

Creation Research Society Quarterly

Haec credimus:

For in six days the Lord made heaven and earth, the sea, and
all that in them is, and rested on the seventh. — Exodus 20:11

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BIG BEND NATIONAL PARK, TEXAS

CREATION RESEARCH SOCIETY

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ARTICLES	DEPARTMENTS
Sources and Applications of Botanical Alkaloids 132 Offer Evidence of Creative Purpose and Design . . . Richard D. Lumsden	Editor's Comments 120
Ota Benga: The Story of the Pygmy on Display in a Zoo . . . Jerry Bergman 140	Our Apologies 120
An Evaluation of the John Woodmorappe Flood Geology Model—Part II . . . A. W. Mehler 149	Membership/Subscription Application Form 121
Fossil Wood from Big Bend National Park, Brewster County Texas: Part III—Chemical Tests Performed on Wood . . . Emmett L. Williams 169	Order Blank for Past Publications 122
PANORAMA NOTES	Letters: COBE Update by Paul Garner ■ Carbon-14 by David Tyler ■ Whitelaw's Reply by Robert L. Whitelaw ■ Critique of a C-14 Review by R. H. Brown ■ Neandertal Man by Marvin L. Lubenow ■ Genetics of Extra Toes in Horses by John Kaplan ■ A Reply: Horse Toes and Creation Science by George F. Howe ■ Ultrauniform by Robert A. Herrman ■ Tree Rings by Warren F. Forgay ■ Author's Reply on Tree Rings by Gerald E. Aardsma ■ Tree Rings Again by Warren H. Johns ■ Isotope Corrections by Harald Heinze ■ A Response on Isotope Corrections by Gerald E. Aardsma
Science Without God . . . Phillip E. Johnson 162	Keyword Index to Volume 29 . . . 160 Glen W. Wolfrom
The Volcanic Hypothesis for Dinosaur Extinction . . . Michael J. Oard 163	Minutes of 1993 Creation Research Society Board of Directors Meeting . . . David A. Kaufmann 168
Fresh Impact Craters on Venus . . . Michael J. Oard 163	Book Reviews: <i>Michael Faraday—Sandemanian and Scientist</i> reviewed by Don B. DeYoung ■ <i>In the Minds of Men</i> reviewed by Clifford L. Lillo 177
The Eye . . . Bolton Davidheiser 164	
How Bird-Like is Archaeopteryx . . . John Kaplin 164	
A Living Graptolite Found? . . . Michael J. Oard 165	
Reprinted CRSQ Volume 14 . . . Emmett L. Williams 166	



Cover Photograph

Cerro Castellon as seen from the Ross Maxwell Scenic Drive, Big Bend National Park, Brewster County, Texas. This beautiful peak is approximately 3,300 feet high and an unconformity

can be seen in this view. Turn to page 119 for a discussion of this peak. Photograph by Glen Wolfrom (October, 1992), caption by Emmett Williams.

Instructions to authors can be found in June Quarterly.

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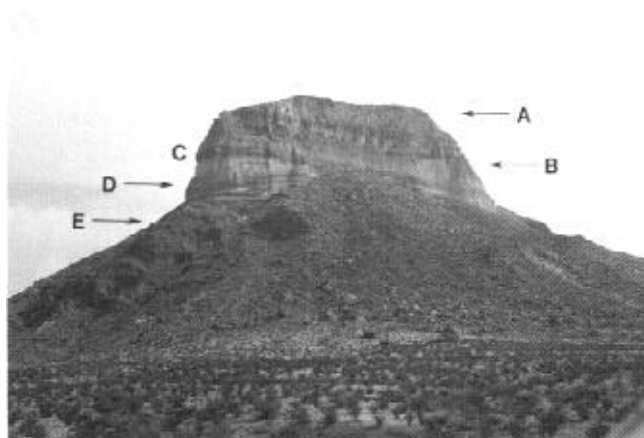
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Cerro Castellan

As Maxwell (1968, p. 85) stated: "Cerro Castellan is a high stack of volcanic rocks (ash, lava, and tuffaceous rocks)." The tuff and tuffaceous material are in the Chisos formation, whereas the flow breccia and lava are in the South Rim formation (Maxwell, et al., 1967, p. 131). See Williams and Howe, 1993, p. 48 for brief descriptions of these formations. The top of the peak is (A) Burro Mesa Riebeckite Rhyolite, (B) Wasp Spring Flow Breccia, (C) an unconformity between the Chisos and South Rim formations, (D) stream channel fill and (E) Bee Mountain Basalt (Maxwell et al., 1967, pp. 131-132; Spearing, 1991, p. 319; Nelson, 1992, p. 45).

A view of Cerro Castellan from a distance is shown below. The peak is supported by a "volcanic spine" (Spearing, 1991, p. 319), but it rests on easily-erodible Cretaceous formations. Sometime in the past, considerable volcanic activity occurred in the Big Bend region to yield such extensive volcanic formations in the Park. Then post-Flood erosion on a vast scale removed much of the volcanic material around Cerro Castellan. This is evident catastrophism on a large scale. (Williams and Howe, 1993, pp. 51-52).

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Editor's Comments

May I wish you a joyous Holiday season and a successful new year. This volume of the Quarterly contains much useful scientific information thus far. I encourage you to work towards having local university and college libraries subscribe to the Quarterly. Part III of a research report on petrified wood is contained in this issue. Another paper deals with design in

living systems. Likewise there are several shorter items on various topics concerning creationism and defects in the naturalistic viewpoint. Possibly many of our readers can contribute notes, letters or articles on the ever-developing creation model of science. May I hear from you?

Don DeYoung

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Our Apologies

The Editors apologize for the condition of Figure 2a page 87 of the September 1993 Quarterly. The last copy sent to us before printing of the Quarterly showed this illustration in perfect shape. Between our receipt of the final proof and the appearance of the Quarterly, someone at the Printers used the illustration as a cutting board.

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CREATION RESEARCH SOCIETY

History The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (with graduate degrees in science) and over 1100 non-voting members. The Creation Research Society Quarterly has been gradually enlarged and improved and now is recognized as the outstanding publication in the field.

Activities The society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. The Society operates two Experiment Stations, the Grand Canyon Experiment Station in Paulden, Arizona and the Grasslands Study Site in Weatherford, Oklahoma.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$18.00 (\$22.00 foreign) per year and may be sent to Glen W. Wolfrom, Membership Secretary, P.O. Box 28473, Kansas City, MO 64118. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at \$18.00 (\$22.00 foreign) per year and includes a subscription to the Quarterlies. All others interested in receiving copies of all these publications may do so at the rate of the subscription price for all issues for one year: \$21.00 (\$25.00 foreign).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, *Biology: A Search for Order in Complexity*, through Zondervan Publishing House, Grand Rapids, Michigan 49506. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.

4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

LETTERS TO THE EDITOR

COBE Update

The discovery, by the COBE satellite, of "wrinkles" in the cosmic background radiation of the universe has been reported in the *Quarterly* (DeYoung, 1992), along with the recognition that problems with the Big Bang theory still remain.

It seems that the COBE data have not helped to resolve some of these outstanding problems. For example, a brief item published in *Nature* (Anon., 1992) comments that the temperature variations discovered by COBE "imply such small primordial density fluctuations that it is already hard for theoretical cosmologists to manufacture galaxies and clusters in the time available," and notes that work by Hogan (1992) provides yet further difficulties.

Hogan (1992) draws attention to the fact that diffuse clouds of hot ionized intergalactic gas associated with superclusters "produce Sunyaev-Zel'dovich and Doppler background anisotropy whose properties may closely mimic those of primordial anisotropy in current data" (p. L77). As the *Nature* report reveals, if some of the anisotropy detected by COBE is due to hot ionized gas in the present-day universe,

then the primordial fluctuations must be smaller still, which makes galaxy formation harder yet . . . which leaves us wondering where the superclusters and their hot gas could have come from (p. 672)!

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Carbon-14

Robert Whitelaw's review of creationist writings (1993) on radiocarbon dating warrants some response. I am not satisfied that the research areas have been adequately delineated, nor that the contributions of the various papers have been judiciously assessed.

The C14 decay rate/generation rate ratio *permits* a theoretical buildup curve to be proposed (although it does not "establish" it), and tentative corrections can therefore be suggested. Having done this, the non-equilibrium model needs *testing*. A prediction of the model is that the C14 dates should be systematically *older* than the chronological ages of the various samples. However, before about 500 BC, the reverse appears to be the case: C14 dates are younger than the ages assigned to the samples. This fact alone means that the correction curve published by Whitelaw must be in error.

There appears to be, in my judgment, only two broad responses that can be made to this situation. One response is to accept that the conventional approaches to calibration are valid. This is the option taken by Aardsma, who maintains from dendrochronological

data that there is no sign of the Flood catastrophe during the past 10,000 years. It is worth noting that this approach also requires acceptance of the conventional timescales for human cultural development and migration during the Holocene.

The second response is to retain the non-equilibrium model of C14 dating, and to challenge the chronological ages assigned to the samples. This requires a radical look at the chronology of the ancient world and also major criticism of the extensive dendrochronological work that has been undertaken in connection with C14 dating. My own two papers (1978, 1979) were an outworking of this second response, and they show at least that the approach is consistent: the prediction that C14 dates are older than the chronological ages is upheld.

I see no evidence in Whitelaw's paper that these crucial points are discussed. A review and critique of 40 years research by creationists requires an incisive analysis of the issues.

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Whitelaw's Reply

Mr. Tyler's second paragraph rightly distinguishes between "theoretical" and "established" buildup curves in the SDR (specific decay rate or activity) of C-14 in the biosphere at any time. Of course, no such curve can ever be "established" for the 5000 years since the Flood, since no records have been kept over that span. The theoretical buildup I assumed is simply based on a constant SPR (specific production rate in the world atmosphere) at the presently measured rate from cosmic input since the Flood, an assumption favored by Libby and others; and a different constant rate for the approximate 2000-year span from Creation to Flood, using the hypothesis described in the Appendix to my earlier paper (1970).

This, I believe is what Tyler means by the "non-equilibrium model." Poor as its assumptions and results may be when applied to any particular specimen selected (assuming such specimen uncontaminated!) I showed that it passed the first test when applied to the large mass of good dates available in both 1969 and 1979, since in both cases it confirmed dramatically the biblical Flood date of ca. 3,000 B.C.

Mr. Tyler appears inclined to reject the corrected Libby dates I used because published (i.e. *uncorrected*) Libby dates prior to 500 B.C. begin to appear younger than "assigned" dates of certain samples. He does not say what kind of samples, or where gathered, or how

carefully screened for possible contamination; nor does he give the basis on which "assigned" dates of such samples were determined. Until one knows these facts I do not see how his findings for a local group of samples can tell us anything useful about the statistical analysis of carefully screened samples which I used.

As to Aardsma's conclusions using tree-ring dating compared with *uncorrected* Libby dates on which Tyler comments, surely it is recognized that a tree-ring count on an ancient log-to-log-to-living tree sequence vs. radiocarbon dates of the rings in the assumed sequence is only as good as: (1) an unbroken sequence of rings and matching overlaps back to a living tree, (2) a knowledge of rings/year throughout the span, (3) a knowledge of both internal inter-ring contamination and external contamination of the rings from environmental effects, especially on the log, (4) how good the C-14 sample is for dating purposes, and (5) how good is the assumed buildup curve of SDR, based upon the assumption of SPR vs. time from which the curve is derived.

When Aardsma or Tyler can assure us that the probable error in a tree-ring calibration caused by these five factors is small, dendrochronology might become a good method for a given nearby specimen over a known span of years. Until then, I for one would not dare to set aside a known biblical date of the Genesis Flood on the basis of a tree-ring calibration spanning thousands of years.

I am happy to note that Tyler's 1977 and 1978 papers confirmed my findings that uncorrected Libby dates "are older than the chronological ages" of a given sample, in general; and I believe an "incisive analysis of the issues" raised by my 40-year survey, which he proposes, would be most welcome in the pages of *CRSQ*.

Reference

Whitelaw, R. L. 1970. Time, life, and history in the light of 15,000 radiocarbon dates. *Creation Research Society Quarterly* 7:56-71, 83.

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Critique of a C-14 Review

The *CRSQ* has published a major contribution (Whitelaw, 1993) to the treatment of C-14 age data from a biblical young earth viewpoint. As a review this feature will be a valuable tool for literature research. As a critique it portrays Robert Whitelaw's viewpoint and understanding of the radiocarbon literature. Any author risks misunderstanding and misrepresentation, particularly in a publication that is highly technical and deals with a controversial viewpoint. Readers who wish to be secure in their own viewpoint and understanding should consult the literature cited and make their own interpretation, rather than be limited by Whitelaw's critiques.

From the five listed papers by R. H. Brown, one of the 21 senior authors of the 32 paper anthology, a few examples will illustrate the need for caution regarding Whitelaw's treatment.

(1) The critique of Paper 5 states that the author "contends that the inventory in the pre-Flood carbon cycle must have been much less than today," whereas

the author dealt primarily with the C-14/C-12 ratio (not the C-14 inventory) in the pre-Flood world.

(2) The paragraph designated (2) in the critique of Paper 21 contains statements concerning the geomagnetic field, cosmic radiation, and their relationship with C-14 production that will astound anyone familiar with the literature on these topics.

(3) Paper 31 is discredited for providing "No basis . . . for assuming a constant [C-14/C-12] ratio since the Flood," yet the development in this paper is based on the assumption that the C-14/C-12 ratio in the biosphere increased rapidly over the first centuries following the Flood.

(4) In the summary at the close of the feature (p. 183) Papers 5 and 29 are severely misrepresented in items A.1, B.4, C.1, and C.2.

Reference

Whitelaw, Robert L. 1993. Radiocarbon dating after forty years: Do creationists see it as supporting the biblical Creation and Flood? *Creation Research Society Quarterly* 29:170-183.

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Neandertal Man

Thomas Mary Sennott's article, "Neandertal Man: Pre-Adamite, Co-Adamite, or Adamite?" (1993) deserves comment. Like some other creationists, Sennott feels that the "Mitochondrial Eve" or mtDNA Eve theory (also known as the "Noah's Ark" or "Out of Africa" theory) tends to validate the Bible. He writes that it is ". . . a confirmation of the Bible, and should lead unbelievers of goodwill to God" (p. 203).

Actually, there is no similarity between this mtDNA Eve and the biblical Eve. In this theory, evolutionists do not address the origin of *all* humans, but only the origin of *modern* humans. As Sennott acknowledges, mtDNA Eve was not the *first* female human, but was herself the product of an alleged evolution from *Homo erectus* ancestors. Further, she was not the *only* female living at that time. There were many female and male contemporaries. It is just that her descendants are the only ones that survived.

A more serious problem has surfaced since Sennott submitted his article. The mtDNA Eve theory has been invalidated. The Berkeley researchers used a computer program they did not fully understand. The results were biased by the order in which the data were entered. Mark Stoneking (now at Pennsylvania State University), one of the original researchers, has acknowledged that the theory is invalid (Hedges et al., 1992). There are attempts to salvage the theory, but serious conceptual and methodological difficulties may never be overcome. While I strongly believe in using proper scientific evidence to substantiate the Bible, I fear that this is one "body of evidence" we will use only to our own embarrassment.

Sennott has done us a service by calling to our attention the remarkable discovery of a bust, carved in ivory, of an Ice Age man (Marshack, 1988). However, Sennott calls this Ice Age person, without reservation, a Neandertal. Nowhere in the article is he called a Neandertal, and Sennott suggests that this is a cover-up. However, 10 anatomically modern human fossil

individuals have been found in that same area, Dolni Vestonice, Czechoslovakia, dated at about the same time—29,000 years ago (ya) (Oakley et al., 1971).

On the basis of pictures of the bust in the article, the person does seem to have a rounded chin and may have rather heavy brow ridges. However, he seems to lack some classic Neandertal features—the jutting forward of the center of the face, the low doming of the skull, and the occipital bun. The pictures show the face and the rear of the skull to be quite vertical, and the skull to have rather high doming. While it is possible that the bust is that of a Neandertaler, Sennott's certainty in this matter is not justified.

Sennott states that the date of the carving, 26,000 ya, places it “well within the Neandertal Era, according to the evolutionists” (p. 201). This is not the case. The most recent European Neandertal remains are from Saint-Cesaire, France, and are dated by evolutionists at 36,300 ya. Of the over 300 Neandertal fossil individuals discovered world-wide, only the remains from Shanidar, Iraq, dated at 26,500 ya, approach Sennott's date. In my book on the human fossils (Lubenow, 1992) I list several fossils of recent date that could be Neandertals, but these are not accepted as such by evolutionists. An evolutionist trend is to extend the Neandertal era back to 300,000 ya or beyond (Stringer, 1993). Thus, 26,000 ya is not “well within” the Neandertal era.

I do not understand Sennott's statement: “Neandertal Man is clearly *Homo sapiens sapiens*, and not a separate species *Homo sapiens neandertalensis* [sic].” That the Neandertals are designated *Homo sapiens neanderthalensis* indicates that they are considered by the scientific community to be the same species as anatomically modern humans. The differences are relegated to the sub-species level. Recently, Chris Stringer (British Museum—Natural History) and Stephen Jay Gould have urged that the Neandertals be considered a separate species and given their older designation *Homo neanderthalensis*. Their reasoning is based on the alleged genetic isolation of contemporary populations of Neandertals and anatomically modern humans in the Levant of Western Asia (Israel). However, at present this is definitely a minority view.

There seems to be a typographical error on page 201. In the mtDNA Eve theory, anatomically modern humans are believed to have migrated out of Africa about 100,000 ya, not 10,000 ya as stated in the article.

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Genetics of Extra Toes in Horses

I enjoyed reading the CRS book “*Vestigial Organs Are Fully Functional*” by Jerry Bergman and George Howe (1990). I also read an early article by O. C. Marsh on living polydactyle horses (1892). They are noted by him to occur “much more frequently than is generally supposed” (p. 340) and he speaks of their great frequency. He concluded that the frequent change to extra digits indicated that horses had a polydactyle ancestry, and that this was actually demonstrated.” He had mentioned examining “a large number of living animals” himself.

Marsh also points out cases where “both fore and hind feet may each have two extra digits fairly developed, and all of nearly equal size, thus corresponding to the feet of the extinct Protohippus [or Hipparion]” (p. 342). One last point is that the “large majority” of polydactyle horses

have been raised in the Southwest, or from ancestry bred there, so that their connection with the Mustangs or semi-wild stock of that region becomes more than probable. It is well known that the tendency to reversion is much stronger where animals run-wild, and this fact must be taken into consideration in discussing the present question, for the late ancestors of the Mustang were certainly wild for at least several hundred years (p. 345).

Since I am a creationist and believe that all types of horses lived at the same time, I was wondering if the breeding of these horses with “Mustangs or semi-wild stock” would bring: about a greater change of expressing extra digits from contact with the gene pool containing this information in a recessive state? Richard Owen suggested mating certain tridactyle horses “might restore the race of hipparions” (1866, p. 795).

Another question: In the genetic square below if we suppose that

AaBb × AaBb				
	AB	Ab	aB	ab
AB	AA BB	AA Bb	Aa BB	Aa Bb
Ab	AA Bb	bb	Aa Bb	aa bb
aB	Aa BB	Aa Bb	aa BB	aa Bb
ab	Aa Bb	Aa bb	aa Bb	aa bb

the resultant AABB is a 3-toed horse where the lateral toes *fully reach* the ground and the aabb is the modern one-toed horse, could we say that the Aabb, aaBb, have *very short* lateral toes and the AABb, AaBB, have *slightly* reduced length lateral toes, and the ones in the middle AAbb, AaBb, aaBB, some blending thereof? Is this possible? or accurate?

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A Reply: Horse Toes and Creation Science

Thank you for bringing the informative article by Marsh (1892) and the earlier piece by Professor Owen (1866) to my attention. Although Richard Owen lived and worked contemporaneously with Charles Darwin and Thomas Huxley, he vigorously opposed Darwin's theory of macroevolution by natural selection. Once Owen asserted that Darwin had left "the determination of the origin of species very nearly where he [Darwin] found it (1958, p. 64).

Marsh indicated (p. 39) that reports of horses with more than one digit per foot go all the way back to Julius Caesar. He also related that there are various degrees of this phenomenon, from just one extra toe on one of the legs of a horse to two extra toes on each foot (three toes on every foot.)

Marsh's sketches of living horses and his detailed drawings of foot anatomy from various museum specimens are fascinating and deserve further study, especially the pictures of the horse with an extra digit visible on each front leg. In 1955, John Klotz included some of these sketches by Marsh in his classic creationist book *Genes, Genesis, and Evolution* (p. 198).

Marsh saw such digit data as evidence for evolution, showing the "descent of the horse from comparatively recent polydactyle [sic] ancestry" (p. 351). Richard Owen (1966) however, asserted that all of these hoof changes could occur quite rapidly in horse populations and that we could possibly produce some of these extinct horses by breeding: "The pairing of the horses with the metapodials bearing to type, phalanges and hoofs, might restore the race of hipparions" (p. 795). Since the change from one-toed to three-toed (or vice versa) can apparently occur rapidly, Owen cited this as strong evidence against gradualistic evolution:

Now, the fact suggesting such possibilities teaches that the change would be sudden and considerable: it opposes the idea that species are transmuted by minute and slow degrees (p. 795).

Owen also saw the appearance of the horse's extra toes as militating against the "natural selection" argument of Charles Darwin. Owen reasoned that the change would occur abruptly with little or no deference to selection: "change of structure would precede that of use and habit . . . a personified 'selecting Nature,' would have had no share in the transmutative act" (p. 795).

Considering the utility of horses in man's history and agriculture, Owen asserted that horses were divinely ordained to become man's faithful servants:

Of all the quadrupedal servants of Man none have proved of more value to him, in peace or war, than the horse; none have cooperated with the advanced races more influentially in Man's destined mastery over the earth and its lower denizens. In all the modifications of the old palaeotherian type to this end, the horse has acquired nobler proportions and higher faculties, more strength, more speed, with amenability to bit. No one can enter the 'saddling ground' at Epsom, before the start for the 'Derby,' without feeling that the glossy-coated, proudly-stepping creatures led out before him are the most perfect and beautiful of quad-

rupeds. **As such, I believe the Horse to have been predestined and prepared for Man.** It may be weakness; but, if so, it is a glorious one, to discern, however dimly, across our finite prison-wall, evidence of the '**Divinity that shapes our ends,**' abuse the means as we may (p. 796). (emphasis mine)

The following statement is another stimulating Owen quotation (p. 797) concerning unreasonable aspects of evolution theories as he saw them:

To suppose that coexisting differentiations and specializations, such as *Equus* and *Rhinoceros*, or either of these and *Tapirus*, which have diverged to generic distinctions from an antecedent common form, to be transmutable one into another, would be as unscientific, not to say absurd as the idea, which has been bolstered up by so many questionable illustrations, and foisted upon poor, 'working men,' of their derivation from a Gorilla!

But let us return to the question about breeding extra-toed horses. Obviously one would need to obtain living male and female tridactyl phenotypes. These could be bred and records kept in an attempt to discover what genetic mechanism governs this emergence of three toes in modern horses. Experiments like these would be both time-consuming and expensive and would require stable facilities. According to Marsh, however, the change occurs frequently so it should not be difficult to secure breeding stock. Perhaps some CRSQ readers are prepared to undertake such an investigation!

Possibly tridactyly is dependent on two or more loci in a polygenic matrix, as suggested in the diagrams. The various shades of "toe condition" might hinge on the number of dominant alleles (A or B) present at the 2 loci on different pairs of chromosomes—4 (AABB), 3 (AaBB or AABb), 2 (AAbb, AaBb, etc.) or fewer. This is a scheme that geneticists have called "multiple genic" inheritance and it seems to apply to human height and skin color.

But the condition might instead be dependent upon a simple dihybrid recessive where any dominant gene (at either locus) is epistatic to the recessive alleles. This is known as "duplicate dominant epistasis" and would permit that only the aabb individual would be tridactyl while all the other combinations in the 16-membered square would produce "normal" monodactyl horses.

Questions like these may have already been answered in genetic studies but I am unaware of such published works. Perhaps CRSQ readers will be able to shed further light on recent studies concerning the genetics of extra toes in living horses.

As with so many other cases in creation study, it would be instructive to know if all of the fossil horse-like creatures were of the same **kind**: 4-toed browsers like *Eohippus*, 3-toed browsers like *Meshippus*, 3-toed grazers like *Parahippus*, 1-toed grazers like *Pliohippus*, and our own 1-toed grazer, *Equus*. Or maybe these types each represent separately created kinds, many of which went extinct after the Flood. Upon observing single-toed changes, man himself may have gotten involved in the business of breeding and selecting pure line, 1-toed *Equus* races.

G. A. Kerkut (1960) attempted to analyze and classify all museum specimens of the supposed fossil horse

series. What Kerkut discovered concerning bones of fossil horse-like creatures was that:

it is difficult to find a critical account of the basic information (p. 145) . . . [and that] It takes a great deal of reading to find out for any particular genus just how complete the various parts of the body are and how much in the illustrated figures is due to clever reconstruction. The early papers were always careful to indicate by dotted lines or lack of shading the precise limits of the reconstructions, but later authors are not so careful. Secondly it is difficult to find out just how many specimens of a given genus are available for study (p. 146).

Kerkut also emphasized the lack of intermediate forms and the fact that it is impossible to show which of these fossil horses descended from which (p. 149). Further work is needed in both genetics and paleontology before we can understand how living three-toed horses relate to their fossil tridactyl counterparts.

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Ultrauniform

From the letters that I have received, a few readers of my Quarterly papers still appear slightly confused as to the relation between the metamorphic-anamorphosis (MA)-model and the concept termed the "uniformity of nature." From a theological viewpoint, the concept of the uniformity of nature can be phrased in the following manner. To whom is the behavior of a natural system uniform? I give a few comparative examples. The MA-model, when theologically interpreted, specifically states that all natural system behavior is ultrauniform from God's viewpoint. But such behavior may appear to be chaotic, random, or, shall we say, incomprehensible from the viewpoint of any entity within the universe (i.e. natural entities). Any natural system behavior that might be perceived by natural entities as being uniform is actually a restriction of this exceptionally refined and elegant ultrauniformity.

All natural system behavior, from God's viewpoint, is interrelated. This interrelation is ultrauniform. There may appear to be no such interrelation from the viewpoint of a natural entity. Further, any natural system can suddenly appear in structured form or have its behavior appear to change suddenly from the viewpoint of a natural entity. From God's viewpoint, such a sudden appearance or a sudden change need not be "sudden," but can be created by means of ultrauniform processes. God allows natural entities to alter natural system behavior. However, natural system behavior will always be guided, sustained and upheld by ultrauniform processes that cannot be altered by natural entity intervention and ultrauniform processes cannot be duplicated by natural entities.

A major conclusion of the MA-model is that there may exist ultranatural laws coupled with appropriate

initial conditions or even Divine hypotheses that can neither be comprehended nor described by a natural entity. Yet, the ultrauniformly obtained consequences of such laws can be perceived by natural entities and the ultralogical conclusions of Divine hypotheses can be described by natural languages. This indicates the dangers of re-interpreting the Scriptures or adding extrabiblical hypotheses.

I hope these few examples help to clarify the MA-model approach to the concept of the uniformity of nature and how, when theologically interpreted, this model is able to differentiate between these two viewpoints.

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Tree Rings

I have read with great interest and dismay Gerald Aardsma's paper "Tree-Ring Dating and Multiple Ring Growth Per Year" (1993). The chief problem with the Aardsma paper is that it allows tentative scientific data to reject clear biblical chronology. The same reasoning exactly is used by theistic evolutionists to reject biblical limitations on the reproduction of "kinds," or by progressive creationists in using certain geological data to reject clear biblical teaching on the days of Creation or on the Flood in Genesis.

By advocating a date for the Flood of 15,000 B.P., Aardsma must realize that there are only eight *possible* gaps in the Genesis chronologies. This would require each gap to be almost 2000 years long. He gives no biblical evidence, because there is none. And what qualitative difference is there between gaps in the Genesis chronology of 2000 years each, and gaps of 200,000 years each?

The tree-ring dating method, like all other dating methods not based on written historic records, is based on the assumption of uniformitarianism. Henry M. Morris says ". . . one should not base his biblical exegesis on some latter-day scientific theory" (1976, p. 285). This is exactly what Aardsma does, however, and he makes no real effort to show how his Flood date squares with Genesis.

Dr. Aardsma states: "Efforts to overturn these long tree-ring chronologies and thereby allow for a more traditional Flood date have not proven successful when examined quantitatively" (p. 188). Well, perhaps not, so far. But is that not the purpose of creation research? Just because Aardsma has been unable to reconcile tree-ring data with a "traditional Flood date" does not mean that such reconciliation is impossible or that, even if it is, the Genesis chronology is thereby in error and must be reinterpreted to give an older date of 15,000 B.P. Indeed, we have no promise from God that all problems in reconciling all data with Genesis is (not the reverse!) will be solved before the Lord Jesus returns. Our duty is to keep the faith, and maintain our commitment to the literal historicity and inerrancy of the Bible.

Dr. Aardsma makes the following remarkable statement:

For myself, the explanation which seems least objectionable is that the Flood probably occurred at

a much more remote date than traditional biblical chronology has led me to believe, and that there must exist some other legitimate way of understanding the biblical numerical data in Genesis 11 which has yet to be discovered (p. 188).

In other words, the Bible is “objectionable” because it does not agree with tree-ring data. One instead should have argued: “there must exist some other way of understanding these long tree-ring chronologies” which does not overthrow biblical chronology.

Nor can Dr. Aardsma claim (p. 188) that he was “driven” to his Flood date simply because he has been engaged in the admirable work of trying to construct a quantitatively functional model for radiocarbon within a Flood model of earth history. The data did not “drive” him anywhere. He chose to go there. He chose to go there because he seems impatient, unable to admit that his model has so far failed to achieve proper reconciliation. Such true reconciliation may not be achieved by him in his lifetime, nor by anyone else. This does not warrant rejecting biblical data because it does not agree with certain tree ring data.

At one time it seemed perfectly reasonable for people to reject other aspects of biblical chronology, simply because the Bible did not agree with their particular data on hand. Later on, the Bible was shown, even on a secular basis, to be accurate.

Scientific data, models of origins, and uniformitarian dating techniques can never be anything but tentative and incomplete. One-time non-repeatable events such as the Creation or the Flood are outside the strict domain of science. The moment we believe only that part of the Bible that has scientific data to “verify” it, or the moment we disbelieve that part of the Bible which conflicts with current interpretations of (necessarily) incomplete data, we are denying the authority and inerrancy of Scripture, however much we may protest to the contrary. Divine revelation is either the *final* authority or in need of one (such as tree-ring data). But between the two positions is a watershed of immense implications.

Aristotle once wrote that a small error in philosophy at the beginning leads to a very large error at the end. This is the real danger in the Aardsma paper. I do not doubt that Dr. Aardsma is well-intentioned. I do not doubt that he has worked hard on his data. But I do not believe that his impatience is justified or acceptable. He may not be able to reconcile biblical chronology with his data. But someone else may do so, God willing. And if no one does, we nevertheless must remain faithful to God and his Word, trusting in Him to give us the courage to continue and to do our duty, and uphold the noble and courageous principles for which the CRS was founded some 30 years ago.

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Author's Reply on Tree Rings

I appreciate Warren Forgay's taking the time to comment on my paper, though I must immediately register a strong denial of one of his assertions. He wrote, “In other words, the Bible is ‘objectionable’ . . .”. I find it difficult to conceive of an assertion about myself which could possibly be further from the truth, and I deny its validity in any context.

Mr. Forgay's criticism of my paper is well summarized in his second sentence: “The chief problem with the Aardsma paper is that it allows tentative scientific data to reject clear biblical chronology.” The remainder of his letter simply restates this charge in various ways.

This statement seems to me to suffer from two misapprehensions. When these are corrected, I think Mr. Forgay's concerns vanish. The first may be purely semantic, so I will discuss it only briefly. It is expressed in Mr. Forgay's phrase “tentative scientific data.” It is not really correct to speak of scientific *data* as being tentative. Scientific *interpretations* of data are tentative (and this is possibly what Mr. Forgay meant to say).

I do not mean to nitpick by noting this. The problem which I have sought to alert the recent-creationist scientific community to which, in my paper, is that our best efforts to *interpret* the tree ring/radiocarbon *data* within a traditional date for the Flood have not been successful. Mr. Forgay's letter seems to have been written with a great deal of emotion, and such a reaction to biblical chronology issues is not unusual, but when our emotion has run its course, the *data* must still, somehow, be faced. The tree ring/radiocarbon data are not tentative; the tree-rings really exist (in excess of 10,000 of them, one after the other), and the concentrations of radiocarbon in these rings will not be different tomorrow than it was measured to be yesterday. These data will not vanish; we need to find a workable interpretation of them.

The second misapprehension—more crucial to Mr. Forgay's concerns and the bulk of the letter—is expressed in the phrase “clear biblical chronology.” It would be very nice if biblical chronology were “clear”—if, for example, the date of the Flood were a known biblical fact—but, alas, it is not. Problems abound.

Nowhere in Scripture is any total of years from Creation to the Flood or from the Flood to Christ given. If one wishes to learn the extent of these elapsed times using biblical data, to obtain a “biblical” date for Creation or the Flood, he must elect to *calculate* them. This process of calculation necessarily involves assumptions about the biblical text and its interpretation, and the legitimacy of these assumptions cannot be guaranteed. The three major versions of the Pentateuch (i.e. Masoretic, Septuagint, and Samaritan) show major, systematic variations in the numbers recorded in Genesis 5 and 11 (see Figure 1). Though the Masoretic Text is the source of the numbers recorded in Genesis 5 and 11 in our modern English Bibles, it is the *Septuagint* genealogy (with its additional name “Cainan” following Arphaxad) which is recited by Luke in the New Testament. Comparing Scripture with Scripture it is possible to show that, as a rule, biblical genealogies are abridged (i.e. contain gaps). Some conservative Old Testament scholars have suggested that this may be the case with Genesis 5 and 11 as well. It is impossible to know from Scripture just where or how big such gaps might be. Is

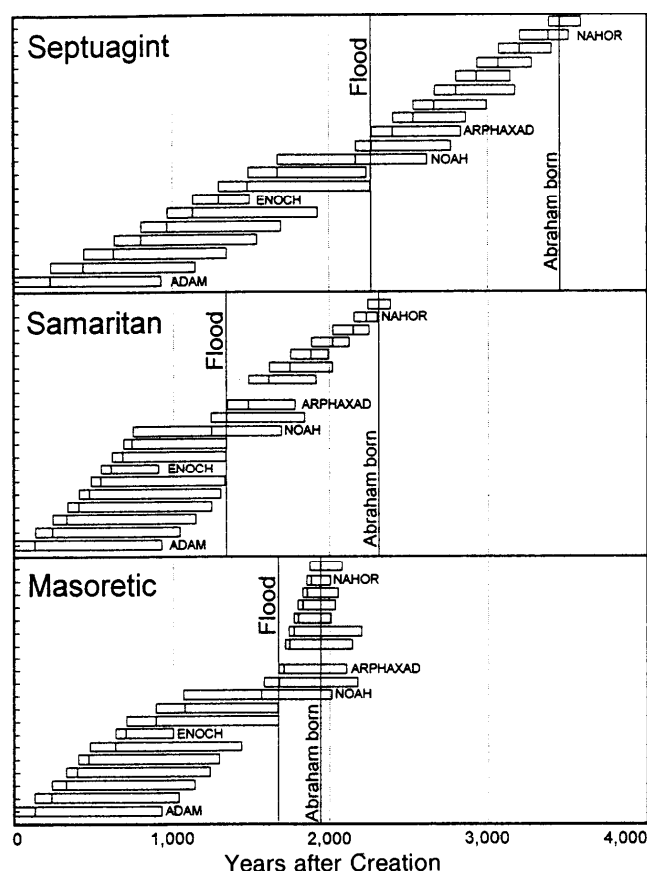


Figure 1. Graphical representation of the numbers recorded in Genesis 5 and 11 as preserved in the Masoretic text, Septuagint, and Samaritan Pentateuch.

it surprising, then, that while biblical chronologies have been derived by numerous scholarly and devout individuals, their main distinguishing mark is that no two ever agree in detail? Some that I have seen, which agree in their assumption that the numerical data found in Genesis 5 and 11 is all one needs to compute the date of Creation, still differ over this date by 7,000 years!

If biblical chronology is "clear" then the vision of conservative Christian chronologists regarding this issue has been peculiarly cloudy. But biblical chronology is not "clear." Tradition regarding biblical chronology may be clear; but let us not confuse tradition and text.

We need to think very carefully about this, and separate what the text actually says from what we may, simply by force of habit, be reading into it, for I think we are probably in for some unexpected discoveries in the future in this area of the chronology of earth history. I say this partly because of the apparent failure of old paradigms at present (such as my paper addressed), and partly because this has already been the case in my own research experience. Specifically, I have recently discovered a gap of a full millennium in traditional Old Testament chronology between the Exodus and Samuel, of all the unexpected places! (The details of this discovery are discussed in the ICR monograph "A New Approach to Old Testament Chronology from Abraham to Samuel") I suggest we need to face the fact that we actually know less about the chronology of earth history than we have traditionally assumed. This may seem unsettling to some, but I am confident

that when the process of new discoveries is complete (and Mr. Forgay is quite correct in asserting that this may not be accomplished in our lifetime, though I pray that God will see fit to allow it to be in our lifetime and soon, as the answers seem desperately needed), it will be apparent to all that there is no final conflict between the explicit statements of Scripture and the data of science.

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Tree Rings Again

As one who was raised with a belief in the accuracy of Ussher's chronology as modified by Edwin R. Thiele (1965), I have been led independently to the same conclusions with respect to the accuracy of dendrochronology as those reached by Gerald E. Aardsma in his excellent article, "Tree-ring Dating and Multiple Ring Growth per Year" (1993). The turning point in my experience was not the impact of the bristlecone pine chronology, which was first reported as having a 7100-year continuous sequence of tree rings (Ferguson, 1968), but instead it was the European oak chronology, which was first reported as having an unbroken sequence of 7,272 years (Pilcher, et al., 1984). By 1984 the bristlecone pine chronology had been extended to 8,681 years, and by 1991 the European oak chronology had been extended to 9,928 years (Becker, et al., 1991). Recently a 1605-year pine chronology has been appended to the oak chronology, so that its starting point has an absolute date of 9494 B.C. (Becker, 1993). This new finding places the end of the ice age at about 11,500 B.P., which harmonizes quite well with two ice-core dates of 11,550 B.P. and 11,640 B.P. for the end of the last glaciation (Alley, et al., 1993).

After having completed my coursework in paleobotany, I had the chance to observe firsthand ring patterns in European oaks while teaching in England from 1978 to 1980. The cross sections of sawn oak logs that I observed revealed unambiguous patterns of tree rings. Oaks, in contrast to pines and other trees, do not suffer from the problem of having multiple rings in a year's time, since they have ring-porous wood. Huber and Gertiz (1970, p. 209) illustrate "the only double ring found in oaks" in their examination of thousands of tree rings. The interannual or "false ring" has much smaller vessels than does the normal ring. In his extensive research Baillie (1982, p. 48, 53) has located just one example of a double ring in Irish oaks, which also is clearly differentiated from a normal ring by its smaller conducting vessels. Double rings do not translate into double tree growth for European oaks. Baillie's double ring has no greater annual thickness than any of the normal single rings pictured from the same log, while Huber and Gertiz's double ring has 40-50 percent greater thickness than any of the four adjacent rings. Even with increased total thickness, each half of a double ring on average has no more than 70-75 percent cell production of a normal ring.

While in England, I came across the report of a 2990-year oak chronology based on the recovery of hundreds of sub-fossil stumps from Irish bogs (Pilcher, et al.,

1977). Because this oak sequence was not anchored to another sequence of medieval and modern Irish oaks, it was known as a "floating chronology," which at that time could be dated only by radiocarbon. Since then, the gap has been bridged and the 2990-year floating chronology has been incorporated into the 7272-year chronology to continuing to the present. We know now that this floating sequence should be dated to the period 4000 B.C. to 1000 B.C. The advantage of the Pilcher et al. (1977) article over Ferguson's articles on the bristlecone pine chronology is that it has included in an appendix the raw data of ring width measurements for all 2990 years. Each ring-width index is the mean thickness for a given year of usually 10 to 40 individual trees with cross-matching ring patterns. The ring-width index has been adjusted to a scale of 0-200, wherein 100 is the average thickness and 200 is the maximum thickness for any of the 2990 years. Thus the numerical data are relative and not absolute measurements.

The ring-width data in the 1977 Pilcher et al. article provides an excellent opportunity for creationists to test the validity of the European oak chronology for the period 4000-1000 B.C. Physicist Robert H. Brown, after exhaustive analysis of the radiocarbon problem in relation to a Flood date of 2300 B.C. to 3400 B.C., has concluded that the radiocarbon age as measured against tree-ring and historical dates is fairly reliable back to 3500 B.P. or to about 1500 B.C. (Brown, 1990). According to Brown's model for converting radiocarbon years into calendar years, trees growing prior to the Septuagint Flood date of about 3400 B.C. would have had to produce up to 20 rings in a given year in order to reduce the bristlecone pine chronology into biblical time frame (see Aardsma, 1991). If 20 years per year were applied to European oaks, then the average ring-width index prior to 3400 B.C. would be only 5 as opposed to 100! If only three rings were produced per year for that period, the average index would be 35 or at most 50, due to the fact that annual tree growth is limited by the length of the growing season, temperature, moisture, availability of nutrients, and amount of insect attack. False rings are due to stress, such as drought or frost (Kozlowski, 1971, pp. 64-74), and result in decreased growth, not increased growth. Examining the raw data in the 1977 Pilcher et al. article, I do not find a ring-thickness reduction for the Irish oaks prior to the biblical Flood dates of 2300 B.C. (Hebrew text) or 3400 B.C. (Greek text).

A simple test has been devised to either support or to deny the validity of the Irish oak sequence. I have divided the ring-thickness data into two groups: Group A, which is the control group covering approximately the period 1600-1040 B.C., when I believe dendrochronology as supported by radiocarbon dating is generally reliable; and Group B, which is the experimental group spanning approximately the period 3800-3240 B.C., which is thought to be mostly prior to the biblical Flood date derived by a literal, no-gap application of the chronological data in Scripture utilizing any of the variant texts. Groups A and B each have a continuous sequence of 560 ring thicknesses, interpreted as exactly 560 years, according to Pilcher et al. (1977). The ring-width measurements have been summed on two histograms, each representing a total of 560 measurements (Figures 1 and 2). A single tree-ring width datum is

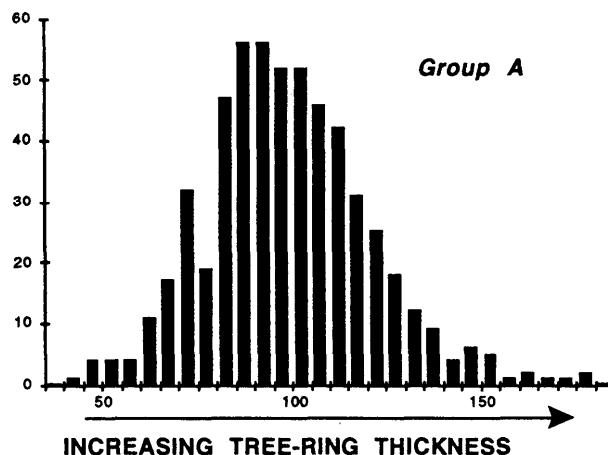


Figure 1. Ring-width measurements for the control group covering the period 1600 B.C.-1400 B.C. The number of rings indicates the total number of years with the same thickness measurement. The increment interval is 5, and the scale is 0-200 with 200 being the maximum thickness for any tree measured (N = 560).

based upon an average measurement of about 16 trees, so that each histogram actually represents about 9000 measurements.

A comparison of the two histograms, the one for the control group and the other for the experimental group (B), suggests a normal distribution curve in each case. If two or more tree rings were being produced per year in N. Ireland for the period 4000-3000 B.C., then one would expect that Group B would have a preponderance of thin rings (index values 0-50). The total absence of skewing for the Group B histogram in the direction of thinner rings eliminates the hypothesis that the presence of multiple interannual rings can resolve the problem of a tree-ring sequence antedating the biblical Flood. This means that one ring represents one year for the Irish oak master chronology for the last 6000 years. This simple test can be applied to even older tree-ring sequences as the ring-width index values become available to researchers. The evidence that pines and cypresses in the western U. S. occasionally produce multiple growth rings (Glock and Agerter, 1963; Lammerts, 1983) cannot therefore invalidate the 1 to 1 ratio of tree rings to calendar years in European

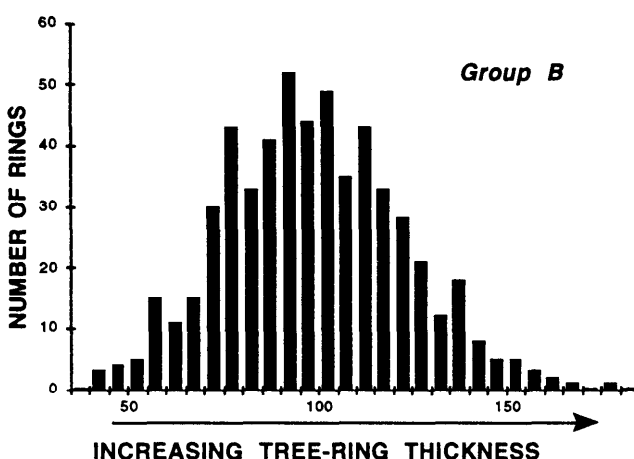


Figure 2. Ring-width measurements for the experimental group covering the period 3800 B.C.-3240 B.C. (N = 560).

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Isotope Corrections

Aardsma (1992) criticized my discussion (Heinze, 1992) of M. A. Cook's assertion (Cook, 1966), based on lead ore models and fast neutron cross sections, that radioactive decay may have been faster in the past. Aardsma claimed that:

- 1) The lead ores that Cook cited had very small, but non-zero Pb-204 concentrations. Cook thus was in error in considering the ores in question to be free from "common lead."
- 2) Aardsma further referred to Cook's real "source" (Nier, 1939), claiming that Nier's data shows the expected Pb-208/Pb-204 ratio of 29.5 for "common lead."
- 3) Aardsma claimed to have checked the "original sources" of Cook's Katanga lead ore data.
- 4) Moreover, Aardsma asserts, Cook misread Nier's data.

I would like to make the following comments on Aardsma's claims:

First, Pb-204 was indeed present in some of the Katanga ores. However, it was present in traces only, and even these varied in amount by a factor of about three. Nier stated that about 50 percent of the Katanga

ores cited underwent alteration. The other Pb-204 values were so small that Nier did not include them in the list since they would only show that common lead was practically absent. It seems much more probable to me, that the traces of Pb-204 came into the ores as contamination. To remove them without affecting the other lead isotope ratios would be nearly impossible, due to the fact that Pb-206/Pb-207 is approximately constant in all of the Katanga ores studied and is thus unaffected by these hypothetical alterations. Pb-204 may have originated by the mechanisms that Cook cited: successive radiative neutron captures by lead isotopes of smaller mass number and/or by different procedures, such as preferential leaching.

Second, Aardsma's claim that the ores showed the "expected" 29.5 ratio for "common lead" shows that he has confused the concepts of "common lead" and "primeval" or "primordial lead." The approximate 29.5 ratio is found in the (claimed) primordial lead of iron meteorites (Tatsumoto, Knight, and Allegre, 1973), but the concept of "common lead" refers to the lead in an ore that is understood to be present before the minerals formed. "Common lead" varies in composition from ore to ore. In addition, Nier listed only *radiogenic* ores in his table of Katanga ores, *not* common ores. The actual ratio in Nier's paper that Aardsma referred to is $.247/.007 = 35.3$. Although this ratio is close to 29.5, Aardsma misunderstands the significance of this fact. If Aardsma indeed would make this correction for "common lead," i.e. subtract the 29.5 ratio for Pb-208/Pb-204 from the Katanga ores, some samples would yield **NEGATIVE** ages!

Third, Aardsma claimed to have checked the "original" sources. He effectively checked only the comment from Nier. The original source is found in the analyses of G. P. Baxter et al. in the *Journal of the American Chemical Society*, volumes 55, 57, and 59 of the thirties.

Fourth, Aardsma's claim that Cook misunderstood Nier's data appears to fall back on Aardsma himself.

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A Response on Isotope Corrections

I think Harald Heinze and I are now in agreement regarding the essential point: Cook's assertion that fast neutrons produced Pb-208 in a Katangan uranium ore body is unfounded, being based solely upon his mistaken interpretation of dashes as zeroes in a table of data.

Cook argued for fast neutron production of Pb-208 in this ore as follows:

1. There is no Pb-204 in the ore, so the Pb-208 is not due to the presence of common lead (since Pb-204 is present in all common lead).

2. There is no thorium in the ore, so the Pb-208 could not have come from decay of thorium.

3. Thus, the Pb-208 must have come from the addition of neutrons to Pb-207 atoms in the ore.

Having now gone back and checked some of the original sources of the data which Cook used, Heinze agrees with me that, "Pb-204 was indeed present in some of the Katanga ores." Thus, the first premise of Cook's argument is false, and his conclusion is unfounded. The Pb-208 in the ore is easily accounted for as due to the presence of common lead, and no appeal to fast neutrons is necessary or warranted. Cook simply misinterpreted the data table from which he was working.

This is the essential point; the remainder of Heinze's letter deals with relative inconsequentialities. He is correct in asserting that: "Common lead" varies in composition from ore to ore." But this fact does not alter my point—the Pb-208 in these ores is found in the expected range of Pb-208/Pb-204 for common lead, and no appeal to fast neutrons is necessary or warranted in explaining its presence.

Heinze's statement: "Aardsma claimed to have checked the 'original sources' of Cook's Katanga lead ore data" is not correct. (The same idea is repeated near the end of the letter.) I made no such claim. I tried to make the point that Cook obviously should have checked the original sources before making his claim regarding fast neutrons, and Heinze should have checked Cook's work, including the original sources, before asserting that "It can be said with confidence, however, that Cook's ratios demand accelerated decay in the past" (Heinze, 1992, p. 165), especially since both claims are so radical. I only needed to check a single original source to verify that Cook had misinterpreted the data

table from which he had worked, and this is all I did. Since I explicitly stated "It was necessary [for me] to go back to at least one of the original sources for the Katanga data to be quite certain about what had been found in the Katanga ore" (CRSQ 29:105), and since I only referenced or referred to one original source in my letter, and since it would obviously be pointless to check all of the original sources when it was perfectly clear from reading just one that Cook had indeed misinterpreted the data table and his argument was thereby invalid, and since I nowhere claimed in my letter to have checked all of the original sources, I do not understand how Heinze made this mistake.

I am similarly at a loss to understand what logic led Heinze to his final remark: "Aardsma's claim that Cook misunderstood Nier's data appears to fall back on Aardsma himself." This remark seems totally out of place and incorrect to me.

I think Heinze's assertion that some of the Katanga ore samples would yield negative ages if corrected for primordial lead sounds interesting, though I do not immediately see how he arrives at this conclusion either. I encourage him to pursue this possibility, nonetheless, for a quantitatively and logically rigorous demonstration of this sort would obviously be of interest to many recent creationists, myself included.

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SOURCES AND APPLICATIONS OF BOTANICAL ALKALOIDS OFFER EVIDENCE OF CREATIVE PURPOSE AND DESIGN

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Abstract

Natural products phytochemistry, exemplified by the "bitter herbs," has served the medicinal needs of mankind since antiquity, and continues to do so in the present era. The appearance of pathogens resistant to existing pharmacology, notably to synthetic drugs, new diseases, and the continuing bane of cancers, cardiovascular diseases, endocrine dysfunctions, neurological disorders, immunopathology, etc. are stimulating renewed interest in possible biological sources of new therapeutic principles.

Remarkably, biogenic alkaloids having no direct function in the metabolism or structure of the plants that manufacture them have highly specific molecular interactions in man (or his infectious pathogens and/or their vectors) and the agents which plague his food sources. Such interactions underlie their pharmacological (or pesticidal) properties. These and related observations have significance to a creationist concept of their origin.

Introduction

In its quest for cures (and profits), the 20th century pharmaceutical industry has turned in large measure from natural sources to synthetic chemistry to provide our medicinal needs. Having thus progressed from the products and practices of arcane apothecary in our own culture, Western physicians of the present era tend to discount most of the natural "folk medicines" still employed in non-industrialized societies as super-

stitious placebos, or of dubious therapeutic value, at best. [Critics maintain that such "medicinal" preparations packaged today for sale in health food stores, homeopathic and naturopathic "clinics," etc., typically contain quantities of potentially active ingredients too small to elicit pharmacological effects]. Attempts to incorporate them in modern medical practice are routinely branded as quackery. The National Council Against Health Fraud (comprised of some 2,300 physicians, scientists, and educators) is urging more stringent regulation of commercial herbal and homeopathic

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products otherwise that hint at health claims (Cote, 1993). Currently, most herbs, irrespective of their advertised or imputed applications, are considered food or food additives by the regulatory agencies; the majority of these products are, in terms of their realized health benefits, no more than expensive multivitamin tablets. Some, however, taken in unsupervised megadoses can produce undesirable side effects.

In the U.S., any substance that would be classifiable as a drug and so marketed as a medicine for use in the treatment of disease is subject to formidable evaluation by the Food and Drug Administration, and how it is used to continuing oversight by state medical boards. And justifiably—recall, for example, the controversy over Laetrile (originally a derivation from apricots) as a putative treatment for cancer (Kittler, 1963). Its efficacy to this application was eventually determined to be nil; the danger lay in the fact that many patients abandoned bona fide medical treatment for this vain hope of a cure. Thus, it is newsworthy when the shaman's crude balms, poultices and brews are discovered to contain, on occasion, potent antibiotic, anti-inflammatory, anti-tumorigenic and anti-pyretic (fever-breaking) principles, powerful analgesics, etc. Such research into folklore medicinals has nonetheless been sporadic, and regarded for the most part as time and cost inefficient. Still, it is not that long ago when in this country salicum—a preparation of white willow tree bark—was taken for the relief of headache; today, we reach for the synthetic acetyl salicyclic acid (aspirin), a nearly exact chemical replica of the natural medicine. If not any more efficacious, it is certainly more convenient.

However, faced with new diseases (e.g., AIDS) or ones newly characterized (e.g., Alzheimer's), and the challenges cancer, cardiovascular disease, diabetes, and an increasing number of drug-resistant strains of infectious pathogens [e.g., refractory tuberculosis (Beardsley, 1992) and malaria, below] continue to present, medical science is once again giving biology serious consideration as a source of "new" chemotherapeutic principles. As at least one authority has observed (Plotkin, quoted in Stix, 1993, p. 142), "Synthetics haven't proven to be the panacea." Since 1986, the National Cancer Institute has screened some 23,000 extracts from 7,000 plant species endogenous to the tropics. Several entrepreneurial ventures, with evocative names like Shaman Pharmaceuticals and Xenovia, have emerged during the last five years, along side such established concerns as Merck, Monsanto, Eli Lilly, Glaxo, Sandoz, and SmithKline Beecham, and the university-based institutes, where there has been a resurgence of interest and substantial investment in researching natural products pharmaceuticals. The effort is being glamorized not only by Hollywood (with Sean Connery in the role of a zealous botanist seeking the "silver bullet" cure for cancer in *Medicine Man*), but also by various activist "green groups" (e.g., Rainforest Alliance) who see the prospects of phytochemical resources as economic leverage to the mission of habitat conservation and the salvation of exotic biodiversity for its own sake (Joyce, 1992). Professional plant taxonomists, now calling themselves "ethobotanists," whose research for some time has been considered prosaic even by their academic colleagues, are finding increas-

ing demand for their services in the biotechnology industry, as are those with doctoral degrees in pharmacognosy—the study of drugs from natural sources.

The fact of the matter is that plants and their natural products biochemistry have been serving man's medicinal needs since the Fall, as well as his nutritional needs since his creation. It has been said that a weed is only a plant for which a use has not yet been discovered. Thus has the Lord by His provision of the "bitter herbs" (referenced in Exodus 12: 1) blessed his human creation, even as it groans in its rebellion-inflicted travail.

Loosely defined, *alkaloids* are just that—"bitter herbs": pharmacologically active substances of complex and diverse organic chemical structure, characteristically bitter in taste and alkaline in reaction, found in the roots, leaves, bark, seeds, and other parts of a wide variety of plants. Alkaloids, as defined by their organic chemical properties, are also elaborated by some kinds of animals, but the discussion here will focus on those of botanical origin. [In some cases, zoological alkaloids may be acquired dietarily from primary botanical sources (see Williams et al., 1991)]. Typically, these compounds have no readily identifiable direct function for the plants that manufacture them, except as their toxicity and sharp unpleasant taste might provide a measure of defense against herbivores, parasites, and "pests" generally, or as their properties otherwise might serve to attract pollinating insects. Even so, considering the alkaloids as a whole, natural selection falls short as an explanation of their persistence and ubiquity.

Quinine and Malaria

The single most widespread disease of mankind, at present and historically, is malaria, manifested as a consequence of infection by protozoans of the genus *Plasmodium* (Figure 1). According to World Health Organization statistics, the current death rate is 1-2 million annually, the highest mortality being among children of sub-Saharan Africa (Ritter, 1992). It has been estimated (Zimmerman, 1960) that, cumulatively, half of the deaths in human history have been malaria-related. The impact of malaria on the history of the Old World has been reviewed by Sigerist (1970). Today there are more than 270 million people afflicted with malaria worldwide (Ritter, 1992), and over 1.4 billion people are living in areas where *Plasmodium* and the mosquitoes that transmit them (*Anopheles* spp.) also abide (Schmidt and Roberts, 1981). Extensive efforts are being made to develop an effective vaccine, but one suitable for wide scale use has yet to be obtained (Wyler, 1990; Gibbs, 1993). Epidemiological control measures continue to focus primarily on eradication of the mosquito vectors, and human infections are addressed pharmaceutically.

The ancient Chinese seem to have discovered the first antimalarial drug, represented by the Ch'ang shan herb and its alkaloid content (Schmidt and Roberts, 1981), but this remained obscure to Europeans until recently. On the other hand, the conquistadores discovered circa 1500 AD that the bark of *Cinchona* trees as brewed by the natives of South America is highly effective against malaria (also against amebiasis and several other endemic parasitic diseases that afflicted

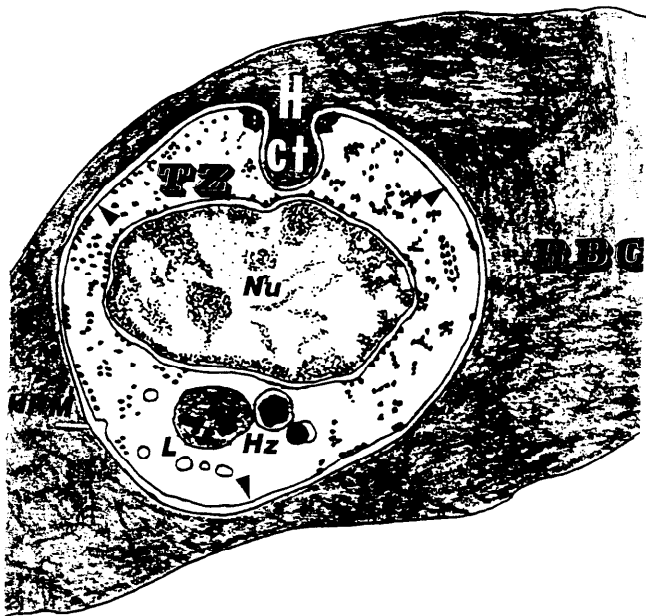


Figure 1. Drawing (from electron micrographs; see, e.g., Aikawa et al., 1966) of a malarial parasite (*Plasmodium* trophozoite, TZ; Nu, trophozoite nucleus) within its host erythrocyte (RBC). Its nutrition is derived largely from feeding on hemoglobin (H), ingested via the cytotome (Ct), and digested within lysosomes (L); at Hz, the dense, hemoglobin-derived pigment is being processed to the residual hemozoin crystalloid end product of hemoglobin digestion. This, apparently, is the site of the antimalarial action of the quinoline drugs quinine and chloroquine. The parasite's cell membrane (arrowheads) is the site in chloroquine-resistant strains of a transport mechanism for chloroquine efflux. Paralleling the parasite cell membrane is the host cell's plasma membrane-derived membrane (HPM) circumscribing the parasitophorous vacuole in which the parasite resides. See Aikawa (1971) for additional details of malarial parasite fine structure and host-parasite relationships.

the original inhabitants of the New World). The name honors a Countess Cinchona, who, on returning to Europe from Peru in 1640, formally introduced the remedy to civilized society. In exchange for this medical contribution to their culture, the Europeans introduced indigenous Americans—albeit with no malice aforethought—to such maladies as syphilis and pneumococcal pneumonia, viral poxes, perhaps cysticercosis taeniasis solium [i.e., the manifestation of infection with the so-called pork tapeworm, which remains a highly significant disease in Central and South America (see Flisser et al., 1982)], and imported African malaria with their slaves (see Zimmerman, 1980, and references therein). Fortunately, the active principle in the cinchona brew—the alkaloid quinine—was effective against some of these pathogens as well.

Cinchona trees in their native South American habitats proved to be relatively inaccessible for obtaining large quantities of “fever bark” and with the European colonization of the Far East and Pacific, where malaria proved to be especially bothersome, *Cinchona calisaya*/ *C. ledgeriana* was transplanted by Dutch entrepreneurs to Indonesia for cultivation. Plantations in Java were especially productive. By the 1920's, the German pharmaceutical industry had perfected quinine's efficient extraction and, in the patent process, gained a monopoly on its international distribution. Then came World War II and the major sources of quinine were denied the Allies [Java fell to the Japanese

in early 1942]. Anticipating the problems a shortage of quinine might raise, the U.S. military included on one of its last B-17 flights out of the soon to be lost Philippines a quantity of cinchona seeds, and new plantations were begun, ironically, in Central and South America. Even so, it was probably not lost upon the minds of military medicine that it would take awhile for the seeds to sprout and the trees (ergo bark) to grow. Meanwhile, the Allies all too soon (1942) found themselves conducting counterattacking military operations in the malaria infested jungles of New Guinea and the Solomons. In Papua, the U.S. Army's 41st division suffered a disabled by malaria ratio of 361 cases per 1,000 troops; on Guadalcanal, the ranks of the 1st Marine division were riddled more by malaria than Japanese ordnance, forcing its entire replacement; the much needed veteran 1st Marines did not fight again for a year (Morison, 1948, 1950; Luce and Billings, 1950).

As is often the case, necessity proved to be the mother of invention. A synthetic quinoline, chloroquine, developed by U.S. chemists in late 1941, was rushed into wholesale production and subsequently became the world's principal antimalarial drug. A variety of other synthetics used in conjunction with chloroquine increased the efficacy of malarial pharmacotherapy. Quinine per se faded into history. Man's creative genius had triumphed, it was said, over the caprice of nature and war's fortune. The eminent parasitologist Asa Chandler remarked in 1955 that “. . . (while) quinine remained the standard treatment for malaria for 300 years . . . it is still used only by physicians who have not kept up with the times” (p. 204).

Since the turn of the century, with knowledge of malaria's cause and transmission, the disease has been eradicated in most of the developed regions of the world. Post World War II, we have had the United Nations and its various proclamations of a new world order, and interests otherwise—politically, economically, and altruistically—in the underdeveloped sector, and a World Health Organization. With its new armamentarium of synthetic drugs coupled with the advent of DDT, the 1950's technology confidently predicted victory—globally—over the scourge of malaria. Professor Chandler (1955) wrote “Although there will be some areas in which malaria will continue to thrive for awhile Soper's estimate that 90 per cent of the malaria in the world can be wiped out by 1960 is not a pipe dream” (p. 209). According to Chandler, “. . . the slow process of evolution on which our parasitic enemies must depend is no match for the swift development of advantages afforded by human ingenuity” (1955, p. 2).

But there is a sequel to this story. During the 1960's, in the highlands of South Vietnam, the U. S. Marines discovered—again the hard way—an especially virulent strain of malaria, and something else. This *Plasmodium* variant was chloroquine resistant (Canfield, 1972). Other related synthetics in contemporary usage, e.g., amodiaquin, were likewise ineffective. For yet others, the “spread” between dosages effective against the parasites and significant patient toxicity was dangerously close, or for other reasons were contraindicated. Out of the desperation also born of necessity a supply of “obsolete” natural quinine was found, tried, and—it worked (Modell, 1968)! Ironically, among the scientists

suggesting this approach was Clark Read, who had obtained his Ph.D. under Asa Chandler's direction.

The antimalarial action of the quinoline alkaloids is apparently related to the process by which the intra-erythrocytic parasites (i.e., the stage living and multiplying in the red blood cells) sequester, and thereby render harmless, the digestion products of the hemoglobin on which they feed (Fitch, 1983; Slater and Cerami, 1992) (Figure 1). The drugs block one or more of the enzymes involved in the production of hemozoin crystals ("detoxified" ferriprotoporphyrin). The subsequent build-up of toxic heme residues kills the parasite. Parenthetically, it should be noted that this event is primarily therapeutic to the febrile paroxysms brought on by erythrocytic schizogony (multiplication of the parasites in the rbc's) and does not kill the non-hematophagous exo-erythrocytic (liver-dwelling) stages from which the erythrocytic form is derived. Therefore, to eliminate infection *in toto*, patients are concomitantly treated with other drugs effective against specific biochemical pathways in these stages [reviewed by Warhurst (1973) and Schmidt and Roberts (1981); see also Coatney (1976) for an insightful analysis of malarial relapse].

The chemical structures of quinine and chloroquine are provided in Figure 2, for comparison, since the differences underlie the mechanism for quinine's efficacy in the face of chloroquine resistance. In the chloroquine-resistant strains, there is a plasma membrane incorporated transport system which has a high affinity interaction with the molecular structure of chloroquine (vs. quinine) and pumps it out of the cell (Ginsberg et al., 1987). [The efflux of chloroquine by this carrier is probably a fortuitous coincidence (unless one chooses to believe that the parasite is designing a countermeasure to chloroquine therapy), but the function of this carrier in the parasite's physiology otherwise is yet unknown]. Therefore, these parasite cells do not accumulate enough chloroquine to inhibit heme processing. Absent a comparable efflux of quinine, however, quinine remains within and kills the chloroquine-resistant cells.

Strains resistant to synthetic antimalarials other than quinolines, e.g., the pyrimidine derivative pyrimethamine (Daraprim), have also been encountered. [In susceptible varieties, pyrimethamine is a selective inhibitor of *Plasmodium* dihydrofolate reductase (DHFR), an enzyme essential to the parasite's growth]. The basis for pyrimethamine-resistance has not yet been elucidated, though it may reflect the presence of a structural variant of *Plasmodium* DHFR (Wyler, 1990).

For a detailed, comprehensive technical treatise on alkaloid and other pharmacology respective of malaria and other diseases of protozoan etiology, see Steck (1971).

Alkaloids have also played a significant role in the control and prevention of malaria and other insect-borne diseases as insecticides and repellants. Among the more potent naturally occurring compounds with this activity are the pyrethrins, from *Crysanthemum* flowers. Meanwhile, strains of anophiline mosquitoes resistant to DDT (the villain in Rachael Carlson's *Silent Spring*) and other synthetic insecticides have been encountered.

As evidenced by the current statistics, man's technology, its prognostications notwithstanding, has so far

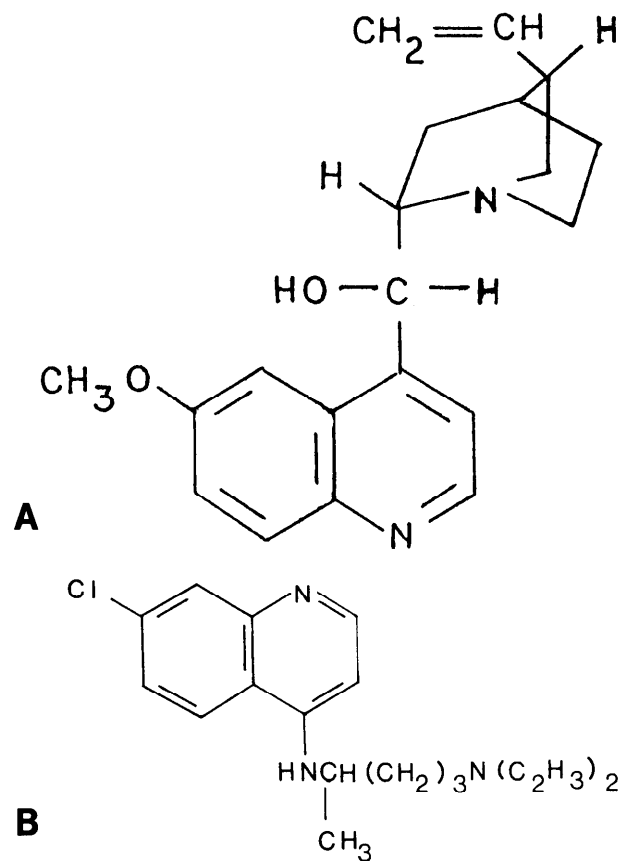


Figure 2. Molecular structure of two quinoline antimalarial drugs. A, the naturally occurring alkaloid, quinine. B, a synthetic version, chloroquine. From *The Merck Index*, eighth edition.

been inadequate to the cosmopolitan eradication of malaria. Schmidt and Roberts (1981), vs. Soper's earlier optimism (per Chandler, 1955), soberly reflect that "... known since antiquity ..." (p. 141) "Malaria will be with us for a long time, probably as long as there are people" (p. 164).

Shedding little light on the problem or being productive to a solution is the prevailing establishment view that the parasites and their vectors are *evolving* drug resistance and insecticide tolerance, respectively. The term "acquired resistance" is, for the most part, misleading, since what is actually being observed is a statistical phenomenon applied to populations of organisms, not necessarily biological changes in the organisms themselves. Selection, as it may enhance changes in the composition of a population's structure, does not "create" biological characteristics *de novo* [for a critical review of the Cairns/Hall directed mutation hypothesis, see Lenski and Mittler, 1993]. Rather than "newly evolved (or evolving)" *Plasmodium* and *Anopheles* species, it seems clear from comparative biochemical studies (when these are interpreted without the evolutionary presumption) that the explanation lies in pre-existing genetics (i.e., already established variants) and/or inductive mechanisms analogous, e.g., to those of mammalian hepatocytes that underlie the expression of phenobarbital tolerance (Orrenius and Ericsson, 1966; Gillete et al., 1969). In the liver, barbituates (and other exotic toxins) are fortuitously rendered pharmacologically inactive by an oxidative hydroxylation en

zyme system otherwise devoted to processing nascent vitamins, endogenous hormones, etc. It increases quantitatively with increasing (or chronic) presentations of its substrates. Inductive mechanisms might include selective gene activation and quantitative modifiers respective of gene products, gene amplification (increase in gene copy number), and/or isoform diversity in gene products [for identification and discussion of these mechanisms as they apply to variation, see Li and Graur (1991); Lumsden et al. (1992); Lumsden and Lumsden (1992)]. This perspective might identify a target of opportunity in the rational development of future therapies and control efforts. A non-evolutionary explanation has already clarified one aspect of malarial epidemiology, pharmacodiversity and differential virulence—the infectivity for humans by certain *Plasmodium* species normally occurring in simians (Garnham, 1966; Coatney et al., 1971; Collins and Aikawa, 1977). Thus, in some cases, “new” strains are, in reality, “old” species in different surroundings. Not unpredictably, evolutionists (see, e.g., Mattingly, 1976) strain this observation as “evidence” for the evolution of human malarial parasites from those of simian ancestry (co-evolving with their hosts, but this is a *non sequitur* in so far as the drug resistance problem is concerned.

Some Other Therapeutic Alkaloids

Botanical alkaloids have found widespread application in public health. A few examples of medicinal alkaloids are noted here [references to these, and the identification of others, can be found in various editions of the *Merck index* and *Physician's Desk Reference*]. Also note that in addition to those developed as human medicines per se have been the alkaloids of significance to veterinary medicine (especially as antiparasitic drugs) and agriculture (as pesticides). Starvation, after all, is a disease of some consequence. Among the examples of alkaloids with this agronomical application is nicotine. The insecticidal use of nicotine amounts to over 500 tons annually in the U.S. alone. It is also used as an external parasiticide for large animals and poultry and as a veterinary antihelminthic. Some food plants, notably the “wild types” vs. their horticulturally developed variants, are invested with endogenous alkaloids that confer resistance to foraging insects and parasites.

Among the more remarkable, recently discovered naturally occurring insecticides is azadirachtin, from the neem tree (endogenous to India and Burma). Amazingly, its toxicity is selective for pest species (including mosquitoes and the desert locust), leaving pollinating insects (and vertebrates) unharmed (cf. DDT, etc.). Its mode of action is twofold: one fragment (decalin) disrupts the susceptible insects' growth and development; another (the hydroxy furan component) deters them from feeding (Aldhous, 1992) (Figure 3).

Extracts of the tropical vines *Chonodendron* and *Strychnos*, employed by Amazonians to augment their hunting and military prowess, have been adopted (as, e.g., tubocurarine) in contemporary surgery as a muscle relaxant. On the other hand, eserine, an alkaloid of *Physostigma* vines, is an antidote for curare poisoning; its modern medicinal uses include reducing intraocular tension in glaucoma and the management of myasthenia gravis (a progressively paralytic disease initially manifesting in the facial musculature). Atropine, from

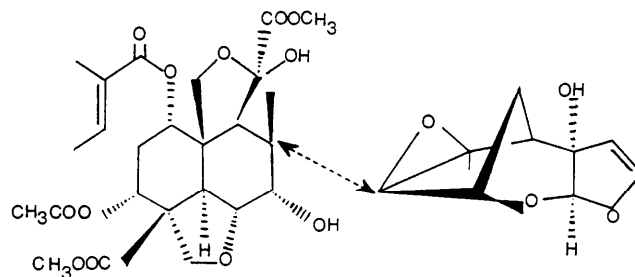


Figure 3. An alkaloid insecticide, azadirachtin, from the neem tree. At left, its decalin component; at right, its hydroxyfuran component. From Aldhous (1992).

Atropa belladonna (deadly nightshade), has a long history as a medicinal sedative (its nefarious Borgian applications notwithstanding) and antispasmodic. The latter property has had application to the treatment of cystitis, constrictive bronchial and esophageal spasms, and, in ophthalmology, it is used as a mydriatic—i.e., to dilate the pupil of the eye; a recent application has been its use as an antidote to “nerve gas” poisoning. Historically more infamous, perhaps, is the conium alkaloid of hemlock, though in less than Socratic dosages it has had useful medicinal applications as an anodyne (pain reliever). Used for over two thousand years in India as a tranquilizer and treatment for snakebite, alkaloids produced by the *Rauwolfia* herbs were discovered by Western medicine in the 1930's and developed (as reserpine and its derivatives) for the pharmacotherapy of hypertension.

From antiquity, Chinese herbalists have employed a brew from the fruit, bark and wood of *Camptothecin acuminata* to shrink tumors. Its active principle, the alkaloid camptothecin, is the only known specific inhibitor of topoisomerase, the enzyme which uncoils DNA prior to its replication (Wang, 1985); camptothecin thereby blocks a mechanism essential to tumor cell proliferation. A semi-synthetic version of camptothecin (SmithKline's topotecan, which has lesser side effects) is presently in clinical trials (Stix, 1993), with encouraging results against no less than eight kinds of cancer. Spurred by reports that the rosy periwinkle (*Vinca rosea*) was being used in a folk treatment for diabetes in the Philippine hinterlands, Eli Lilly & Co. during the 1950's isolated the alkaloid vinblastin, which, while found ineffective for diabetes, has remarkable efficacy in the treatment of childhood lymphocytic leukemia (Joyce, 1992). Akin to the activity of the alkaloid colchicine (from meadow saffron, used in treating gout), vinblastin, at the level of molecular biology, inhibits microtubule polymerization, and thereby arrests cell division (Soifer, 1975; Salmon et al., 1984).

As reviewed by Stix (1993), at least three extracts from exotic plants have been discovered that exhibit activity against various facets of AIDS. One, from a yet taxonomically unclassified vine growing in the rain forests of Cameroon, inhibits replication of HIV (human immunodeficiency virus). Another, Calanolide A, from the Malaysian tree *Calophyllum lanigerum*, appears effective against an AZT (azidothymidine)-resistant form of HIV. A third, prostratin, from *Homo-lanthus nutans* (a plant species native to Samoa), appears to protect cells of the immune system from destruction by the AIDS-causing virus; for years,

Samoans have been using this preparation to treat yellow fever and other viral illnesses.

Besides their medical uses, alkaloids have been invaluable to cell biological research as highly selective inhibitors (antagonists) or activators (agonists) to functions associated with the cytoskeleton, membranes, the genome, etc. Colchicine and vinblastin, for example, have served as probes to elucidating the roles of microtubules; cytochalasin B to the diagnosis of activities involving actin-type microfilaments. The highly selective effects of certain alkaloids on ion-gating channels have provided stepwise analysis of the events involved with the generation of action potentials. Other alkaloids, e.g. forskolin, are specific agonists of adenylyl cyclase; caffeine inhibits phosphodiesterase. Thus have the roles of cyclic nucleotides and related entities in a myriad of regulatory functions in cells been identified. Such basic research findings have had far ranging applications to our present understanding of cell structure and function, beyond those of pragmatic medical practice.

The Taxol Enigma

Another antimitotic alkaloid, taxol (which, cf. colchicine and vinblastin, inhibits microtubule *de*-polymerization), has proven remarkably effective in the treatment of lung, breast, and ovarian cancer (De Brabander, 1986). However, it takes over 10 tons of bark from the yew tree (*Taxus brevifolia*) to produce two pounds of taxol, and it requires 100 years or more for a Pacific yew to achieve a girth of just nine inches. Each potential patient (over 100,000 at present in the U.S. alone) would require the taxol contained in at least six trees per year.

Since the molecular structure of taxol has been elucidated (Figure 4), it would seem that chemists could solve the problem of scarcity by synthesizing the drug. However, to date, this task has proven greater than the efforts of the best laboratories in the world (Erickson, 1991; Amato, 1992). Among the alternatives to its industrial manufacture being explored is the *in vitro* cultivation of yew tree cells from which biosynthesized taxol might be harvested.

Chance Evolution or Creative Design?

Evolutionists tell us that the components of every organism, including the taxol in the yew tree—indeed, the yew tree itself—came about by processes originating in physicochemical randomness. This, they offer, explains the lack of specific function for many of the aforementioned alkaloids in the metabolism and structure of the plants in which they are found, overlooking at that point any purpose for which they might have been designed otherwise. Yet, in the case of taxol, such spontaneous molecular collocations have not yet been

replicated in the orderly, purposeful investigations of our most competent chemists. The problem of synthesizing taxol, or a suitable derivative, may eventually be overcome, but it is doubtful that the pharmaceutical industry will resort to random chance in the process. More likely, it will require a great deal of intelligence, technology, and purpose aforethought. How, then, can these same chemists credit mindless evolution for the origin of this substance?

There are two general observations germane to the creationist concept of purpose and design in the context of the present topic. The first is that the synthetic drugs have been inspired by empirical experience with the natural products and elucidation of their structure. The synthetics are typically replicas of naturally occurring molecules or modifications to them. Thus, in the manufacture of topotecan, 10-hydroxyl-9-diethylamino methyl, is added to camptothecin *per se* to increase its water solubility and thereby improve its clinical use. Man's wisdom, or inventiveness, has not devised the structures of these drugs *de novo*; man has only learned, in some cases, how to assemble them. The point is that neither their structures nor their pharmacological activities are immediately predictable from brute organic chemistry.

The second concerns the highly specific effects *plant* alkaloids have on *animal* cells and the systems they constitute, systems that in many cases do not even exist in the plants themselves. A number, for example, are distinctly neurotropic. Moreover, there is the extraordinary stereospecific fit, ubiquitously, between medicinally significant alkaloids and molecular receptors (or structures otherwise, e.g., cytoskeletal tubulin) at these exogenous sites of their pharmacological activity. In some cases, an underlying commonality of chemical structure is suggested, particularly for those alkaloids having a substitutionary "first messenger" effect at receptors *per se* (Figure 5). This references the binding of a ligand to a cell surface receptor, which in turn is linked to regulatory enzymology (e.g., adenylyl cyclase) or permeability (e.g., to Ca^{++}). See reviews by Snyder (1985) and Carafoli and Penniston (1985). Meanwhile, however, the receptors themselves, given their absolutely essential roles in the regulation of cell function, are otherwise structured to interact selectively with such endogenously produced, non-alkaloid ligands as biogenic amines, steroid and peptide hormones, neurotransmitters, kinins, prostaglandins, etc. Yet curare and atropine, endogenous to plants, bind specifically, as antagonists of the neurotransmitter acetylcholine at neuromuscular functions (hence their paralytic effect). [Acetylcholine, released from axon terminals, transiently binds to receptor channels in postsynaptic nerve and muscle cell membranes, generating a transmembrane, usually stimulatory, current flow. A spatially approximate enzyme, acetylcholine esterase, subsequently breaks down acetylcholine, stopping the signal. See review by Unwin (1989)]. Physostigmine (see eserine, above), from Calabar beans, is a specific inhibitor of acetylcholine esterase; this inhibition retards the regulatory decomposition of acetylcholine, enhancing the stimulatory effect of this neurotransmitter (hence eserine's anti-paralytic effect). *Rauwolfia*-produced alkaloids (see reserpine, above) act upon mechanisms which regulate indolamine (e.g., serotonin) and cate-

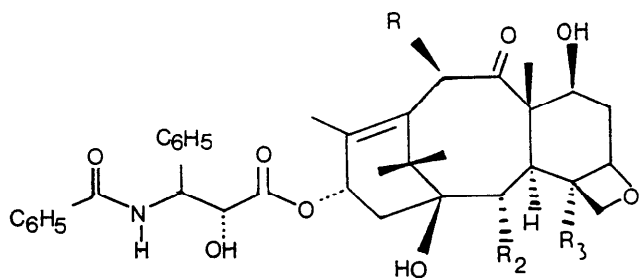


Figure 4. The yew tree alkaloid, taxol. From Amato (1992).

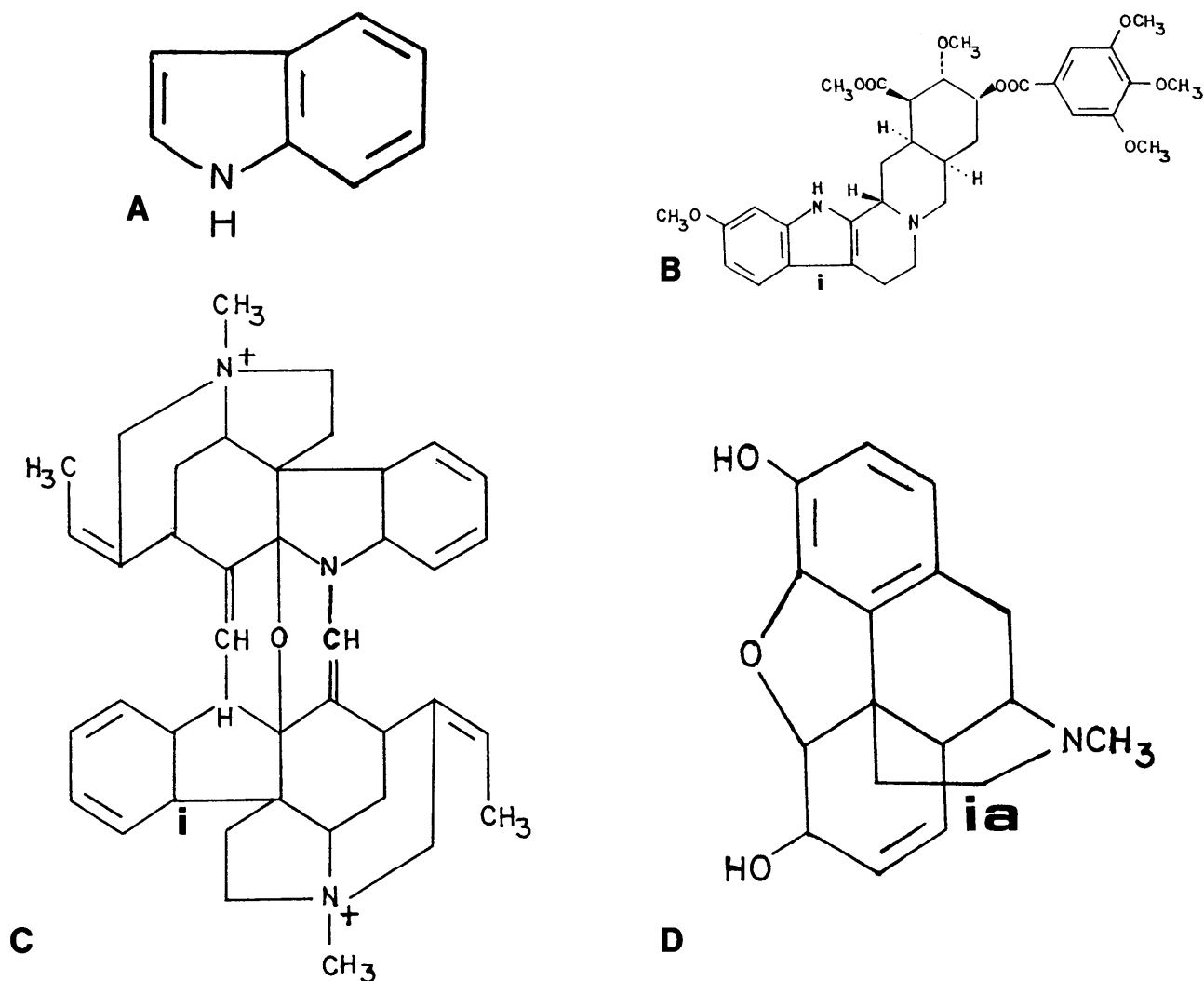


Figure 5. Receptor interactive botanical alkaloids frequently contain an indole structure (i) or analogue of it (ia) which may contribute to their affinity for sites on animal cell receptors and underlie their specific pharmacological activity as agonistically or antagonistically binding ligands. A, indole. B, reserpine. C, curare (C-curarine). D, morphine. From *The Merck Index*, eighth edition.

choline (e.g., adrenaline) concentrations in the mammalian central nervous system and peripheral tissues. Alkaloids produced in the seeds of certain poppy flowers (*Papaver somniferum*) interact kinetically with the receptors otherwise responsive to the peptide analgesics—the endorphins and enkephalins (Snyder, 1977)—produced in mammals; hence the narcotic effect of opium and its derivatives. Quinine selectively blocks metabolic pathways unique to pathogenic microorganisms; i.e., the vulnerable “target” enzymology of the drug in *Plasmodium* trophozoites is non-existent in the parasite’s human hosts. Meanwhile, quinine has no apparent function for the cinchona trees that manufacture it. And what natural principle would predict the effects plant alkaloids such as Calanolide A have against the AIDS virus? The selectively pesticidal activity of azadirachtin? These and the many additional examples which could be cited must strike the evolutionists as remarkable, if not inexplicable, “coincidences.”

Ransom (1965, p. 117) finds that the

secular economy is . . . inspired when science has found a process or tool that promises to win for

mankind a fresh advantage from nature . . . It says nothing about God, who vanishes from the picture as soon as men think they see through nature.

What the secular economy is talking about in this instance is how the profits and rights to the “new” phytopharmaceuticals, as they might be discovered and exploited, should be distributed (Joyce, 1992); have we here negotiations among “. . . experts in greed—an accursed brood!” (2 Peter 2:14), who would eschew acknowledging the higher Source (and ultimate Owner) of the substances that would accrue to their good fortune? What royalties would He receive? Whom would the patents honor?

Thorns Among the Roses?

But there is an even darker side to the alkaloid story. Outwardly paradoxical to the creationist point of view would be that the medicinal efficacy of alkaloid drugs is often not without undesirable side effects. Many are frankly poisonous. If divinely created, why these “imperfections”? Of course, overt toxicity is often dosage related. Moreover, note that since the Fall, “. . . the

whole creation has been groaning . . . (Romans 8:22); see discussion by Morris (1988, pp. 124-128) of *devolutionary* changes and the development of disease itself, noxious elements, etc., respective of Genesis 3:17-18. A perhaps germane analogy in principle to this point is the example of hemorrhagic poisoning evidenced by cattle that have fed on silage contaminated with sweet clover. Cattle eating freshly cut clover or pasturing in fields in which it is growing do not develop sweet clover poisoning. The cause is a *decay* product, the anticoagulant dicoumarin, which is formed during the spoilage process from the harmless coumarins in fresh clover. Then there is the question raised by Williams et al. (1991) concerning various overt defense mechanisms (many of which employ alkaloids) evidenced by present day organisms: were some created as such, i.e., prior to the Fall? If so, what would have been their purpose to a perfectly harmonious creation?

Further potential rebuttal: why would a caring God have created addictive narcotics, for example? Where is the altruistic principle in that? The skeptic would point out that a crack cocaine addict, or her unborn child, is hardly blessed in that event. But *God* is not the cause of that unhappy circumstance, some exegeses of Genesis 3:18 notwithstanding (again, see Morris, 1988). Need we be reminded of *man's* ability, by his own volition and perverse ingenuity, to corrupt God's gifts? Even Christians who would abstain from alcohol, tobacco, and the non-prescribed use of drugs are not immune from this principle, as the incidence of dietary abuse—manifested in overweight, hypercholesterolemia, etc., and their morbid sequelae (Lumsden and Allen, 1992)—would attest.

Cocaine is an alkaloid originally employed productively as a topical anesthetic; the street drug heroin is aberrantly derived from the same family of alkaloids that have given us the medically legitimate analgesics morphine and codeine, papaverine (used as a smooth muscle relaxant and in the treatment of tinnitus), and noscapine (an antitussive, or cough remedy). The nicotine alkaloid has had application historically, as tobacco poultices, to the succor of rheumatic diseases; tobacco need not always have been a source of self-inflicted carcinogens inhaled in pipe, cigar or cigarette smoke. As noted above, nicotine is otherwise widely used today, beneficially, as an agricultural insecticide and veterinary antihelminthic. Its oxidation product, nicotinic acid, is, by the way, a natural constituent, albeit in usually minute amounts, of all living cells. Appreciable amounts are found in milk, white meat, liver, alfalfa, legumes, whole cereals, and corn. The nicotinamide derivative is, of course, otherwise known as vitamin B₃.

Where God-given resources are concerned, physical as well as spiritual, man would perish for a lack of knowledge, though it is there for anyone who seeks Him. Where ignorance has combined with pride, the results have been disastrous for mankind. Henry Morris summarizes man's plight in the title to one of his books, *The Long War Against God*. Where the particular topic of this paper is concerned, better we appreciate that God, (not evolution) gave every plant to use for our good (Genesis 1:29; 8-9). We should see His nature in what He has made (Romans 1:20), and for all things give thanks (Psalm 107; I Thessalonians 5:18)

This leads me to a final observation. The power of prayer, as it would call upon God's power, is man's greatest resource in the face of adversity. There is abundant contemporary testimony that He does in fact directly intervened on occasion, to relieve physical suffering and in the physical healing and curative processes. However, the view some take of secular medicine—as a compromise of one's faith—misses the point of the above discussion. God, as He created these medicinal principles (presciently?), provided them for our well-being, is not honored by eschewing them. Would a parent or guardian, who in naming and claiming a faith healing of his sick child and thereby forbids medical treatment, be tempting God? While man does not live by bread alone, he does not do very well without the bread either. The Lord provided manna—a physical substance—to sustain the Israelites—physically—during their 40 years sojourn in the wilderness. Given the state of the world today, are we not still lost in a wilderness, but yet still blessed by God's provisions? Let us praise Him, giving thanks in *all* circumstances.

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OTA BENGAL: THE STORY OF THE PYGMY ON DISPLAY IN A ZOO

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Abstract

One of the most fascinating historical accounts about the fallout of biological evolution theory on human relations is the story of Ota Benga, a pygmy who was put on display in an American zoo as an example of an evolutionarily inferior race. The incident clearly reveals the racism of evolutionary theory and the extent that the theory gripped the hearts and minds of scientists and journalists in the late 1800s. As humans move away from this time in history, we can more objectively look back at the horrors that evolutionary theory has brought to society of which this story is a poignant example.

Introduction

Genetic differences are imperative to the theory of naturalistic evolution because they are the only source of innovation for evolutionary advancement. History and tradition has, often with tragic consequences, grouped human phenotypes that result from genotypic variations together into categories now called races. Races function as evolutionary selection units that are of such major importance that the subtitle of Darwin's classic 1859 book, *The Origin of Species*, was "the preservation of superior races." This work was critical

in establishing the importance of the race fitness idea, and especially the "survival of the fittest" concept in evolution. The question being asked in the early 1900s was:

Who was, [and] who wasn't human? It was a big question in turn-of-the-century Europe and America . . . The Europeans . . . were asking and answering it about Pygmies. . . . often influenced by the current interpretations of Darwinism, so it was not simply who was *human*, but who was *more human*, and finally, who was the *most human*, that concerned them (Bradford and Blume, 1992, p. 29).

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The racism that evolution spawned—the belief some races were inferior and closer to the lower primates—included the polyphyletic view that Blacks had evolved from the strong but less intelligent Gorillas, the Orientals from the Orangutans, and Whites from the most intelligent of all primates, the Chimpanzees (Crookshank, 1924). The belief that Blacks were less evolved than Whites and, as many early evolutionists concluded, would eventually become extinct, is a major chapter in our modern western cultural history. The nefarious fruits of evolutionism, from the Nazis' conception of racial superiority to its utilization in developing governmental policy, are all well documented (Bergman, 1992, 1993a).

There was especially a concern about evolutionism because of the problem of racism in early twentieth century America. Some scientists felt that the solution was to allow Darwinian natural selection to operate without interference. In Bradford and Blume's words,

Darwin was understood to have shown that when left to itself, natural selection would accomplish extinction. Without slavery to embrace and protect them, or so it was thought, blacks would have to compete with Caucasians for survival. Whites' greater fitness for this contest was [then believed] beyond dispute. The disappearance of blacks as a race, then, would only be a matter of time (1992, p. 40).

Each new American census though, showed that this prediction of Darwin was wrong because "the Black population showed no signs of failing, and might even be on the rise. . . . Not content to wait for natural selection to grind out the answer," one senator even tried to arrange a state of affairs to convince or even force Blacks to return to Africa (Bradford and Blume, 1992, p. 41).

One of the more interesting incidences in the history of evolution and racism is the story of the man who was put on display in a zoo (Brix, 1992). Brought from the Belgian Congo in 1904 by noted African explorer Samuel Verner, he was soon "presented by Verner to the Bronx Zoo director, William Hornaday" (Sifakis, 1984, p. 253). The man, a pygmy named Ota Benga (or "Bi" which means "friend" in Benga's language), was born in 1881 in Africa. When put in the zoo, he was about 23 years old, only four feet-eleven inches tall, and weighed a mere 103 pounds. Often referred to as a boy, he was actually a twice married father—his first wife and two children were murdered by the white colonists, and his second spouse died from a poisonous snake bite (Bridges, 1974).

He was first displayed in the anthropology wing at the 1904 St. Louis World's Fair with other pygmies as "emblematic savages" along with other "strange people." The exhibit was under the direction of W. J. McGee of the Anthropology Department of the St. Louis World's Fair. McGee's ambitions for the exhibit were to "be exhaustively scientific in his demonstration of the stages of human evolution. Therefore he required 'darkest Blacks' to set off against 'dominant Whites' and members of the 'lowest known culture' to contrast with 'its highest culmination' " (Bradford and Blume, 1992, pp. 94-95). The exhibit was also extremely popular and "attracted considerable attention" (Verner,

1906a, p. 471). The pygmies were selected because they had attracted much attention as an example of a primitive race. One *Scientific American* article said:

The personal appearance, characteristics, and traits of the Congo pygmies . . . [conclude they are] small, ape-like, elfish creatures, furtive and mischievous, they closely parallel the brownies and goblins of our fairy tales. They live in the dense tangled forests in absolute savagery, and while they exhibit many ape-like features in their bodies, they possess a certain alertness, which appears to make them more intelligent than other negroes. . . . The existence of the pygmies is of the rudest; they do not practise agriculture, and keep no domestic animals. They live by means of hunting and snaring, eking this out by means of thieving from the big negroes, on the outskirts of whose tribes they usually establish their little colonies, though they are as unstable as water, and range far and wide through the forests. They have seemingly become acquainted with metal only through contact with superior beings . . . (Keane, 1907, pp. 107-108).

While the pygmies stayed in America, they were studied by scientists to answer such questions as "how did the barbaric races compare with intellectual defective Caucasians on intelligence tests" or "how quickly would they respond to pain" (Bradford and Blume, 1992, pp. 113, 114). The anthropometricists and psychometricists concluded that their intelligence tests proved that pygmies "behaved a good deal in the same way as the mentally deficient person, making many stupid errors and taking an enormous amount of time" (Bradford and Blume, 1992, p. 121). Nor did they do very well in the sports competition. In Bradford and Blume's words, "The disgraceful record set by the ignoble savages" was so poor that "never before in the history of sport in the world were such poor performances recorded" (1992, p. 122). Ironically, Professor Franz Boas of Columbia University, a Jew who was one of the first anthropologists who opposed the racism of Darwinism—and who spent his life fighting the now infamous Eugenics movement—"lent his name" to the anthropological exhibit at the St. Louis Fair (Bradford and Blume, 1992, p. 113).

The anthropologists then measured not only the live humans, but in one case a "primitive's" head was "severed from the body and boiled down to the skull. Believing skull size to be an index of intelligence, scientists were amazed that this skull was larger than that which had belonged to the statesman Daniel Webster" (Bradford and Blume, 1992, p. 16).

A *Scientific American* editor said of the Fair, "of the native tribes to be seen in the exposition, the most primitive are the Negritos—little fellows of a distinctly negro type . . . nothing makes them so happy as to show their skill, by knocking a five-cent piece out of a twig of a tree at a distance of 15 paces. Then there is the village of the Head-Hunting Igorotes, a race that is generally superior to the Negritos and a fine type of agricultural barbarians" (Munn, 1904, p. 64). The same source referred to pygmies as "ape-like little black people" (Munn, 1905, p. 107) and theorized that the evolution of:

The anthropoid apes were soon followed by the earliest type of humanity which entered the Dark Continent, and these too, urged on by the pressure of superior tribes, were gradually forced into the great forests. The human type, in all probability, first emerged from the ape in southeastern Asia, possibly in India. The higher types forced the negro from the continent in an eastward direction, across the intervening islands, as far as Australia, and westward into Africa. Even today, ape-like negroes are found in the gloomy forests, who are doubtless direct descendants of these early types of man, who probably closely resembled their simian ancestors. . . . They are often dirty-yellowish brown in color and covered with a fine down. Their faces are fairly hairy, with great prognathism, and retreating chins, while in general they are unintelligent and timid, having little tribal cohesion and usually living upon the fringes of higher tribes. Among the latter, individual types of the lower order crop out now and then, indicating that the two were, to a certain extent merged in past ages (Munn, 1905, p. 107).

When on display, the pygmies were treated quite in contrast to how they first treated the whites who came to see them in Africa. When Verner visited the African king,

he was met with songs and presents, food and palm wine, drums. He was carried in a hammock . . . how were the Batwa treated in St. Louis? With laughter. Stares. People came to take their picture and run away. . . [and] came to fight with them. . . . Verner had contracted to bring the Pygmies safely back to Africa. It was often a struggle just to keep them from being torn to pieces at the fair. Repeatedly . . . the crowds became agitated and ugly; the pushing and grabbing took on a frenzied quality. Each time, Ota and the Batwa were "extracted only with difficulty." Frequently, the police were summoned (Bradford and Blume, 1992, pp. 118-119).

How Ota Came to the United States

Ota Benga was spared from a massacre perpetuated by the Force Publique, a group of thugs working for the Belgium government endeavoring to extract tribute (in other words, steal) including labor and raw materials from the native Africans in the Belgian Congo. The story is as follows: while Ota was out on a hunt, he successfully killed an elephant, and then came back with the good news to his people. Tragically the "camp Ota had left behind had ceased to exist. What Ota saw when he returned was different enough from what he remembered to make him doubt his eyes" (Bradford and Blume, 1992, p. 104). In short, his wife and children were all murdered, and their bodies were mutilated in a campaign of terror undertaken by the Belgian government against the "evolutionarily inferior natives." Ota himself was later captured, brought to a village, and sold into slavery.

In the meantime, Verner was looking for several pygmies to display at the Louisiana Purchase exposition and spotted Ota at the slave market. Verner bent down "and pulled the pygmy's lips apart to examine his

teeth. He was elated; the filed [to sharp points] teeth proved the little man was one of those he was commissioned to bring back. . . . With salt and cloth he was buying him for freedom, Darwinism, and the West" (Bradford and Blume, 1992, p. 106). Ota's world was shattered by the Whites, and although he did not know it the white man who was now his master had the same intention, he did know he had little choice but to go with him. Besides this, the events of the slave market were only one more event in Ota's life which pushed him further into the nightmare which began with his discovery of the slaughter and gross mutilation of his family. Verner managed to coerce only four pygmies to go back with him, a number which "fell far short of McGee's initial specification, the shopping list that called for 18 Africans, but it would do" (Bradford and Blume, 1992, p. 110).

After the fair, Verner took Ota and the other pygmies back to Africa—Ota almost immediately remarried, but his second wife also soon died (a victim of snake bite). He now no longer belonged to any clan or family since they were all killed or sold into slavery. His other people ostracized him, calling him a warlock, and claiming that he had chosen to stand in the White man's world outside of theirs. The white men were both admired and feared, and were regarded with awe and concern: they could do things like record human voices on Edison cylinder phonographs—which the pygmies saw as machines that stole the soul out of the body, allowing the body to sit and listen to its soul talking (Verner, 1906b).

After Verner collected his artifacts for the museums, he decided to take Ota back to America, (although Verner claims that it was Ota's idea) just for a visit though—Verner would take him back to Africa the next time he visited there. Back in America, Verner endeavored to sell his animals to zoos, sell his crates of things that he brought back from Africa to museums, and also to place Ota Benga. When Ota was presented to Director Hornaday of the Bronx Zoological Gardens, Hornaday's intention was clearly to "display" Ota. Hornaday "maintained the hierarchical view of races . . . large-brained animals were to him what Nordics were to Grant, the best evolution had to offer" (Bradford and Blume, 1992, p. 176). This "believer in the Darwinian theory" also concluded that there exists "a close analogy of the African savage to the apes" (*New York Times*, Sept. 11, 1906, p. 2). And too, Verner was then having serious money problems and could not afford to take care of Ota. At first Ota was free to wander around the zoo, helping out with the care of the animals, but this was soon to drastically change.

Hornaday and other zoo officials had long been subject to a recurring dream in which a man like Ota Benga played a leading role . . . a trap was being prepared, made of Darwinism, Barnumism, pure and simple racism . . . so seamlessly did these elements come together that later those responsible could deny, with some plausibility, that there had ever been a trap or plan at all. There was no one to blame, they argued, unless it was a capricious pygmy or a self-serving press (Bradford and Blume, 1992, p. 174).

Ota was next encouraged to spend as much time as he wanted inside the monkey house. He was even

given a bow and arrow and was encouraged to shoot it as part of "an exhibit." Ota was soon locked in his enclosure—and when he was let out of the monkey house, "the crowd stayed glued to him, and a keeper stayed close by" (Bradford and Blume, 1992, p. 180). In the meantime, the publicity began—on September 9, the *New York Times* headline screamed "bushman shares a cage with the Bronx Park apes" Although the director, Dr. Hornaday, insisted that he was merely offering a "intriguing exhibit" for the public's edification, he "apparently saw no difference between a wild beast and the little Black man; [and] for the first time in any American zoo, a human being was displayed in a cage. Benga was given cage-mates to keep him company in his captivity—a parrot and an Orangutan named Dohong" (Sifakis, 1984, p. 253).

A contemporary account stated that Ota was "not much taller than the orangutan . . . their heads are much alike, and both grin in the same way when pleased" (Bradford and Blume, 1992, p. 181). Benga also came over from Africa with a "fine young chimpanzee" which Mr. Verner also deposited "in the ape collection at the Primates House" (Hornaday, 1906, p. 302). Hornaday's enthusiasm for his new primate exhibit was reflected in an article that he wrote which begins as follows:

On September 9, a *genuine* African Pygmy, belonging to the sub-race commonly miscalled 'the dwarfs,' . . . Ota Benga is a well-developed little man, with a good head, bright eyes and a pleasing countenance. He is not hairy, and is not covered by the 'downy fell' described by some explorers. . . . He is happiest when at work, making something with his hands (*italics in original*, 1906, p. 301).

He then tells about how he obtained the pygmy from Verner who

was specially interested in the Pygmies, having recently returned to their homes on the Kasai River the half dozen men and women of that race who were brought to this country by him for exhibition in the Department of Anthropology at the St. Louis [World's Fair] Exposition (Hornaday, 1906, p. 302).

The Influence of Evolution

The many factors motivating Verner to bring Ota to the United States were complex, but he was evidently "much influenced by the theories of Charles Darwin" a theory which, as it developed, increasingly divided humankind into human contrived races (Rymer, 1992, p. 3). Darwin also believed that the blacks were an "inferior race" (Verner, 1908a, p. 10717). Although biological racism did not begin with Darwinism, Darwin did more than any other man to popularize it among the masses. As early as 1699, English physician Edward Tyson studied a skeleton which he believed belonged to a pygmy, concluding that this race was apes, although it was discovered that the skeleton on which this conclusion was based was actually a chimpanzee (Bradford and Blume, 1992, p. 20).

The conclusion in Verner's day accepted by most scientists was that after Darwin "showed that all humans descended from apes, the suspicion remained that some races had descended farther than others . . . [and that] some races, namely the white ones, had left the ape far

behind, while other races, pygmies especially, had hardly matured at all" (Bradford and Blume, 1992, p. 20). Many scientists agreed with Sir Harry Johnson, a pygmy scholar who stated that the pygmies were "very apelike in appearance [and] their hairy skins, the length of their arms, the strength of their thickset frames, their furtive ways, their arboreal habits all point to these people as representing man in one of his earlier forms" (Keane 1907, p. 99). One of the most extensive early studies of the pygmies concluded that they were "queer little freaks" and

The low state of their mental development is shown by the following facts. They have no regard for time, nor have they any records or traditions of the past; no religion is known among them, nor have they any fetish rights; they do not seek to know the future by occult means . . . in short, they are . . . the closest link with the original Darwinian anthropoid ape extant" (Burrows, 1905, pp. 172, 182).

The pygmies were in fact a talented group—experts at mimicry, physically agile, quick, nimble, and superior hunters, but the Darwinists were blind to an objective study of them (Johnston, 1902a; 1902b; Lloyd, 1899). An excellent modern study by Turnbull (1968) shows the pygmies in a far more accurate light and demonstrates how absurd the evolution world-view of the 1900s actually was.

Verner was no uninformed academic, but "compiled an academic record unprecedented at the University of South Carolina, and in 1892, only 19 years of age, graduated first in his class" (Bradford and Blume, 1992, p. 69). In his studies, Verner

familiarized himself with the works of Charles Darwin. *The Origin of Species* and *The Descent of Man* engaged Verner on an intellectual level, as the theory of evolution promised to give scientific precision to racial questions that had long disturbed him. According to Darwin . . . it was 'more probable that our early progenitors lived on the African continent then elsewhere' (Bradford and Blume, 1992, p. 70).

His studies especially motivated him to answer questions about Pygmies such as:

Who and what are they? Are they men, or the highest apes? Who and what were their ancestors? What are their ethnic relations to the other races of men? Have they degenerated from larger men, or are the larger men a development of Pygmy forefathers? These questions arise naturally, and plunge the inquirer at once into the depths of the most heated scientific discussions of this generation (Verner 1902b, p. 192).

One hypothesis that he considered was that the

Pygmies present a case of unmodified structure from the beginning [a view which is] . . . against both evolution and degeneracy. It is true that these little people have apparently preserved an unchanged physical entity for five thousand years. But that only carries the question back into the debated ground of the origin of species. The point at issue is distinct. Did the Pygmies come from a man who was a common ancestor to many races

now as far removed from one another as my friend Teku of the Batwa village is from the late President McKinley? (Verner, 1902b, p. 193).

Many people saw a conflict between evolution and Christianity, and "For most men, the moral resolve of an evangelist like Livingstone and the naturalism of a Darwin canceled each other out. To Verner, though, there was no contradiction . . . [and he was] equally drawn to evangelism and evolutionism, Livingstone and Darwin" (1992, p. 70, 72). In short, the "huge gap between religion and science" did not concern Verner. He soon went to Africa to "satisfy his curiosity first hand about questions of natural history and human evolution . . ." (Bradford and Blume, 1992, p. 74). He wrote much about his trips to Africa, even advocating that the Whites take over Africa and run the country as "friendly directors" (Verner, 1908b, p. 10718). Verner concluded that the Pygmies were the "most primitive race of mankind" and were "almost as much at home in the trees as the monkeys" (1902b, pp. 189-190). He also argued that the blacks in Africa should be collected into reservations and colonized by "the White race" and concerns over the social and legal relations between blacks and whites should be solved by "local segregation of the races" (1906b p. 8235; 1907a, p. 8736). Verner was not a mean person, and cared deeply for other races, but this care was influenced in a major adverse way by his evolutionary beliefs (Verner, 1902a).

Henry Fairfield Osborn—a staunch advocate of evolution who spent much of his life proselytizing his faith and attacking those who were critical of evolution, notably Williams Jennings Bryan, made the opening-day remarks when the zoo first opened (Bradford and Blume, 1992, p. 175). Osborn and other prominent zoo officials believed that not only was Ota less evolved, but that in this exhibit the Nordic race had "access to the wild in order to recharge itself. The great race, as he sometimes called it, needed a place to turn to now and then where, rifle in hand, it could hone its instincts" (Bradford and Blume, 1992, p. 175).

In one of the announcements, Ota was described as a sensation—he made faces and "the crowd loved that" (Bradford and Blume, 1992, p. 180). Some officials may have denied what they were trying to do, but the public knew full well the purpose of the new exhibit: "There was always a crowd before the cage, most of the time roaring with laughter, and from almost every corner of the garden could be heard the question 'Where is the pygmy?' and the answer was, 'in the monkey house'" (New York Times, Sept. 10, 1906, p. 1). The implications of the exhibit were also clear from the visitors' questions:

Was he a man or monkey? Was he something in between? "Ist das ein Mensch?" asked a German spectator. "Is it a man?" . . . No one really mistook apes or parrots for human beings. This—it—came so much closer. Was it a man? Was it monkey? Was it a forgotten stage of evolution? (Bradford and Blume, 1992, p. 179).

One learned doctor even suggested that the exhibit should also be used to help indoctrinate the public in evolution:

It is a pity that Dr. Hornaday does not introduce the system of short lectures or talks in connection

with such exhibitions. This would emphasize the scientific character of the service, enhance immeasurably the usefulness of the Zoological Park to our public in general, and help our clergymen to familiarize themselves with the scientific point of view so absolutely foreign to many of them (Gabriel, 1906, p. 6).

That he was on display was indisputable: a sign was posted on the enclosure which said "The African Pygmy, 'Ota Benga.' Age, 23 years. Height, 4 feet 11 inches. Weight 103 pounds. Brought from the Kasai River, Congo Free State, South Central Africa by Dr. Samuel P. Verner. Exhibited each afternoon during September" (New York Times, Sept. 10, 1906, p. 1). And what an exhibit it was.

The orangutan imitated the man. The man imitated the monkey. They hugged, let go, flopped into each other's arms. Dohong [the orangutan] snatched the woven straw off Ota's head and placed it on his own. . . . the crowd hooted and applauded. . . . children squealed with delight. To adults there was a more serious side to the display. Something about the boundary condition of being human was exemplified in that cage. Somewhere man shaded into non-human. Perhaps if they look hard enough the moment of transition might be seen. . . . to a generation raised on talk of that absentee star of evolution, the Missing Link, the point of Dohong and Ota disporting in the monkey house was obvious (Bradford and Blume, 1992, p. 181).

It was also obvious to a *New York Times* reporter who stated "the pygmy was not much taller than the orangutan, and one had a good opportunity to study their points of resemblance. Their heads are much alike, and both grin in the same way when pleased" (Sept. 10, 1906, p. 1). That he was made much fun of is also indisputable: he was once given a pair of shoes which "over and over again the crowd laughed at him as he sat in mute admiration of them" (New York Times, Sept. 10, 1906, p. 1). Another *New York Times* article by one of the editors, after studying the situation, penned the following:

Ota Benga . . . is a normal specimen of his race or tribe, with a brain as much developed as are those of its other members. Whether they are held to be illustrations of arrested development, and really closer to the anthropoid apes than the other African savages, or whether they are viewed as the degenerate descendants of ordinary negroes, they are of equal interest to the student of ethnology, and can be studied with profit. . . . As for Benga himself, he is probably enjoying himself as well as he could anywhere in this country, and it is absurd to make moan over the imagined humiliation and degradation he is suffering. The pygmies are a fairly efficient people in their native forests. . . . but they are very low in the human scale, and the suggestion that Benga should be in a school instead of a cage ignores the high probability that school would be a place of torture to him and one from which he could draw no advantage whatever. The idea that men are all much alike except as they have had or lacked opportunities for getting an education out of books is now far out of date.

With training carefully adapted to his mental limitations, this pygmy could doubtless be taught many things . . . but there is no chance that he could learn anything in an ordinary school. (September 11, 1906, p. 6).

That the display was also extremely successful there was never any doubt. Bradford and Blume claimed that on September 16, "40,000 visitors roamed the New York Zoological Park . . . the sudden surge of interest . . . was entirely attributable to Ota Benga" (1992, p. 185). The crowds were so enormous that a police officer was assigned full-time to guard Ota (the zoo claimed this was to protect him) as he was "always in danger of being grabbed, yanked, poked, and pulled to pieces by the mob" (Bradford and Blume, 1992, p. 187).

Although it was widely believed at this time, even by eminent scientists, that Blacks were evolutionarily inferior to Caucasians, caging one in a zoo produced much publicity, especially by ministers and Afro-Americans. In Bridges' words

The Pygmy worked—or played—with the animals in a cage, naturally, and the spectacle of a black man in a cage gave a *Times* reporter the springboard for a story that worked up a storm of protest among Negro ministers in the city. Their indignation was made known to Mayor George B. McClellan, but he refused to take action (1974, p. 224).

When the storm of protests broke, Hornaday "saw no reason to apologize" stating that he "had the full support of the Zoological Society in what he was doing" (Bradford and Blume, 1992, p. 182). Evidently not many persons were very concerned about doing anything until the Afro-American community entered the foray. Although even some Blacks at this time accepted the notion that the pygmies were "defective specimens of mankind" several Black ministers were determined to stop the exhibit (*New York Times*, Sept. 10, 1906, p. 1). Especially did the use of the display to argue that Blacks were an inferior race make them "indignant." Their concern was "they had heard Blacks compared with apes often enough before; now the comparison was being played flagrantly at the largest zoo on earth." In Reverend Gordon's words, "our race . . . is depressed enough without exhibiting one of us with the apes. We think we are worthy of being considered human beings, with souls" (*New York Times*, Sept. 11, 1906, p. 2). Further, many of the ministers opposed the theory of evolution, concluding that "the exhibition evidently aims to be a demonstration of the Darwinian theory of evolution. The Darwinian theory is absolutely opposed to Christianity, and a public demonstration in its favor should not be permitted" (*New York Times*, quoted in Bradford and Blume, 1992, p. 183).

A *Times* article responded to the criticism that the display lent credibility to evolution with the following words: "One reverend colored brother objects to the curious exhibition on the grounds that it is an impious effort to lend credibility to Darwin's dreadful theories . . . the reverend colored brother should be told that evolution . . . is now taught in the textbooks of all the schools, and that it is no more debatable than the multiplication table" (Sept. 12, 1906, p. 8). Yet, *Publishers Weekly* commented the creationist ministers

were the only ones that "truly cared about him" (Anon., 1992, p. 56).

Soon some Whites also became concerned about the "caged Negro," and in Sifakis' words, part of the concern was because "men of the cloth feared . . . that the Benga exhibition might be used to prove the Darwinian theory of evolution" (1984, p. 253). The objections were often vague, as in the words of *The New York Times* article of September 9:

The exhibition was that of a human being in a monkey cage. The human being happened to be a Bushman, one of a race that scientists do not rate high in the human scale, but to the average non-scientific person in the crowd of sightseers there was something about the display that was unpleasant. . . . It is probably a good thing that Benga doesn't think very deeply. If he did it isn't likely that he was very proud of himself when he woke in the morning and found himself under the same roof with the orangutans and monkeys, for that is where he really is (1906, p. 9).

Some reporters, instead of ridiculing the zoo, criticized those who objected to the exhibit because they did not accept evolution. In Bradford and Blume's words, "New York scientists and preachers" wrangled over Ota, and those who believed that "humans were not descended from the apes and that Darwinism was an anti-Christian fraud . . . were subject to ridicule on the editorial pages of the *New York Times*" (1992, p. 191, 196). Although opinions about the incident varied, it did result in many formal protests and threats of legal action to which the zoo director eventually acquiesced, and "finally . . . allowed the pygmy out of his cage" (Sifakis, 1984, p. 253). Once freed, Benga spent most of his time walking around the zoo grounds in a white suit, often with huge crowds following him. He returned to the monkey house only to sleep at night. Being treated as a curiosity, mocked, and made fun of by the visitors eventually caused Benga to "hate being mobbed by curious tourists and mean children" (Milner, 1990, p. 42). In a letter to Verner, Hornaday revealed some of the many problems that the situation had caused:

Of course we have not exhibited him [Benga] in the cage since the trouble began. Since dictating the above, we have had a great time with Ota Benga. He procured a carving knife from the feeding room of the Monkey House, and went around the Park flourishing it in a most alarming manner, and for a long time refused to give it up. Eventually it was taken away from him. Shortly after that he went to the soda fountain near the Bird House, to get some soda, and because he was refused the soda he got into a great rage. . . . This led to a great fracas. He fought like a tiger, and it took three men to get him back to the monkey house. He has struck a number of visitors, and has 'raised Cain' generally (Bridges, 1974, pp. 227-228).

He later "fashioned a little bow and a set of arrows and began shooting at zoo visitors he found particularly obnoxious! After he wounded a few gawkers, he had to leave the Zoological Park for good" (Milner, 1990, p. 42). *The New York Times* described the problem as follows:

There were 40,000 visitors to the park on Sunday. Nearly every man, woman and child of this crowd made for the monkey house to see the star attraction in the park—the wild man from Africa. They chased him about the grounds all day, howling, leering, and yelling. Some of them poked him in the ribs, others tripped him up, all laughed at him (Sept. 18, 1906, p. 9).

The resolution of the controversy, in Ward's words, came about because:

In the end Hornaday decided his prize exhibit had become more trouble than he was worth and turned him over to the Reverend Gordon, who also headed the Howard Colored Orphan Asylum in Brooklyn (1992, p. 14).

Although Hornaday claimed that he was "merely offering an interesting exhibit and that Benga was happy. . . ." Milner (1990, p. 42) notes that this "statement could not be confirmed" since we have no record of Benga's feelings, but many of his actions reveal that he did not adjust very well to zoo life. Ota Benga unfortunately has left no written records whatsoever of his thoughts about the affair or anything else, thus the only side of the story that we have is Verner's voluminous records, the writings by Hornaday, the many newspaper accounts, and a 281 page book entitled *The Pygmy in the Zoo* by Philip Verner Bradford, Verner's grandson. Bradford had the good fortune in his research that Verner saved virtually every letter that he had ever received, many of which discuss the Ota Benga situation, all which he had access to when doing his research. Interestingly Verner related what he feels is the pygmy view of evolution:

After my acquaintance with the Pygmies had ripened into complete mutual confidence, I once made bold to tell them that some of the wise men of my country asserted that they had descended from the apes of the forest. This statement, far from provoking mirth, met with a storm of indignant protestation, and furnished the theme for many a heated discussion around the Batwa firesides (Verner, 1902a, p. 190).

After Benga left the zoo, he was able to find care at a succession of institutions and with several sympathetic individuals, but he was never able to shed his freak label history. First sent to a "colored" orphanage, Ota learned English and also took an interest in a certain young lady there, a woman named Creola. Somehow even Ota's supporters half believed some of the stories about him, and an "incident" soon took place there which touched off a controversy. As a result, Ota was soon forever shuffled miles away from Brooklyn and Creola. In January 1910 he arrived at a Black community in Lynchburg, VA, and there he seemed to shine.

Black families [there] entrusted their young to Ota's care. They felt their boys were secure with him. He taught them to hunt, fish, gather wild honey. . . . The children felt safe when they were in the woods with him. If anything, they found him overprotective, except in regard to gathering wild honey—there was no such thing as too much protection when it came to raiding hives. . . . A

bee sting can feel catastrophic to a child, but Ota couldn't help himself, he thought bee stings were hilarious (Bradford and Blume, 1992, pp. 206-207).

He became a Christian, was baptized, and his English vocabulary rapidly improved. He also learned how to read—and occasionally attended classes at a Lynchburg seminary. He was popular among the boys, and learned several sports such as baseball (at which he did quite well). He later ceased attending classes and became a laborer on the Obery farm for 10 dollars a month plus room and board (Bradford and Blume, 1992, p. 204). The school concluded that his lack of education progress was because of his African "attitude" when actually probably "his age was against his development. It was simply impossible to put him in a class to receive instructions . . . that would be of any advantage to him" (Ward, 1992, p. 14). He had enormous curiosity and a drive to learn, but preferred performance tests as opposed to the multiple choice kind.

Every effort was made to help him blend in (even his teeth were capped to help him look more normal), and although he seemingly had adjusted, inwardly he had not. Several events and changes that occurred there caused him to become despondent. He checked on the price of steamship tickets to Africa, and concluded that he would never have enough money to purchase one. He had not heard from Verner in a while, and did not know how to contact him. Later employed as a laborer in a tobacco factory in Lynchburg, VA, he grew increasingly depressed, hostile, irrational, and forlorn. When people spoke to him, they noticed that he had tears in his eyes when he told them he wanted to go home. Concluding that he would never be able to return to his native land, on March 20, 1916 Benga committed suicide with a revolver (Sanborn, 1916). In Ward's words: "Ota . . . removed the caps from his teeth. When his small companions asked him to lead them into the woods again, he turned them away. Once they were safely out of sight, he shot himself . . ." (1992, p. 14).

To the end, Hornaday was inhumane, seriously distorting his situation, even slanderously stating that Ota "would rather die than work for a living" (Bradford and Blume, 1992, p. 220). An account of his suicide was published by Hornaday in the 1916 *Zoological Bulletin*. Even at this late date, Hornaday's evolution-inspired racist feelings clearly showed through:

the young negro was brought to Lynchburg about six years ago, by some kindly disposed person, and was placed in the Virginia Theological Seminary and College here, where for several years he labored to demonstrate to his benefactors that he did not possess the power of learning; and some two or three years ago he quit the school and went to work as a laborer (emphasis mine, 1916, p. 1356).

In Hornaday's words, Ota committed suicide because "the burden became so heavy that the young negro secured a revolver belonging to the woman with whom he lived, went to the cow stable and there sent a bullet through his heart, ending his life."

How does Verner's grandson, a Darwinist himself, feel about the story? In his words,

the forest dwellers of Africa still arouse the interest of science. Biologists seek them out to test their

blood and to bring samples of their DNA. They are drawn by new forms of the same questions that once vexed S. P. Verner and Chief McGee; What role do Pygmies play in human evolution? What relationship do they have to the original human type. . . . (Bradford and Blume, 1992, pp. 230, 231).

He adds that one clear difference does exist, and that is, "Today's evolutionists do not, like yesterday's anthropometricists, include demeaning comments and rough treatments in their studies (p. 231)." They now openly admit that the "triumph of Darwinism" was "soon after its inception [used] to reinforce every possible division by race, gender, and nationality" (p. xx). Part of the problem also was "the press, like the public, was fascinated by, or addicted to, the spectacle of primitive man" (p. 7). The tragedy, as Buhler expressed in a poem, is:

From his native land of darkness, to the country of the free, in the interest of science . . . brought wee little Ota Benga . . . scarcely more than ape or monkey, yet a man the while! . . . Teach the freedom we have here in this land of foremost progress—in this Wisdom's ripest age—we have placed him, in high honor, in a monkey's cage! Mid companions we provide him, apes, gorillas, chimpanzees (1906, p. 8).

Note: The spelling in some of the quotes has been modernized.

Appendix

Newspaper Articles on Ota Benga in St. Louis

African Pygmies for the World's Fair; amazing Dwarfs of the Congo Valley to be seen in St. Louis, some red, some black. They antedate the Negro in Equatorial Africa. Fearless Midgets who boldly attack elephants with tiny lances, bows and arrows. *St. Louis Post-Dispatch*. June 26, 1904.

An untold chapter of my adventures while hunting Pygmies in Africa [by] Samuel P. Verner. *St. Louis Post-Dispatch*. September 4, 1904.

Barbarians meet in athletic games; Pygmies in mud fight, pelted each other until one side was put to rout. Crow Indian won mile run; Negritos captured pole-climbing event and Patagonians beat Syrians in tug-of-war. *St. Louis Post-Dispatch*. August 6, 1904.

Cannibals will sing and dance. *St. Louis Post-Dispatch*. August 6, 1904.

Driven from huts by rainstorm; Pygmies and Ainus seek shelter for night in Indian school; resembles Noah's Ark; savages insist on taking pets from jungle homes with them to escape terrors of lightning. *St. Louis Post-Dispatch*. Aug. 20, 1904.

Enraged Pygmies attack visitor; H. S. Gibbons of Durango, Colorado, photographed them, but gave no tips. He was pursued and beaten; money would have been an effective weapon, but he wouldn't use it. *St. Louis Post-Dispatch*. July 19, 1904.

Exposition envoy Pygmies' victim? Fair officials have not heard for two months from explorer sent to African wilds. Tribe uses deadly arrows; perilous undertaking of Anthropological Department approved by Belgian Colonial Government. *St. Louis Post-Dispatch*. Monday. April 18, 1904.

Gifts to royal pair cost \$2.50; President Francis makes happy the hearts of World's Fair Pygmies for \$8.35. Barrel of salt for king; and other presents of similar value are given little Africans before departure. *St. Louis Post-Dispatch*. Dec. 4, 1904.

Pygmies demand a monkey diet; gentlemen from South Africa at the Fair likely to prove troublesome in matter of food. *St. Louis Post-Dispatch*. July 2, 1904.

Pygmies shiver over camp fire; "Give us blankets," is their greeting to missionary who brought them out of Africa. Say it's cold in St. Louis; discard palm leaf suits for warmer clothing—declare Americans treat them as they would monkeys. *St. Louis Republic*. Saturday. August 6, 1904.

Pygmy dance starts panic in Fair Plaza; seeing unclad Africans advancing toward her, brandishing their spears, woman screams and crowd follows her in terror. *St. Louis Post-Dispatch*. July, 1904.

10,000 strange people for Fair; The World's Fair Pike will soon be the most cosmopolitan spot on face of the earth. Whole shiploads en route; furthestmost corners of the earth are to be represented by natives in their characteristic splendor. *St. Louis Post-Dispatch*. Friday. April 1, 1904.

To exhibit man at the St. Louis Fair; Dr. McGee gathering types and freaks from every land. He explains the plans of the Department of Anthropology, of which he is the head. *New York Times*. Nov. 16, 1904?

Trying ordeal for savages; scientists will begin a special study of World's Fair Tribes September 1. *St. Louis Republic*. Aug. 14, 1904.

Verner escapes being eaten by cannibals; Man who went in quest of African Pygmies cables exposition company. *St. Louis Republic*. May 5, 1904.

World's Fair Department of Anthropology; portions of ancient cities are to be represented and unwritten history revealed. Treasures of antiquity will be so arranged as to show the bearing man's past achievements have upon contemporary progress. *St. Louis Republic*. March 6, 1904

Newspaper Articles on Ota Benga in New York

African Pygmy's fate is still undecided; Director Hornaday of the Bronx Park throws up his hands. Asylum doesn't take him; Benga meanwhile laughs and plays with a ball and mouth organ at the same time. *New York Times*. Sept. 18, 1906, p. 9.

A Pygmy among the primates; one of the "bantams" of the African race at the Zoological Park—his diversion—twenty-three, and twice married—to return to Africa later. [New York] *Evening Post*. Sept. 10, 1906.

A word for Benga; Mr. Verner asks New York not to spoil his friend, the bushman. *New York Daily Tribune*. Oct. 3, 1906.

Benga. *New York Times*. Sept. 23, 1906: [Editorial] p. 8. Bushman shares a cage with Bronx Park apes; some laugh over his antics, but many are not pleased; keeper frees him at times; then, with bow and arrow, the Pygmy from the Congo takes to the woods. *New York Times*. Sept. 9, 1906, p. 6.

Benga tries to kill; Pygmy slashes at keeper who objected to his garb. *New York Daily Tribune*. Sept. 26, 1906.

Colored orphan home gets the Pygmy; he has a room to himself and may smoke if he likes. To be educated if possible; when he returns to the Congo he may then help to civilize his people. *New York Times*. Sept. 29, 1906, p. 7.

Escaped the gridiron: Pygmy Man saved from cannibals visits New York. *New York Daily Tribune*. Sept. 16, 1906.

Hope for Ota Benga: if little, he's no fool; and has good reason for staying in the white man's land. Won't be an entree here; but his chief in Africa may die soon and the custom is to have a cannibal feast. *New York Times*. Sept. 30, 1906, p. 9.

Lively row over Pygmy. *New York Times*. Sept. 10, 1906.

Man and monkey show disapproved by clergy; The Rev. Dr. MacArthur thinks the exhibition degrading. Colored ministers to act; The Pygmy has an orang-outang as a companion now and their antics delight the Bronx crowds. *New York Times*. Sept. 10, 1906, p. 1.

M'Clellan snubs colored ministers; curtly refuses to receive protest against exhibition of man in ape cage. *New York American*. Sept. 12, 1906.

Negro clergy protest; displeased at exhibition of bushman in monkey house. *New York Daily Tribune*. Sept. 11, 1906, p. 6.

Negro ministers act to free the Pygmy; will ask the mayor to have him taken from monkey cage. Committee visits the zoo; public exhibitions of the dwarf discontinued, but will be resumed, Mr. Hornaday says. *New York Times*. Sept. 11, 1906, p. 2.

No aid from M'Clellan; Mayor "too busy" to see committee of colored men; they visited to protest against the public exhibition of a Negro dwarf in the monkey house at the Zoological Park—the delegation told by a subordinate to complain to the New York Zoological Society. *The [New York] Evening Post*. Sept. 11, 1906.

Ota Benga at Hippodrome; Pygmy meets his old friend, the baby elephant, giving out programmes. *New York Daily Tribune*. Oct. 3, 1906.

Ota Benga now a real colored gentleman; little African Pygmy being taught ways of civilization at Howard Colored Orphan Asylum. *New York Daily Globe*. Oct. 16, 1906.

Ota Benga, Pygmy tired of America; the strange little African finally ended life at Lynchburg, Va. Once at the Bronx Zoo; his American sponsor found him shrewd and courageous—wanted to be educated. *New York Times*. July 16, 1916, p. 12.

Ota Benga says civilization is all witchcraft; on exhibition at the New York Zoological Park, in Bronx, he rules monkey house by jungle dread. Wants to go home to buy him a wife; African Pygmy asserts New York is not wonderful and that we are all madmen. *New York World*. Sept. 16, 1906.

Pygmy to be kept here; colored ministers want to take him when guardian comes. *New York Times*. Sept. 19, 1906, p. 1.

Still stirred about Benga. *New York Times*. Sept. 23, 1906, p. 9.

The Black Pigmy in the monkey cage; an exhibition in bad taste, offensive to honest men, and unworthy of

New York City's government. *New York Journal*. Sept. 17, 1906.

The Mayor won't help to free caged Pygmy; he refers Negro ministers to the Zoological Society. Crowd annoys the dwarf; failing to get action from other sources the committee will ask the courts to interfere. *New York Times*. Sept. 12, 1906, p. 9.

Topics of the times; send him back to the woods. *New York Times*. Sept. 11, 1906, p. 6.

Topics of the times; the Pigmy is not the point. *New York Times*. Sept. 12, 1906, p. 8.

Zoo has a Pygmy too many; does anybody want this orphan boarder? He does not bite, he does not vote, his manners, though various, are mild—Prof. Verner, African Traveler, why don't you come and get him. *New York Sun*. Sept. 17, 1906.

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AN EVALUATION OF THE JOHN WOODMORAPPE FLOOD GEOLOGY MODEL—PART TWO

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Abstract

The assumption of time-equivalence of index fossils is the basis of evolutionist geology. In this review of the Woodmorappe Flood Model it can be shown that there is a simpler and better explanation for the separation of fossils in a short time-frame. Rather than time itself being the determining factor in the positioning of fossils, geographical and tectonic causes provide the basis for a diluvial paradigm which is superior to the standard geologic framework.

Introduction

In Part One of this paper (Mehlert, 1993) attention was focused mainly on the deficiencies of the uniformitarian paradigm. We now turn to the positive side of flood geology and examine the mechanism of the Tectonically Associated Biologic Provinces concept (TAB). The relationship between the flora and fauna of a pre-Flood geographic area or province with the sedimentary deposits existing today is of utmost importance, and will be explored in detail.

The Origins of Ecological Zones and Biogeographic Zones: The Mechanics of TAB

To the uniformitarian, ecological zonation is caused by organisms evolving and matching their environment, while biogeographic zonation is the result of organisms evolving in a distinct and physically separate area from the mainstream.

Creationists are not bound by these preconceived ideas and are free to look for possible Divine causes behind these zonations. If God during the Creation Week formed ecological and geographic zones in order to create a far larger diversity of organisms, we might find evidence of these zones reflected by the fossils. All over the world He may have created numerous special niches and areas for different faunal populations. If we can link these niches with tectonics, we may well find a totally different reason for fossil differentiation.

According to Woodmorappe's TAB concept (1983, pp. 133-186) it is possible to theoretically link the fauna of a province or zone with tectonics—in this case, downwarping or subsidence (See Figures 1 and 2). We could visualize four types of provinces or geographic regions, each supporting its own special 'mix' of plants and animals, and further visualize similar

provinces or zones repeating themselves around the earth. The area of these four types could range from very small to quite large—a few kilometers to hundreds of kilometers.

Zone 1 would, in a global Flood, subside or downwarp first, followed in order by Zones 2, 3 and 4, and this pattern could be repeated with Zone 4 always the last to downwarp (Figure 1). In this example, the zones are all terrigenous, but in fact they could also include marine areas. Also, there could be variation of life forms in the same numbered zones. There are two factors to be considered here: Because biotas within geologic periods exhibit biogeographic differentiation (i.e. 'epochs,' or 'stages'), tectonic differentiation may well play a lesser role than biogeographic differentiation. If there is greater biogeographic differentiation than tectonic differentiation, it is not special pleading to invoke the TAB concept as the major factor in total biostratigraphic differentiation.

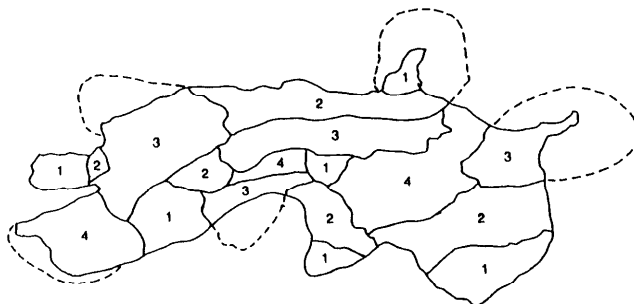


Figure 1. Possible locations of the four TAB provinces relative to each other on an imaginary land-mass. In this case, all are terrigenous for simplicity. The dotted lines extending into the sea indicate possible marine extensions of land TAB provinces. In real life, all TAB 1 provinces would be virtually exclusively marine, reflecting the actual marine fossil domination of that era.

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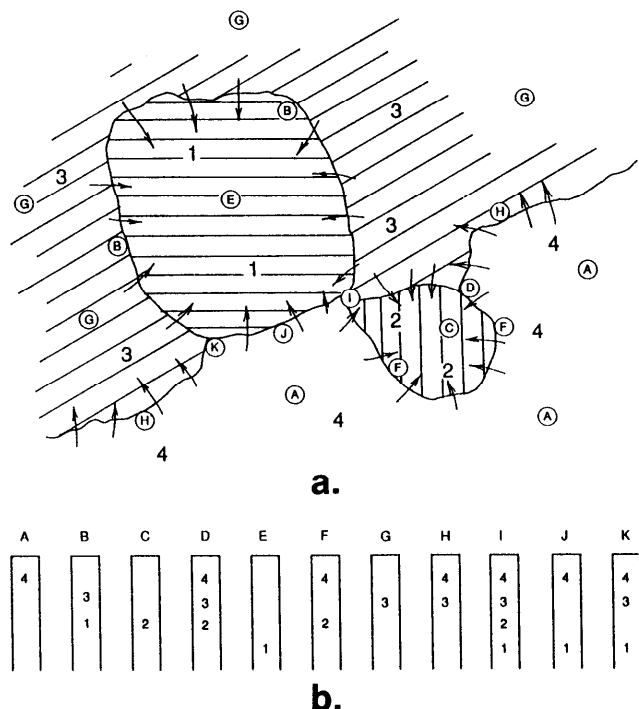


Figure 2. a. Schematic depiction of the four TAB provinces as numbered, 1, 2, 3, 4 (Lower Paleozoic, Upper Paleozoic, Mesozoic, Cenozoic). TAB 1 subsidizes first, followed in order by TABs 2, 3, 4. Arrows show Floodwater flow during the Deluge. Lettering in small circles represents the 'fossil succession' at those points as shown—e.g., the full geologic column is shown at Location I where all four TABs form a junction. At E only TAB 1 sediments and organisms are deposited. TAB 1 deposits are buried the deepest.

b. The columns A-K show the subsequent depositions of sediments corresponding to the locations in capital letters in (a) (Woodmorappe, 1983, Figure 4, p. 161).

We return to the matter of independent evidence for linkage between tectonics and biogeography: Are there possible reasons to link the two? According to Woodmorappe the answer is 'yes,' and he cites some examples. Oceanic current patterns can result in differentiation, the temperature of the water being a major factor. Salinity is another factor, and both can be controlled by submarine topography. Applied to TABs, a province could have had uniform water temperature (regulated by the topography), which in turn may have been a reflection of the tectonic stability of the region. Other causal factors on land could be the chemistry, the nutrients, and trace elements in the soils.

Evidence of Tectonics

It is obvious that in such a model as Woodmorappe's, if downwarping played a large role in biostratigraphic differentiation, there should be some evidence to support his contention. Tectonic activity should be more obvious in the lower rocks and less apparent as one proceeds stratigraphically upward. Indeed there is such evidence. Ronov (Woodmorappe, 1983, p. 158) in an exhaustive study found that geosynclines occupy 40 percent of the area of oldest geologic periods, but less than 20 percent of more recent periods. The Mesozoic-Cenozoic eras contain over 57 percent of the total volume of Phanerozoic platform sediments but only 41.3 percent of the total volume of geosynclinal sediments.

The ratio (volume) of geosynclines to platformal sediments of the entire Phanerozoic is 1:2. The following list shows the four eras or sub-eras, the ratio of geosynclines to platformal sediments, and Woodmorappe's TAB provinces:

Cenozoic (youngest)	1:6	TAB 4
Mesozoic	1:8	TAB 3
Upper Paleozoic	3:4	TAB 2
Lower Paleozoic (oldest)	3:1	TAB 1

TAB 1 provinces are the lowest (earliest) sediments to be laid down; TAB 4 provinces are the highest (latest).

It can be seen at once that there was much less tectonic activity in the Cenozoic and Mesozoic, and considerably more in the lower eras. This trend strongly supports Woodmorappe's concept as geosynclines are always regions of greatest tectonic activity—downwarp, subsidence, or uplift.

We have also seen that significantly, Lower Paleozoic fossils have a much greater tendency to superpose among themselves than is the case in the higher portion of the column. This is clearly shown in Woodmorappe's research (1983, pp. 152-153). This tendency is most noticeable in the Cambrian-Devonian periods, less so in the Carboniferous-Permian, and even less in the Triassic-Cretaceous. It is almost non-existent in the Tertiary. This data shows that Lower Paleozoic fossils were deposited in smaller geographic areas than is the case for 'higher' fossils, thus again supporting the TAB concept.

The Reason for the Four-way Breakup of TABs 1-4

Because adjacent periods share a great many fossil families between them, if we take these groupings; Cambrian-Devonian (Lower Paleozoic), Carboniferous-Permian (Upper Paleozoic), Triassic-Cretaceous (Mesozoic), and the Tertiary (Cenozoic), which seem to fall into natural discrete entities (Turek et al., 1988, p. 488), we can apply the tectonic activity to the four eras as shown in the previous list.

Woodmorappe cites Furnish et al. and Philips' definition of ancient (Paleozoic), medial (Mesozoic), and recent (Cenozoic). Every geologist knows the basic differences between the marine invertebrate faunas of these eras and the 'boundaries' between them which represent intervals of faunal crisis such as the K/T (end of Cretaceous) 'extinctions.'

As uniformitarians are not deterred from proposing various models of tectonic action, neither should creationists be. The reasons why such activity takes place is immaterial, whether they be natural or the work of Divinity ('providence').

TAB 1 (Lower Paleozoic)

TABs are not equivalently distributed over the earth and the reason why ocean floors are almost exclusively Mesozoic and Cenozoic is because they were overlain by sediments originating from TABs 3 and 4. Precambrian biotas can be assigned to the most tectonically affected TAB 1. In any case, Precambrian biotas are minute when compared with the rich diversity and numbers of Phanerozoic biotas. Precambrian fossils often range into the Lower Paleozoic (TAB 1) and despite the 'presence' of the Precambrian-Cambrian unconformity in some areas of the globe, in other

places such as the Burgess Shales, the Precambrian deposits grade *conformably and continuously* into Cambrian formations.

The Lower Paleozoic or TAB 1 provinces contain almost exclusively marine fossils indicating that these regions were exclusively marine in nature. In fact, all geologic periods, even those containing terrigenous organisms, are still dominated by marine biotas. The conclusion is that the Upper Paleozoic, the Mesozoic and the Cenozoic TABs often were partly land and partly sea. If a particular fossil region such as the Gondwana Formation of South Africa was totally land in origin, then that TAB (3 in this case) was also of totally terrigenous geography before the Deluge. Sometimes a TAB will contain alternations of marine and non-marine biotas which suggest that the regional manifestation of that TAB originally contained both marine and land areas.

Most sediments are local or regional in origin. In Woodmorappe's model, each regional manifestation of a TAB is independent of other regional manifestations. There are no major global volumetric tendencies in respect of primary lithologies—every geologic period has shales, sandstones, limestones. While the percentages of each type of sediment fluctuate between geologic periods, there is no major trend in the Phanerozoic. My research indicates that although this is generally true, we find strong indications of a change in the Miocene Epoch of the Tertiary, and I will refer to this again.

The *Modus Operandi* of TABs

The actual mechanics of a global Flood have posed some problems for Diluvialists as we do not know exactly the origin of all the waters. A global water canopy could certainly have produced heavy rain for a period, but I suspect the majority of the water came from the 'fountains of the deep'—geothermal activity and volcanism on a large scale. Petersen (1981) wrote a very interesting paper on this subject and proposed that in the beginning an extensive layer of water separated two layers of earth's crust which he called 'The Deep.' These waters were ejected by tectonic activity and supplied the majority of the global Floodwaters.

Woodmorappe has, as we have seen, equated each of his TAB provinces with eras and sub-eras. We have noted the evidence of considerable tectonic activity in the Lower Palaeozoic to which TAB province number 1 has been allocated. All TAB 1 regions and their associated portions of antediluvian unconsolidated regolith would downwarp or subside simultaneously, taking with them the biota of each region. Thus the Lower Paleozoic was deposited first, followed by whatever other TAB provinces were nearest, the Floodwaters carrying the soils and organisms from TABs 2, 3, and 4 in that order. The water-transported sedimentary particles and organisms would always flow from an area of lesser tectonic proclivity into areas of higher activity, i.e. from TAB 4 provinces into TAB 3, 2 or 1 areas etc.

The sequence of TABs deposited would always follow the same relative order, whether or not all of the four TABs were actually present in a given region (Example: TABs present are shown in the right):

Cenozoic (highest)	4	4	4
Mesozoic			3
Upper Paleozoic	2	2	2
Lower Paleozoic (lowest)	1	1	1

We see from this how stratigraphic 'successions' of multiple TABs could have been generated at and/or near junctions of TABs (Figure 2). In a geographic center of large representatives of a specific TAB, only the biota of that TAB would be superposed, i.e. a TAB 2 would have only the fauna and flora of the Upper Paleozoic deposited. Such singular 'successions' are seen in the form of thick geosynclinal deposits containing a few mutually-adjacent geologic periods such as the Lower Paleozoic Caledonian geosynclinal accumulations. Also, platform deposits with singular geologic periods would occur. As we have seen, the 'higher' or younger geologic periods have more of this type of formation than earlier or 'lower' periods.

The arrows in Figure 2 indicate direction of flow from areas of lesser subsidence into areas of greater degree of downwarp, following a pattern which is the same irrespective of whether it is river and stream, or progressional intra-Flood or recessional. The skies dumped the rain, and the fountains of the deep poured forth all over the globe, more so in some areas than in others. The 'Cenozoid' or TAB 4 provinces would show the least activity, TABs 1 and 2 the most. In some cases such as ocean beaches we could expect them and their contained fossils to be preserved intact by the Flood waters and sea-level rises in a quiet manner. Around rivers and river mouths, most sedimentary material would be swept offshore and in these cases hydrodynamic sorting would come into play. Salt- and fresh-water lakes sometimes would suffer fairly gentle deposition resulting in 'ancient' shore-lines but in many cases the picture would have been much more violent.

Woodmorappe (1983, p. 162) found that more than half of the earth's land surface has two or fewer of the four TABs (the four eras/sub-eras) superposed at any one locality. In view of this fact (established by the previously mentioned detailed listings and mapping of all fossil localities on the earth), one can safely conclude that the dominant mode of sedimentation during the Flood involved very little tendency for TAB constituents to be transported much beyond their boundaries. Otherwise we would expect to find much more than half the earth's land area containing more than two locally/regionally superposed TABs. If we include oceanic data applicable to TABs 3 (Mesozoic), and 4 (Cenozoic), the tendency increases so that only about one-sixth of the earth's entire surface has more than two locally superposed TABs. Oceanic sediments, mostly the upper half of the geologic column, tend to be more restricted in their Flood movement/transport than land sediments.

When we further note that the regions of greatest completeness of the geologic periods are also regions of greatest sedimentary thickness (geosynclines), and thus are also areas of the most superposed index fossils, we become more confident about the TAB concept as this would appear to be further independent support for the model. Most geosynclines would be areas of greatest (and earliest) downwarping caused probably by the region settling after the ejection of water, steam, etc. from below the old surface; and most would be

found to be Paleozoic—TABs 1 and 2. Some of these massive deposits are up to 40,000 feet in thickness, up to 200 kilometers wide and over 1,000 kilometers in length. Often, these great sedimentary depressions became uplifted later to form plateaus and mountain ranges. In a few rare cases, material from all four TABs will find their way into these regions, and thus in occasional deposits we will find fossils from all four eras/sub-eras as can be seen in Figure 2. One can see from this how, at the margins of TABs, various different sequences of superposed/juxtaposed fossils could occur, but almost always in the same relative order.

Other factors such as sorting, preservation bias, chance or differential escape potential would account for some local sequences. In the Woodmorappe model, sedimentation is primarily controlled by tectonics sequentially downwarping various TAB provinces throughout the Flood with mass transport of sediments from one region to another and thus depositing great thicknesses in some cases, less in others.

Woodmorappe's diluvian interpretation is scientifically superior to the uniformitarian view because it explains fossil succession/separation with less multiplication of hypotheses and special pleading. The uniformitarian geologist has to resort to special pleading when he stresses the time value of index fossils while ignoring the so-called long-range forms. In other words, he is really assuming short time-frames for some fossils in a type of circular reasoning. We have already seen how the Woodmorappe model could have produced these stratigraphically restricted but widespread fossils and shortly we will go into more detail. This diluvian concept accounts consistently for both fossil types in one uniform model without the need for the proliferation of unobserved evolutionary processes. The uniformitarian must take into account all these factors plus vast amounts of geologic time in his explanation of the stratigraphic record. We will return to the subject of evolution and chronology at the conclusion of this work.

The Dominant Position of TABs

The TAB process according to Woodmorappe dominates in the process of fossil separation, especially in the 'dividing' of the Phanerozoic into four separate segments while ecology and biogeography supplement the concept by further influencing the differentiation, especially within and between the so-called geologic periods. In Figure 3, we see how sequences of 12 randomly chosen fossils would occur. The divisions are four-fold, with TAB 1 (Lower Paleozoic) at the bottom, then ascending to TAB 2, (Upper Paleozoic), TAB 3 (Mesozoic) and TAB 4 (Cenozoic) at the top. Twenty-one possible fossil locations (the vertical lines), randomly taken from the global surface, are shown in each grouping with three types of TAB influence: First, other factors such as ecological zonation, sorting etc. having little or no effect on the TAB process; Second, these factors working together with TABs in a synergistic fashion, and Third, the other factors working against the TAB process. It is stipulated for this example that sedimentation rates are identical and that all four TAB provinces are locally present. Fossils A, E, and I belong to TAB 1 (Lower Paleozoic), and tend to be restricted to the lowest stratigraphic levels, although

obviously this would not always be the case because the mechanism would not be absolutely efficient, and exceptions will occur due to local factors such as gradational biogeographic boundaries—this is to be expected since most index fossils do not superpose locally.

Fossils B, F and J are TAB 2 biota and this is reflected in their general restriction to that stratigraphic zone. C, G and K are TAB 3, and D, H, and L are TAB 4 fossils. We see that in the neutral (TAB-only effect) first column, only occasionally do we find fossils ranging into other TAB areas e.g. fossil C of TAB 3 at locations 6, 13, 18 and 20 is 'outside' its expected zone, number 6 ranging up into TAB 4, number 13 into TAB 2, number 18 into TABs 2 and 1 and number 20 into TAB 4. In the second column where the other factors happen to be working with the TAB process, the fossil ranges are even more restricted but in the third column where other factors work against the TAB process thus 'smearing' its effect, the fossils tend to be all over the place, even though the majority are still restricted to their 'correct' stratigraphic levels.

Before examining this illustration more closely, I digress briefly to point out that in the 'real world' neither sedimentation rates nor volumes are constant, and all four TAB regions may not be locally present. Thus the amounts of sediment and number of organisms may vary from one TAB area to another, and between the types of TABs themselves, and therefore local regions of sediment and fossil content will vary in thickness and number of buried organisms. Further, if a particular TAB is not present in the region, neither its sediment nor its fossils will appear in the record there. Thus, if a pre-Flood area contained only TABs 2 and 4, we would not expect to find fossil-free deposits of rock where TABs 1 and 3 would have been.

Only TAB 4 rock superposed on TAB 2 deposits would be found, and depending on local tectonic dynamics and topography, there would be either a 'deceptive' conformity (paraconformity) or perhaps an angular unconformity between the two. A uniformitarian would study this sequence and conclude that the 'missing' fossils were either never deposited in time or had entirely eroded away. The vertical lines in Figure 3 represent stratigraphic 'ranges' of the fossils, the short ones being confined (to a uniformitarian, a short time-frame), and others representing long stratigraphic range which the orthodox geologist would interpret as having lived through several stages, periods and even eras.

In column two (synergistic), where other factors such as sorting, chance, differential escape etc. work in a way supportive to TAB deposition, thus accentuating its effects, the stratigraphic differentiation will be more acute than in the other columns. In fact all three types would occur to a greater or lesser degree—neutral (TAB alone), synergistic (supporting TAB process) and antagonistic (working against the TAB processes). For instance, in Column three (antagonistic), if a pre-Flood organism was benthic and would normally tend to be buried at a very low stratigraphic level, but it was dwelling in a TAB 3 or 4 environment, and would be 'higher' in the column, then we could say that ecological zonation worked against the TAB process in that case. Such a case could have produced a fossil like K or L (third column) which, although generally restricted to its 'expected' level, would sometimes be found smeared

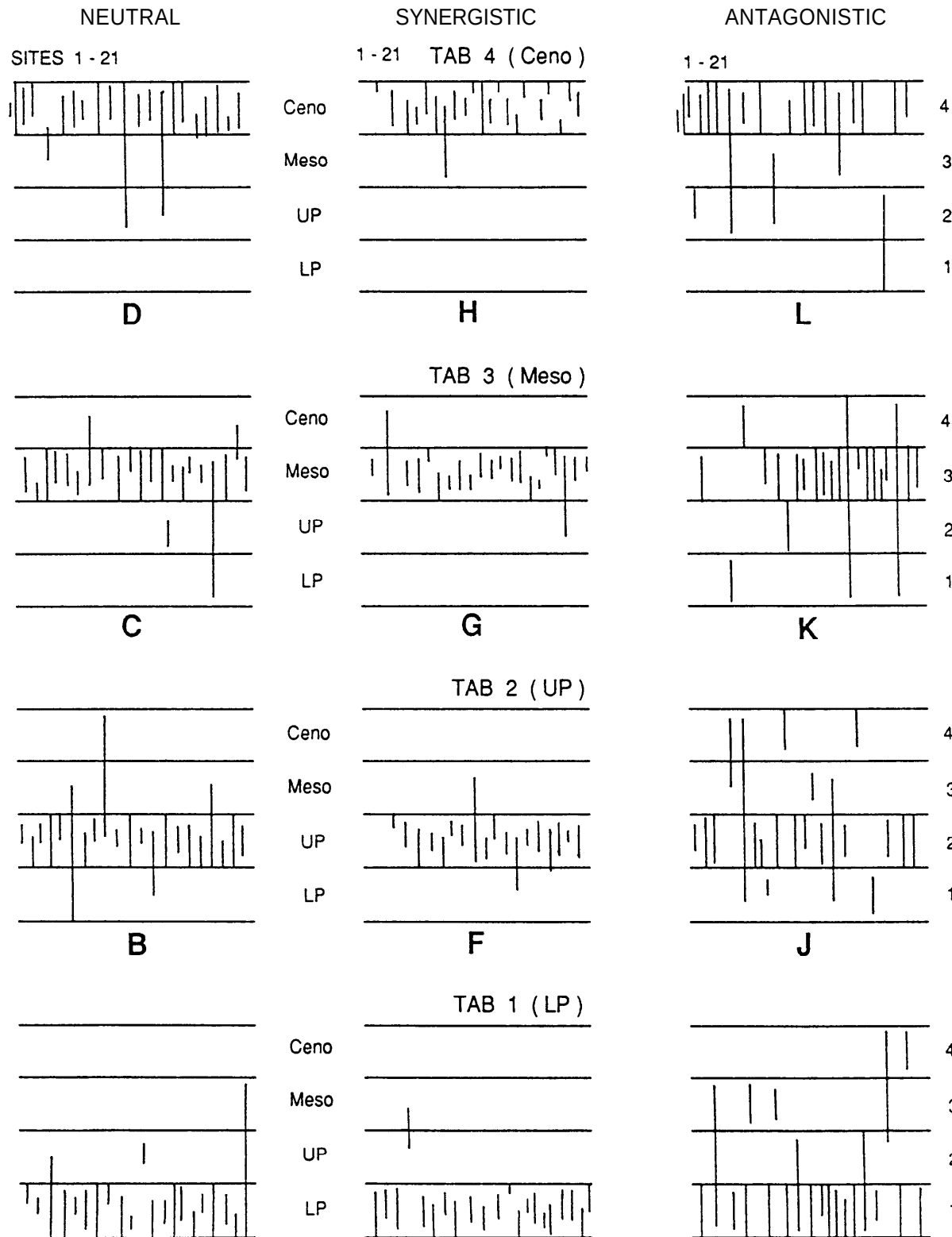


Figure 3. The three columns, each containing four groups of eras/suberas represent situation where other factors are working with, against, or neutrally in respect of the TAB process. For example, column two (synergistic) indicates how 21 fossils (vertical lines) might be positioned stratigraphically where other factors such as ecological zonation, chance, etc. are working with and supporting the TAB process. Note here how much more restricted are the fossils' stratigraphic ranges in column two as compared to those in column three where the other factors work against the TAB process. In column two only a very small number of fossils extend outside their range. These short-range fossils are, to the uniformitarian, index fossils. Each column is further divided into four groupings to indicate how fossils A-L relate to each other. These are shown in capital letters beneath each segment. See text (Woodmorappe, 1983, Fig. 7, p. 164).

into several TAB stratigraphic zones or even translocated right outside its expected zone. On the other hand where the other factors work together with the TAB process; say a plant fairly high in elevation and growing in a TAB 4 region, the converse would happen. Consider fossil H, second column. It would be almost entirely restricted stratigraphically to the upper rock layers and would be so confined even within that layer.

Where these multiple effects were synergistic, this acute stratigraphic restriction of the organism will increase its chances of never being found overlapping with a like organism confined to a different stratigraphic interval—both will then appear to the uniformitarian geologist as having lived only a short time and he would consider them as chosen or index fossils. The same would occur whether it was a single organism or a suite (assemblage) of fossil fauna—almost always they would be very restricted stratigraphically no matter where found in the world. With the 12 fossils and 21 random sites for each TAB type, there are 252 possible individual stratigraphic occurrences. Every site is geographically discrete and any occurrences can be juxtaposed with any other.

These juxtapositions will be either compatible (overlapping) or incompatible (non-overlapping). The long-range fossils C18 (18th vertical bar), B18, K12, L19 and so on which 'spread' into different geologic periods or eras would be ignored by the uniformitarian geologist as having no time significance. It can be seen from Figure 3 that the 'incompatible' juxtapositions (the very short-range) fossils or index fossils are generated most frequently from fossils E, F, G and H in the synergistic column.

The creation of index fossils is an interplay of actual TAB-generated stratigraphic restrictions of an organism with the limited number of opportunities for fossils to be juxtaposed. The fact that there are so few chances for any two fossils to juxtapose means that mixtures and overlaps will occur only when certain combinations of TAB-generated stratigraphic ranges simultaneously occur. Consider fossils F and H in locations F11 and H7 in Figure 3. The chance (in this diagram) of an occurrence of fossil F to be in any particular site (F11), is one in 21 and the same goes for fossil H at site H7.

Taken together that means a one in 441 chance of them juxtaposing. Very limited opportunity therefore exists, but if they do occur, the uniformitarian geologist would ascribe some time significance to them.

The same principle of limited opportunity for juxtapositioning governs all fossils. This must be kept in mind in the following discussion. As seen from Figure 3, if we take as an example the fossils E, C, H and I, and note that they are persistently 'incompatible' (not juxtaposed) and further couple them into EC, IH, IC, HE and CH, we note that E is always stratigraphically below C and C is always below H (Figure 4). This would give an upward chronological trend E-C-H of these imagined index fossils. Other fossils would not be accepted as chosen fossils because they are partly or totally compatible stratigraphically with each other, i.e. fossil J is compatible with both C and E; I is incompatible with and below H but any imagined time relationship could be 'refined' by observing that I is also incompatible with and below C. As I is compatible with E it would be regarded as being time-equivalent with E but not ranging stratigraphically higher and 'younger' than E because like E, fossil I is incompatible with and stratigraphically below C. To summarize, E, C, and H would be main index fossils and I could be an 'auxiliary' one. Fossil J is a 'long-ranging' one and therefore useless as an index. In his Figure 8 (not reproduced here), Woodmorappe links a large number of fossil sites from around the globe showing how they relate to each other. His concept is applied to actual index fossils from 48 regions, the relationships previously mentioned appear in Figure 4.

When one notes that certain combinations are consistently incompatible, each fossil appears to denote a time horizon relative to the other and can be 'correlated' with other imagined time horizons. Although the examples are simplified, it can be seen how the TAB process would provide the main source of actual biostratigraphic differentiation, while the proven general non-superpositioning of fossils is the element which draws in the component of imagination to the whole concept of the differentiation—i.e. as stated earlier in this paper, the geologic column is a *mixture* of physical reality and evolutionary concept.

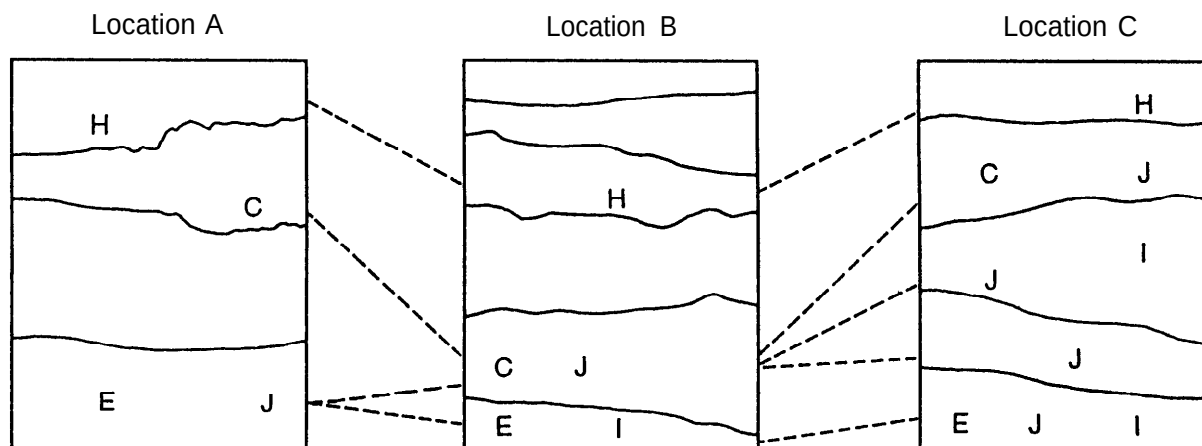


Figure 4. The letters H, C, E, I, and J denote the same fossils as in Figure 3. Illustrated is how these index fossils are placed in an imagined evolutionary time-stratigraphic relationship. Each fossil is imagined to represent a time horizon relative to other index fossils, i.e., any fossil H is of the same age as any other fossil H, no matter where it lies stratigraphically. Fossil H is always 'younger' than fossils C or E, giving a chronostratigraphic 'progression' E-C-H, earliest to latest. Since fossil J is compatible with C and E, it is useless as a time marker and is considered a long-ranging form. Fossil I is compatible with E but is incompatible with, and always below C (Woodmorappe, 1983, p. 166).

Difficulties to be Considered

The TAB concept provides a unified system for geology and biostratigraphy which accommodates a number of problems and puzzles faced by evolutionary geology and is applicable to all the sedimentary deposits from the upper Precambrian at least to the middle Tertiary. Before the upper Precambrian, only unicellular life-forms are found; presumably these lower layers represent a portion of the created pristine regolith which was placed there to water and provide the conditions for the pre-Flood tilling of the soil and for plant growth. These one-celled organisms are common throughout the whole geologic column and many are virtually identical to extant forms such as many algae and bacteria. Some of this regolith would have become saturated with single-celled forms from the Floodwaters, whereas multicellular animals and plants would not have been able to have penetrated below a certain depth. A much greater part of the pristine regolith became, during and after the Flood, the sedimentary rock systems of the Upper Precambrian to the middle Tertiary.

The TAB process, (with the additional factors of ecological zonation, hydrodynamic sorting, chance, preservation bias, biogeography etc.), not only supplied the mechanisms for fossil separation between eras and sub-eras but also between and within geologic periods, epochs, ages and biozones. It also solves problems such as paraconformities or deceptive conformities where a very 'young' formation may rest conformably on a very 'old' formation, with many millions of years of 'evolutionary time' missing between the two. There are thousands of these cases which could be considered as possible weaknesses in historical geology.

Sometimes geologists can legitimately point to signs of erosion in the understrata. An example is the presence of an occasional channel or small 'valley' in some of the Grand Canyon contacts such as those between the Esplanade Sandstones and the overlying Hermit Shales, and between the Temple Butte Limestone and the overlying Mississippian Redwall Limestones. These valleys and channels are usually filled with material which is the same as the overlying layer, but are these indications of erosion really pointers to great passages of time? Not at all; the TAB system can account for them in a short time frame. Such 'valleys' and channels could well be the result of strong scouring currents coming immediately afterwards and dumping the next lot of sediments in them as well as onto the preceding sediments. Depending on local tectonics and topography plus the other factors, such currents would be expected. Cross-bedding, plastic deformation or folding and other phenomena of geomorphology are also explicable in the TAB model.

The model also is the only diluvial theory which can account for those fossil sites where the floral and the faunal remains match—e.g. 'Devonian' plants juxtaposed with 'Devonian' insects, or say 'Cretaceous' dinosaurs and 'early' angiosperms. In all other diluvial models I have studied, there is little attempt to account for these sites where extinct animal fossils are found together with or close by the corresponding extinct flora. When one studies the geologic phenomena of past times one is struck by the immensity and scale of

events such as volcanism, mountain-building, huge fossil graveyards and uplift, in proportions which literally dwarf present-day observed processes. The present is certainly not the key to the past—a past which shouts 'catastrophism.'

Radiometric Dating

Up to now I have not referred to the practice of dating certain non-sedimentary rocks by radiometric methods. This particular work by Woodmorappe deals only with sedimentation processes but in other places he has raised many serious objections to radiometric methods, and for readers who may wish to study this subject, his relevant works are listed in the references at the conclusion of this article. Woodmorappe is just as thorough in this field as he is in other aspects of earth history. Also, Snelling has published an article on radiometric dating which casts grave doubts upon its value (1992).

Extinctions

This question has been the subject of much debate—not only the animals and plants which seem to have disappeared gradually over apparently long ages, but the mass extinctions of the late Permian and the K/T events of the late Cretaceous when nearly 20 percent of all families around the globe 'disappeared' from the record. In the Permian extinction, half of all animal families went, and perhaps as many as 90 percent of all species. So far we have focused on why fossils differ from one rock horizon to another; but now we ask why is there 'progressive' extinction? Why are fewer and fewer extant taxa represented, the lower we go stratigraphically? For instance, only 2.5 percent of extant families are also found in Cambrian rocks. Why do the most recent geologic periods share more taxa with the present, and the older ones share less?

In the Lower Paleozoic we find that only 11-15 percent of fossil families are still represented today but the figure rises to 60-80 percent for more recent periods. Uniformitarians have advanced a number of suggestions for progressive extinctions, ranging from genetic exhaustion to failure to adapt. While the latter may have some limited value, it does not seem to be capable of accounting for more than a small proportion of cases. Macbeth (1971, p. 118) informs us that for every species in existence now about 99 have become extinct, but it remains unclear why any given species and more importantly, why any particular family has disappeared. Such phrases as 'not viable' or 'lost adaptation' are really meaningless. Overspecialization may have some bearing on the matter but it is also vague. The problem is compounded when we remember the considerable numbers of persistent types called living fossils, which have survived for allegedly up to hundreds of millions of years. During this time, if it ever existed, countless changes must have taken place in climate, salinity, environment, enemies and diseases.

The two main concepts, gradual extinction by environmental change and catastrophic change by asteroid impact, face the problem of explaining how they could be sufficiently efficient and global in extent to completely destroy so many forms. Woodmorappe shows that a global Flood explains them best as it was simultaneously global and pervasive in its effects. The

global Flood is scientifically superior because it offers a single unified explanation compared to multiple causes throughout the geologic column for the uniformitarian side.

The answer to the problem of decreasing shared percentage of ancient families in progressively older rock is fairly mundane and once again the TAB process supplies that answer. The process governed how many organisms of each antediluvian biogeographical zone survived, whether TAB 1, 2, 3, or 4. The deeper the burial of a group of pre-Flood organisms (irrespective of whether they were buried *in situ*, nearby, or further away), the less the probability that any of them or any of the associated seeds, spores, eggs or larvae survived and therefore were available to repopulate the post-Flood earth. Where burial was shallow, less sediments were suspended in the Floodwaters and the deposition period was less. In these circumstances it is more than probable that some organisms did survive. Figure 5 shows how depth of burial and survival chances were controlled by the TAB mechanism. This differential survival of TAB faunas and floras is the key to understanding the mystery of progressive extinctions in relation to the current biosphere. There is no need to postulate long geologic ages and evolution.

It can be seen in Figure 5 that surviving organisms were numerically and taxonomically impoverished much more in the lower deposits (TABs 1 and 2), than those buried in the higher strata (TABs 3 and 4). Obviously the biota of TAB 4 had the best chance of survival, and as these representatives began to repopulate the post-Flood world they dominated it compared with the few survivors of the lower TABs. The organisms which were separated into the four TAB provinces before the Flood were now in direct competition with each other. Many of those from lower-buried equivalents were at a numerical (and ecological) disadvantage and many more of them were forced to extinction than were those of higher burial.

Another factor is that the higher TAB organisms, being more numerically abundant, received a reproductive advantage because the pre-Flood ecological 'webs'—animals, bacteria, vegetation etc., were more likely to have remained reasonably intact than was the case for those buried more deeply. The result is that the TAB 4 taxa (Cenozoic to middle Tertiary) have much more in common with today's taxa than those of (decreasingly) TABs 3, 2, and 1. We recall that only 2.5 percent of modern families are represented in Cambrian rocks, 24 percent in Permian deposits, 49 percent in Jurassic beds, and 82 percent are represented in the Cretaceous.

The so-called major 'sudden' mass extinctions of the late Permian, Cretaceous and other periods were certainly sudden, but in real time—due to the Flood. In the evolutionary context they are really an illusion. The fact is that a large number of Permian families (52 percent) can also be found in the 'next' period, the Triassic, and 70 percent of Cretaceous families are still represented in the Tertiary, despite the so-called mass extinctions. The main difference between Mesozoic rocks and those of the Tertiary is that the former was originally inhabited by various families or groups of dinosaurs and other reptiles plus other forms which occupied some TAB 3-type provinces. The latter con-

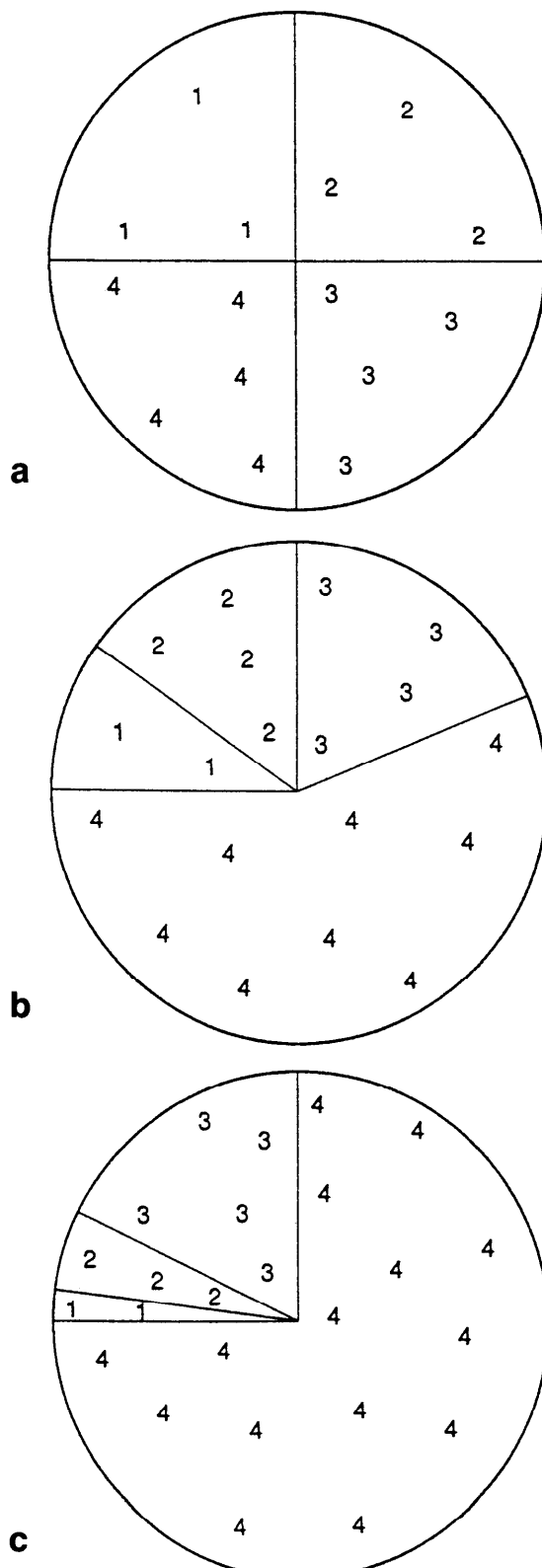


Figure 5. Illustration of how the Flood affected the pre-diluvial life-forms: a = pre-Flood biosphere with all four TABs approximately equally represented; b = Early post-Flood biosphere—TAB 4 organisms expand their percentage share of life-forms; c = extant biosphere—TAB 1 types being buried deepest are now much reduced as a percentage of total population (Woodmorappe, 1983, Figure 9, p. 168).

tained virtually none of these forms and many TAB 4 provinces (Cenozoic, Tertiary), were home to different animals and plants such as mammals and angiosperms (the flowering plants). There was no 'natural,' evolutionary extinction. The Flood produced such oddities as 'living' fossils. On the other hand, many creatures peculiar to just one or two sub-populations of TAB provinces (not all four provinces need have had exactly the same types as each of the others), were simply destroyed—it was a quirk of the Flood.

Animals on the Ark

Most creationists would accept that representatives of all avian, all land-dwelling reptilian and mammal families, and all terrestrial amphibian families were taken on the Ark. We may therefore ask the question: Why do these creatures follow the same progressive extinction pattern which applies to those not on the Ark? The short answer is that all these saved creatures were ecologically dependent on organisms which went through the Flood. Consider the food chain—the Lower Paleozoic reptiles ate TAB 1 vegetation: the Mesozoic dinosaurs and other reptiles primarily depended on TAB 3 vegetation, while mammals generally relied on TAB 4 vegetation. The dinosaur families of the Mesozoic (TAB 3, Triassic, Jurassic, Cretaceous) were apparently not sufficiently viable enough to cope with the new post-Flood conditions. As all vegetation, being exposed to the Flood, was subjected to immediate differential extinction, the animals released from the Ark were subjected to the same differential extinction which paralleled that of the vegetation on which they were dependent. As Woodmorappe says, the main reason why mammals proliferated at the expense of dinosaurs and other reptiles was due to the more favorable environment of TAB 4 vegetation as the remnants of the plant kingdom began regenerating on the earth.

Classification Matters

Two vital points must be remembered: When speaking of 'families' and 'geologic periods,' I am not giving any approval to these terms in an evolutionary context. In the TAB Flood model, a 'family' simply means a kind or type created by God, and within which, already-existing genetic variability is expressed according to environmental and other conditions. No approval is intended for a 'family' to mean an evolution-oriented idea of gradual naturalistic progression of forms which can be classified as being related in phylogenetic terms. Not all evolutionary 'families' are equatable with created kinds or types. Some members of these created groups were positioned in different TABs—some in all four, others in only two or three, and no doubt there were differences in provinces even within a particular TAB.

What about evolutionist claims that 27 new orders or mammals 'appeared' in the Eocene epoch of the Tertiary? What are we to make of the claim that no new animal families, apart from the alleged hominids, have appeared since the middle Tertiary (the Miocene epoch), no new orders since Mesozoic times, and no new classes since the mammals allegedly arose from certain reptiles in the middle Mesozoic? What about the 10 families of the order foraminifera all of which

are still in existence, yet six of them date from Paleozoic times?

From the TAB-model viewpoint, these claims merely reflect the created make-up of the various TAB provinces and the varieties within them. Different dinosaur families represent various TAB 3 provinces, and various mammalian families are from various TAB 4 provinces. An entire family comprising 10 or 20 varieties which did not have been present in any single province; make up that family would only two or three varieties would be enough to establish that family's presence in the province. Obviously most mammals (including humans) inhabited areas which were the last to down-warp and become totally flooded. Of course it is now impossible to tell the degree of any changes which may have occurred in TAB populations between Creation and the Fall, and between the Fall and the Flood, but all changes would have been lateral and within each group's genetic boundaries.

Post-Flood Disturbances and Survival Factors

For hundreds or even thousands of years after the main phase of the Flood, intense geological activity would have been occurring as the earth gradually returned to equilibrium. Many of the extant inland lakes and seas are the remains of flooded areas which we know were much larger in the past. Raised shore lines around some of them indicate that they were much larger in area and depth after the Flood. Some good examples are Lake Bonneville (Utah), Lake Texaco (Mexico), Lake Lahontan (Nevada), the Dead Sea, and the Caspian Sea. Previous water levels in these lakes range from 175 feet higher in Texaco, 1,000 feet higher in Bonneville, 1,400 feet higher in the Dead Sea and 250 feet higher in the Caspian. Whether due to glaciation immediately after the Flood or the Deluge itself, the fact remains that these lakes and seas were much bigger not long ago, so perhaps the world is still 'drying.'

In any case the post-Flood world was very different from the antediluvian one and many of the 'family' representatives which left the Ark succumbed—some quickly, some over a longer time. However those representatives which did survive and repopulate the earth, contained within their DNA the genetic capability to speciate and fill the various niches around the globe. This is why, despite the continuing decrease of shared families and species from the Middle Tertiary until now, there is in most cases a high degree of similarity between modern forms and those of say the late Miocene epoch. For instance, the percentage of living species of mollusks represented in the Pliocene is around 60-80 percent as against less than 5 percent in the Eocene epoch in the earlier Tertiary. Of course if we use the family taxon, the percentage would be appreciably higher; almost all extant families are also found in the Pliocene.

Can we pick the rocks which reflect the final recessional stages of the main-phase Flood? I believe we can; there are a few clues and pointers. What is different about the Cambrian to middle Tertiary span (TABs 1-4) compared with the late-Miocene to Recent epochs? Glenn Morton (1985) explains that in every geologic period prior to the Tertiary, we find huge

sedimentary deposits of various types on a continental or global scale. In the Cambrian we find the St. Peter sandstone which extends from Oklahoma to Canada. The Cambrian blanket of sand is found over nearly all of North America and similar deposits are located in Greenland, Scotland, England, Turkey, Arctic Russia, Middle Asia, Siberia, China, Australia, South Africa and South America. In the Ordovician, dolomites range over much of northeast America, and are found in Scotland, Greenland, England, Wales and China. Every geologic period seems to have continental and global-sized deposits of sandstone, shales, limestones including chalk, and coal.

In the Cretaceous rocks just 'below' the Tertiary, we find enormous deposits of chalk, sands, and shales; and in the lower Tertiary, rocks are found which contain huge deposits of greensands, coal, and shales which can be traced over large parts of the globe. However, when we come to the mid-Tertiary deposits we begin to see the end of these world-wide depositional systems, although lower Tertiary greensands are still widespread and Eocene deposits of nummulitic limestones are found widely. Morton informs us (1985, p. 102) that the final widespread deposits are found in the Miocene (Mid-Tertiary)—the diatomaceous rocks up to three kilometers thick in California, Mexico, Japan and much of Asia, Algeria, Italy and much of Europe. But, he explains—"For some reason, unexplained by (historical) geologists, the world-wide depositional systems ceased in the Tertiary strata." Morton believes that the pre-late-Miocene strata were formed by the action of a world-wide Flood and that younger rocks, i.e., later than the mid-Miocene, were formed by processes in operation today. We simply do not find these global-sized systems in the so-called Pliocene, Pleistocene and the Recent.

Whitcomb and Morris (1961) also believe that the final stages of the Flood equate with middle Tertiary deposits. The uplifts of the Pliocene epoch are well known and they cite von Engel and Caster as stating that the Himalayas and the Alps acquired much of their height in this epoch, and that Pliocene and Pleistocene diastrophism is perhaps the greatest and most widespread that the earth has known since Precambrian times (p. 286). We know of the Pleistocene ice-age which seems to follow the final Flood activity almost immediately. We thus seem to have reasonable grounds for believing that TAB 4 provinces (Lower to middle Tertiary) had no influence after Miocene times and therefore the interval from the late Miocene to the present represents normal depositional processes. If the present is the key to the past, then it applies *only* to the very recent past, and not to the systems prior to the middle Tertiary. Life today is remarkably similar to the life of the Pliocene and the Pleistocene, except for some extinctions.

What about Human Fossils?

Woodmorappe (1983, pp. 167-171) believes the pre-Flood human population may have been low—perhaps only 10 million. We should remember that animals and plants were multiple creations whereas Adam and Eve were but a single created pair. He also cites other valid reasons for a low pre-Flood population. Apart from the TAB process, the most telling argument raised

by Woodmorappe (1983, p. 169), is this—the volume of Phanerozoic rock is about 700 million cubic kilometers. If all human remains were distributed randomly by the Flood, the pre-Flood bones and artifacts would approximate one specimen per 70 cubic kilometers of rock. Even if 10 million human remains were concentrated in just one million cubic kilometers of Phanerozoic rocks, this is only 10 specimens per cubic kilometer and the chances of discovery would be very small.

Woodmorappe published a diagram (1983, p. 171), in which he visualizes the possible pattern of pre-Flood human settlement and this should be studied in detail by interested readers. The TAB processes, along with a much more influential differential escape factor, plus a probable low antediluvian human population, are sufficient to account for the lack of pre-Pleistocene human fossils. My own presupposition is that the 10 million people would probably not be distributed evenly on a global scale—most would be found within a few thousand kilometer radius with the Middle-East roughly at the center, and again mostly around rivers, seaways, estuaries and coastal areas.

Some Further Problems

Although I consider the TAB Flood model to be the most scientifically and Scripturally satisfying I have seen, there remain some problems and difficulties. Glenn Morton (1985, pp. 139-141) has reported possible large-scale time-consuming erosion in the Appalachians where Paleozoic strata are contorted in folds 10 to 20,000 feet high and with up to 10,000 feet eroded from the top folds. These flattened folds are covered by 2,500 feet of unfolded Cretaceous strata. Morton calculated the time required for the erosion alone on the order of 1.3 million years. The lithification, folding, and thrusting times are not estimated. This would appear to be a serious problem but there are other possibilities. If the Appalachian folded sediments were still soft, 10,000 feet may have been washed away as the Cretaceous (TAB 3) currents were operating. Neither lithification, folding nor erosion must necessarily take millions of years to occur; the whole process can be quite rapid.

Fossil Reefs

A great deal has been written about the alleged reefs now fossilized *in situ*, but both Woodmorappe (1980, pp. 213-214), and Austin (1975, pp. 16-59) have provided much evidence to the contrary—that these 'reefs' were chunks of coral reef washed into place by the Floodwaters, and their arguments are quite sound.

The Depth of Sediments

Some may object that the total thickness of the world's sedimentary strata is too thick to have been laid down in one year, such as the 40,000 feet in the Baltimore Basin. There are many such thick deposits around the world but they are not world-wide thicknesses. They only occur at certain spots and there is simply no need to add 25,000 feet of Cambrian, 30,000 feet of Ordovician, etc. to arrive at a fictitious pile 70 miles high.

Too Much Carbon for One Biosphere?

Morton (1985, pp. 144-146) raised the problem of the massive amount of organic fossil materials (coal, oil, limestone etc.), but there are two replies to this. First, much of the world's oil may be inorganic in origin and not derived from the remains of once-living organisms. Thomas Gold first espoused this theory (1986), and was ridiculed by some of his colleagues. However, to test his theory, deep drilling was begun about 1988 in granitic rock formation in Sweden—the last place one would expect to find oil. Gold has been vindicated—project manager Kenney announced that oil began to flow at a depth of 2,800 meters (about 10,000 feet). We now know that material containing carbon was included in the solids that contributed to the make-up of the earth—when the solids are heated in the high pressure interior of the globe, a variety of oil-like molecules is produced (Highfield, 1991, p. 1). This was a newspaper report and to date I have not seen any published material in the literature. Woodmorappe has published an excellent paper in which he argues compellingly for a pre-Flood biosphere which was quite capable of supplying the quantity of carbon required. With an inorganic origin for at least some oil, Woodmorappe's case is even more convincing (1986, pp. 205-218).

Finally we come to the question of the Precambrian-Cambrian unconformity. If there was a clear global separation it would be a setback for the TAB model. There are some fossils of interest in the upper Precambrian and some questionable unicellular ones before that, so the upper Precambrian must be a part of TAB 1 deposits. However, while the unconformity does exist in many places, in others the transition from Precambrian to Cambrian is not marked by any physical sign but is rather a discontinuity, the only evidence being fossiliferous. To prove the point I quote from McMenamin (1987)—“. . . many regions are now known where Precambrian and Cambrian formations grade continuously into each other.”

Whatever possible problems or objections may exist, there are other factors which tend to offset them as we have seen. If Flood models and hypotheses have apparent difficulties, so do all 'naturalistic' theories, and deciphering the events of past times is always fraught with questions because no trained observer was present to record what happened. There is no reason to deny the validity of Scriptural references to the Deluge, and when a powerful theoretical case such as that of Woodmorappe is proposed, it deserves close study by all geologists whether creationist or uniformitarian, especially when there is some supporting independent evidence in favor of it, and when it provides so many resolutions of previously considered problems.

Conclusions

The Woodmorappe TAB model is the first and only scientifically and theoretically satisfying paradigm of which I have knowledge. It was first published in 1983 and capped a series of previous studies of high quality by Woodmorappe on the unreliability of standard geological thinking. Although it does not eliminate all problems encountered by previous authors who had tried to establish a viable diluvian model, the TAB

concept does cope very well with most of the major ones and almost all the minor difficulties.

In the nine years since it appeared in print, the TAB model has attracted very little comment or examination—this may be due to its complexity but I urge readers to make the effort to understand it and make constructive criticism. Unless creationists can counter uniformitarian geology as well as we have countered mechanistic organic evolution, we will fail to shake the evolutionist establishment, because the largely hypothetical geologic column is the real backbone of evolutionary theory. To dislodge evolution requires sound, scientific, creationist Deluge geology as well as the already powerful case against organic evolution itself.

I have not attempted to establish a time-scale for the Woodmorappe model but he does believe it to be very short. My own belief is that the time required is a little longer, based on what I have seen myself and/or studied, but not much longer—only thousands of years and certainly not the millions required by evolution. It is time that earth scientists changed their attitudes toward geochronology—there is nothing wrong in using age, epoch, period, era etc. as names as being descriptive of placement and/or type of fossils contained but not as time markers. I now hope that a full range of good quality discussion on the TAB model will ensue—it deserves far better than the general neglect it has so far received.

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KEYWORD INDEX TO VOLUME 29

GLEN W. WOLFROM*

- ABIOTENESIS see life, origin of
 ANTISENSE RNA 63a
 ARCHAEOPTERYX 146a
 ARCTIC 189a
 ARK, NOAH'S 28p, 135p, 196p
 ARKANSAS TRIAL 204r
 ASTRONOMY 50L, 53L, 135p
 ATAVISM 33a
 ATMOSPHERE, EARTH 98r
 ATMOSPHERE, MODELING 140a see also climate modeling
 BIG BANG 53L, 102L
 BRAIN, HUMAN 102L
 BUCKMINSTERFULLERENES 193p
 BUCKYBALLS see buckminsterfullerenes
 C.O.B.E. 102L see also big bang
 CANOPY, VAPOR 53L, 140a, 170a
 CANYON FORMATION 18a
 CAPITAN LIMESTONE 28p, 135p
 CARBON-14 DATING 45a, 47n, 85p, 170a, 196p see also dating, radiometric
 CARBON ECONOMY 170a, 196p
 CARBON MONOXIDE 102L
 CATASTROPHISM 28p, 97r, 135p, 189a
 CATERPILLER, CATKIN 63a
 CAVE/CAVERN 83p
 CELLS, DIFFERENTIATION 63a
 CHAOS 99r see also entropy; thermodynamics
 CHEMICAL EVOLUTION 85p
 CHRONOLOGY, BIBLICAL 170a, 184a, 196p
 CLIMATE, MODELING 140a see also atmosphere, modeling
 COELACANTH 160r see also fossils, living
 CONODONTS 192p
 CONSTANTS 104L
 CONTINENTAL DRIFT 13a, 196p see also plate tectonics
 COPERNICUS 159r
 1 CORINTHIANS 2:13-14 160L
 1 CORINTHIANS 3:19 127a
 CORN 196p
 CREATIONISM, CRITIQUE 98r, 194p, 204r
 CREATIONISTS, ANTI- 97r, 194p
 CRIMINOLOGY 33a
 CRS, FELLOW(S) 114n, 126n
 CRS-SPONSORED RESEARCH 62n
 CURSE, ADAMIC 89a
 DAKOTA FORMATION 6a
 DARWIN, CHARLES 70a, 97r, 146a
 DARWINISM, CRITIQUE 48r
 DARWINISM, SOCIAL 33a
 DATING, RADIOMETRIC/ISOTOPIC 45a, 47n, 83p, 85p, 127a, 135p, 170a
 DATING 72a, 120a, 184a
 DAY-AGE THEORY 28p
 DEATH 89a
 DECLARATION OF INDEPENDENCE 100r
 DEEP SEA DRILLING PROJECT 27p
 DEEP SEA RIDGES 13a
 DENDROCHRONOLOGY 135p, 170a, 184a
 DENTINE 192p
 DEPOSITION see sedimentation 6a
 DESIGN, HUMAN BODY 196p
 DESIGN 28p, 85p, 194p
 DINOSAUR(S), LIVING 158r
 DINOSAUR(S) 49r, 206r
 DINOSAUR EXTINCTION 49r, 97r
 DINOSAUR RIDGE 6a
 DNA/RNA 63a, 196p
 DOG KIND 196p
 EARTH, AGE OF 98r, 170a, 196p
 EARTH 85p
 ECOLOGICAL ZONATION 28p
 ECOLOGY 28p
 EDUCATION 28p
 EMBRYOGENESIS 63a
 ENTROPY 25p, 63a
 EROSION 196p
 EVAPORITES 13a, 196p
 EVE see mitochondrial Eve
 EXTINCTION, MASS 97r
 EYE 195p
 FAITH 127a
 FIBRONECTIN 63a
 FLIGHT 84p
 FLOOD, NOACHIAN 13a, 28p, 53L, 83p, 184a
 FLOODS LEGENDS 85p
 FLOOD MODEL(S) 53L
 FORESTS, ARCTIC 189a
 FOSSILIZATION 192p
 FOSSILS 196p
 FOSSILS, LIVING 13a, 160r
 FOSSILS, MAN 196p
 FOSSILS, TRANSITIONAL 146a
 FOUNTAINS OF THE DEEP 13a
 FROG 196p
 GAIA 102L
 GALAPAGOS ISLANDS 85p
 GALILEO 159r
 GENES, ACTION OF 63a, 102L
 GENES, HOMEOTIC 63a, 102L
 GENESIS 1:28 28p
 GENESIS 1:31 102L
 GENESIS 2:1-2 102L
 GENESIS 7:11 13a, 170a
 GENESIS 8:2 170a
 GENESIS 10:25 13a
 GENETIC ENGINEERING 135p
 GENETICS 63a
 GENETICS, MOLECULAR 199a
 GENOME 102L
 GEOCENTRIC THEORY 161L
 GEOLOGICAL AGES/COLUMN 170a
 GIANTS, PHYSIOLOGICAL PROBLEMS 84p
 GISH, DUANE T. 114n
 GRAND CANYON, FORMATION 18a

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 For multi-page items, the reference is to the first page only. Letters
 following numbers indicate: a—article; L—letter; p—panorama;
 r—review; and n—note. CRS—Creation Research Society.

- GRAND CANYON RESEARCH STATION see Van
 Andel Research Center
 GYRO, LASER 137a
 HELICTITES 83p
 HELIUM, ATMOSPHERIC 98r
 HIRSUTENESS 33a
 HORSE EVOLUTION 28p, 97r
 HOT SPRINGS 13a
 HUMMINGBIRD 194p
 HYDROTHERMAL VENTS 13a
 ICE AGE(S) 28p, 72a, 85p, 120a, 135p, 196p
 INFORMATION, GENETIC 63a
 INTELLIGENCE, CREATIVE 63a
 INTERNATIONAL CONFERENCE ON
 CREATIONISM 101L
 IO, HEAT FLUX 115a
 IODINE 53L
 IRIDIUM 49r
 KEPLER 159r
 KIND(S) 85p, 135p, 196p
 LADY HOPE 70a
 LANGUAGE 199a
 LEAD ISOTOPES 104L
 LICHENS 196p
 LIFE, ORIGIN OF 196p
 LIGHT, SPEED OF 115a
 LUNG CAPACITY 84p
 MACROEVOLUTION 28p, 146a
 MAGNETIC FIELD 28p, 85p
 MAMMAL-LIKE REPTILES 192p
 MAN, ORIGIN OF 199a
 MARSH, FRANK, L. 126n
 MATTHEW 7:9 127a
 MATTHEW 18:6 127a
 METEORITE, IMPACT 49r
 METEORITE(S) 54L
 MICROEVOLUTION 146a, 199a
 MICROMETEORIDS see meteorite(s)
 MIGRATION, HUMAN 85p
 MILLIPEDE 88p
 MISSISSIPPI RIVER see river
 MITOCHONDRIAL EVE 199a
 MORRISON FORMATION 6a
 MUTATIONS 85p
 NATURAL SELECTION 28p, 135p, 146a
 NEANDERTAL MAN 199a
 NEUROBIOLOGY 102L
 NEUROTRANSMITTERS 102L
 NEW AGE 102L
 NEWTON 159r
 NITRIC OXIDE 102L
 OCEANS, COMPOSITION OF 13a
 ORDER 99r see also random(ness); thermodynamics,
 second law
 OVERTHRUST(S) 28p, 192p, 196p
 PALYNOLOGY see pollen, fossil
 PANTHEISM 102L
 PATRIARCHS, GENESIS 135p
 2 PETER 3:4, 7, 10 24p
 PHILOSOPHY 85p
 PHYLOGENY 85p
 PLANETS 127a
 PLATE TECTONICS 27p, 53L, 189a see also
 continental drift
 PLEIOTROPY 28p
 POLLEN, FOSSIL 6a
 POLLEN 189a
 POPULATION CONTROL 135p
 PROBABILITY 196p
 PROVERBS 3:5 127a
 PSEUDOGENES 63a
 RACE 33a, 196p, 199a
 RANDOM(NESS) 85p see also order
 RECAPITULATION, EMBRYONIC 196p
 RELATIVITY 137a
 RESPIRATION 84p
 RIVER, MISSISSIPPI 85p
 ROMANS 1:19-20 127a
 RUSCH, W. H., SR. 133n
 SAGAN, CARL 127a
 SCIENCE 99r, 127a
 SCIENCE, ERRORS 127a
 SCIENCE, PHILOSOPHY OF 28p, 160L, 196p
 SCIENTIFIC METHOD 160L
 SCRIPTURE 28p, 48r, 127a
 SEDIMENTATION, RATE OF 6a
 SEDIMENTATION 135p
 SIN NATURE 89a
 SNAILS, TOOL-USE 193p
 SOLAR SYSTEM, AGE/ORIGIN OF 28p
 SOLAR SYSTEM 24p
 SPACE MEDIUM 137a
 SPEECH, HUMAN 28p
 SPEEDOMETER, LASER 137a
 SPELEOTHEMS 83p
 SPIDER 88p
 STALACTITES 83p
 STALAGMITES 83p
 SULFIDE DEPOSITS 13a
 SUPERNUMARY DIGITS/NIPPLES 33a
 TAIL, HUMAN 33a
 TAPHONOMY 192p
 TELEOLOGY 85p see also design
 THEISTIC EVOLUTION 28p
 THERMODYNAMICS, SECOND LAW 25p, 63a,
 89a, 135p see also entropy
 THERMODYNAMICS 25p, 28p, 99r, 135p
 THRUST FAULT see overthrust(s)
 TRACE ELEMENTS 135p
 TRACE FOSSILS, FOOTPRINTS 6a
 TRACE FOSSILS, RIPPLE MARKS 6a
 TREE RINGS see dendrochronology
 UNIFORMITARIAN(ISM) 28p, 97r
 VAN ANDEL RESEARCH CENTER 62n
 VARIATION, BIOLOGICAL 196p
 VARIATION, PHENOTYPIC 63a
 VARVE CHRONOLOGY 72a, 120a
 VELIKOVSKY 97r
 VERTEBRATES 192p
 VIRGIN BIRTH 89a
 VITALISM 63a
 VOLCANISM, POST-FLOOD 135p
 WALLACE, ALFRED RUSSELL 97r
 WEATHER 204r
 WOLFROM, G. W. 133n
 WOOD, MUMMIFIED (DESICCATED) 189a

PANORAMA NOTES

Science Without God

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Once, theology was the queen of the sciences. Lately it has been replaced by physics, but there are signs that the physicists want to become theologians. Books by leading physicists bearing titles like "The Mind of God," "The God Particle" and "Theories of Everything" now claim for physics the power to describe all of reality. Ambitions like this have important consequences, and invite the rest of us to consider whether the outlook of a particular group of scientists is suitable for everybody.

One of the best of these books is Steven Weinberg's "Dreams of a Final Theory," published recently by Pantheon. Mr. Weinberg received the Nobel Prize in 1979 for his role in developing a unified theory of the electromagnetic and weak nuclear forces, a major step toward the final theory of his title. The "standard model" of elementary particles now consists of Mr. Weinberg's electroweak theory and quantum chromodynamics, which describe the strong nuclear force. Gravity, the fourth known fundamental force, is subject to the very different principles of general relativity. Some physicists believe that it may be possible to formulate a theory unifying all four forces, a goal frequently labeled the "holy grail of physics" or the "theory of everything."

Nothing New Under the Sun

Big Bang cosmology provides the conceptual basis for the hope that a final theory exists, and also for the notion that such a theory would be the most important piece of knowledge that humans have ever discovered. At the earliest instant of the Big Bang, when the cosmos was compressed into a single point, conditions were so hot and dense that a symmetry among all the forces may have prevailed. At that moment only the theory and the particles are supposed to have existed, and science assumes that nothing fundamentally new has entered the cosmos since. That is why physicists say that a unified particle theory would in principle govern everything that has happened, which makes it important enough to justify the \$8 billion (and climbing) to be spent on the Texas supercollider. The supercollider is expected to confirm the electroweak theory one way or another and to provide a basis for the next step toward a grand unified theory.

As science writing, "Dreams of a Final Theory" has many virtues, but for most readers the important thing will be its philosophical message. Although Mr. Weinberg professes to find philosophy useless in physics, he enthusiastically promotes his own philosophy, called reductionism. Reductionists assert that consciousness is a product of brain chemistry, that the life processes are directed by the DNA genetic program, that the DNA code itself is reducible to the laws governing the physics and chemistry of lifeless matter, and that everything that has happened in our universe is ultimately traceable to the initial conditions of the Big Bang.

Reductionism is understandably appealing to particle physicists, since it makes their discipline more funda-

mental than others, and for the same reason it is distasteful to other scientists who think that these physicists are a bit too full of themselves. There are many antireductionists in science, especially in biology, who speak of "emergent" properties of organisms that cannot be fully understood as products of DNA or chemistry. Such statements do not really contradict reductionism, however, if they mean only that science does not yet have a reductionist understanding of the emergent principles.

Unfortunately, any biologist who invokes some mystical element in the life processes that is not derived from chemistry or physics is deemed guilty of "vitalism," which in contemporary science is a thought-crime only marginally less reprehensible than outright creationism. The commitment of science to the faith that nature is a permanently closed system of material causes and effects allows no coherent alternative to reductionism, and so reductionism dominates despite the muttering.

Mr. Weinberg promotes reductionism not only within science but as a world view aimed at producing a rational society. He hopes that discovery of a unified particle theory will convince the public that nature is governed by impersonal laws, and thus discredit "irrational beliefs," which range "from relatively harmless superstitions like astrology to ideologies of the most vicious sort." He does not say explicitly what vicious ideologies he has in mind—he is, after all, trying to persuade Americans to pay for the supercollider—but he leaves careful readers in little doubt. The "dark forces of religious enthusiasm" are gathering strength in Asia and Africa, he warns, and reason and tolerance are not safe even in the West. Reductionist science must come to the rescue of rationality, supplanting religious visions with a cheerless prospect of an impersonal universe that exists for no purpose.

But how tolerant do the triumphant scientists plan to be toward those who don't think that reductionist naturalism is a rational philosophy? Many well-educated people think that there is an intelligence behind the cosmos, and that life and consciousness cannot be explained in terms of physics and chemistry alone. Such people may want to dispute undemonstrated reductionist claims about such subjects as the origin of life and the reducibility of mental life to chemical reactions in the brain. May these persons obtain a fair hearing?

The answer seems to be no, they may not. Mr. Weinberg, like many of his colleagues, regards dissent from naturalism as a repudiation of rationality. He concedes that one of the effects of reductionist science—indeed, one of its aims—is to discredit theistic religion. Nonetheless, he insists that "it is simply not the business of the public schools to concern themselves one way or the other with the religious implications of scientific theories." Within science itself, of course, only an unquestioned naturalism is allowed. That means that the scientific community claims the sole right to decide for the nation that God is a product of the human imagination rather than the ultimate reality behind the cosmos. Whatever else one may say about this claim to power, it does not reflect either uncertainty or tolerance.

No Sacred Common Ground

There is nothing wrong with the desire to discourage fanaticism, and to bring as much of life as possible under the influence of reason. One thing the 20th century has taught us, however, is that fanaticism can as easily be founded in scientific atheism as in some twisted understanding of the will of God. Mr. Weinberg thinks that people will become more rational if science can convince them that nature is governed by impersonal laws. But these laws apply only to matter and the forces that operate upon it. Naturalistic metaphysics relegates questions like how we should live or what we should value to the realm of subjective opinion. It provides no sacred common ground, other than a supposedly value-free science, to unite differing human groups and give them a foundation to reason from. Is it any wonder that the great universities that are permeated by this philosophy are themselves being torn apart by groups that demand separate academic departments to promote their ideologies?

"Dreams of a Final Theory" is a good book and an honest one. It provides not a vision of the future, however, but a last flicker of the dying flame of Enlightenment rationalism. There was a time when it seemed reasonable to think that the death of God would usher in an Age of Reason. A few relics from that time of dreaming are still with us.

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The Volcanic Hypothesis for Dinosaur Extinction

Scientists are valiantly seeking the cause for the extinction of the dinosaurs and many other organisms at the end of the Cretaceous period of geological time. Since 1980 the asteroid extinction hypothesis has gained momentum. The main evidence is a large enrichment of the element iridium found at the Cretaceous-Tertiary boundary at 10 locations around the world including Italy, Denmark, New Zealand and Montana. Meteorites are high in the relative abundance of iridium, while the earth's crust is very low. Further support comes from possible soot from impact-caused fires and shocked quartz found at the boundary. Tremendous effort is now being expended on finding the smoking gun—the tell-tale crater.

While this flurry of research has been proceeding, other scientists have been discovering evidence that volcanoes can explain the observations attributable to an impact. A recent summary of the volcanic hypothesis was published by Charles Officer (1993) in *New Scientist*. He points out that the geochemistry of iridium and other platinum group elements are poorly known. Since 1980 scientists have discovered very high levels of iridium in airborne ash particles from recent eruptions on Hawaii, Kamchatka and Reunion Island (Officer, 1992, 1993). The high amount of iridium also is deposited in a sedimentary layer, and it has been discovered in volcanic dust bands from Antarctic ice cores. Furthermore, no iridium enrichment has been associated with known impact craters, except possibly for one impact in South Australia (Officer, 1992, p. 313).

An analysis of the carbon isotope ratios found at the Cretaceous-Tertiary boundary suggests that the carbon came not from soot but from volcanic eruptions. What about the shocked quartz, believed to be uncontroversial evidence for an impact? Sure enough, shocked quartz has now been found in a large landslide from the Alps. It has also been discovered in ash-flow deposits from the gigantic Toba eruption on Sumatra (Albritton, 1989, p. 154).

Although meteorite impacts probably were associated with the Flood, volcanism was also extensive during the Flood. Sedimentary rocks labeled Cretaceous and Paleocene are exposed at the surface over most of central and eastern Montana. This is where an iridium spike has been found. In these sedimentary rocks there is extensive volcanic debris, which could explain this particular iridium anomaly. Although the Flood is the cause of the extinctions, the volcanic hypothesis fits into the Flood model quite well.

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Fresh Impact Craters on Venus

Surprise is a common emotion in planetary exploration. The latest results of the radar mapping of Venus, published in the August 25, 1992, issue of the *Journal of Geophysical Research*, live up to that sentiment. The Magellan polar-orbiting satellite was commissioned to map by radar surface features of Venus to a resolution of 300 meters. Impressive tectonic, volcanic, impact, and surficial landforms were resolved over 89% of the surface.

The surface consists of 85% lava flood plains, dotted with thousands of individual volcanic structures, and 15% tectonically deformed highland plateaus (Saunders et al., 1992, p. 13,068). Although Venus is considered the Earth's sister planet, there is little or no evidence of plate tectonic processes: "In general, the preserved record of global tectonics of Venus does not resemble oceanic plate tectonics on Earth . . ." (Solomon et al., 1992, p. 13,199).

Of the many interesting geological features, I wish to focus attention upon are the impact structures. The important feature of these impact structures is that they are predominantly fresh. There are more than 842 impact craters greater than 35 km in diameter. (Craters less than 35 km are rare because of the filtering effect of the extremely thick atmosphere on Venus.) Sixty-two percent of these impact structures are said to be pristine (Schaber et al., 1992, p. 13,257). Only 4% are embayed by lava, despite the ubiquity of volcanic features. The remaining 34% are affected by tectonism, likely an ongoing process as indicated by locally steep topography. The craters are uniform across the surface, which means there has been little if any selective ero-

sion or lava filling. However, the impact density is much lower than on other planets and the Earth's moon. The rarity of impacts is a surprise and difficult to explain.

A creationist would simply explain the fresh appearance of the impact craters as a product of a recent catastrophic cratering process. Possibly, they are related to the onset of the Genesis Flood. They look fresh because they are fresh. The observations especially support a young planet and hence a young solar system. There has not been enough time to fill too many of the impacts with lava.

Evolutionary scientists are usually not lacking in explanatory hypotheses. Since Venus is shy of craters and most craters appear fresh, Schaber et al. (1992) postulate a period of catastrophic volcanic resurfacing of the planet, followed by little or no volcanism. The lack of volcanism has allowed the craters to increase over time with little or no modification, except by faulting. They claim this resurfacing event occurred 500 million years ago. But, this date is based on the estimated population of Venus-crossing meteoroids and the number of observed impacts on Venus. It is based strictly on uniformitarian mathematics, not on the surficial erosion and weathering rate.

Can the impacts remain generally unmodified for up to 500 million years? Perhaps, but 500 million years of geological time is probably stretching it. Because of lack of water, the surface of Venus likely has a slow weathering rate. However, this conclusion is partly based on the generally unmodified appearance of the craters (Saunders et al., 1992, p. 13,070), which begs the question. However, chemical weathering and mass wasting occur. There is even mechanical weathering from wind close to the equator, as shown by more than 3400 wind streaks. (The large number of wind streaks was another surprise.) It will be difficult to resolve the effects of these modification processes on the impact craters, and whether the postulated 500 millions years will hold up to scrutiny. Regardless, the observations are explained more readily by a creationist model of a young Venus.

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The Eye

In an article on the evolution of the eye, H. S. Hamilton says, "In fish generally, visual activity is probably poor but there are exceptions" (1993, p. 195). His examples may be supplemented with statements from the classic work on the eye by Dr. Stephen Polyak, *The Vertebrate Visual System* (1968):

The way in which the Vertebrate eye came into being is unknown, in spite of some of the best

efforts in biology to find the answer. Numerous more or less ingenious hypotheses have been made, without any of them being sufficiently convincing . . . The most remarkable feature of the eye of the now living Vertebrates is its uniformly high state of structural and functional perfection. This is noteworthy, especially in view of an almost endless variation in detail. The Vertebrate eye, as we know it, is a finished product, a perfect apparatus, even in the phylogenetically lowest representatives, the Cyclostomes and Hagfishes. . . Truly, it is difficult to visualize an eye more perfectly devised than that found even among the most primitive of the modern Vertebrates, the Cyclostomes (Lamprey, Hagfish) . . ." (p. 768).

The phylogenetical perfection of the visual function of the Vertebrates, as far as available evidence permits us to judge, was not a straight line ascending from the lowest to the highest levels. Among the fishlike classes, especially among the many Teleosteans [the common bony fish] there are some with structurally highly organized eyes, including a differentiated fovea, and sight which is among the keenest of all Vertebrates . . . the Fishes, even though phylogenetically the most primitive Vertebrates, are among the most advanced visually" (p. 958).

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How Bird-like is Archaeopteryx?

In 1863, Professor Owen published a description of the London specimen of Archaeopteryx together with four beautifully drawn plates. He demonstrated in detail just how bird-like this fossil is, contrasting it with a pterodactyl. He concluded that it was "unequivocally" a bird, "with rare peculiarities indicative of a distinct order in that class." It is well worth briefly reviewing the famous anatomist's work. I will list some of the similarities he delineates between Archaeopteryx and extant birds and refer the interested reader to the article for a more comprehensive treatment (Owen, 1863).

Referring to the scapula he notes,

In its slightly bent, lamelliform or sabre-shaped figure, and in the concavity between the glenoid articulation and the short acromial projection on the outer side, it closely resembles the scapula of a bird (p. 36).

It "bears nearly the same proportion in length to the humerus and femur as in some of the more slender-limbed Falconidae" (p. 43).

The humerus has the same slight sigmoid flexure as in the bird. It presents about the same proportion in length to the trunk as in the Peregrine Falcon, the Touraco, and most Gallinae.

The right ulna shows the convexity at the part of the proximal end next [to] the radius, as in modern birds. Both ulna and radius closely resemble the antibrachial bones of the bird.

A single carpal, of large size, wedged between the end of the radius and the base of a metacarpal, is shown on the left side of *Archaeopteryx* indicating a structure of the wrist like that in the bird (p. 37).

"The claw-phalanx" has

a degree of curvature equal to that of the claw-phalanx of a Raptorial bird. So much of the skeleton of the hand as is exposed to view in the present specimen unquestionably accords in its proportions with that of the bird (p. 38).

... the positive proof of the ornithic proportions of 'the hand or pinion, of the existence of quill feathers, and the manifest attachment of the principal ones, or 'primaries: to the carpal and metacarpal parts of a short terminal segment of the limb, sufficiently evince the true class-affinity of the *Archaeopteryx*' (p. 39).

The femur ... is slightly bent. In some birds (*Corythaix*) [*Touraco*], it shows the same bend as in *Archaeopteryx*.

The distal end of the tibia expands anteriorly, and the contour shown by the inner surface of the right tibia, and the hinder and inner part of the left one, agrees with the peculiar structure of that part in birds. In the proportion of the tibia to the femur, exceeding as it does the latter bone by rather more than one-fourth of its own length, *Archaeopteryx* resembles some birds (*Grouse*, *Touracos*, many *Insectores*) [p. 41].

The proportion of the metatarsus to the tibia resembles the average or common proportion in birds.

The difference from the Reptilian structure, and especially from the Pterosaurian modification thereof, is here most striking. The tarsus is a distinct segment in the volant reptiles, and the metatarsals equally retain their distinctness, and correspond in number with the toes. The entire tarso-metatarsal segment of the limb in the *Pterodactyl* is much shorter in proportion to the tibia than in *Archaeopteryx* and most birds (p. 42).

... The wings, in their present state of preservation, agree in form and proportion with those of the Gallinaceous or 'round-winged' birds (p. 36).

The furculum of *Archaeopteryx* presents the proportional strength, thickness, and span of the arch which characterize the diurnal Raptorial birds; but the piers or crura do not arch into one another below by so open a curve; they have converged in a form more angular, more like that in the Owls, and still more like that in some *Grallae*, with a strong furculum as e.g., in the *Spoonbill* ... and *Argala*; only, as before remarked, the type of pelvic limb precludes any useful comparison with birds of the Wading order. The furculum in *Columbidae* and *Cracidae* is feeble in comparison with that of *Archaeopteryx* ... The furculum of *Archaeopteryx* is of a bird of a more powerful flight than in the true Gallinacae (p. 43).

With the exception of the caudal vertebrae, and possible the bi-unguiculate and less confluent condition of the manus, the parts of the skeleton preserved in this rare fossil feathered animal accord with the strictly ornithic modifications of the vertebrate skeleton (p. 45).*

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John Kaplan**

*Editor's Note: Readers interested in recent discussions of fossil birds please consult the following Quarterly selections.

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A Living Graptolite Found?

Graptolites are important index fossils for dating the early Paleozoic period of geological time, especially the Ordovician and Silurian. Weller (1960, p. 559) states: "Graptolites evolved relatively rapidly and are considered to rank among the best and most reliable fossils for paleontologic zonation and correlation." Just recently, one of them very likely was discovered alive, which raises several intriguing questions.

At 253 meters depth off New Caledonia, the French submersible "Cyana" collected an extant pterobranch, a colony forming hemichordate, "... that has an astonishing physical resemblance to graptolites, a group considered to have been extinct since the Carboniferous, 300 million years ago" (Rigby, 1993, p. 209). For years scientists have been debating the affinity of graptolites to living pterobranchs. Now that relationship apparently has been solved. Dilly (1993, p. 77) summarizes his report on the specimen: "There is little if any reason for not considering *C. graptolitoides* as a living fossil and a member of the graptolites previously thought to be extinct for over 300 million years."

Left unmentioned are what this discovery means to the graptolite fossil dating scheme and why graptolites have not been found in the rocks for the past 300 millions years of geological time.

Since there are many varieties of graptolites, it is unknown whether this particular "graptolite" or pterobranch has been used for dating a particular lower Paleozoic rock layer. If scientists have found one living graptolite, they likely will find more with further undersea exploration. It is difficult to see where this discovery will lead, but it seems that one of the best index fossils for dating Phanerozoic sedimentary rocks is questionable.

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Introduction

The *Creation Research Society Quarterly* has been published since 1964 (29 complete volumes). In an effort to make these volumes available, all of the missing issues have been reprinted. Brief synopses have been written on volumes 1-13 and have appeared in the previous 13 Quarterlies. In each synopsis, major articles are reviewed to give a person interested in scientific creationism a general idea of the contents of that volume. Many of the articles are of continuing interest and value.

Astronomy

Gerardus Bouw (1977a, pp. 17-24) presented a treatise on the rotation-curve of the Virgo cluster of galaxies. He offered some evidence for a young cosmos and urged caution on using the mass anomaly argument. Also he showed how modern cosmology could not explain the data he had generated. The same author (Bouw, 1977b, pp. 108-112) discussed galaxy clusters and the mass anomaly. He claimed that "the mass anomaly appears to mean that astronomers do not understand the cosmos well enough to draw any definite conclusions" (p. 112). The limitations of science in understanding the universe were noted.

Physics and Engineering

Barnes, et al. (1977, pp. 38-45) developed a classical approach to electrodynamics. Dr. Barnes has devoted considerable effort in trying to remove some of the conclusions of special relativity from physical science. Also Pemper and Barnes (1978, pp. 210-220) worked on a classical theory of the electron. In all of these studies, the concept of physically identifiable models was offered rather than an appeal to abstract mathematics. Likewise a brief critique of atomic clocks was offered (Essen, 1977, p. 46).

Russell Humphreys (1978, pp. 209-210) suggested that creationists could make better use of the second law of thermodynamics if they understood that it applied to open as well as closed systems and that there are no known exceptions to this principle of science. He noted that the sun bathing the earth *increases* its entropy which counters so many absurd claims of evolutionists. Also see Williams, 1981. The stability of the Ark of Noah was examined by Collins (1977, pp. 83-87). He concluded that the ship was extremely stable, "well able to withstand the forces hurled against it . . ." (p. 83).

Scientific Dating Methods

In an interesting article, Tyler (1977, pp. 92-99) examined the crisis in radiocarbon calibration. Included in the article was a discussion of Egyptian archaeological samples and tree growth-rings. It was concluded that the assigned ages to the Egyptian samples are questionable. Radiohalos in coalified wood were offered as evidence for a young earth (Connor, 1977, pp. 101-102). The mystery of radiohalos was the title of an article by Talbott (1977, pp. 103-107). He discussed the work of Robert Gentry on this fascinating topic.

Rodabaugh (1977, pp. 107-108) noted that materialists have increased the age of the earth exponentially in

the time period from 1850 to 1976 (age inflation?). Creation with the appearance of age was presented by Marsh (1978, pp. 187-188). He explained that it would have been impossible to create anything without the appearance of age.

Weather

A discussion on the catastrophic freezing of the Beresovka mammoth was presented by Dillow (1977a, pp. 5-13). He postulated a sudden climate change to cause the preservation of the large animal. The stomach contents of the specimen were listed. A thermodynamic analysis was conducted to determine the rapidity of the freezing operation. Dillow (1977b, pp. 139-146) examined the attenuation of visible radiation in a postulated pre-Flood vapor canopy. Included is an account of near eastern worship of the stars and its effect on their culture. Since the New Age movement has become prominent in the western world, an expose of near eastern mysticism is welcome.

Zoology

The hummingbird is presented from a design perspective (Keithley, 1977, pp. 3-4). It was shown that the creature could not have evolved by natural processes. Ettari (1977, pp. 35-37) explained that termites had to be designed. Several characteristics of the troublesome insect were examined from this viewpoint. Frair (1977, pp. 61-62) briefly debunked the hypothesis that avian and mammalian hearts are examples of evolutionary perfection. The reptilian heart was discussed also. He noted:

In studies of the vertebrate heart it would appear beneficial if students of comparative anatomy could be relieved of the tension to explain details of cardiac anatomy and physiology in phylogenetic terms and be encouraged to understand the various features with primary attention on needs of particular organisms in their environments (p. 62).

Genetics

Many articles on genetics in relation to the creation/evolution controversy were featured in this volume of the Quarterly. In a detailed article, Ouwenel (1977, pp. 26-34) carefully used genetic variation, molecular genetics, heterozygosity, allelic substitution, reproductive isolation and a discussion of natural selection to show that evolutionary genetic speculation is hopeless scientifically. Tinkle (1977a, p. 53) briefly noted that sex could not have evolved, it had to be operational in the beginning. Interdependence in DNA and RNA are necessary for mutual synthesis and this is evidence for design (Sharp, 1977, pp. 54-61). In developing his thesis the author covered enzyme biosynthesis, possible number of proteins, left-handed amino acids, induction, repression, the genetic code, repair processes and antibodies. Only creation by an intelligent Being can explain this dependence, i.e. the "processes" had to be operational from the beginning. Continuing this line of reasoning, Cuozzo (1977a, p. 92) said the enzymes and receptors could not have evolved together. He concluded:

Mutually dependent organs are useless without each other. The simultaneous precision changeover

is a lot to ask of natural selection! Special creation would appear to be a preferable explanation for the known data.

Tinkle (1977b, p. 113) continued his discussion of mutant plants that had appeared in past *Quarterlies*. He explained the difference between acquired characteristics and mutations and their relation to variation in living organisms. Seventeen genetic problems for naturalists were outlined by Poettcker (1977, pp. 113-123). He differentiated between observable variation (after its kind) and macroevolution (great genetic change over vast epochs of time to produce new kinds). The article included such topics as chromosome changes, mutations and their effect, origin of dominance, polyploidy, chromosome number, natural selection, genetic drift and supposed chemical or molecular evolution. As a fitting summary of all of these excellent treatises, Tinkle (1977c, pp. 155-156) explained why the science of genetics favored the creation model.

Bible History, Anthropology

Hanson (1977a, pp. 62-69) carefully studied post-Flood human population growth. Employing several independent mathematical methods, he concluded "that a [human] population of many millions could have resulted after 200 years starting from Noah and his family" (p. 62). Evidence was presented by Strickling (1977, pp. 147-148) to indicate that the Egyptian sage Imhotep may have been Joseph of the Bible. Two articles on skull 1470, found by Richard Leakey, were contained in this volume (Hummer, 1977, pp. 168-172; Cuozzo, 1977b, pp. 173-176). Hummer urged caution in interpreting the skull features and Cuozzo considered that the ape-like features could have developed by environmental occurrences after the death of the organism. The discussions make interesting reading.

Geology

Several past volumes of the *Quarterly* contained research work on the rapid growth of dripstone. Helmick, et al. (1977, pp. 13-17) added a thoughtful piece of field work on the quantitative growth of stalactite and flowstone-like structures on a bridge to this discussion. They noted from their study that rapid dripstone formation was possible. Heinze (1977, p. 87) briefly discussed rapid delta formation. Since uniformitarian geologists have postulated extensive delta formation in shallow seas in the past, this article and the Woodmorappe treatise (1978, pp. 189-208) deserve careful study. Woodmorappe offered a Diluvian interpretation of "ancient" cyclic sedimentation. Cyclothems occur in many deltas and a model based on the Flood was offered. This detailed model included the deposition of coal, underclays, sandstones and shales. Also see *Studies in Flood Geology* offered by Creation Research Society Books.

Ecological zonation of fossils was presented by Clark (1977, pp. 88-91). This subject had been discussed by Burdick (1976, pp. 96-98) previously. Hanson (1977b, pp. 157-168) developed a model for comparing pre-Flood and post-Flood geomorphology. Biblical evidence, Flood geometry, kinematic relationships, possible changes in the earth's angular velocity, the earth's moment of inertia, possible changes in the earth's axis

of rotation, formation of ice and a possible explanation for the frozen mammoths were included. Cox (1977b, pp. 149-155) considered pillars, polystrate formations and potholes from the aspect of a model called rock disintegration to account for these features in the geologic record. Earlier he (1977a, pp. 47-52) suggested that kames and eskers could be explained by the same mechanism rather than glaciation. Burdick (1978, pp. 222-224) offered evidence of glaciation in Wisconsin.

General

Keith (1977, pp. 24-26) offered some insights into the life and writings of H. J. Massingham, an English writer. The author considered Massingham to be a Christian ecologist. A report on the research being sponsored by the Society was outlined by Williams (1977, p. 125). Neilson (1977, pp. 180-182) noted some creationist scientific disciplines that could be considered certain whereas others are open to uncertainty. A study of *Beowulf* by Rooster (1978, pp. 221-222) indicated possible "evidence of a universal flood and subsequent dispersion" (p. 221). Also this volume of the *Quarterly* contained several notes, book reviews and letters to the editor.

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MINUTES OF 1993 CREATION RESEARCH SOCIETY BOARD OF DIRECTORS MEETING

On Thursday, 20 May 1993, a meeting of the Executive Committee was held at the Grand Plaza Hotel, Grand Rapids, Michigan, from 2000 to 2235 hours to set the agenda for the committee meetings on Friday. On Friday, 21 May 1993, between the hours of 0800 and 1700, the Constitution/Bylaws, Financial, Publications, Quarterly Editorial and Research Committees held meetings. The Chairman of each committee recorded the business in preparation for the Saturday business meeting.

Friday evening open meeting of the Creation Research Society was held in the ballroom of the Amway Grand Plaza Hotel, Grand Rapids, Michigan. Dr. Wayne Frair, President, opened the meeting by reading from Job 12:7-10 and noted that a study of nature provides a direct view of God's handiwork.

Dr. John Meyer, Director of the Van Andel Research Center, introduced Mr. Jay Van Andel, one of the co-founders of the Amway Corporation. Mr. Van Andel welcomed the audience to the hotel and expressed pleasure that the CRS Van Andel Research Center which is currently under construction at Chino Valley, Arizona, will help to advance creation science. Dr. Meyer showed slides of the Center being built and discussed the following research projects to be conducted in the future: cross-bedding and footprints in Coconino Sandstone, rapid stalactite formation in caverns, pine pollen in Precambrian Hakatai shale and a short-wave radio study on the origin of meteors.

Dr. Emmett Williams, Research Committee Chairman, showed slides of various silicified and charcoalified wood specimens collected by permit at Big Bend National Park, Texas. Dr. Eugene Chaffin, Vice President, showed slides of supposed overthrusts in mountains of southwest Virginia. Dr. Donald DeYoung, Editor of the CRS Quarterly, presented an illustrated talk about the meteor crater in Arizona for which several different "ages" have been calculated using various methods of dating. CRS Board Member Dr. Russell Humphreys gave a presentation on how relativity might explain a young universe that appears old from the earth. CRS Board Member Dr. Duane Gish detailed the legal aspects surrounding the near closure and subsequent reinstatement of the Institute for Creation Research Graduate School in San Diego, California. The meeting was adjourned at 2145 hours for refreshments, book sales and social discourse.

On Saturday, 22 May 1993, the closed business meeting of the Board was called to order at 0800 hours.

Present: T. Aufdemberge, D. Boylan, E. Chaffin, D. DeYoung, W. Frair, R. Gentet, D. Gish, G. Howe, R. Humphreys, D. Kaufmann, J. Klotz, L. Lester, J. Meyer, D. Rodabaugh, E. Williams, G. Wolfrom, P. Zimmerman.

The minutes of the 1992 meeting were read and accepted. Secretary Kaufmann reported that the following were elected to the Board for a three-year term: T. Aufdemberge, D. Boylan, W. Frair, R. Gentet, G. Howe. It was passed that the Secretary send a letter of appreciation to Dr. W. Rusch for his many years of service to the CRS and the cause of creation.

The Financial Secretary's report by Zimmerman was given as follows: the building program is proceeding using money from the Van Andel grant. The Treasurer's report by Meyer was given as follows: total income for 1992 was \$130,153.38. Total expenses for 1992 were \$154,306.46.

The membership report by Wolfrom was given as follows: total membership for 1992/93 was 1716 (651 voting, 705 sustaining, 325 subscribers and 35 students). Editor DeYoung reported that we published 50% of submitted articles, 100% of book reviews, 100% of Panorama notes and 67% of letters to the editor for a total of 73 items published.

The research report by Williams was given as follows: two proposals have been approved; "Ultrastructure of Arthropods" by R. Lumsden and "Rhythmite Deposits in Eastern Washington" by M. Oard. It was passed that the Van Andel Research Center (VARC) and its Director were primarily established/hired to provide publishable data (information) for *CRSQ*. All work/equipment/field work financed by the CRS are expected to be written and published in the *CRSQ*. If anyone wishes to publish their finding in other journals/conferences then they must pay for the use of the VARC and the services rendered. This payment must be provided in advance of the service rendered.

The constitution/bylaws report by Boylan was given as follows: all Board members have been issued copies of the Constitution/Bylaws and Position Descriptions for each Officer/Chairperson. It was passed that Lester be responsible for developing a questionnaire to be sent to our members. The publications report by Howe was given as follows: the storage of books will be relocated to the VARC. Chaffin will continue to review John Reed's proposed video on creation. No CRS booklet proposals have been approved as yet. It was approved to allow Linn Carothers to publish a low-

cost English edition of *Why Not Creation* in Russian speaking countries. It was approved to distribute Tom Barnes' new book on science and the Bible. The quarterly/editorial report by DeYoung was given as follows: a meeting was held with the printer and agreement was made on some cost cutting measures. It was passed that the Board express its appreciation to Editor DeYoung for five years of past service and Associate Editor Williams for ten years of past service in publishing the CRSQ.

The financial report by Zimmerman was given as follows: it was recommended that 1) the Board develop and follow procedures for responsible accountability: a) develop a line item budget for each activity, especially the Director of VARC, b) no spending of funds unless specifically authorized in the budget or with approval of Supervisor/Chairman, c) require full disclosure of all expenses; and 2) request Treasurer to develop a voucher for use in processing expenses including categories, budget reference, approval and documentation.

It was passed that the Secretary send a letter of appreciation to Dr. John Klotz for his past 30 years of service to the CRS and the cause of creation. It was

passed to nominate E. Chaffin, L. Lester, D. Rodabaugh and G. Wolfrom for the 1994 Board of Directors election. Dr. Richard D. Lumsden was also nominated for the above slate. A budget for the VARC for 1994 was passed. It was passed that the issue of joining the Evangelical Council for Financial Accountability be determined by the Executive Committee.

It was passed that officers be nominated and elected by secret ballot. The following officers were elected for 1993/94: President, W. Frair, Vice President: D. DeYoung, Secretary: D. Kaufmann, E. Chaffin was appointed Editor and G. Howe was appointed Associate Editor of the CRSQ for the 1994/95-1998/99 five year term.

It was passed that the 1994 Board of directors meeting be held at Chino Valley, Arizona. Rodabaugh was appointed Program Chairman for the Friday night Mini-Symposium at our 1994 meeting at Chino Valley, Arizona. It was passed to increase all categories of dues except patron and life by two dollars each effective 1994/95 publishing year.

The meeting was adjourned at 1520 hours.

David A. Kaufmann
Secretary.

FOSSIL WOOD OF BIG BEND NATIONAL PARK, BREWSTER COUNTY, TEXAS: PART III — CHEMICAL TESTS PERFORMED ON WOOD

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Abstract

Various tests were performed on samples of wood collected from the Dawson Creek region of Big Bend National Park. No radiohalos were found in the charcoalified material. No C-14 was detected in a charcoalified wood sample. The silica content of the silicified wood specimens was found to be generally greater than 90%. Comments and a discussion of the test results are offered on the nodular objects found in and around a clay mound. All data were interpreted within a Diluvialist model where possible.

Key Words: Charcoalified Wood; Silicified Wood; Energy Dispersive X-Ray Analysis; Dawson Creek, Big Bend National Park.

Introduction

The formations in which fossil wood was found in the Dawson Creek area of Big Bend National Park were discussed in Part I (Williams and Howe, 1993). Also the importance of bentonite deposits in relation to the silicification of wood was presented and applications were suggested within a tentative catastrophist model. A theoretical model for the silicification of wood was elucidated in Part II (Williams, 1993). Possible rapid burial and silicification were discussed within the framework of a young earth model. An examination of autochthonous and allochthonous deposition of wood at various locations was included in Part II.

This part contains the results of the tests conducted on the wood samples (a search for radiohalos, C-14 dating measurement and various chemical analyses).

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Charcoalified Wood Samples

A fossil wood limb or small diameter log (Figure 1) was found buried approximately 20 feet deep at the base of a bentonite mound. The outside of the limb was mineralized (Figure 1c) whereas the interior was charcoalified (Figure 1d). Other smaller pieces of charcoalified wood were found in the mound (Figure 2) in "lenses" or layers about four feet apart vertically.

A specimen of charcoalified wood was subjected to a standard carbon analysis by a combustion technique and found to contain 59.2% carbon by weight. No elements were detected in an EDX (energy dispersive x-ray) analysis.* Since the lower detection limit is atomic number 10, carbon, oxygen and hydrogen would not be indicated if present. However the mineralized exterior (Figures 1c and 2), when analyzed by EDX techniques, revealed the presence of silicon, iron, sulfur, calcium, potassium and aluminum (Figure 3).

*For an introductory explanation of this technique, see Vaughan, 1989.

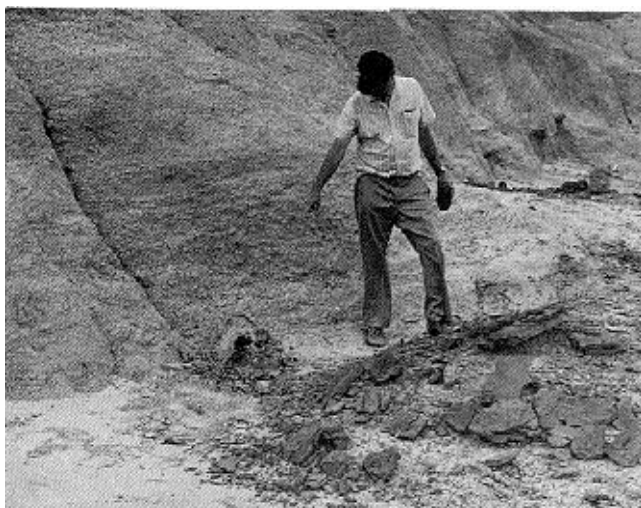


Figure 1a. Location of charcoalified wood limb (?) in bentonite mound. Emmett L. Williams is pointing to the specimen—Dawson Creek area, Big Bend National Park. Photograph by George F. Howe.



Figure 1b. A closer view of the charcoalified limb (~4 inches in diameter). Photograph by George F. Howe.



Figure 1c. Another view of fossil site—charcoalified interior of limb with pieces of the mineralized exterior shown to the right of the 5.5-inch mechanical pencil. Photograph by George F. Howe.

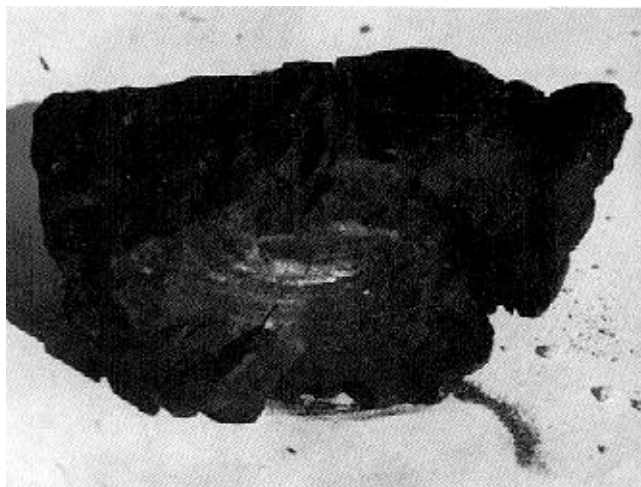


Figure 1d. Charcoalified interior of limb. Photograph by George F. Howe.

No Radiohalos Detected

Thin sections of various charcoalified wood samples were prepared and examined by Robert Gentry of Earth Science Associates. He found no radiohalos in any of the thin sections as was found in coalified wood samples he had examined in previous studies (Gentry, et al., 1976). He writes (1991):

... thin sections ... were microscopically examined for radioactive halos and/or radioactive staining ... no visual evidence of staining from radioactivity was found. The obvious conclusion is that uranium and its daughters are not present in the specimens in sufficient quantities to have caused discoloration as seen in many coalified wood specimens from the Colorado Plateau and Chattanooga shale.

Radiocarbon Age Measurement

A sample of charcoalified wood was subjected to a radiocarbon age determination. The specimen was cleaned to remove dirt and other foreign material and



Figure 2. Small piece of charcoalified wood with mineralized exterior seen above the hammer. This fossil was found higher in the same bentonite deposit as in Figure 1. Photograph by Emmett L. Williams.

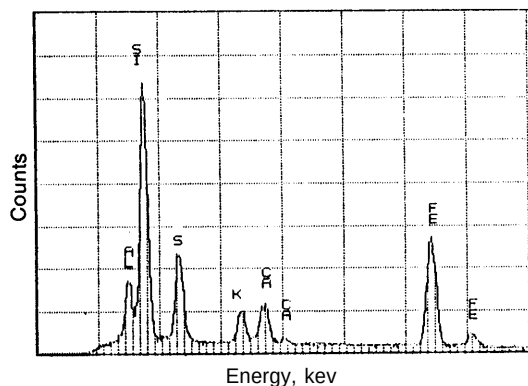


Figure 3. EDX spectrum of mineralized exterior of charcoaled wood; Si—silicon, Al—aluminum, S—sulfur, K—potassium, Ca—calcium, Fe—iron.

then was split into small pieces. It was treated with hot dilute hydrochloric acid to remove any carbonates and then treated with hot dilute sodium hydroxide to remove humic acids and other organic contaminants. After washing and drying, the pieces were combusted to recover carbon dioxide for the analysis. No C-14 was detected, thus the age according to the Libby method (equilibrium model) was greater than 42,000 C-14 years BP.* Using the nonequilibrium model, the age telescopes to approximately 5350 years BP (Brown, 1992). Also a recent article on the nonequilibrium model of C-14 age determination (Whitelaw, 1993) may be of interest to the reader.

Infrared Spectrum

An infrared spectrum was obtained from a sample of the charcoaled wood dried for approximately 82 hours over calcium sulfate in a dessicator and then pressed into a KBr pellet. The resultant spectrum, shown in Figure 4, is similar to Cope's spectrum 5e (1979, p. 670) of a Mesozoic charcoaled phytoclast,** except that there is more OH stretching absorption from our sample. A discussion of this spectrum is contained in Appendix I.

Speculations Concerning the Charcoaled Wood Limb

The carbon content (59.2%) of our charcoaled wood sample is lower than any of Cope's Mesozoic charcoaled phytoclasts (Cope, 1979, p. 666) by about eight percent. Thus the presence of more oxygen and hydrogen in our sample would result in greater absorption of incident infrared radiation in the OH stretching frequency range.

When wood is pyrolyzed, gases such as carbon monoxide, methane and hydrogen as well as tars are produced in the temperature range of 280-500°C (Cope and Chaloner, 1985, p. 258). Likely our sample was not exposed to as high temperatures as the ones analyzed by Cope. Thus not as much oxygen and hydrogen were released during natural pyrolysis of the limb and this is reflected in a lower carbon content. The more decomposition of wood achieved during pyrolysis, the higher the carbon content of the remaining charcoal.

*Radiocarbon age determination was performed by Geochron Laboratories Division, Krueger Enterprises, Inc., Cambridge, MA.

**Organic particles which show evidence of plant origin and behave as discrete clasts during sedimentation.

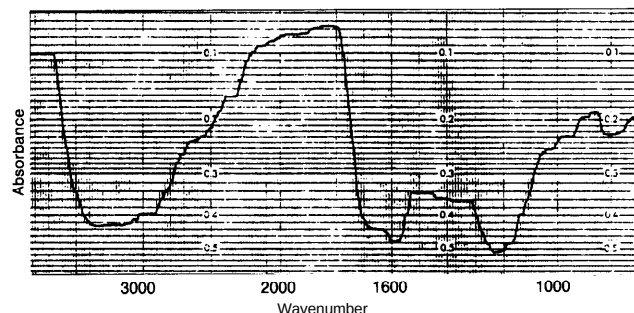


Figure 4. Infrared spectrum of charcoaled wood sample.

In analyzing artificial charcoals produced from Sequoia wood (Cope, 1979, p. 667), the following carbon composition vs. pyrolysis temperatures were found (Table I). We can conclude from these data that the interior of the charcoaled limb reached temperatures between 320 and 360°C during natural pyrolysis.*

Table I. Carbon Content of Dry Wood and Artificial Charcoal (Sequoia Wood) (Cope, 1979, p. 667).

Specimen	Carbon Content (weight percent)
Sequoia wood, dry	47.8
Sequoia wood pyrolyzed to 300°C	55.2
Sequoia wood pyrolyzed to 400°C	65.5

Assuming the reliability of the laboratory procedures in the determination of radiocarbon content and the accuracy of the nonequilibrium calculation, the charcoaled limb (Figure 1a) possibly was from a pre-Flood or early post-Flood tree. It could have been deposited at or near the site of discovery by receding Flood water or during a period of post-Flood erosion and transport (after-effects of the Flood). Eventually (likely very quickly after deposition) the limb may have been exposed to hot volcanic gases and/or hot falling volcanic ash.** Absorbed water was expelled and the interior of the limb was baked at temperatures slightly above 300°C. The exterior of the limb was subsequently mineralized. This mineralization combined with burial under bentonite prevented water penetration and later silicification, preserving much of the interior structure of the wood. This speculation is offered as only one of the several possibilities of how the charcoaled wood was formed and buried at this location.

Origin of Fossil Charcoaled Wood

This type of fossil wood is referred to as fossil charcoal or fusain by Sander and Gee (1990) who stated that:

Although its origin was formerly in dispute, it is now clear that fusain is the result of wildfire and does provide an additional source of paleobotanical information. Through charring, wood is rendered into an excellent preservation state . . . (p. 269).

Herendeen (1991a; 1991b) labeled fusinized wood as charcoaled wood and we prefer this designation.

*As can be observed in Figure 1c, a shrinkage of interior wood structure occurred probably during pyrolysis. See McGinnis et al., 1974 for an investigation of artificially charcoaled wood and their discussion of the shrinkage of cellular dimensions as a result of pyrolysis.

**See Austin, 1984, pp. 87, 89 for a brief discussion of the temperatures that can be attained by ash blown from a volcano.

Earlier Schopf (1975, pp. 44-45), in discussing fusinized plant tissue, made the following comments on the concept that fusain is a result of fires:

The prevalence of the minor proportion of fusain and the fact that fusain is most abundant in Paleozoic coals (4-15 or 20%) and least abundant in Tertiary coals (1 or 2%) does not seem to favor origin by fires. The charcoal theory of origin of all fusain is principally objectionable because it is commonly taken to be an indication of periodic drouth [sic] and a susceptibility of vegetation to conflagration for which all other evidence is lacking. But if forest fires were such a consistent element of the ancient environment, surely other clear indications of heating also would be found. Instead of this we find resinous bodies, for example, variously preserved. Some of those which may even be closely associated with fusain are scarcely altered. Others obviously are fusinized, just like some of the cellulosic and lignocellulosic tissues. For some and probably for the majority of the occurrences of fusain, the forest fire origin seems ruled out (p. 45).

However, as noted at the beginning of this section, the generally accepted mechanism for the formation of fossil charcoal is wildfire. Also as noted there has been controversy concerning the origin of fusain. See Cope, 1979 for a brief discussion of the "fire" vs. "non-fire" origin proposals for fusinite. M. J. Cope and W. G. Chaloner have promoted the fire origin hypothesis for the material as well as performed many studies on charcoalified wood (i.e., Cope, 1979; Cope and Chaloner, 1980; Cope and Chaloner, 1985; Chaloner, 1989). They claimed:

[Fossil] Charcoal results from incomplete combustion of plant tissues . . . and is a common product of natural wildfires (forest fires). . . . Such burning has three essential requirements: (1) a suitable fuel, (2) an ignition source, and (3) the necessary level of atmospheric oxygen to support combustion. Suitable natural ignition sources are lightning strike, volcanic activity, meteorite fall, spontaneous combustion and sparks due to a rock fall (Cope and Chaloner, 1980, p. 647).

Another piece of charcoalified wood has been found about seven miles southwest of our collection site at Rattlesnake Mountains in Big Bend National Park and reported by Sander and Gee, 1990. We suggest that due to the post-Flood volcanic activity in the Big Bend area, the likelihood of finding fossil charcoalified wood is high.

Chemistry of Silicified Wood

Sections (Figures 5 and 6) of silicified logs as well as fragments of disintegrating logs were found in the collecting area* (shown in Figures 1a and b of Williams and Howe, 1993, p. 49). A typical EDX spectrum of

*The silicified wood generally is located in steeply-sloped bentonitic clay deposits (mounds or rounded knobs) well above the desert pavement. During periods of erosion the logs are exposed as the sediment is washed away. Continued erosion causes the wood to slide or tumble down the steep slopes to the base of the mound. Sometimes the logs are located some distance away from the base of the clay mounds. Weathering causes the exposed logs to break into various-sized fragments.

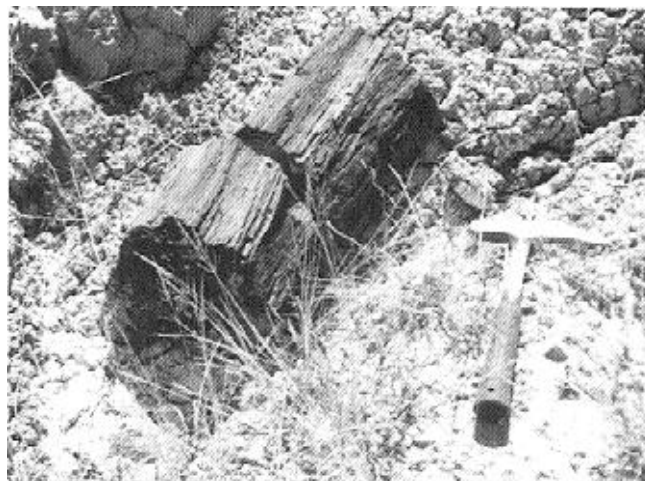


Figure 5a. Silicified sections of logs at the base of a clay mound. Recent erosion caused the sections to be washed from a higher position in the mound—Dawson Creek area, Big Bend National Park. Photograph by Emmett L. Williams.

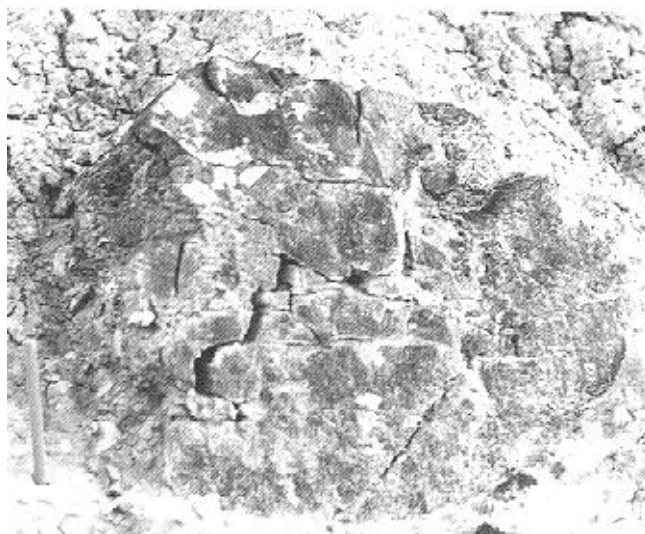


Figure 5b. Exposed end of silicified log found approximately 30 feet above the base of a clay mound—Dawson Creek area, Big Bend National Park. Photograph by George F. Howe.

pieces of this wood is given in Figure 7. The major constituent is silicon (indicative of a high SiO_2 content) with trace amounts of aluminum, sulfur, potassium, calcium and iron. The silica (SiO_2) content of these specimens varied between 94 and 96%. Quartz, containing 96-97% silica, was deposited in fissures in some of the silicified logs (Figure 8, this report; also see Figure 1, Williams, 1993). A translucent specimen of silicified wood with more visible structural detail (Figure 9) was studied. Only silicon was indicated on the EDX spectrum (Figure 10) and the silica content of the sample was found to be 93-95%.

Lighter-colored specimens were found in the collecting area shown in Figure 1c of Williams and Howe, 1993, p. 49. A typical disintegrating section of fossil wood can be seen in Figure 11. Specific pieces are shown in Figure 12. An EDX analysis revealed mainly silicon with traces of magnesium and aluminum. The silica content obtained from two determinations was



a.



b.



c.

Figure 6. Exposed disintegrating silicified logs—Dawson Creek area, Big Ben National Park. a. Photograph by Glen W. Wolfrom, b. and c. Photographs by Emmett L. Williams.

approximately 85 and 96%. The silica content of the various samples is given in Table II and the procedure for the analysis is given in Appendix II.

Calcified Wood or Mineral Nodules?

In the collecting area, shown in Figure 1c of Williams and Howe, 1993, p. 49, several rounded, nodular-like objects (Figures 13-15) were scattered over the desert pavement, evidently exposed by erosion of a clay mound. Assuming these objects to be specimens of silicified wood we found, however, that they contained only 4-5% SiO₂ (Table II). An EDX analysis (Figure 16)

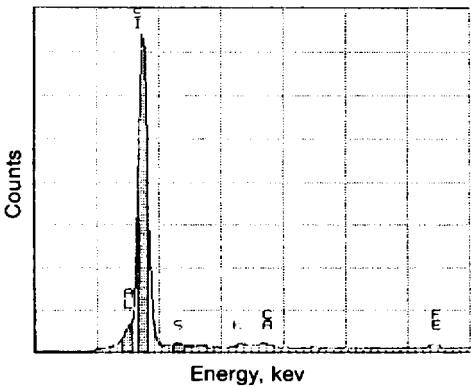


Figure 7. EDX spectrum of silicified wood fragments; Si—silicon, Al—aluminum, S—sulfur, K—potassium, Ca—calcium, Fe—iron.

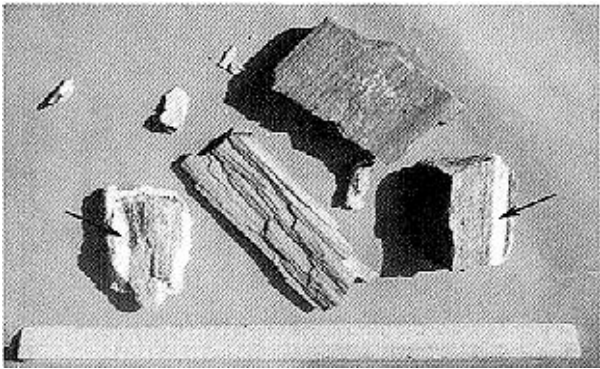


Figure 8. Fragments of silicified wood containing infiltrated quartz (white areas indicated by arrows). Photograph by Emmett L. Williams.

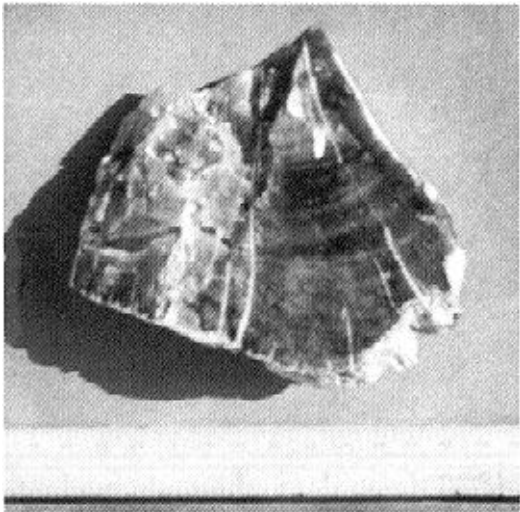


Figure 9. Translucent silicified wood fragment—Dawson Creek area, Big Bend National Park. Photograph by Emmett L. Williams.

Table II. Silica Content of Silicified Wood From the Dawson Creek Region of Big Bend National Park.

Specimen Designation	Reference Photographs	Weight Percent SiO ₂
19—dark brown pieces	Figures 5 and 6	94.85 ± 1.07
19—infiltrated quartz	Figure 8	96.82 ± 0.50
19—translucent specimen	Figure 9	94.12 ± 1.61
25—light brown fragments	Figures 11 and 12	90.72 ± 8.03
CN—calcified wood/nodules?	Figures 13,14 and 15	4.8 ± 0.5

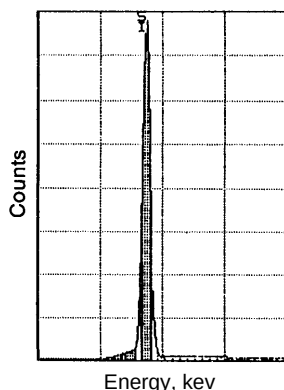


Figure 10. EDX spectrum of translucent silicified wood fragment.



Figure 11. Fragmented silicified wood—Dawson Creek area, Big Bend National Park. Photograph by Glen W. Wolfrom.

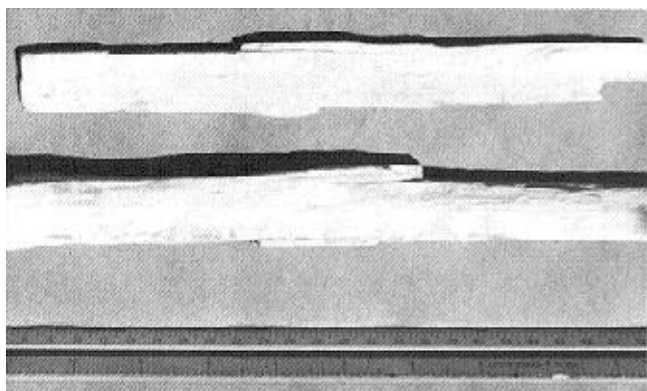


Figure 12. Individual pieces of the wood shown in Figure 11. Photograph by Emmett L. Williams.

showed an unusually high calcium content. Further chemical analysis indicated a calcium oxide content of 51-52% which converts to 91-93% CaCO_3 . Density measurements and dry ashing of samples at 900°C indicated that this 91-93% estimate is essentially correct. The procedure for the analysis for calcium oxide (CaO) is given in Appendix III.

Since the silica content of the rounded objects was low, initially it was decided they were indeed mineral nodules. Maxwell, et al. (1967, pp. 88, 91), in discussing the Javelina formation reported the presence of:



Figure 13a. Disintegrating rounded nodules on desert pavement near clay mound. Photograph by Emmett L. Williams.



Figure 13b. Fragments from another rounded nodule. Photograph by George F. Howe.

... impure concretionary-like nodules of calcium carbonate, $\frac{1}{4}$ inch to $2\frac{1}{2}$ inches across with a few up to 8 inches across. They have rough surfaces and some nodules have radiating interior structures or shrinkage cracks commonly filled with calcite.

The rounded nodules (?) we studied definitely have a radiating interior but some do not have a particularly rough surface. The nodules (?) examined are in various states of preservation—some can be broken apart by hand, whereas others can be broken apart only with the use of a hammer.

When pieces of the rounded objects were subjected to scanning electron microscopy at magnifications of 1000X, possible wood-like structures were detected. (A discussion of the microscopic structure of all of the specimens will be presented in Part IV of this series.) At this time we have reached no definite conclusions as to whether the material is fossil wood or mineral nodules. Representative samples of all of the various materials collected [charcoalified wood, silicified wood and calcified wood/nodules(?)] have been sent to Dr. Elisabeth Wheeler of North Carolina State University, an authority on the structure of wood, for identification.



a.



b.

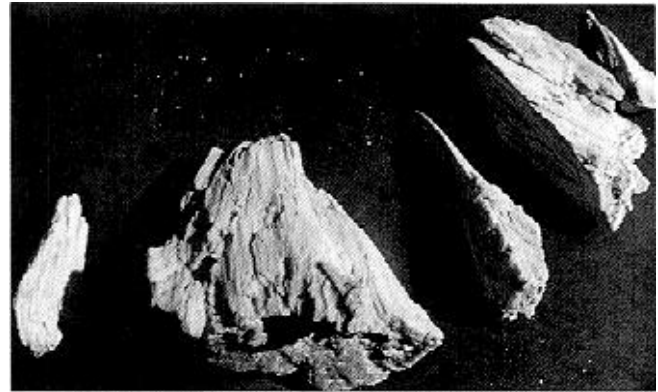
Figure 14. Close-up views of disintegrating nodules. Photographs by Glen W. Wolfrom.

Conclusions and Conjecture

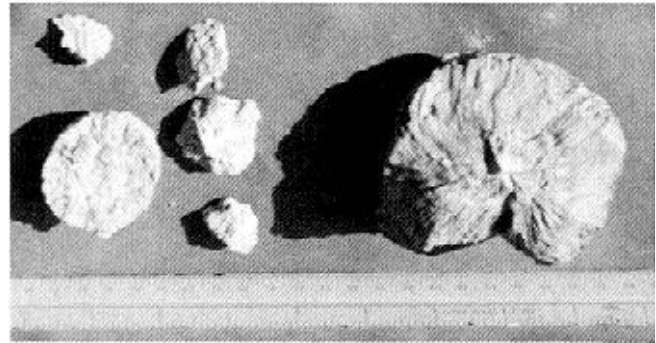
The chemical analyses of fossil wood samples from the Dawson Creek area of Big Bend National Park have been reported in this article. The silicified specimens usually contain over 90% silica. Smaller amounts of other elements present in the samples could have come from the overlying clay, or could have been introduced into the fossils during a period of intense volcanic activity after the Flood. For instance, sulfur could have entered the deposited wood as dissolved sulfur dioxide since SO_2 is emitted from active volcanos.

The carbon content of the charcoalfied specimen we analyzed indicates that the interior of the wood was subjected to temperatures in the range of 300-400°C. An interesting riddle is why some of the wood in this area is silicified, while some is charcoalfied. We attempt an answer based on a Flood model. Assuming all of the wood was transported to the Dawson Creek area by receding Flood water, some of the wood was left exposed (not covered by sediment) and was subjected to burning or baking (under a covering of settling hot volcanic ash) during a period of post-Flood volcanic activity. Later post-Flood reworking during possible transgression and regression cycles could have buried the once exposed wood.

Other logs could have been buried under silica-rich sediments by receding water and not exposed to any



a.



b.

Figure 15. Fragments from nodules. a. Photograph by George F. Howe, b. Photograph by Emmett L. Williams.

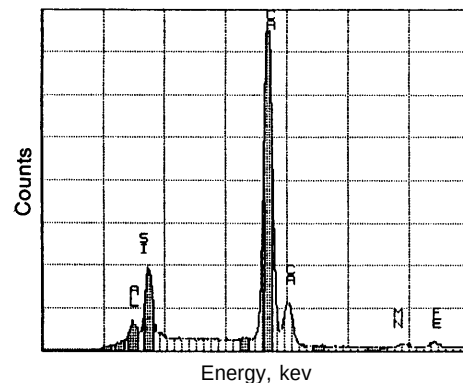


Figure 16. Typical EDX spectrum of calcified wood/nodule? CA—calcium Si—silicon, Al—aluminum, Mn—manganese, Fe—iron.

pyrolysis during the volcanic activity. These samples could have silicified later during a postulated post-Flood period of high precipitation. As noted in Part II of the series, rapid silicification of wood is definitely possible. The authors realize the tentative nature of these suggestions and that other explanations could account for the field evidence.

Acknowledgments

Bryan Vogt, Chemistry Department, Bob Jones University graciously performed the infrared spectroscopy on a sample of charcoalfied wood. The following people offered helpful comments on the manuscript: Robert H. Brown, Larry Helmick, Glen Wolfrom and John Woodmorappe. The opinions expressed in this paper remain solely those of the authors. The authors

thank the many donors to the Creation Research Society Research Fund, interest from which financed a portion of these studies. Appreciation is expressed to personnel of the Southwest Region of the National Park Service and personnel of Big Bend National Park for allowing us to collect the various fossil wood specimens.

Appendix I

Analysis of Infrared Spectrum of Charcoalified Wood

The theory of absorption of infrared radiation by characteristic molecular vibrations can be studied in various treatises, e.g., Nakamoto, 1970. The principal absorptions shown in Figure 4 are likely a result of the following characteristic vibrations (Cope, 1979, p. 671; Nakamoto, 1970, p. 322):

3500-3000 cm ⁻¹	OH stretching
3050-2850 cm ⁻¹	CH stretching
2920 and 2850 cm ⁻¹	aliphatic CH ₂ stretching
1700 cm ⁻¹	C=O stretching
1600 cm ⁻¹	C=C stretching in aromatic rings and polyaromatic structures
~ 1200 cm ⁻¹	C-C skeletal vibrations, C-OR stretching, C-OH deformation
~ 800-740 cm ⁻¹	aromatic CH bending, out-of-plane CH bending

Cope (1979, p. 671) noted that "... charcoalified clasts ... differ from the coal fusinites by the presence of absorptions corresponding to aliphatic CH₂, C=O and OH groups." Thus infrared spectra along with other analytical data can be used to differentiate charcoalified wood from coal fusinite. Likewise an absorption of infrared radiation in the 800-740 cm⁻¹ range indicates charcoalified wood rather than natural or artificial charcoal.*

Appendix II

Analysis for Silicon Dioxide

1. Specimens were ground to a fine powder and dried at 110°C for one hour.
2. The mass of the powder analyzed ranged from 0.1 to 0.6g and was digested either in fuming nitric acid or aqua regia in a digestion bomb at 150°C for one hour.
3. After digestion, the liquid was transferred to a porcelain crucible and treated with concentrated hydrochloric acid.
4. The sample was evaporated to dryness at 150°C in order to dehydrate any soluble silicates.
5. The residue was redissolved in concentrated hydrochloric acid, filtered and rinsed with deionized water.
6. The sample and ashless filter paper were charred then ignited at 1000°C for one hour.
7. The sample was cooled and weighed. This remainder was reported as percent SiO₂.

*Dr. Larry Helmick (personal correspondence, 1993) offered the following comments:

A strong, broad IR absorption band from 2500 to 3666 cm⁻¹ is very typical of hydroxyl groups of carboxylic acids. Strong absorption at 1766 and 1266 is also typical of C=O and C-O stretching of carboxylic acids, which further supports the presence of a carboxyl group. Spectra with strong OH stretching absorption bands should also exhibit OH bending bands, which might account for the weak band at about 800 cm⁻¹.

Appendix III

Chemical Analysis for Calcium Oxide

1. Half-gram samples were weighed to the nearest 0.1 mg.
2. Ten ml of 12M HCl were added to each sample and the sample was sonicated until dissolution appeared to be complete.
3. A 10 ml aliquot of solution was transferred to a conical flask and 15 ml of NH₃-NH₄Cl buffer, 50 mg of ascorbic acid and 10 ml of a solution, 0.4 M in NaCN and 0.75 M in triethanolamine as well as 4 to 5 drops of 0.1% calmagite, were added.
4. This solution was titrated with a 0.015 M EDTA solution which had been standardized against primary standard CaCO₃.

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BOOK REVIEWS

Michael Faraday — Sandemanian and Scientist by Geoffrey Cantor. 1991. St. Martin's Press. New York. 359 pages. \$45.00.

Reviewed by Don B. DeYoung*

Geoffrey Cantor is Professor of Science History at the University of Leeds, England. He has given us a look at the Christian motivation behind Faraday's scientific research — a topic ignored in almost every textbook.

Michael Faraday (1791-1867) was the son of a poor blacksmith in London. He never had formal schooling, but nevertheless grew to become perhaps the greatest experimentalist of the 1800s. At age 20 he attended the public lectures of chemist Humphry Davy. Faraday then presented Davy with a neatly bound copy of the lecture notes (a success tip for students!). Davy immediately hired Faraday as a laboratory assistant, which began a career that eventually eclipsed that of Davy himself. Faraday's accomplishments include the discovery of benzene, liquefying of chlorine, and the alloying of steel. More important, he discovered the force relationships between electricity and magnetism, and constructed the first electric motor. Faraday coined many new terms such as *cathode* and *electrolysis*. James Clerk Maxwell, an admirer, later translated Faraday's empirical *lines of force* into mathematical *fields*.

Faraday's life centered around a group which he called "a very small and despised sect of Christians, known, if known at all, as Sandemanians" (inside front cover). This conservative group, somewhat similar to the Quakers or Plymouth Brethren, numbered 600 in England; a remnant still exists today. Author Cantor initially expresses surprise that a fundamentalist could become a leading scientist (p. viii). He then goes on to show that Faraday's success derived *from* his biblical position, not in spite of it.

Faraday believed the foremost rationale for science was that it displayed the structure of the Creation and thereby glorified the Creator (p. 195). Thus he was strongly motivated by the noble search for order in nature. To share his enthusiasm, he gave brilliant public demonstration-lectures which drew standing crowds. Many called it a worship experience.

Faraday belonged to the Royal Society, and was offered its presidency in 1858. He declined on the basis of pietistic principle — he did not like pompous titles! Faraday rubbed shoulders with geologist Charles Lyell and also Charles Darwin. However, he was not pulled into their values or evolutionary speculation; his strategy was silence. He had his own agenda for creation research, and was unfazed by others. Faraday left no written comments on how he interpreted Genesis, although the Sandemanian view would certainly be literal. Incidentally, the most marked book in Faraday's well-worn Bible was Job. The science of Faraday's era was not aloof and opposed to religion, as so often true today. Faraday would certainly find present-day science trends morally unattractive.

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The study of Faraday's life is refreshing: no scandals, a successful marriage, and a consistent Christian kindness that was applied to everyone without exception. His life clearly shows that true science is not opposed to revealed theology. I was encouraged by Cantor's fair treatment of Faraday. Although Cantor readily states that he himself is not (yet!) a Christian, great respect is shown for the sterling life of scientist Michael Faraday.

*In the Minds of Men** by Ian T. Taylor. 1992. TFE Publishing. Toronto. 498 pages. \$25.00.

Reviewed by Clifford L. Lillo**

Many books on creationism have concentrated on one or two aspects of the subject, and the creationist would need to read them all to gain the full picture. However, Ian Taylor has managed to cover the whole gamut of creation science as well as to relate the evolutionary viewpoint to the social ills of today. He begins with a philosophical discussion of life after death and the observation that "experiences reported by individuals alleged to have returned from the dead lie beyond any proof" (p. 1). Because of this, "the acceptance of such accounts by others becomes a matter of faith" (p. 2).

Taylor next takes us briefly through the lives of Socrates, Plato, and Aristotle. Socrates, says Taylor, "believed profoundly that the universe is under the control of a single Divine Spirit, while the human soul is immortal and meets with judgment and retribution in the other world" (p. 5).

The author next details events preceding Darwin's theory, illustrating how Robert Malthus, Charles Lyell, and Alfred Wallace influenced Darwin's thinking. When Darwin published his *Origin of Species* in November 1859, he "believed that there would be found in the fossil record creatures that once existed at every stage of variation, not only as one species became another but as one major group became another" (p. 150). Since there was no evidence for transitional forms in the fossil record, "a massive effort began among the proponents of the theory to excavate fossils, particularly of the vertebrates, with the hope of finding transitional forms" (p. 150). They were not successful.

In every case, the creatures appear abruptly in the record, and so far as can be told from the fossil bones, each creature is in perfected form. The absence of transitions was a continuing problem for Darwin, as it still is to the paleontologists today (p. 151).

In the final chapters, Taylor shows how evolutionism has permeated all areas of study, forming the basis for Marx's socialism, Hitler's Aryan super race theories, and modern-day secular humanism. But this is not just a book on philosophy. The author covers the facts of creationism as well. Evidence is presented for a young earth, as indicated by the lack of extensive deposits of

*Editor's note: This book was reviewed previously by Don B. DeYoung. 1985. CRSQ 22:89-90.

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meteoritic dust on the earth, the very small amount of moon dust, the earth's decaying magnetic field, missing radiogenic helium, the rapid formation of stalactites and stalagmites, and Robert Gentry's polonium halos.

Taylor also reveals the truth about Ernst Haeckel's fraudulent drawings of embryos, the hoax of the Pilt-down man, and the deceit of Eugene Dubois in com-

bining an ape's skullcap with a human thigh bone found in a different place 10 months later and calling the mixture Java man. Because Ian Taylor has done such a thorough job in researching and reporting on efforts of evolutionists to make the theory acceptable to scientists, this is a book creationists should give to evolutionist friends.

An Interesting View on Glaciation (Quote)

There is currently a misconception, on the part of the younger generation of glacialists, that the ice front was bordered by a zone of bitterly cold climate. Actually the temperatures of the area bordering the front were probably little different from those of today at the same latitudes. Polar cold may have existed in the interior of the ice sheet but its terminal margin represented at every stage a balance between supply and melting. The floods of water that were released at the ice margins when the glacial epoch came finally to a close are clear evidence that the ice was not dissipated through dry, cold evaporation. The conditions instead were comparable to those existing today at the borders of the large ice fields of Alaska and Iceland.

von Engel, O. D. 1961. *The Finger Lakes region: its origin and nature*. Cornell University Press. Ithaca, NY. p. 8.

Quote

THERE IS A SHARP DIFFERENCE BETWEEN SCIENTIFIC CREATIONISM AND RELIGIOUS CREATIONISM

Scientific Creationism proposes:

- I. Special creation of the universe and earth (by a Creator), on the basis of scientific evidence.
- II. Application of the entropy law to produce deterioration in the earth and life, on the basis of scientific evidence.
- III. Special creation of life (by a Creator), on the basis of scientific evidence.
- IV. Fixity of original plant and animal kinds, on the basis of scientific evidence.
- V. Distinct ancestry of man and apes, on the basis of scientific evidence.
- VI. Explanation of the earth's geography by a world-wide deluge, on the basis of scientific evidence.
- VII. Relatively recent inception of the earth and living kinds (in comparison with several billion year theories), on the basis of scientific evidence.

Religious Creationism teaches:

- I. Divine creation of the heaven, stars, and earth by God, on the basis of Genesis.
- II. Application of the curse, pronounced by God after Adam's fall, to produce deterioration in the earth and life, on the basis of Genesis.
- III. Divine creation of plant and animal life, Adam the first man, and Eve from Adam's side by God, on the basis of Genesis.
- IV. Fixity of original plant and animal kinds, determined by God, on the basis of Genesis.
- V. Distinct ancestry of Adam and apes, on the basis of Genesis.
- VI. Explanation of the earth's geography by a world-wide flood in which only Noah, his family, and animal pairs were preserved in an ark, on the basis of Genesis.
- VII. Six thousand year time since creation of the earth, life, and Adam, on the basis of Genesis.

We are not trying to bring the Bible or Genesis (or religious creationism) into public schools. We are not trying to exclude evolution from public schools, unless creation is also excluded. We are asking public schools to be neutral between theories of the origin of the world, life, and man. We are asking public schools to present the scientific evidences for creation (or scientific creationism) along with the scientific evidences for evolution.

John N. Moore

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