55.
2. Bronowski J, Long WM. 1951. Statistical methods in anthropology. Nature 168:1116-1118.
3. Bronowski J, Long WM. 1953. The Australopithecine milk canines. Nature 172:251.
4. Bronowski J, Long WM. 1952. Statistics of discrimination in anthropology. American Journal of Physical Anthropology 10(4):385-394.
5. Zuckerman S. 1988. Monkeys, men and missiles: an autobiography, 1946-1988. London: HarperCollins.

ARTICLE

THE GENESIS CREATION STORY: TEXT, ISSUES, AND TRUTH*

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WHAT THIS ARTICLE IS ABOUT

After an introduction, pausing on the place of Creation in the Bible, this paper examines exegetically the Hebrew text of the biblical Creation story (Gen 1:1 - 2:4a), paying close attention to its sounds, rhythm, words, syntax, literary structure in relation to its parallel text (Gen 2:4b-25), and its literary genre and style, without ignoring its literary extrabiblical environment.

From the given of the biblical text, the paper then addresses specific issues pertaining to the modern reader of the biblical text; the intention of the text in regard to 1) the historical-scientific nature of the information thereby provided; 2) the problem of time and the traditional proposed solutions (gap theories, critical theories); and 3) the creation of lights (the sun, the moon, and the stars). Then moving away from the debate, "creation is not evolution," I will explore and suggest from the text, theological-philosophical lessons in regard to the "truth" of Creation, its relation to history, worship, salvation, and hope (only a summary for this presentation) and conclude on the place of Creation in the life of the believer.

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INTRODUCTION: A CREATION AND BIBLICAL FAITH

The canonical Bible begins with creation (Genesis 1:1-2:4a) and ends with re-creation (Revelation 21-22). The same literary principle holds for the Old Testament (see its end in Malachi 4:5-6) or the Hebrew Scriptures (see its end in 2 Chronicles 36:23) as well as for the New Testament starting with the Gospels which like to begin with a reference or an allusion to creation (see Matthew 1 through its genealogy genre; Mark 1:1 through its first word "beginning"; and especially John's prologue (1:1-13) with its explicit reference to the creation story), and concluding with Revelation 21-22. The same literary principle is attested in Hebrews 11 which begins its didactic poem on faith with faith in creation — "By faith we understand that the worlds were framed by the word of God, so that the things which are seen were not made of things which are visible" (v. 3) — and concludes it with the perspective of re-creation — "And all these, having obtained a good testimony through faith, did not receive the promise, God having provided something better for us, that they should not be made perfect apart from us" (vv. 39-40). It is also significant that the definition of faith it gives as a prelude to the poem (v. 1), the only biblical definition of faith, describes faith precisely on the basis of the reference to creation and re-creation: "Now faith is the substance of things hoped for [re-creation; see vv. 39-40], the evidence of things not seen [creation; see v. 3]."[1]

The importance of creation in the Bible is also notable through the pervasive presence of this reference within the Hebrew Scriptures. In the Pentateuch, it occurs in reference to the event of the Exodus (ch 15). Among the Prophets, it reappears in reference to the return from the Exile (Isaiah 40-45; Jeremiah 4:23-26; 31:35-37). It reappears in the book of Proverbs, as a reflection on the wonder of creation (Proverbs 8:22-31); in the book of Job, as a response to suffering (Job 38-41); in the Psalms, as hymns addressed to God in the context of worship (chs. 8, 33, 139, 148). In apocalyptic literature (see Daniel in every chapter), the reference or the allusion to creation is a prominent motif in relation to existence (Daniel 1) and also within the cosmic and eschatological perspective (see especially Daniel 7, 8, and 12[2]). In the New Testament, creation also plays an important role in relation to the existential commitment responding to God's act of salvation and the need to become a new creation (2 Corinthians 5:17) or as the eschatological solution (Revelation 21-22). From the biblical perspective, creation is then an important topic that deserves particular attention and study.

METHODOLOGY

Five principles will characterize my approach to the biblical text.

1. Close Reading

Considering the biblical text as an inspired text written with a high degree of intentionality, I will read the text with great care, paying attention to its Hebrew words, its syntax, its style, and observing its regularities as well as its irregularities to determine as far as possible its intended meaning.

2. Literary Sensitivity

The story is first of all a written document and implies, therefore, a literary approach ("literature" means "writing"). I shall analyze its specific form, sounds, rhythm, structure, for this aspect is the first data of the text; it is a music before being a useful and meaningful message to be decoded through our mind. In the biblical world (as in ancient "primitive" Near Eastern culture) the form, the discourse that was sounded was given in relation to the spiritual or theological truth. See Martin Buber's principle on the relation between the *wie* and the *was*.[3]

3. Intertextuality

As far as possible, I will search within its immediate context or within the biblical context at large for other biblical texts that are referring or alluding to our text. This inquiry is important as it will provide us with an interpretation of the text that is closer to its original intention, not only because it belongs to the same "inspiration" (from the same divine source) but also because it is historically and culturally closer to the text. The process of intertextuality will be traced, however, with control. The connection between the referring text and our text will have to be clearly established through the use of the common association of specific key words, as far as possible a "unique" association, or even a common literary pattern (frequency, sequence, and structure).

4. Context

The biblical story has not been given *in vitro*. God has informed His servant and inspired him to make sure that he received His will, yet the story has been written by a person who belonged to his time and culture. The biblical text should also then be explored in relation (positive or negative) to its cultural environment, not only to perceive how it could have been understood at that time ("what it meant"), but also to discern

where and how the biblical author situates himself in connection to the cosmological traditions he was acquainted with and referred to.

THE TEXT

I. "POETIC"

The biblical creation story, just as any other biblical text, comes to us first as a "poetic" expression, a "sound and music" experience, before being a meaningful message. The observation holds in general for any text, whatever the nature of the message it may convey, whether it means truth or fiction. But it is particularly true for (ancient) Near Eastern literature. I take "poetic" here in a broad sense, as referring essentially to the form of the text: its artistic shape, the choice of words, their sound effect, the play on words, the parallelisms, the repetitions, the rhythm and the literary structure of the text — all that gives our text its effect on me physically; all that speaks to my ears, my eyes, and makes it easy to remember.

A. The Rhythm 7

The rhythm of seven runs through the whole text. Not only the story has seven steps (seven days of creation), but the rhythm affects the text internally even to the use of words. A number of key phrases are used seven times: "It was so"; "God said"; "It was good" (the seventh in v. 31 has "It was very good"). A number of keywords are used seven times or in a multiple of seven. The word *bara* ("create") is used seven times; "God," 35 times; "earth," 21 times. Actually, the text starts with the rhythm of seven. The first verse has seven words. The second verse has 14 words. This emphasis on the number seven is meaningful. This is already a way to suggest to the reader the idea of perfection and completion.

B. The Sounds

Alliterations, assonances, and onomatopoeia hit the ears and already suggest a meaning through the sounds. The first two words begin the same way with the same five consonants (alliteration): "b" "r." The first sound of the text is an explosion: "**b**" — ***B**ereshit bara*.[4] Hear the way "void" or "nothingness" is suggested through the play of sounds "o/u": *tohu wa bohu*, *tehom*, *hoshek*. Hear the way the power of the wind and its movement is suggested through the words *ruah merahefet*.

C. The Literary Structure

Certainly the most elaborate "poetic" work of the creation account may be recognized in its literary structure. The observation of the literary structure of the text is crucial for it provides us not only with the general orientation of the text which thus serves as a control in our micro exegesis of the text, but also with specific clues regarding the intentions hidden in the text. The first and certainly most prominent feature of the literary structure (Genesis 1:1-2:4a) is its division into seven steps and its parallelism with Genesis 2:4b-25. The detailed description and demonstration of this parallelism is given in my dissertation;[5] the main features are summarized below:

1) Both texts are divided into seven sections; each creation work (nine in both; distributed the same way) is introduced by the same stylistic expression: in C by imperfect verb *wayyomer*; in C' by the imperfect verb of the same phonetic start, *wayyit*, *wayyts*.

2) Correspondences are noted between the respective sections:

C	C'
Introduction (1:1-2)	Introduction (2:4b-6)
1. Light/darkness (1:3-5)	1. Man/dust (s:7)
2. Firmament in heaven (1:6-8)	2. Garden on earth (2:8)
3. Water and land, plants (1:9-13)	3. Plants, water, and land (2:9-15)
4. Luminaries separate days and seasons (1:14-19)	4. Tree of knowledge of good and evil separated from other trees (2:16-17)
5. First creation of animal life (1:20-23)	5. First concern for a companion for man (2:18)
6. Creation of animals and man continued (1:24-31)	6. Concern for a companion for man continued (2:19-22)
7. Pattern (2:1-3):	7. Pattern (2:23-24):
a. end of process	a. end of process
b. divine involvement	b. divine involvement
c. separation of Sabbath	c. separation of couple from parents
d. blessing of Sabbath	d. unity of couple
Conclusion (2:4a)	Conclusion (2:25)

3) Same longitudinal correspondences: 1 parallels 4; 2 parallels 5; 3 parallels 6.

4) Parallelisms of structure between the introductions: a) temporal clause; b) parenthesis: description of the earth in a stage of "not yet," water element; c) then divine work ("said" // "formed….").

Just as a testimony (among others) of how this literary observation has been received by biblical scholars, see the following review:

> *Certainly Doukhan's theory…has great merit. He has demonstrated a degree of unity in the structure and message in Genesis 1-2 never previously established. The parallels he has pointed out between the two introductions to C and C' are particularly strong. In addition, the parallel he describes between the two sections 7 is striking,…Thanks especially to Doukhan's work, any reading of Genesis 1-2 as two unrelated texts juxtaposed to one another is impossible.*[6]

II. GENEALOGY

Although there are poetic elements in the biblical story, most scholars agree that the general stylistic tone of Genesis 1:1-2:4a is prosaic. It is poetic in the sense that it is a recitation to be remembered, as William Albright has suggested.[7] The regularity, the rhythm, the play on words, and the parallelism between this text and Genesis 2:4b-25 obviously show that both texts were composed for recitation. It is also prosaic as its stylistic features suggest:

1) It describes an event unfolding from beginning to end; we are in time (not so in poetic fiction). The chronological intention is not only given in the text through the progression of the week, from the first day to the seventh day, but also by means of the parallelism with the other text that clearly describes the progression of a historical event.

2) The use of the imperfect form with conversive *waw*, a classical form of the narrative text.

3) The repetition and the monotonous tone of the text give the impression of some kind of objective "legal" report.

But it is not just a story or the report of an event. The text has been dressed in the stylistic garment of a genealogy. A comparison with other genealogies (especially the next genealogy in Genesis 5) reveals the following common features:

1) Repetition of the same introductory formulas and the same concluding formulas: Introduction: name and lived number of years, begot a son parallels "And He said"; Conclusion: all the days,

name, number of years, died parallels "So the evening and the morning was the ___ day."

2) Same lack of human life and involvement.

3) Marks the place of a turning point in salvation history.

4) Connection with the other genealogies of the book of Genesis (e.g., the blessing promised in 1:28 is realized in Genesis 5, just as the blessing promised in 9:1 is fulfilled in the genealogy of Genesis 10).

5) Specifically designated at the end by the technical term *toledoth* ("genealogy"), a term which is usually associated with the genealogies of biblical lives.

III. POLEMIC

The biblical creation story is not just embedded in the context of the book of Genesis and the Bible; it is also situated in the context of its Near Eastern cultural environment. The biblical author is very well aware of the cultural world around him and of its mythological cosmogonies to which he responds in a definite polemic manner.

A. The Lamps

The sun and the moon (1:15) are not given their usual names, *šemeš* and *yareah*, which may confuse them with *shamash*, "the sun god," and *yarih*, "the moon god." Instead, they are called *meor*, a word that is always used in the Pentateuch to designate lamps (Exodus 25:6; 27:20; 35:8, 14; 39:37; Leviticus 24:2; Numbers 4:9, 16). The sun and the moon are just vulgar lamps.

B. The Great Fish

It is noteworthy that the technical verb *bara* ("create") is associated only with three creations: the general creation of heaven and earth (Genesis 1:1); the creation of human beings (Genesis 1:27), and the creation of the great fish (Genesis 1:21). Why the fish? To emphasize the non-divine nature of this animal which was worshiped as a god in both Babylonian and Egyptian religions. The big fish of the ancient cosmogonies is just an ordinary fish for Genesis.

C. Primeval Water

In the Genesis creation story, the water of the Introduction (Genesis 1:2) is associated with darkness, *tohu wa bohu* (idea of "emptiness"), *tehom* (idea of "deep abyss"), in order to counteract the ideas promoted in Babylonian and Egyptian cosmogonies that viewed the primeval waters as the living god who generates the world (*Nun* in Egypt and *Tiamat* in Babylon). These waters are, therefore, qualified in the immediate context of the biblical creation story in negative terms in relation to darkness and emptiness. This lesson is again confirmed through the parallelism with the other creation story. The description of Earth's condition before God's first word of creation that is given as a watery element in Genesis 1:1-2 parallels the description of Earth's state in Genesis 2:4b-6 that is given in terms of "not yet" and "not" (of course, here from the particular perspective of the sixth day).

This does not mean, however, that the author is thinking of symbolic water. He may well be referring to real water, an element that might have been created before this creation week; the text does not speak about it, nor does it say when or how this element might have been created. Yet the author's concern is not so much water *per se*; again, he is not dealing with the creation or the chemical description of water as such. His specific concern is rather to deny the mythological view that the "primeval water" (a concept that is common in all the Near Eastern world) was a divine agent of life. For the biblical author, life was distinct from and outside of water: "The spirit of God was hovering over the face of the waters" (Genesis 1:2). What you see as a living divine being producer of life, says Genesis, is just water, a "neutral" element associated with darkness, emptiness, and nothingness. Life comes from elsewhere: God.

D. Ex-nihilo Creation

The Genesis creation story is not performed from any already existing divine substance, His blood, sperm, or saliva, as is the case in other ancient cosmogonies (Egyptian and Babylonian). It is not an *ex-divino* creation. Neither is it the result of a struggle between already existing gods — as is the case in Egyptian cosmogony where the sun god *Re* fights the ocean god *Nun* or in Babylonian cosmogony where *Marduk*, the god of order, struggles against *Tiamat*, the divine fish of water. God creates out of something which is neither Himself nor something or someone else. He creates through His word, *ex-nihilo*.

Also the fact that the creation story is a genealogy betrays the author's concern to provide a polemic against the mythical idea of divine procreation.[8] It is, indeed, significant that our biblical genealogy is to tell us that creation did not take place as the result of some kind of sexual procreation; it is instead the creative act of a God who precedes and determines the power of giving life.

E. The Introduction

This is perhaps the only place where the biblical text seems to deliberately echo the ancient Near Eastern texts of cosmogony (Egyptian as well as Babylonian). Both sources display, indeed, the same parallels of structure associated with the same motifs:

1) Dependent temporal clause: general introduction, reference to heaven and earth.

2) Parenthetic clause: description of earth at the stage of "not yet," water element.

3) Main clause: God's action of "creation…."

THE BIBLICAL TEXT

1) In the beginning of creation…of heavens and earth.

2) As the earth was *tohu wa-bohu*; and darkness was on the face of the abyss (tehom), and the spirit of God was hovering on the face of waters.

3) Then God said: "let there be light!..." (Genesis 1:1-3).

THE BABYLONIAN TEXT (*ENUMA ELISH*)

1) When on high the heaven had not been named, nor firm ground below….

2) Naught but primordial Apsu, their begetter (and) Mummu-Tiamat, she who bore them all, their waters comingling as a single body; no reed hut had been…no marsh had appeared….

THE EGYPTIAN TEXT

Unlike the other testimonies, ancient Egyptian literature did not preserve a single document of cosmogony. The texts are scattered in time and space, and belong to different stories and theological traditions. But

here also the parallels of motifs and of literary patterns is striking at the beginning of the story. The divine act of creation is here also introduced by a temporal clause and negatively, using a particular formula[9] that reminds of the biblical and the Babylonian Introductions:

1) When….

2) "…did not exist" or "there were not yet struggles…" Description of the pre-created state of the earth as a water element (see above).

3) Then divine act of creation.

Note that like the Hebrews, the Egyptians referred to the event of creation as a beginning. They expressed that idea with the technical term *sp tpy* ("first time"). One text states that the creator-god "began the earth at the first time (*sp tpy*)." Now, it is remarkable that the Egyptian word *tpy* which means "first, beginning" is derived from the word *tp* which means "head"; note, indeed, that in Hebrew the word *reshit*, which means "first, beginning," is also derived from the word *rosh*, which means "head." Furthermore, like in the Hebrew text, the Egyptian creation also concerned "heavens and earth." In one text the creator god *Re* is called the one who "made sky and earth,"[10] a way of saying that he created all. Indeed as in Biblical Hebrew, the Egyptian expression "heavens and earth" (*pt ta*) is a merism, referring to the opposites, to imply the totality. For the ancient Egyptians, creation was then comprehensive. In one text, we read, for example, that the creator-god "created all that exists."[11] The Egyptian tradition has preserved the idea of a creation by the divine word. The Memphite god, it is said, has conceived with his heart and created with his tongue: "Every word of the god (*Ptah*) came into being through what the heart thought and the thought commanded."[12]

We could go on and observe many other common motifs between those texts, but it is noteworthy that the greatest concentration of parallels, whether of ideas, language, and literary patterns, occurs here in the context of the introductions. This observation should not mislead us, however. Instead of being an argument on behalf of the Babylonian/Egyptian influence on the biblical text, thus undermining the original inspiration of the biblical text, it is, on the contrary, a significant clue of the author's strong polemic intention against these accounts. Indeed, this literary connection between these two introductions constitutes a classic polemic means commonly used in ancient literature to refute the opposing view. A good illustration of this literary device of polemic can be found in Job 18-19:

"Bildad the Shuhite answered and said: 'How long till you put an end to words?'" (vv. 1-2). (Bildad will then argue that Job must be a wicked man [v. 5], "Who does not know God" [v. 21], since he is suffering [vv. 7, 12-19]). "Then Job answered and said: 'How long will you torment…with words?'" (Job 19:1-2). Job then proceeds to refute Bildad; and by the end of his plea, he starts over on the motif "words": while Bildad wishes the end of Job's words, Job wishes that his words will be inscribed, engraved, on a rock forever (vv. 23-24); and then responding to Bildad's charge that he does not know God, Job repeats the same word to affirm, "For I know" (v. 25) and again at the end of his discourse, "that you may know judgment" (19:29).

To be sure, the parallels are not perfect, the introduction of the polemic texts does not exactly duplicate the text it responds to. There are many important differences that should not be overlooked. Yet the parallels between the introductions of the Genesis creation story and those of the ancient Near Eastern texts, just as between the introduction of Job's speech and Bildad's, are significant enough to suggest that they are intended for polemic purposes.

ISSUES

From the data provided by the form of the text, its genre, and the way it situates itself within its own cultural environment, we may now be able to interrogate the text in regard to specific issues that are the concern of the modern reader.

I. HISTORICAL/SCIENTIFIC INFORMATION

A. The Lesson of the Connection

The fact that our creation story in Genesis 1:1-2:4a is connected to the historical narrative in Genesis 2:4b-25 suggests the author's intention to communicate his report on the creation of the universe as an event of the same historical nature as the formation of human beings. As Bernhard W. Anderson points out:

> *Often we detach "creation" from this historical context and consider it as a separate "doctrine" (which happens usually in discussions of the relation between science and religion). But this violates the intention of the creation stories. They want to speak to us primarily about history. Accordingly, the greatest weight must be given to the form of these stories:*

they are "historical accounts" and, as such, are part of the historical narration.[13]

Another lesson of this connection is to draw our attention to the "not yet" condition of this creation in comparison to the actual present condition of the human world. Already this observation about the goodness and perfection of creation was repeated over and over again in the first creation story through the rhythm of seven: "It was good." Now the connection with Genesis 2:4b-25 is more specific. Not only was creation good, perfect, and complete, but it was not yet touched by evil, sin, and death. This is the main lesson of the story contained in the second creation story. Man has not yet sinned and death has not yet come (Genesis 2:6-7). And this lesson is not just at the core of the story, it appears in the introduction and the conclusion of our text as an inclusio, a literary device to notify the reader that this is intended to be the central idea of the passage. In the introduction (Genesis 2:5), the keywords are "not" (*ayin* and *lo*) and "not yet" (*terem*; twice), suggesting the perspective of the writer. What characterizes this world of ours was "not yet" there when God created it. In the conclusion (Genesis 2:25), the play on words between *arom* ("naked") and the *arom* ("cunning") of the serpent which comes in the next verse (Genesis 3:1) betrays the intention of the author to imply that the tragedy which will later involve the serpent and human beings has not yet struck. It has been identified as a "prolepsis pointing forward to Gen 3:7."[14] Indeed, one of the intentions of the function of this chapter 2 is to affirm and emphasize the perfect state of creation as it came from the hand of God and not yet affected by evil, sin, and death.

B. The Lesson of the Polemic

The fact that our text has been written with a strong polemic intention directed against mythological material suggests the author's intention to affirm the independence of his inspiration. His account is not the mere product of folk imagination and memory; it is not a myth, but it is instead a historical event which belongs to the process of revelation.

This strong polemic intention does not mean, however, that the biblical author was determined by his polemic and shaped his whole account under its pressure, thus affecting the content of his report. The very fact that after the introduction the parallels and the polemic hints become only sporadic and accidental, touching only on specific words or motifs, and never again recur through a consistent literary sequence is a strong

indication to the contrary. Indeed the biblical author not only meant to respond to his eventual disputants, but he wanted to take us to a direction altogether different that would have nothing to do with the contemporary confrontation. In fact, the very reason of the polemic itself, namely its anti-mythological purposes, should have prevented this confusion to happen. Indeed in ancient mythological literature, the message (poetic or philosophical) does not necessarily depend on the historical actuality of the story that conveys it. In the myth of the cave, Plato explains that in order to have access to the truth, we must get out of the sensible reality. In order to represent a metaphysical or theological reality, the platonic symbol resorts then to a chimere, or an allegory borrowed from the non-real. The message is disincarnate. The flesh of history is unable to carry the spiritual truth.

In mythological material, as it is in Greek thinking, thought precedes the event of the story and does not depend on its actuality to be true. On the contrary, the Hebrew uses historical reality to signify the spiritual truth. Apart from that reality, truth does not exist. In Hebrew thinking, it is the event that precedes the categories of thought. It is the event that makes theology; that is theology. The Hebrew author of the creation story was then more concerned with reporting the event than with teaching a theological thesis or even refuting different opinions and theological errors. The biblical anti-mythological polemic is more than an apologetic argument, thus standing and even existing negatively versus the other, being what the other is not. Precisely because it intends to testify about an event, the biblical testimony is presented as existing by itself. For that reason, the biblical story is to be read respectfully, taking into consideration the presented data as it stands, not as a story referring to an event for theological purposes (mythological material), but rather as a testimony that describes the content of that event as well as the way it develops its course, including the sequence of its components. This is why if we use the same method for the biblical text as for traditional mythological literature (e.g., historical-critical interpretations) and despise the historical intention of the biblical text, we may then run the risk to be at odds with the biblical text and totally miss the point.

C. The Lesson of Genealogy

The fact that our text has been cast in the mold of genealogy and explicitly identified as such suggests the author's intention to communicate his information as material enrooted in the flesh of history. Genealogy

is, indeed, in the ancient Near East and in the Bible the most tangible evidence of historical existence. Also by using the term *toledoth* for the creation of heaven and earth, as well as for the genealogy of the patriarchs, the author shows his intention to relate his story to the history of mankind, an intention which has been understood by the Jews who express this unity of creation and history by dating their calendar from the creation of the world.

Now, the fact that the text presents itself as a genealogy indicates also its limitations: the text does not claim to be scientific. It simply testifies that the event took place, but does not explain how it worked scientifically. We do not have all the ingredients disclosing the mechanism of creation. Just as for the genealogy everything is correct but not the whole data is given.

II. THE DAYS OF THE CREATION WEEK

Regarding the nature of the days of the creation week, the text is quite clear and explicit. The text does not imply that they are symbolic or cosmic, but it gives us enough clues about the author's intention to refer to days that are of the same temporal nature as our human days.

A. Evening and Morning

The first observation concerning these days is that they are explicitly qualified with the same composition: they have "evening and morning." Such a cyclical light-darkness arrangement clearly means that the earth was now rotating on its axis with a source of light on one side of the earth (although the sun was not yet operating). The length of such days was that of a normal solar day. In no way could the term apply to large periods of time (a geological or symbolic period). Otherwise, it would imply regular long periods of darkness, a condition that would have made impossible the survival of life.

It is also significant that the Sabbath, the seventh day, is the only day that does not have the mention of "evening and morning." The reason for this exceptional omission is that this is the only real full day of the creation week when humans are present. Although humans are present on the sixth day, which is also qualified with the expression "evening and morning," the fact that they have been created within the day implies, indeed, that only the seventh day was their first and only full day of the creation week. Only the seventh day was the day they experienced totally, from sunset to sunset. For this day, we do not need, therefore, the specifi-

cation "evening and morning." For the other six days, on the other hand, humans are totally or at least partially absent, and therefore the author feels necessary to specify "evening and morning" to make it clear and emphasize that these days are of the same nature as our human days.

B. A Cardinal Number

The way the first day is called in comparison with the other days seems also to carry some significance. This is the only day that is indicated with a cardinal number, *yom ahad*, "day one" (instead of first day). All the other days are called with ordinal number: "second day," "third day," etc. It is as if the author wished to set the time and notify us from the start about the nature of these days. The phrase *yom ahad* means literally "day absolutely unique." The same word is used for God in the *shema* (Deuteronomy 6:4) to emphasize God's absolute uniqueness. In fact, the phrase *yom ahad* is always used in the Bible to refer to days of 24 hours and never to any other period of time. The fact that the week of creation starts with this specification about the first day not only suggests that all the days of this week are like the first day, "unique days" (not periods implying several days), but also prevents us from interpreting these days as only referring to the order of creation.

III. THE SUN, THE MOON, AND THE STARS

Two main problems are associated with the creation of the luminaries in the creation story: How were the first three days monitored since the sun and the moon only appear on the fourth day? What does the creation of the luminaries on the fourth day mean in the creation story?

A. The Days Before the Sun

The solution to the former problem is suggested in the connection that is intended by the text between the creation of the lights on the fourth day and the creation of light on the first day. This connection is indicated not only by the structure of the creation story (see above the longitudinal correspondence of day one related to day four, etc.), but also through specific echos and parallels.

We have the same introductory verb *wayehi*, "let there be," followed by the etymologically related words *or* ("light"; v. 3) and *meorot* ("luminaries"; v. 14). It is also significant that the function of the luminaries on the fourth day is described with the same phrase as the function held by God on the first day:

In v. 4, it is God who "divides the light from darkness."

In v. 18, it is the luminaries which "divide the light from darkness."

This parallel between the two functions suggests that what is being performed by the luminaries on the fourth day is taken care of by God Himself from the first day. The days before the fourth day are thus of the same nature as the days ruled by the sun and the moon.

B. The Creation of the Sun and Moon

The solution to the second problem about the creation of the luminaries is implied in the language used to describe that creation. There is one important difference, indeed, between the creation of light on the first day and the creation of the luminaries on the fourth day. The creation on the first day concerns the creation of light *per se*: "let there be light…" (v. 3). The *yehi* ("let there be") is syntactically related to *havedil* ("divide") by the means of the preposition *lamed*. In the fourth day of creation, the luminaries are never given by themselves. Their creation always applies to the function of the luminaries. *Yehi* is always related to their various functions ("divide," "rule," "give light"; vv. 14-17). This syntactical form is unique in the creation story. The contrast between this description of the division (between light and darkness) on the fourth day and the description of the division between the waters in relation to the creation of the firmament on the second day is particularly instructive.

Contrary to what takes place for the sun and the moon, the creation of the firmament is decomposed in two distinct and consecutive operations (with no syntactical relation): 1) the creation of the firmament *per se* (vv. 6a, 7a), and then 2) the creation of its function of division between the waters (vv. 6b, 7b). The syntax of the passage indicates a difference between the two objects of creation. While there is a *yehi* ("let there be") applying to the firmament and another *yehi* applying to the function of dividing; for the sun and the moon, there is one common *yehi* that is syntactically related to the verb and not to the noun object (the sun and the moon). From this difference of language it is clear that the author is not referring to the creation of the luminaries (sun and moon), but rather to their function. This observation suggests at least that those luminaries were already created before the fourth day of the creation week. Whether this operation took place on the first day or even before the creation week, the text does not say.

C. The Creation of the Stars

As for the stars in v. 16, they are only mentioned as extra information, like some kind of appendix, as if they were not directly relevant to the matter. It is for instance remarkable that the verb "made" (*'sh*) is not repeated in relation to the "apparition" of the stars. A literal translation of the passage will give the following: "And God made (*'sh*) the big luminaries, the bigger luminary and the smaller luminary; the bigger luminary to rule the day, and the smaller luminary to rule the night, in addition to the stars." It is noteworthy that the function of the stars is not explicitly given. In fact, it is only the function of the two luminaries that is given. This omission about the function of the stars may be explained in two ways. Either the function of the stars is the same as the one of the two luminaries, in which case they are also included under the term *meorot* ("luminaries"); it is not clear then why this particular syntax. Or, the function of the stars is different from that of the sun and the moon, a function that has nothing to do with the earth; in which case they are not among the *meorot* ("luminaries"), but then why mention them since they are irrelevant to our system?

It seems to me that this particular syntax that exceptionally omits the reference to the function of the stars could very well pertain to the polemic concern associated with the sun and the moon. Since the sun and the moon are not explicitly identified with their technical names *shemesh* and *yareah*, they are only vaguely identified as "greater light" and "lesser light," the biblical author feels necessary to specify their function in order to make it clear that he is referring to the sun and the moon. On the other hand, the stars are designated under their usual technical name *kokhavim*; and, therefore, there is no need to characterize these through their function, since this is already implied in their explicit designation. In fact, they have their place in the same cosmic function; in biblical tradition the stars are, indeed, associated with the moon in the ruling of the night (see Psalm 136:9 where the stars and the moon are associated in the ruling of the night within a context referring to the creation story).

IV. TIME

Time remains the most crucial and certainly the most difficult issue at stake in the problem of creation. Indeed, contrary to the official scientific explanation, the biblical text affirms that the world, the human universe, did not come as a result of chance and a natural process from within, but as the direct product of God's intelligent creation. And because

God did it, the work of creation took the time He wanted, namely, a week, the first and absolutely independent unit of time. The problem for modern interpreters of the Bible is immense. It means to reconcile the biblical testimony with the scientific requirement of time for the old earth that is thought to be ours. Basically two proposals have been suggested by biblical interpreters:

1) Critical scholars in general have interpreted the biblical text as poetry or a hymn containing imaginary mythological material and therefore irrelevant to history and science. I have already responded to that argument (see above).

2) Conservative scholars in general have been keen to reconcile the apparent scientific need for a long time with their faith in biblical revelation; they have therefore introduced into the biblical text the idea of a pre-creation which would have taken place billions of years before the biblical week of creation. This theory has been called "gap theory". It suggests that Genesis 1:1 refers to this pre-creation, then v. 2 describes the world empty and void for billions of years (gap), and then v. 3 starts the new creation, formation, furnishing of this empty space for one week. From my perspective, this whole idea of "gap theory" raises serious philosophical/theological problems and more importantly cannot seriously be defended exegetically. This does not exclude the possibility that God may have created something before (including for instance water, or stars); this creation, however, is not the point of our creation story that speaks only about what took place during the first creation week.

I will essentially focus here on the exegetical argument from the text. In my view, the syntax and the literary structure of the introduction of the biblical creation story (Genesis 1:1-2) hardly supports any kind of gap theory (active or passive). The following reasons justify my resistance.

A. The Inclusio

From the outset, it is, indeed, remarkable that the introduction (Genesis 1:1) and the conclusion (Genesis 2:4a) echo each other as an inclusio using exactly the same language *bara* ("create") *shamayim* ("heaven") *waarets* ("and the earth"). Since the conclusion refers to what takes place during the creation week, it follows that the introduction refers also to the same work of creation and not to another probable pre-creation.

B. The Literary Structure

The parallelism of structure between the two introductions (Genesis 1:1-2 and Genesis 2:4b-6) suggests that just as the second creation story reads in one breath with no gap inside, the first creation story should imply the same one-breath reading (same reasoning in regard to the parallel with the Babylonian creation story).

C. The Word *Bereshit*

On this first word, biblical interpreters disagree depending upon whether one analyzes this word as a construct ("In the beginning of…") or an absolute case ("In the beginning,…"). The absolute case is supported by some ancient versions (LXX, Vulgate, Targum) and the fact that the absolute case for *reshit* is attested at least once (Isaiah 46:10). I personally (with many other scholars) hold the view that it is a construct case for the following reasons:

1) The parallel of structure with Genesis 2:4b-6 and the Babylonian creation story.

2) The great majority of occurrences of (*be*)*reshit* (49 out of 50) are construct cases.

3) The fact that Proverbs 8:22-35 which clearly refers to our creation story thematically and structurally (see its seven sections corresponding to the seven sections of the creation story) uses *reshit* in the construct form (8:22).

4) The fact that the technical phrase *bereshit* is only attested in the construct; it is found only in the book of Jeremiah (26:1; 27:1; 28:1; 49:34-35) within a theological context that refers or alludes to creation displaying the same pattern that characterizes the introduction of Genesis 1: there also the word of God (*amar*) is systematically articulated on the word *bereshit* and comes after it. We have then the formula "In the beginning of [*bereshit*]…God said [*wayyomer*]."[15] (Note incidentally that in the last passage the word of God is articulated seven times thus pointing to the structure of the Genesis creation story.)

5) The observation that if the author really meant an absolute case he should have used it with the article (*bareshit* instead of *bereshit*), a form that is attested in Nehemiah 12:44 (see also the Samaritan version on Genesis 1:1).

6) This reading "in one breath" is the one received in Jewish tradition (see especially Ibn Ezra and Rashi in *Miqraoth Gdoloth*) which never heard about the *Enuma Elish* account.

It is clear to me then that the biblical text does not imply any kind of gap theory. The biblical text leaves us with the problem of time. For the intention of the text is clear: God created all the human cosmos (heaven and earth) during this first week. The text means to tell us that everything, "all" (emphasis on the seventh day), has been created during the first week and says nothing about a pre-creation. Otherwise why rest on the seventh day? The celebration on the seventh day would lose its *raison d'être*, as the culmination, the conclusion, of the whole process of creation at the seventh step, a number which marks the climax only if it implies the work was limited to six days and not if it also implies several additional billions of years before that week.

In fact, as Exodus 20:11 says, "In six days the Lord made the heavens and the earth, the sea, and all that is in them." The commandment does not suggest either that the biblical creation story was also concerned with some kind of pre-creation. Instead, it clearly states that everything was created by God during six days and therefore enjoins mankind at the end of these six days to join God in His holy rest, as a celebration and a commemoration to mark the conclusion of the creation week.

The dilemma is not so dramatic for the holder of the "passive gap theory," but it still carries and raises the same problems. If the creation *ex-nihilo*, the creation of original matter, the creation of heaven and earth took place billions of years ago, why is the last day of this creation given as the seventh day of the same creation of heaven and earth (Genesis 2:1-2)?

I do not think either that the text allows for the idea of the creation of matter in vv. 1-2 during the first night as a part of the creation on the first day, that is, before the creation of light in v. 3. For the Hebrew day implies both night and day. The words *ereb* and *boqer* do not imply two distinct periods of time (night and day) but represent the two extremes of the time of the day to imply the totality of the day (*merismus*). Light or day as well as darkness or night belong to this first day of creation.

And yet the biblical creation story is not unaware of the problem of time and suggests a connection through its connection with its parallel text. The fact that in the text of Genesis 2:4b-25 man, the garden, the trees, etc., are given as a "finished" "mature" creation may suggest a key for the problem of time implied in Genesis 1:1-2:4a. The miracle of this

"compression" of time for the creation of man and his immediate environment (as described in the second creation story and also attested in the first on the sixth day of the creation week) makes possible the idea of the other miracle of compression of time for the cosmic creation (matter, rock, light, the firmament, the earth).

Of course, this solution is hypothetical. Could it be otherwise? After all we are concerned with the divine work of creation. But at least this parallel of thinking is allowed by the creation story through its connection with its parallel text. Certainly this option is one of faith. Scientifically, reasonably, time is a necessary factor to produce a mature earth, but is it not the same for the creation of man? If we have the faith to believe that God could "by-pass" time for the creation of man and his environment, we can have faith for the other creation. After all, whatever we do, whether we allow for more or less time, the problem of time will always remain as real and acute anyway. From the perspective of faith, the solution is easy. From a scientific perspective, it remains to be explored whether or not this idea of compression of time is a possible option.

CONCLUSION: OUR FAITH IN CREATION

Indeed, the affirmation of creation pertains to both faith and science. Both perspectives are then needed in that discussion. There is merit and justification for a strong and deep conviction about the event of creation, for only faith can make justice of this event, since no humans were present or involved in that operation. There is also merit in showing the weaknesses and the limitations of evolution as a scientific option or a philosophical thesis; for we live in a critical world and only a rigorous and serious intellectual defense will make our faith in creation a reasonable position. But I think our testimony should take us beyond the dogmatic faith or the apologetic argumentation (without abandoning either one), to adopt a more positive stance and to explore further and discover the meaning, the beauty, and the depth of the biblical truth of creation, and eventually think creatively on creation. For creation is more than a revealed truth to be imposed "by faith" on the faithful believer; more than an argument against evolution to be proved "by reasoning" to the unbeliever. Creation is life itself.

ENDNOTES

1. On the theological significance of this literary observation of "beginning and end in the Bible," see especially: Westermann C. 1972. Beginning and end in the Bible, translated by K Crim. Philadelphia, PA: Fortress Press.

2. See: Doukhan J. 1993. Allusions à la création dans le livre de Daniel: Dépistage et Significations. In van der Woude AS, editor. The Book of Daniel in the Light of New Findings. Leuven, Belgium: Leuven University Press, p 285-292.
3. Buber M. 1964. Schriften zur Bibel, vol. 2 of Werke. Munich: Kösel Verlag; Heidelberg: Verlag Lambert Schneider GmbH, p 1112.
4. A simplified transliteration has been used in this paper to facilitate its reading and to accommodate the non-technical eyes of lay readers.
5. Doukhan JB. 1978. The Genesis Creation Story: its literary structure. Andrews University Seminary Doctoral Dissertation Series, vol. 5. Berrien Springs, MI: Andrews University Press, p 78-79.
6. Garrett DA. 1991. Rethinking Genesis: the sources and authorship of the first book of the Pentateuch. Grand Rapids, MI: Baker Book House, p 195.
7. Albright WF. 1957. The Refrain 'And God saw kî tôb' in Genesis. In: Mélanges bibliques rédigés en l'honneur de André Robert. Travaux de l'Institut Catholique de Paris 4. Paris: Bloud & Gay, p 26.
8. See: Westermann C. 1966. Genesis. Neukirchen: Neukirchener Verlag, p 22.
9. Hornung E. 1996. L'Esprit du temps des pharaons. Philippe Lebaud Editeur/Editions du Félin, p 34, 35.
10. Lichtheim M. 1973. Ancient Egyptian literature. Berkeley and San Francisco: University of California Press, Vol 1, p 106.
11. Chassinat E. 1892-1897. Le Temple d'Edfou. Paris: Mémoires de la mission archéologique française, Vol 6, p 4, 16.
12. Pritchard JB, editor. 1969. Ancient Near Eastern texts relating to the Old Testament. Third ed. Princeton, NJ: Princeton University Press, p 4-6.
13. Anderson BW, 1967. Creation versus chaos: the reinterpretation of mythical symbolism in the Bible. New York: Associated Press, p 33.
14. Walsh JT. 1977. Genesis 2:4b-3:24: a synchronic approach. Journal of Biblical Literature (1977):164.
15. The same connection is attested in John 1:1 in a context that is consciously reminiscent of the text of the Genesis creation story. Although the Gospel of John does use the phrase "in the beginning" as an independent clause, following the Septuagint of Genesis 1:1, it also relates the word "beginning" to the word of God — "In the beginning was the word" (John 1:1).

ANNOTATIONS FROM THE LITERATURE

BIOGEOGRAPHY: DISPERSAL OF SOUTHERN FISHES?

McDowall RM. 2002. Accumulating evidence for a dispersal biogeography of southern cool temperate freshwater fishes. Journal of Biogeography 29:207-219.

Summary. Certain taxa are found on two or more of the southern continents, but are absent from the northern continents. This is usually explained as due to the movement of continental plates. According to vicariance theory, such groups were once widely distributed on Gondwana, and were separated by division of Gondwana into the present southern continents. Freshwater fish are often thought to be especially good indicators of past continental connections, because of their supposed inability to tolerate salt water for extensive periods of time. Two families of lampreys and two families of bony fish (Galaxiidae and Retropinnidae) are restricted to the southern continents, and have been used as evidence for previous continental connections. However, these families all have some members that enter the sea, and some of the distribution patterns suggest dispersal. There is no compelling evidence to rule out dispersal as the best explanation for the distribution of these fishes.

Comment. Numerous groups of organisms are restricted to the southern continents, isolated from each other by wide expanses of ocean. Two types of explanations have been offered for such distribution patterns: dispersalist and vicariance. According to dispersalists, isolated populations represent immigration and colonization of new regions by dispersal across barriers. Vicariance theory proposes that dispersal is too rare and untestable to be a useful explanation. Instead, isolated populations represent a historical fracturing and separation of an ancestral range as continents broke apart and drifted away from each other. Vicariance explanations have dominated biogeography for the past couple of decades, but dispersalist explanations are coming to be increasingly recognized. Even multiple congruent phylogenetic patterns in different groups can be the result of multiple dispersals, especially where consistent patterns of wind or ocean currents occur.

One should be cautious in accepting claims that present distribution patterns can be traced back to the breakup of Gondwana.

EVO-DEVO: TEETH IN CHICKS

Mitsiadis TA, Chéraud Y, Sharpe P, Fontaine-Pérus J. 2003. Development of teeth in chick embryos after mouse neural crest transplantations. Proceedings of the National Academy of Sciences (USA) 100(11):6541-6545.

Summary. In vertebrates, teeth develop via inductive interactions between neural crest-derived mesenchyme and overlying oral ectoderm. Mitsiadis et al. created mouse/chick chimeras by grafting mouse anterior neural tube into chick embryos from which the anterior neural tube had been removed. In these chimeras, migration of mouse neural crest cells to the oral region and induction of tooth germ-like structures was demonstrated. These results were interpreted to support the hypothesis that ancestors of modern birds lost the ability to produce teeth when avian mesenchymal cell's ability to be induced by ectoderm during tooth development disappeared.

Comment. Other papers have demonstrated the ability of avian ectoderm to induce dentin production in mammal cells. In possibly the most spectacular of these papers,[1] at least one fully formed tooth was produced with "enamel matrix proteins" apparently derived from the avian ectoderm. Both creationist and Darwinist authors have commented on these papers.[2] In Mitsiadis et al., tooth germs that were produced lack many of the structures characteristic of more developed teeth. This may be attributed to termination of the experiment prior to full tooth development.

The important question from an evolutionary standpoint is, does this experiment, and others like it, demonstrate that bird's ancestors once had teeth? The answer is, not necessarily. What has been demonstrated is induction of tooth production by avian ectoderm in mouse cells that are thought to have last shared a common ancestor with birds 300 million years ago.[3] In addition, Mitsiadis et al. appear to show that the induction is via pathways similar to those used in normal mouse tooth development. That signaling mechanisms of this complexity would be maintained over the time period suggested seems incredible, especially considering other profound changes that have occurred in these two animal classes.

An alternative explanation may be that a Designer used similar tools to signal the location of oral ectoderm in a wide range of organisms. While these signals are necessary for normal facial development in birds and mammals, differences between the two groups result from the interaction of these signals with other cells. Use of off-the-shelf components like those demonstrated to be expressed in both mouse and bird facial development by Mitsiadis et al. suggests a single Designer more than they suggest common ancestry. This is especially true given the time periods and mechanism suggested for evolution of birds and mammals. (T.S.)

NOTES

1. Kollar EJ, Fisher C. 1980. Tooth induction in chick epithelium: expression of quiescent genes for enamel synthesis. Science 207: 993-995.
2. See Leonard Brand's comments on Endnote 1, in: Brand L. 1997. Faith, reason and Earth history: a paradigm of earth and biological origins by intelligent design. Berrien Springs, MI: Andrews University Press, p 130; and Stephen J. Gould's comments on the same paper in Gould SJ. 1993. Hen's teeth and horses toes: further reflections on natural history. NY: WW Norton, p 177-186.
3. The mammal reptile split is thought to have occurred before the reptile bird split. The mammal reptile split is put at 300 million years ago by Vaughan TA. 1986. Mammalogy, 3rd Edition. Philadelphia, PA: Saunders College Publishing, p 26.

EVO-DEVO: WINGS ON AND OFF

Whiting MF, Bradler S, Maxwell T. 2003. Loss and recovery of wings in stick insects. Nature 421:264–267.

Summary. Molecular phylogenies of the stick insects (Phasmatodea) require that wings and flight evolved independently at least four times. Of the three families, 500 genera and approximately 3,000 described Phasmid species, only 40 % are fully winged. The wings when present show a high degree of homology with other insect wings. Instead of following the traditional dogma that once wings are lost, they cannot re-evolve, Whiting et al. suggest that selective pressure exists to maintain genetic information necessary for wings. In this particular group of insects, they suggest that genes for production of wings were present in a common ancestor and were maintained over the course of evolutionary time in wingless species, being activated when selective pressure made wings adaptive.

Comment. Evolution of the original genetic information used for production of wings is not discussed in this paper. In addition, evidence other than that inferred from molecular phylogenies is not presented to make a convincing case for the absence then presence of wings. For example, no fossil sequences that trace absence and appearance of wings in stick insects are presented. However, the model suggested is consistent with the design argument that information cannot be generated for free. Whiting et al. argue that the information for wings was present ever since the Phasmid order arose. The problem is that evolution of these various taxa within the Phasmatodea is thought to have occurred over millions of years. The explanation given, that some information necessary for wings is needed for production of other structures like legs, begs the question of how the information unique to wing formation could have survived in absence of direct selective pressure over such long time spans. It also suggest an interesting pathway for investigation, genetic analysis of information necessary for wing formation and a study of whether this information is in fact present in living wingless stick insects. (T.S.)

EVOLUTION AND RELIGION

Ruse M. 2003. Is evolution a secular religion? Science 299:1523-1524.

Summary. Creationists sometimes assert that evolution functions as a secular religion rather than a scientific theory. Is there any merit to this claim, or is it merely another "creationist trick?" The answer can be found in the history of evolution. This history can be divided into three phases: pre-Darwinian; Darwinian; and neo-Darwinian.

In the pre-Darwinian stage, evolution was a pseudoscience, much as mesmerism or phrenology. Darwin brought evolution into the scientific arena, but it never really caught on very well. Evolutionary theory had no practical application, and other areas of science received prominence. Thomas Huxley saw the Anglican Church as a competitor for the evolutionary theory of origins, and attempted to establish his own church, based on evolution. Huxley helped establish "new cathedrals of evolution" otherwise known as natural history museums.

In the neo-Darwinian stage, evolutionary theory became quantitative and gained prominence in the universities as a fully scientific field of study. However, even the secular neo-Darwinians felt the need

to comment on morals, values, and cultural needs. This trend has continued to the present. We have two kinds of evolution. One is the professional, scientific evolutionism, which is not a secular religion any more than industrial chemistry. The other type of evolution is a popularized form where evolution is used to develop claims about the nature of reality, the meaning of life, and rules for behavior. This latter form of evolution can be fairly described as a kind of secular religion, and should not be a part of science classroom teaching.

Comment. Ruse has made an important point — that much of what passes for scientific thinking in the popular culture actually functions as a form of secular religion. However, one wonders if this can be avoided by those who adopt and promote a theory of origins. Even the "scientific" type of evolution has implications for morality, the nature of reality, and other issues of a generally religious nature. Few among us can think about these issues for very long without facing the question of how they apply to our own lives. Perhaps there is no way to make the study of origins a neutral subject within a science classroom.

EVOLUTION AND SCIENCE

Sober E, Steel M. 2002. Testing the hypothesis of common ancestry. Journal of Theoretical Biology 218:395-408.

Summary. The idea that all living organisms descended from a single common ancestor is widely accepted but with little attention to testing this assumption. As the authors state "the typical question is *which* tree is the best one, not *whether* there is a tree in the first place" (italics in original). At least three arguments for common ancestry have been proposed. Crick proposed that the genetic code is a "frozen accident." If the code arose by chance, independent lineages might be expected to have different genetic codes. The same argument could apply to left-handed amino acids and other biochemical universals.

A second argument for common ancestry was proposed by Oparin and others: that living organisms altered their environment so that conditions were no longer favorable for life to originate a second time. This argument can be supplemented by the observation of the tendency for one lineage to eventually eliminate the others. Given enough time, all the survivors are probably from the same lineage.

A third argument developed by Penny and others states that species of a single lineage are more likely to exhibit congruence in character state patterns that species of multiple lineages. When species show similar patterns of relationship based on different data sets, they are probably truly related. None of these tests is quantitative, nor conclusive. Sober and Steel present a model based on information theory, and recommend its use in testing common ancestry. Evidence for some genealogical relationships may be irretrievably lost with the passage of time.

Comment. We salute Sober and Steel for addressing this issue in an open manner. We suspect that it may be impossible to distinguish evidence for independently created lineages from loss of information with time.

Penny D, Hendy MD, Poole AM. 2003. Testing fundamental evolutionary hypotheses. Journal of Theoretical Biology 223:377-385.

Summary. This is a response to the paper by Sober and Steel, who argued that common ancestry might be untestable because long ages of time might have erased the pertinent evidence. In contrast, the authors of this paper claim that some alternatives to the theory of common ancestry can be formulated and tested. Two types of arguments are presented. First, Penny et al. respond to Sober and Steel's argument that methods of tree construction based on parsimony assume common ancestry. Their response is that methods other than parsimony can be used, and should be favored if they give more consistent results when analyzing and comparing different data sets. The second argument by Penny et al. is that alternative hypotheses of ancestry can be tested and rejected. They give two examples: the theory of influenza viruses from outer space, and the theory that every species was created separately (which they call "intelligent design"). They conclude by noting the difficulty of testing common ancestry, but propose that further analysis will produce tests of competing hypotheses.

Comment. This paper illustrates the difficulty all of us have in responding to criticisms made by persons with presuppositions that clash with our own. I will discuss three problems with the arguments presented.

First, Penny et al. argue that the best method for tree construction is the method that gives the most congruent results from different data sets. However, this is true only if the species actually do share a

common ancestor. If they have separate origins, the best method might be the one that shows the greatest conflict in the different trees. Conflict among evolutionary trees based on different data sets is so widespread and common that one may prefer the conclusion that common ancestry has been falsified.

Second, there is an inconsistency in one of their arguments. In discussing how to test for common ancestry, Penny et al. make the statement that "a minimal-length Steiner tree can be calculated for any data…". This statement is followed later in the same paragraph by a defense of their ability to test the theory of descent for mammals because it "allows a comparison against a null alternative (that there was no treelike information in the data)." A null hypothesis (there is no treelike information in the data) that must be rejected in every case (because a tree can be constructed for every data set) can hardly serve as a test of a hypothesis.

Third, the alternative hypotheses for which tests are proposed seem more like straw men than real competing hypotheses. One alternative hypothesis is that influenza viruses have repeatedly come from outer space, rather than descending from a common ancestor. The other alternative hypothesis was that every species was created individually, optimally designed for its present environment. Neither of these hypotheses is taken seriously by those who are skeptical of common ancestry. What would be more interesting would be a test of a hypothesis that there exist multiple independent lineages, each of which has diversified into numerous species. A hypothesis of this type seems to fit the data better than any competitor, notably including the hypothesis of a single common ancestor.

GEOLOGY AND THE BLACK SEA FLOOD

Aksu EE, Hiscott RN, Mudie PJ, Rochon A, Kaminski MA, Abrajano T, Yasar D. 2002. Persistent Holocene outflow from the Black Sea to the Eastern Mediterranean contradicts Noah's Flood hypothesis. GSA Today (May):4-9.

Summary. In 1998 Ryan and Pitman proposed that the Black Sea had experienced a catastrophic inflow of water about 7500 years ago, and that this might have been the basis for the biblical flood story. The catastrophic inflow occurred when a sediment dam across

the Bosphorus Strait was eroded by encroaching waters from the Mediterranean. This supposedly released a huge amount of seawater that poured into the brackish Black Sea, which had a low water level. Evidence reported in this paper indicates that brackish water has flowed continuously from the Black Sea to the Mediterranean for the past 10,000 years. This implies that there was no catastrophic flood in the Black Sea 7500 years ago.

Ryan WBF, Çagatay N, Major CO, Lericolais G. 2003. Evidence for a Black Sea flooding event. Geological Society of America Abstracts with Program 35(6):460 (189-1).

Summary: Seafloor topography of the Black Sea shows an old exposed landscape with shorelines, lagoons, and river channels. Molluscs have strontium ratios indicative of freshwater habitats. Two lowstands are recorded, the second ending at 8,400 radiocarbon years ago, and punctuated by an abrupt shift to marine conditions, based on faunal composition of benthic foraminifera, molluscs, and dinoflagellates. The best explanation for the sudden change from freshwater to marine conditions is a saltwater flood that occurred as the ocean rose and spilled over the Bosphorus barrier. Aksu's criticisms of the Black Sea flood hypothesis were based on misinterpretation of the data.

Tchepalyga A. 2003. Late glacial great flood in the Black Sea and Caspian Sea. Geological Society of America Abstracts with Program 35(6):460 (189-2).

Summary: Runoff from melting glaciers drained into a Great Eurasian Basin System, as evidenced by endemic Caspian molluscs distributed from the Caspian Sea to the Dardanelles. This created a flood that overflowed the Caspian depression into the ancient Black Sea depression, and then into the Sea of Marmara. This freshwater flood may have been the source of the story of Noah's flood.

Preisinger A, Aslanian S. 2003. The Black Sea during the last 20,000 years: sea level salinity and climate. Geological Society of America Abstracts with Program 35(6):461 (189-9) .

Summary: Both the level of the Black Sea and its salinity have risen continuously since the last glacial maximum. At the time that water from the Mediterranean began to overflow the Bosphorus, the level of the Black Sea was about 34 m below present level. The level has increased since that time to the present.

Comment. The hypothesis that the Biblical Flood was based on a catastrophic flood in the Black Sea attracted a great deal of interest and comment, but was not consistent with the Biblical record. Different data sets and observations are used to support conflicting interpretations. The idea that saline Mediterranean waters once flowed into a previously freshwater Black Sea seems widely accepted. More controversial are questions over exactly when this happened and how rapidly it occurred. Regardless of whatever consensus develops on these questions, the Black Sea does not provide a plausible setting for the biblical flood.

MOLECULAR BIOLOGY AND EVOLUTION: GENE DUPLICATION

Force A, Lynch M, Pickett FB, Amores A, Yan Y-L, Postlethwait J. 1999. Preservation of duplicate genes by complementary degenerative mutations. Genetics 151:1531-1545.

Summary. The origin of new genes is a problem for evolutionary theory. The favored view is that genes are occasionally accidentally duplicated, with one gene copy remaining functional while the other copy is free to mutate. The extra gene copy may degenerate into a nonfunctional pseudogene, or it may happen to become a gene for a new function. Degeneration is the most likely result. However, sequence studies indicate that genes thought to be duplicated are preserved more often than theory predicts; hence, some explanation is needed. The explanation proposed here is that genes often have multiple functions, and the different functions may be regulated by different regulatory elements. Thus, one gene copy may lose part of its function, but the other gene copy may compensate for this loss by retaining the function. Losses of different functions in each gene copy would result in preservation of both gene copies. This hypothesis needs further testing.

Comment. The gene duplication theory seems inadequate to explain the gain of function required by evolutionary theory. The hypothesis proposed here may explain how certain genes lose some of their function yet remain useful, but it is not clear how partial loss of function could free a gene to mutate to a new function. It would seem more likely that both gene copies would be subjected to increased stabilizing selection to prevent further loss of function. Although a

few putative examples of gain of function have been proposed, skepticism of such hypotheses seems fully justified on theoretical grounds.

PALEOCLIMATE AND CARBON DIOXIDE

Royer DL, Osborne CP, Beerling DJ. 2002. High CO^2 increases the freezing sensitivity of plants: implications for paleoclimatic reconstructions from fossil floras. Geology 30:963-966.

Summary. Paleoclimatic reconstructions are often based on climatic tolerances of living plants thought to be related to fossils found in an area. Experimental study has revealed that carbon dioxide levels affect the sensitivity of plants to freezing, thus altering estimates of paleoclimate. Increasing the carbon dioxide concentration increases the freezing sensitivity of living plants. If the past concentration of carbon dioxide were double the present value, estimates of paleotemperature minima based on fossil leaves would need to be raised by at least 1.5 to 3°C.

Comment. This discovery could significantly alter interpretations of past climates.

PALEONTOLOGY: PERMIAN BACTERIA IN SALT OR MODERN CONTAMINATION?

Nickle DC, Learn GH, Rain MW, Mullins JL, Mittler JE. 2002. Curiously modern DNA for a "250-Million-Year-Old" bacterium. Journal of Molecular Evolution 54:134-137.

Summary. Vreeland et al recently claimed to have extracted and cultured bacteria from a salt crystal supposedly 250 million years old. However, the DNA sequence of 16S ribosomal DNA has only three clear differences from the sequence of the modern bacterium, *Salicbacillus marismortui*, which is found in salt deposits. This is far less than the amount of DNA differences one would expect to find in such ancient bacteria, and indicates that the bacteria in question were much younger than 250 million years.

Comment. It is difficult to believe that a bacterium could survive for 250 million years. Yet the original researchers used meticulous methods that seem likely to prevent contamination. Might the explanation be that the bacteria were actually present in the salt crystals and

were not contaminants, but that the time since emplacement is much less than the conventional geological age of the material?

PALEONTOLOGY: TRIASSIC BIRD TRACKS?

Melchor RN, de Valais S, Genise JF. 2002. Bird-like fossil footprints from the Late Triassic. Nature 417:936-939.

Summary. Bird-like footprints have been found in the Santo Domingo Formation, an Upper Triassic redbed in Argentina. The tracks are well-preserved and abundant, and exhibit nearly all the features of modern bird tracks. No suitable track-makers are known from Triassic sediments, and it is presumed that the tracks must have been produced by an unknown group of somewhat bird-like theropods.

Comment. The most natural explanation for these tracks is that they were produced by birds. The tracks are significantly separated stratigraphically from any known bird fossils. This stratigraphic separation is somewhat unusual, but not unprecedented. The interpretation that tracks were produced by an unknown theropod, rather than by birds, is drawn by evolutionary assumption instead of the data. If the tracks were made by birds, the hypothesized theropod ancestry of birds would be difficult to defend.

SCIENCE: TESTING THE PAST

Miller K. 2002. The similarity of theory testing in the historical and "hard" sciences. Perspectives on Science and Christian Faith 54:119-122.

Summary. Science proceeds by gathering information, proposing an explanation (hypothesis), and then testing the explanation. This methodology is the same for all branches of science, whether experimental or historical. Strictly speaking, no event is repeatable, so repeatability should not be a strict criterion of hypothesis testing. Both historical and experimental sciences are predictive, testable, and generate new questions for research. Thus, historical sciences such as evolutionary biology, geology and paleontology should not be compared unfavorably with the "hard" experimental sciences such as physics and chemistry.

Comment: Knowledge of initial conditions is a fundamental difference between historical science and experimental sciences. The two

types of investigation may require similar amounts of effort and ingenuity, but there is a difference in the degree of confidence that one should place in the results.

SCIENCE: HISTORY AND THE SCIENTIFIC METHOD

Cleland CE. 2001. Historical science, experimental science, and the scientific method. Geology 29:987-990. See Geology 30:951-954 for some reactions.

Summary. Historical science and experimental science have different methodologies, but neither should be considered more objective, more rational or more securely established by evidential support. Neither inductivism nor falsificationism is actually practiced by real scientists. Experimental scientists make predictions and then try to use experimental tests to rule out false positives and false negatives. Historical scientists construct multiple competing hypotheses and then try to find a "smoking gun" that will favor one hypothesis. Differences between the two methodologies "reflect an objective difference in the evidential relations at the disposal of historical and experimental researchers for evaluating their hypotheses." There is no basis to claim that one of these kinds of hypotheses is "more securely established by evidence."

Comment. The term "science" has become such a culturally powerful word that many find it irresistible to fight to attach this symbol to one's own activities. It is widely agreed that there are clear differences in methodology between "historical scientists" and "experimental scientists." Cleland admits that there are differences in the nature of the evidence available to the different systems of investigation. In view of this, it is quite reasonable to suppose that one methodology actually does reproduce results that are more reliable and "more securely established by evidence" than the other.

SPECIATION IN PARALLEL

Rundle HD, Nagel L, Boughman JW, Schluter D. 2000. Natural selection and parallel speciation in sympatric sticklebacks. Science 287:306-309.

Summary. Several lakes in coastal British Columbia are believed to have been covered by ice until after the Ice Age, so any fish living

in them must be relatively recent colonists. Several of these lakes are inhabited by two different forms of three-spined stickleback fish, which are apparently derived from a nearby marine species. The two forms differ in shape and habits. One form — the Benthic — is larger bodied and feeds on invertebrates in shallow water. The other, Limnetic form, is more slender and feeds largely on plankton in the open water. In each lake, the two forms are reproductively isolated, and it appears at first glance that the two forms represent two species that originally colonized each of the lakes. This idea is supported by experiments that show that the similar forms from different lakes will interbreed with each other, but not with the contrasting form from their own lake. However, molecular studies indicate that the Benthic and Limnetic forms from each lake are more closely related to each other than to the similar forms in other lakes. This implies that parallel speciation has occurred. In other words, the ancestral species invaded each of the lakes, and developed into two forms that are reproductively isolated from each other, but not from similar forms in other lakes. This appears to be an excellent example of natural selection in the wild.

Comment. The explanation from natural selection seems reasonable, and is consistent with creationist theory. This study has rather negative implications for attempts to reconstruct phylogeny solely on the basis of morphology, which is essentially the only basis available for studies of fossils.

LITERATURE REVIEWS

Readers are invited to submit reviews of current literature relating to origins. Please submit contributions to: ORIGINS, Geoscience Research Institute, 11060 Campus St., Loma Linda, California 92350 USA. The Institute does not distribute the publications reviewed; please contact the publisher directly.

Finding Darwin's God: A Scientist's Search for Common Ground Between God and Evolution. Kenneth Miller. 1999. NY: Cliff Street Books. 338 p. Cloth, $25.00; paper, $14.00.

Reviewed by Paul A. Giem, Loma Linda, California

Kenneth Miller is a molecular biologist at Brown University who has long been involved in the creation-evolution controversy. He has vigorously defended Darwinian evolution, and yet is a Catholic, while most of his fellow Darwinists are agnostic if not atheist. In fact, he was cited in the recent PBS video documentary series "Evolution" as an example showing that religion, at least some religion, and Darwinism are not incompatible. *Finding Darwin's God* explains Miller's point of view on evolution, theism, and their relationship.

Miller makes it clear in the Introduction and Chapter 1 that he believes evolution to be the correct way to view the history of life on Earth, and also that he believes in God. He acknowledges that these ideas are not usually thought to be compatible, but intends to explain why he believes they are. First, however, he intends to make it clear why he thinks that evolution is correct.

In Chapter 2 Miller recounts some of the history of Darwin's theory. He readily admits that, like all scientific theories, it is not beyond theoretical question (see also p 130), but thinks that in practice it is extremely well confirmed, so that in the scientific world it might as well be fact. In one sense he states that evolution is a fact; the fossil record was laid down over long ages and organisms that existed long ago are related to organisms that exist today (sometimes called descent with modification; p 53-54). In another sense evolution is theory, as the precise mechanism (natural selection acting on random mutations) is not provable, but he states that this theory is as well established as atomic theory or germ theory (p 54). He does a good job disposing of the idea that because some object cannot be touched, or because some event occurred in the past,

we cannot study it scientifically. He also defends what he calls scientific materialism, or what is elsewhere called methodological naturalism, as the fundamental assumption of science. What he does not do is establish that methodological naturalism must be able to explain the entire universe. This point becomes important in two ways, which we will discuss later. First, Miller himself believes that some events are not explained by methodological naturalism. Second, he sometimes uses methodological naturalism against his creationist opponents.

Chapter 3 explains why Miller thinks that special creationists are wrong. Basically he believes that science can establish the age of Earth, of the universe, and of life on Earth, and that this age is incompatible with special creation. He relies heavily on radiometric dating. He acknowledges other dating methods, but believes them to have major flaws. His criticism of the use of volcanism and erosion to date the earth is correct. Volcanism and erosion are opposite processes, and cannot be used uncritically to date the age of Earth without consideration of each other, and other processes such as continental uplift. In other cases he is not quite as fair, as when he suggests that the mineral content of seawater cannot limit its age (p 64-65). For some minerals, such as aluminum, he is undoubtedly right. However, his hypothesis, that aluminum forms insoluble complexes and settles out, will only work for minerals that are at or near saturation in seawater. Sodium, and especially potassium, may still be useful in setting an upper limit for the age of the ocean, as they are nowhere near the saturation point in seawater.

Miller's treatment of radiometric dating is heavily dependent on Brent Dalrymple (p xiii). Miller's discussion of potassium-argon dating assumes that a given crystalline material "contains no initial argon" (p 68). This statement is demonstrably false for lava. Modern lava commonly has argon that matches the isotopic composition of air and therefore dates to zero using the standard formula, but practically all modern lava contains significant amounts of argon (see, e.g., Dalrymple 1969). The same holds true for synthetic muscovite (Karpinskaya 1967), and there is no reason to suspect that it is not true for biotite. Other minerals, such as sylvite, may be more likely to exclude argon, but they are somewhat of an embarrassment to evolutionists (see the discussion in Giem 1997, p 131-132).

The discussion of short-lived isotopes (p 69-72) is technically incorrect (not all Miller's "Yes-P" nuclides are produced as the result of decay series), but the point is still valid. Isotopes with a long half-life are found

on Earth, whereas isotopes with a shorter half-life are not found unless they are being produced by some other process. However, if either Earth (but not life on Earth) is old, or rapid decay occurred during creation and/or the Flood, one would also expect this pattern from a creationist standpoint.

When Miller discusses rubidium-strontium dating, he states (p 76), "However, no natural process exists that could produce overestimates of age that would pass the rigorous test of isochron analysis." In this he is simply wrong. Two-component mixing lines always precisely mimic isochrons, and it is nearly universally accepted that some "isochron" lines are in fact mixing lines (see Giem 1997, p 144-147). What is not clear is how many "isochron" lines are mixing lines. Speeding up radioactive decay could also explain radiometric dates, although Miller points out problems with this approach.

Finally, Miller criticizes the young-universe theory. Here is where many special creationists are perhaps most vulnerable to criticism. The "appearance of age" is theoretically possible, but scientifically completely unfruitful, whereas conventional cosmology is reasonably cohesive. However, there are other possible creationist solutions to the problem. Russell Humphreys (1994) has proposed one possible solution. Another one is that Genesis records only the creation of the solar system, or even only Earth's surface. If the scientific evidence for the age of life on Earth can reasonably be matched with the Genesis account, I do not see that the problem of the age of the universe should cause one to abandon special creationism.

Chapter 4 discusses multiple creations. Now that Miller thinks that he has established the age of life on Earth, he criticizes, on theological grounds, those creationists who believe in long ages for life on Earth. He notes imperfection, at least theoretical imperfection, in design in nature, and therefore postulates that any designer must be imperfect. Furthermore, the designer must not care about animal life, as he created multiple species, genera, classes, and even phyla, which went extinct after short geological periods, and were therefore wasted, at least from our point of view.

In addition, Miller insists that evolution is up to the job of creating new species, and therefore new genera, classes, and phyla (which does not necessarily follow). He notes that measures of evolutionary change in the present are 10,000 to 10,000,000 times as fast as was apparently the case in the fossil record. He points out that Gould and Eldridge

were evolutionists, and believes that they had successfully harmonized the fossil record with Darwinian theory. Miller may be right, although certainly Gould's and Eldridge's initial statements sound like they disagreed with Darwinian theory, and sudden appearance and stasis were historically more expected by creationists than by evolutionists. His interpretation also has difficulty with the Cambrian explosion, which he barely mentions in this context, without mentioning the problems it causes for him (p 127). He later mentions the Cambrian explosion on p 210-211, and again on p 240, this time in a context which shows that he recognizes the problem.

In my opinion, Miller's attack on Behe's concept of irreducible complexity (Chapter 5) fails. He agrees with Behe on the general principle: truly irreducible complexity (biochemical machines made up of several parts, all of which must be present for significant function) means that direct evolution is not possible (see p 133,143,161). And I agree with him that the cilium is not the best example of irreducible complexity, although he misrepresents Behe's argument. (Behe discusses the basic requirements for a structural protein, a linking protein, and a powering protein, not how many tubules one needs for motion of a cilium.) The other examples Miller gives, with the possible exception of blood clotting, are all examples where irreducible complexity does not exist, and in the case of the Krebs cycle, Behe (1996, p 62-65) had already explicitly noted that this was the case. Here Miller is setting up straw men. Behe's best example, the bacterial flagellum, Miller simply sidesteps (p 147-148), in my opinion unfairly (I have seen him, in a debate with Paul Nelson and William Dembski in Burbank, CA, on 21 June 2002, admit that the flagellum is a point for intelligent design advocates.) Miller's comments on the anatomy of the middle ear are irrelevant to the biochemistry of irreducible complexity (at least with our present knowledge), as Behe (1996, p 15-18) correctly noted in principle.

Miller does make one correct objection to Behe's synthesis. If God created life with all the DNA necessary for the major divisions of life, as Behe postulated, without continued Divine intervention how could the DNA have kept its integrity and not been destroyed by mutations during the presumed 3 billion years while it was silent and not under pressure from natural selection to stay intact? Miller's point is a good one.

But it seems to me that Miller is missing an important point. Behe's argument against undirected evolution may be true even if his personal

synthesis is wrong. Miller's frustration with Johnson may be at least partly misplaced for the same reason. Since Philip Johnson does not take a firm position, Miller is unable to attack Johnson's position. But Johnson's criticisms of undirected evolution may very well be valid even if Johnson does not present a specific substitute for undirected evolution that is theologically and scientifically coherent.

Later on Miller will again misstep while discussing Behe. On p 264 he states, "Michael Behe was correct to point out that Darwinian explanations of biochemical machines are rare, but his arguments require that they be absolutely non-existent." Of course this is not true. To disprove mechanistic evolution, Behe's argument requires only that Darwinian explanations of biochemical machines are truly nonexistent in one instance, although the more instances the stronger the argument. This condition is hard to establish, because we do not always know all of the possible explanations for a given phenomenon. But in theory, if naturalistic explanations of the universe are all that is needed, then there must be at least one naturalistic explanation for each and every event in nature.

In Chapter 6 (amplifying comments in Chapters 1 and 2), Miller notes that atheists try to use evolution to advance atheism. He identifies this linkage as the reason why there is such a negative reaction in some quarters to the theory of evolution. In this Miller is partly right (there are also scientific reasons). He documents the comments of several evolutionists who explicitly state that evolution implies atheism, and creationists who react to atheistic philosophy. He believes that the linkage between evolution and atheism is not valid.

In the rest of the book, Miller starts to create his own synthesis. He starts out with science. However, he rejects determinism, based mostly on quantum theory, with a little chaos theory thrown in (p 241). In fact, since quantum theory can influence genetics, he rejects determinism in the history of life, and hints that determinism is not sufficient to explain thought. He seems to indicate that God could act in quantum gaps (p 213), although he does not expand on that idea. He also argues for the existence of God from the Big Bang and the anthropic coincidences, although he is careful not to press the point too strongly. In fact, he seems to pull most of his punches when attacking atheists. Perhaps he is aware that his arguments for the existence of God are also "God of the gaps" arguments. Certainly he is aware that many, himself included, believe that a "God of the gaps" will eventually be unemployed. Perhaps

he should note that there are different kinds of "God of the gaps" arguments, some more valid than others because they are based on knowledge rather than ignorance.

The nearest I can sum up Miller's belief is the following: God created the universe, and God is continually active in the universe. The way God created life was by evolution. This allows life to be free, and not determined either by God or by initial conditions. It also absolves God of the direct responsibility for evil in this world (but only to the extent that God cannot interfere in nature).

Miller is "interested in a traditional view of God — the one described by the great Western monotheistic religions", not "something smart, modern, and sophisticated" (p 221). He also believes that the great Western religions have three principles in common (p 222). They are: 1) the primacy of God in the universe, 2) that we exist as the direct result of God's will, and 3) God has revealed Himself to us. The last principle prevents us from being deists (reinforced on p 216).

He believes in miracles. He notes (p 239), "Any God worthy of the name has to be capable of miracles," and, "Miracles, by definition, do not have to make scientific sense." Instead (p 240), "They reflect a greater reality, a spiritual reality, and they occur in a context that makes religious, not scientific, sense." That is, they are not irrational. They are just not mechanistic. He accepts such miracles as the Virgin Birth of Christ (p 239).

Miller would prefer to have a universe where God does not have to actively intervene in nature. His theology appears to be akin to that of Howard Van Till, whom Miller cites. He asks, through a quoted lecturer (p 283-284), which pool player is more impressive: one who cleans the table with fifteen shots, or one who takes one shot and sinks all fifteen balls? Miller obviously favors the latter.

This is not just an intellectual preference. Recall Miller's vigorous defense of evolution from its detractors, sometimes using straw men, and his tepid defense of theism. Put with that his pleased reaction when he found out his catechist, Father Murphy, was wrong; there is a naturalistic explanation for flowers (p 260-262). Note his admission that he did "my best to demolish the very idea" that "we were put here for a reason" (p 58, while acknowledging on p 233 that "all Western religions teach," presumably including his own, that "mankind is the *intentional* creation of God" [his italics]). Finally, note that he does not concede to Behe, at least temporarily, regarding the flagellum. One

gets the feeling that at least some of his arguments are not determined solely by the evidence, but have partly to do with his philosophical comfort zone and/or other factors.

There are three questions where Miller is not so clear. The first is whether quantum events are always truly random. As noted above, he hints that God can act in quantum events without violating the laws of nature. But if those events are always truly random, then to ascribe them to God is not necessary, or even meaningful, and God cannot guide the universe in any meaningful way. This brings up the second question. Can God violate the second law of thermodynamics? It is, after all, a statistical law. If He can, then such things as walking on water, feeding 5,000 people, or raising the dead are perfectly possible.

However, this also means that science, as usually understood, has its limits and cannot explain the entire universe. This will not make Miller's evolutionary colleagues happy. The fact that Miller believes in miracles (p 239-240) argues that he does believe in some kind of Divine intervention in nature, but in other places he seems to accept scientific materialism uncritically (e.g., p 14, 27-28), and use it against creationists. One of the important questions is whether God is capable of guiding evolution. If He is (as Miller hints He could be on p 241), then it is not necessary to explain all events as explainable by laws acting on random events. This implies that Darwinian evolution (*random* mutations and natural selection) should not be expected to be the only reason why we are here.

The third question is whether the origin of life can be explained on the basis of purely naturalistic causes. On this point Miller appears to be inconsistent, or at least unclear. Although he admits (p 276) that we do not have "a detailed, step-by-step account of the origin of life from non-living matter," he notes that this is true "only for the moment." He therefore cautions that "it would be foolish to pretend that religious faith must be predicated on the inability of science to cross such a line" (see also his comments on p 215, 262). Perhaps so. But if he can attempt to discredit creationists on the basis of fallible scientific constructs, such as radiometric dating, why can not mechanistic evolution receive the same treatment? Perhaps the argument would not be religious. But surely it could be scientific.

It is important to note that, in spite of his comments on simple and complex compounds, self-replicating RNA, and energy inputs, the gap between life and nonlife puts the flagellum to shame in terms of com-

plexity. There is no known resting point until one has a living cell. A Darwinian explanation would require thousands if not millions of such self-replicating assemblies, each slightly more reproductively fit than the last, at least in some circumstances. In addition, there is the question of the origin of the information content of the cell. This raises the question whether it is proper to greet evolutionary scenarios of the cell with the same skepticism with which we react to purported perpetual motion machines.

Miller appears to get cold feet on pressing this point. For he goes on to say, "Evolution, after all, does not require that life must have originated from naturalistic causes...." In fact, **atheistic** evolution **does** require that life must have originated from naturalistic causes. The only reason why he would make this statement would appear to be to insulate his personal theory from the possibility that the origin of life is in fact not explainable by natural causes. In fact, the most straightforward way of interpreting his final comments is that he believes in a "Creator" who "breathed" "life" into "a few forms or into one" (p 292, quoting Darwin). At least this is what Miller appears to mean when he says, "I believe in Darwin's God." (One may note that Darwin himself appeared to sit on the fence regarding this question, sometimes suggesting a Creator as the origin of life, sometimes suggesting a warm little pond with ammonium and phosphoric salts and electricity.)

The answer to the question of the origin of life is critical. If Miller concedes that the origin of life is not likely to be explained by random processes (note: *not* random mutations) plus natural laws, then his naturalistic friends will forsake him. Furthermore, he will have to give up any idea of a functionally complete universe. For if life is a miracle, his God also intervened in natural history and did not sink all the billiard balls with one shot, so to speak. It took Him at least two. In that case Miller should be more careful of criticizing those who believe in more than two shots, or continuous guidance, or even one recent shot.

However, if Miller chooses to insist that God did not interfere with the universe once He got it started, then Miller has a theological problem. For in that case, how can he believe in miracles in the historical past or the present? The theology of a functionally complete universe has no room for God's intervention in His creation in any way since the Big Bang. If God intervened in the ovum that eventually produced Jesus, then God has intervened in the physical world. If God answers prayer or performs miracles (see p 223), then God intervened in history. Then

one might expect God to also intervene in nature, and nature might not be complete without God's intervention. Miller calls creationists "the true deists" (p 218). But most creationists also believe in the intermittent or continuous intervention of God in His creation. In fact, unless Miller believes in God's special intervention in nature and/or history, he is in practice a true deist. And as he noted (p 216), deism is incompatible with the great Western religions, including Catholicism.

Either God "interferes" in nature, or He does not. You can't have it both ways. If He does interfere, then creationists are not out of line, at least in principle (as Miller admits on p 240). If He does not interfere, then not only are creationists out of line, but also believers in the Virgin Birth, the Resurrection of Jesus, the infallibility of the pope, Mohammed's authority, or that of the 10 commandments.

Some relatively minor observations are in order. It is inconsistent to insist that Genesis is "scientifically incorrect" (p 254) and still insist that "Genesis 1:26 tells us" (p 275) anything reliable. What Genesis 1:26 says may be true, but it is not valid to argue that way; if Genesis is not basically accurate the text is at best a lucky guess. Miller also argues that the early Church Fathers were not Biblical literalists (p 255-256). This is demonstrably wrong (Rose 2000). Augustine, the one example he cites, is the odd man out. In fact, Augustine uses his non-literal understanding to argue, not for long ages, but for an instantaneous creation as opposed to one in six days (Wells 1998). None of the early Fathers believed in evolution remotely resembling the modern sense.

On p 284-285, Miller expertly defends religion against those who would explain it away using evolutionary psychology. His defense is good, and can even be sharpened. If mechanistic evolution were true, we should never know it. Postmodernism is the logical product of an evolutionary psychology. This is certainly not where Miller wishes to go, or most scientists, for that matter.

It is reasonable to ask if Miller's Catholicism is a dumbed-down version with minimal content. Apparently not. He apparently believes in miracles, the Virgin Birth, a literal hell (p 291), and transubstantiation (p 223). Since Pope John Paul II has accepted evolution as scientific fact, I have no reason to suspect that Miller is not orthodox Catholic. However, this should give him some insight into Behe's motivation. Behe, also being Catholic, has no more religious need to challenge the adequacy of evolution than Miller does. Behe's motivation (and perhaps that of others) is that the science won't fit. He should not be put off as

religiously biased. Perhaps Miller should reconsider the scientific evidence.

To summarize the book, Miller makes a valiant attempt to defend Darwinian evolution as the sole cause of the vast variety of life on Earth, and at the same time to defend traditional monotheism. He does not quite succeed. His arguments against short-age creationists are scientifically flawed, and his defense against irreducible complexity, although ingenious, ultimately fails. He prefers to view the universe as having functional integrity, similar to the view of Van Till. However, Miller fails to explain the origin of life itself from natural causes, a necessary part of the functional integrity argument. He also fails to explain how the idea of functional integrity can be compatible with miracles in the historical past or present (which, after all, are a part of our universe). Miller faces a choice. Either he needs to go all the way with functional integrity, argue with atheistic evolutionists for a naturalistic origin of life, and jettison miracles and traditional monotheism, or else he needs to admit that the universe is not functionally complete without God. In that case he can keep miracles and traditional monotheism, and need not have a naturalistic explanation for the origin of life. He will then probably adopt some form of creationism. But he needs to decide whether to be an orthodox Catholic believer, or a believer in God's nonintervention in the universe. He can't have it both ways.

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Darwin's God: Evolution and the Problem of Evil. Cornelius G. Hunter. 2001. Grand Rapids, MI: Brazos Press. 192 p. Cloth, $17.99; paper, $12.99.

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The main thesis of this book is that Darwin's construction of the theory of natural selection, and (naturalistic) evolutionary theory in general, was primarily motivated by theological concerns rather than by scientific data. More specifically, evolution is a theodicy. The thesis is well supported by numerous quotations from past and present evolutionists, who often use theological arguments to justify their conclusions. The significance of theological concerns for Darwin's thinking has been described previously,[1] but Hunter expands the discussion and repeatedly identifies specific theological themes in the arguments of darwinists. The importance of Hunter's argument is summarized in the final line of the book:

> *We need to understand these things because, ultimately, evolution is not about the scientific details. Ultimately, evolution is about God* (p 175).

According to Hunter, evolutionary theory is more a reaction against a certain view of creation than it is an exposition of science:

> *He [Darwin] was motivated toward evolution not by direct evidence in favor of his new theory but by problems with the common notion of divine creation* (p 10).

In particular, evolution is a response to the problem of evil. Darwin was troubled by the evil he saw in nature. In an oft-quoted letter to Asa Gray, he wrote:

> *I cannot persuade myself that a beneficent and omnipotent God would have designedly created the [parasitic wasp] with the express intention of their feeding within the living bodies of caterpillars, or the cat should play with mice* (cited on p 140).

Darwin returned to this theme in his Autobiography:

> *It revolts our understanding to suppose that his [God's] benevolence is not unbounded, for what advantage can there be in the sufferings of millions of lower animals throughout almost endless time?* (cited on p 18).

The book is divided into nine chapters. The first chapter serves as an introduction, in which the main thesis is defined. According to Hunter, evolution cannot be understood without considering its metaphysics:

> *If one already agrees with that metaphysic* [God wouldn't do things that way], *then evolution is compelling; otherwise the theory is a failure* (p 11).

Chapters 2 through 4 consider some of the evidence often used to support the theory of evolution: homology, microevolution, and the fossil record. Each of these chapters ends with a section on metaphysical arguments, in which the role of negative theology (God wouldn't do things that way) is identified. For example, Darwin wrote in the *Origin*:

> *Why should similar bones have been created to form the wing and the leg of a bat, used as they are for such totally different purposes, namely flying and walking?* (cited on p 46).

Here, Darwin tries to use a theological argument to support his own interpretation of the evidence.

Regarding microevolution (Chapter 3), Hunter writes:

> *When evolutionists use evidence against fixity of species to lend credence to evolution, they incorporate a particular metaphysical notion into a scientific theory. Evolution is supported by the premise that God must make species absolutely fixed — beaks must not get longer and coloration must not change. And since beaks do get longer and coloration does change, we know that God must not have created them* (p 64).

The fossil record (Chapter 4) must be interpreted within an evolutionary framework because there is too much death and extinction to attribute to a Creator. As Kenneth Miller[2] puts it:

> ...[the designer] *just can't get it right the first time. Nothing he designs is able to make it over the long term* (cited on p 82).

The next two chapters outline the history of the influence of theological arguments on understanding of nature. In Chapter 6 the views of Joseph Le Conte, H.H. Lane, Arthur W. Lindsey , Sir Gavin de Beer, and Verne Grant are examined. Each is based on what they believe a Creator should have done. Chapter 7 discusses the status of miracles and the autonomy of nature, and the problem of evil, focusing on the

views of Hume and other Enlightenment philosophers. These issues played an important part in Darwin's philosophy of nature:

> *The more we know of the fixed laws of nature, the more incredible do miracles become* (cited on p 120).

Chapter 8 discusses the metaphysical basis of evolution. The evolution theodicy distanced God from nature, thus requiring that nature be autonomous — governing itself without outside divine intervention. God was said to be too important to be directly involved with creation. As Robert Chambers put it:

> *How can we suppose an immediate exertion of this creative power at one time to produce the zoophytes, another time to add a few marine mollusks, another to bring in one or two crustacea, again to crustaceous fishes, again perfect fishes, and so on to the end. This would surely be to take a very mean view of the Creative Power* (cited on p 147).

The poverty of this argument can be illustrated by considering the question: What would be the reaction of the scientific world towards any contemporary scientist who succeeded in producing "a few marine mollusks" from nonliving materials?

Hunter outlines the importance to evolutionary thinking of the restriction of God to secondary processes ("evolution's divine sanction"), and the need for science to have unanswered questions to study ("evolution's intellectual necessity"). Hunter points out the significant influence of gnostic thinking on modern scientists who propose a kind of dualistic distance between the creator and the creation. This gnostic dualism forms the basis of the evolution theodicy.

In the final chapter (Chapter 9), Hunter discusses two reactions to the evolution theodicy of distancing God from nature. One of these reactions is that God actually planned that nature would be autonomous, but He is not responsible for the details, such as natural evil, because He is too distant. This kind of view is commonly called "theistic evolution," although it has a strong deistic flavor. A second reaction is process theology — God is too incompetent to be held responsible for the evil in nature. He learns and suffers with the creation, and some of the events that occur are such that we consider them to be evil. Both reactions are based on acceptance of the evolution theodicy: God and nature are insulated from each other.

Understanding the metaphysical basis of the evolution theodicy helps us understand both its weaknesses and the difficulty of engaging in a meaningful dialogue with its exponents:

> *Evolution's real problem is not its metaphysics but its denial of its metaphysics* (p 159).

I highly recommend this book. It is readable, clearly written, and its propositions are well supported with examples and explanation. The book well illuminates the basis for the depth of feeling that underlies the conflict between creation and evolution. Anyone who wants to truly understand the issues should read it.

ENDNOTES

1. Gillespie NC. 1979. Charles Darwin and the problem of creation. Chicago: University of Chicago Press.
2. Miller KR. 1999. Finding Darwin's God. NY: Cliff Street Books.