

# Creation Research Society Quarterly

Haec credimus:

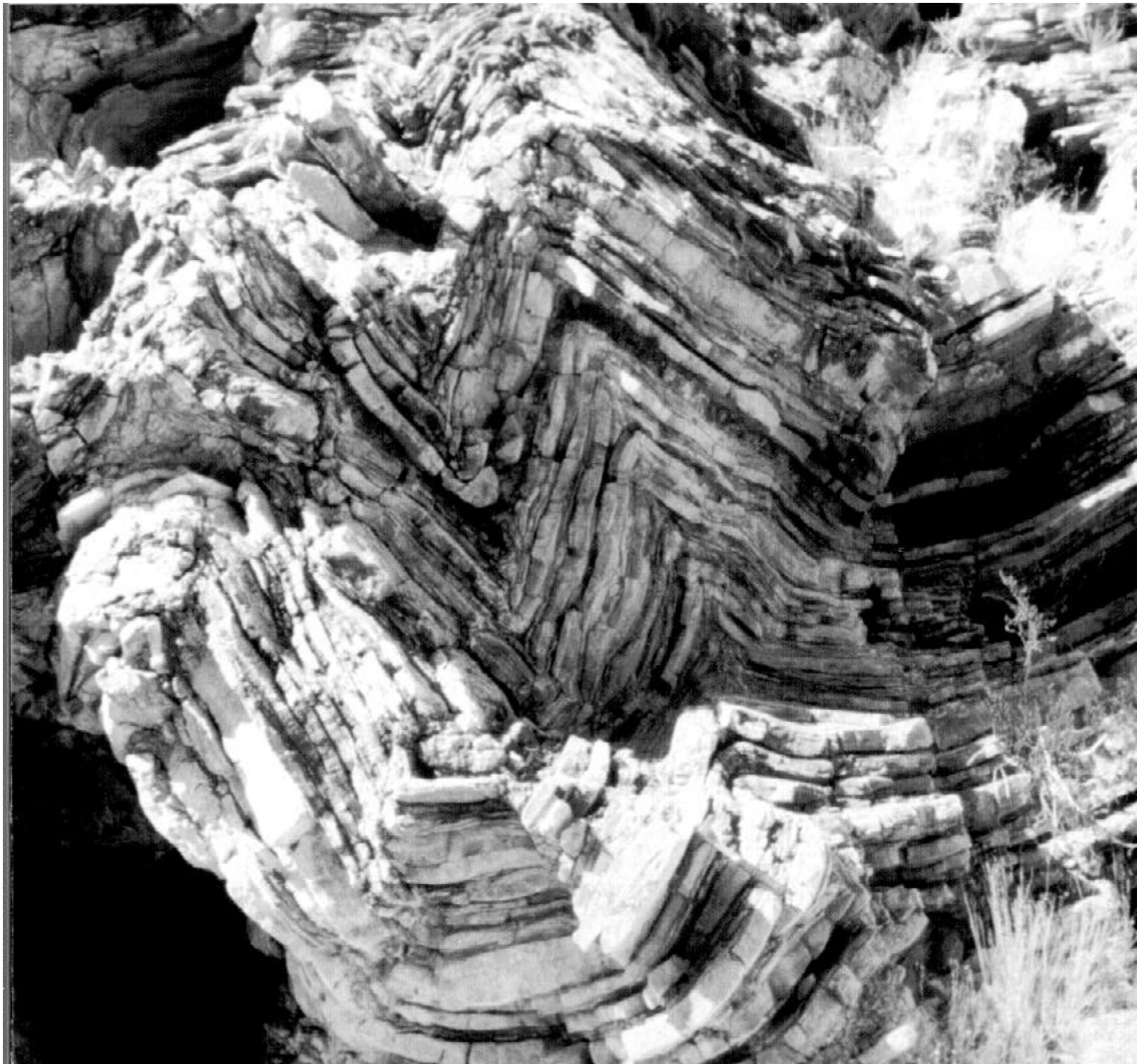
For in six days the Lord made heaven and earth, the sea, and  
all that in them is, and rested on the seventh. — Exodus 20:11

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# CREATION RESEARCH SOCIETY

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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.

### Quote

Alas for the besotted soul who cannot bend the knee of humble adoration before nature's altar, where sacrifices are offered to the Jehovah, pavilioned in invisibility. There is an ardent love of nature as far removed from gross materialism or subtle pantheism on the one hand as from stupid inappreciation on the other. There is such a thing as looking "through nature up to nature's God," notwithstanding the frightened denials of those who, shocked at the growing materialism of the age, would fain persuade this generation to walk blindfold through the superb temple a loving God has placed us in. While every sane and earnest mind must turn, disgusted and humiliated, from the senseless rant which resolves all divinity into materialistic elements, it may safely be proclaimed that genuine aesthetics is a mighty channel through which the love and adoration of Almighty God enters the human soul. It were an insult to the Creator to reject the influence which even the physical world exerts on contemplative natures. From bald, hoary mountains, and somber, solemn forests; from thundering waves and wayside violets; from gorgeous sunset clouds, from quiet stars and whispering winds, come unmistakable voices, hymning of the Eternal God—the God of Moses, of Isaac, and of Jacob. Extremes meet in every age, and in every department. Because one false philosophy would deify the universe, startled opponents tell us to close our ears to these musical utterances and shut our eyes to glorious nature, God's handiwork. Oh! why has humanity so fierce a hatred of medium paths?

Evans, Augusta J. (n.d.) Beulah. A. L. Burt. New York. pp. 234-235.

### Editor's Comments

We are starting our 30th year of publication of the Quarterly. I thank our authors, peer reviewers and proofreaders for their sacrificial efforts. No one, including the editors, receives financial remuneration for their work. There is no paid staff and we have published the Quarterly with volunteer help alone for 30 years! I encourage prospective authors to send us manuscripts, articles, notes and letters to the editor.

This Quarterly contains material on astronomy, geology and biology in the form of notes, articles and a continuing research series. Remember the Quarterly can only be as good as the manuscripts we receive. You can help us. Also encourage libraries to subscribe to the Quarterly. Scholarly creationist material must be readily available to students and other interested persons. I appreciate your efforts!

Don B. DeYoung

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## LETTERS TO THE EDITOR

### The Speed of Light

Jonathan J. Halliwell in *Scientific American* writes (1991, p. 76) that during the inflation following the Big Bang the universe expanded from  $10^{-28}$  centimeter to about one meter. Also he states that the inflation lasted some  $10^{-30}$  second. From these values the radial expansion was about  $1.67 \times 10^{22}$  times the speed of light!

John Boslough in *Stephen Hawking's Universe* states that "Within the first  $10^{-10}$  second after its birth, the universe had already grown to about the size of our solar system (p. 100)." It takes light about four hours to reach Neptune from the Sun. Again by simple arithmetic this makes the expansion of the universe during this time about  $1.44 \times 10^{14}$  times the speed of light.

We are told not to think of the universe as a sphere, but it is difficult to think of something expanding to a meter or a solar system in size from a point as not a sphere. That nothing can move faster than the speed of light is the basis of the "horizon problem" in the universe, stated in this *Scientific American* article and elsewhere. This is reminiscent of Barry Setterfield's work, whether or not there is any relevance.

I have written about this to outstanding evolutionary astronomers and cosmologists with whom I previously have had pleasant correspondence, with no replies. I would be interested in discussion and criticism.\*

#### References

- Halliwell, Jonathan J. 1991. Quantum cosmology and the creation of the Universe. *Scientific American* 265(6):76.  
Boslough, John. 1984. *Stephen Hawking's universe*. Morrow. New York.

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\*Readers may be interested in the Symposium that appeared in the Quarterly on "Variable Constants." See CRSQ 26:121-131; 27:6-15, 60-72, 98-105. Likewise a series of articles for and against a changing speed of light can be found in CRSQ 25:36-45, 84-95, 138-146, 190-197, 206-208; 26:30-33, 68, 138-143.

### Tree of Life

Writers (Anderson, 1992) who discuss the biological nature of unfallen man rarely, if ever, refer to the Bible's teachings concerning the Tree of Life (Genesis 2:9, 3:22). I offer the following line of reasoning for readers' consideration. Adam was never biologically immortal. If deprived of air, he would have died in minutes. If deprived of water or liquids from plants, he would have died in days. If denied ordinary food, the fruit of the many trees (other than the Tree of Life) of which he was permitted to eat (Genesis 2:9, 16-17), he would have died in weeks. Once he and Eve lost access to the Tree of Life, they died in a matter of years—930 years in Adam's case. Notice that Genesis 3:22 was said of Adam after he fell. Although a sinner, Adam could have put forth his hand, eaten of the Tree of Life, and lived forever.

In the original creation, God made provision to overcome at least four possible causes of death—oxygen deprivation, dehydration, starvation and aging. None of this contradicts the apostle Paul's statement that "by one man sin entered into the world, and death by

sin . . ." (Romans 5:12). Physical death was the consequence of Adam's sin in two ways. Aging, always biologically possible, was able to occur because man had lost access to the Tree of life. And the earth (and very likely the entire creation) was subjected to the curse, whose effects perhaps intensified after the Flood.

We can only guess what the fruit of the Tree of Life could have done for Adam's body. Maybe it repaired damage to DNA or cytoplasm. Maybe it prevented gene mutations. If more were known about aging, we might be able to make a better guess. Some might argue that in the original creation there was no need for such preventive capabilities, so God would not have created them. But we should think of the elaborate immune system that man and animals have. Surely this was part of the original creation. Its very existence suggests that it was needed even before man fell.

#### Reference

- Anderson, Albert S. 1992. Magnificent miracle: the virgin conception of Jesus Christ. *Creation Research Society Quarterly* 29:89-97.

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### Dinosaur Name

Reference is made to *brontosaurus* in the CRSQ book review concerning living dinosaurs (DeYoung, 1992, p. 158). Its correct name is actually *apatosaurus*, since 1986, when it was given a "new head" and a new name. The *brontosaurus*, like Piltdown man, never really existed.

#### Reference

- DeYoung, Don B. 1992. Review of *A Living Dinosaur?* CRSQ 29:158-159.

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### Speed of Light

Dr. Chaffin's (Chaffin, 1992) article is an excellent piece of research. The paper documents the improvements in programming the historical positions of Earth and Jupiter, and the application of this technology to determining the value of the velocity of light, *c*, from Roemer's early observations. It would also be interesting to see other data points such as Cassini (1693), Delambre (1738), Martin (1759), and Glasenapp (1861) reanalyzed.

There is one thing that puzzles me about Dr. Chaffin's new numbers. The old Roemer value reported in Pittsburgh (Chaffin, 1990) was 320,000 km/s, obtained from the minimization of the variance with respect to *c* as a variable. This is what is known as a maximum likelihood estimator (MLE). The least square regression should produce the same MLE. It is not apparent what has changed that would cause the MLE to change over 6 percent. Is the distance different, or the data selected for analysis? I am also curious as to why Chaffin's own experimental value of 300,000 km/s, also reported in

Pittsburgh in 1990, dropped only 1100 km/s while Roemer's dropped by over 20,000 km/s. Is there a reason why this large discrepancy should exist?

Chaffin's treatment of the 1879 Harvard value is dubious at best. This value is easily the best, since the data is obtained photometrically and has the most observations. Chaffin attempts to discredit it comparing it with Michelson's 1878 value which is 2.36 standard deviations above the current value of  $c$ . Unfortunately, this procedure could be applied to eliminate all his values.

Chaffin's example of the "tracking" phenomena illustrated in the values of the electron charge may be true for the electron but this does not prove it happened with the  $c$  values or that it is significant enough to negate Norman's (Setterfield and Norman, 1987) conclusions. Tracking should disappear with increased precision. The confidence levels of  $t$  tests on  $c$  data do not decrease as precision increases, even down to the 0.5 km/s error bar (Montgomery, 1992). Such persistence in confidence levels above 95 percent is inconsistent with Chaffin's views. Unless he can give examples, his tracking explanation is not credible.

Lastly, the reported standard deviation of 40 seconds is so large that it is not decisive in distinguishing between constancy and the Setterfield hypothesis. On a normal curve the current value of  $c$  is at the 53rd percentile while the retrodicted value of 301,500 km/s is at the 62nd percentile. While the current value is superior it is, statistically speaking, indecisive.

### References

- Chaffin, E. F. 1992. A determination of the speed of light in the seventeenth century. *Creation Research Society Quarterly* 29: 115-120.
- \_\_\_\_\_. 1990. A study of Roemer's method for determining the velocity of light. *Proceedings of the Second International Conference on Creationism*. Volume II. pp. 47-52.
- Montgomery, A. L. 1992. More evidence that the velocity of light is not a true constant. *Creation Ex Nihilo Technical Journal* 6(2): 173-184.
- Setterfield, B. and T. Norman. 1987. The atomic constants, light and time. Available from Lambert Dolphin, 1103 Pomeroy Ave., Santa Clara, CA 95051.

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### Reply to Montgomery

Alan Montgomery's letter provides a welcome opportunity to clarify the findings of my paper. It is true that my value for the speed of light associated with the seventeenth century data shifted between the results reported at the 1990 International Conference on Creationism and the new results reported in 1992. The reasons are described in the section titled "Improvement of the Goldstein Procedure" of the paper. One factor is the improved data on the position of Jupiter's pole which were incorporated into the calculations. Io orbits Jupiter approximately in the plane of Jupiter's equator. Knowing the position of the pole also pinpoints the plane of Io's orbit. These calculations also take into account the changes in the orbits of Jupiter and the Earth which take place over time. The 1992 results did not significantly change the shape of Jupiter's shadow

or the distances to Jupiter. But they did slightly change the part of the shadow that Io moved through. The preliminary results for the 1600s data were wrong because the plane of Io's orbit was improperly oriented with respect to Earth and the Sun. The preliminary results for the 1988 data did not suffer from this defect since they relied on data taken from the *Astronomical Almanac* for the positions of the Earth, Jupiter, and the Sun. The 1988-1991 results reported in *CRSQ* are based on my SATURN.F77, BRETAG.BAS, and other programs and not directly on the *Almanac* data, although the *Almanac* data validates the programs.

I do not accept Montgomery's assertion that there are reliable data points for Cassini (1693), Delambre (1738) Martin (1759), and Glasenapp (1861). It is true that these authors may have analyzed the data, but they did not provide a result which was accurate enough to be used in this discussion. Also, the data set that they used probably can no longer be precisely identified. Lieske's published archival data provide information that can be analyzed, and that is precisely what my paper did. Setterfield, Norman, Montgomery, and several others have been involved in statistical analysis of speed of light data, and statistical tests of whether the speed of light has been a decreasing function of time. These studies have included not only Roemer method data, but also data based on other methods. Before the 1800s the only other method was the aberration of light method.

Aberration of light data provided by Bradley from 1727-1747 have not yet been sufficiently analyzed to provide conclusive results. Bradley's analysis was accurate enough for his purposes, but he did not include an accurate analysis of the nutation and precession of the Earth's pole. Bradley did analyze these effects (Rigaud, 1972), but he only obtained first order results which did not include the effect on nutation caused by the Sun and second order terms due to the Moon. For the star gamma Draconis which Bradley first employed, the nutation causes variations in position of up to 9.2 seconds of arc as compared to the 20.47 seconds of arc effect due to the annual changes of direction of the Earth's motion through space. The two effects must both be calculated in order to obtain accurate results. Thus I conclude that the early aberration of light data cannot yet be included in the discussion, and the Bradley values for the speed of light must be omitted for the present.

Montgomery misunderstands my statements about the Harvard data. Although photometric methods were used, atomic clocks were not available and the timings were not significantly improved from those of the Paris astronomers of 200 years earlier. This is evident from the results of my computer analysis. My 1988-1991 data gave better agreement with theory, although I had a smaller telescope. The WWV signals were not available in 1878. The differences between calculated and actual eclipse times are generally smaller for the 1988-1991 data than for the 1878-1880 data: Look at the error bars on Figure 3 of my paper. In addition, the calculated minus actual eclipse times for my programs compare favorably with Lieske (1978) in his analysis of the Harvard data, the standard deviation being about 25 seconds. Hence, Montgomery's criticism is unfounded and unwarranted.

I conclude that analysis of these historical data should not be based on an uncritical acceptance of values dredged from antiquity. The analysis must also include a study of how the original authors obtained their results for the speed of light, and whether improvements in their techniques are warranted. I believe our Creator is best served when we are honest and thorough in our endeavors, whatever they may be.

### References

- Lieske, J. H. 1978. Galilean satellites: analysis of photometric eclipses. *Astronomy and Astrophysics* 65:83-92.  
 Rigaud, S. P. (Editor). 1972. Miscellaneous works and correspondence of James Bradley. Johnson Reprint. New York.

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### CATASTROREF

For several years I have been working on CATASTROREF, a computer database on catastrophism in geology. History is now being made. Creationists will have their own database. Our database is now user friendly. The data is available on a double-sided, double-density disk formatted for MS DOS computers. Disks can be furnished in a Macintosh format also.

The heart of CATASTROREF is CATASTRO.TXT, an enormous ASCII text file which can be imported into your word processor. Once there, you can do search and print operations. CATASTRO.TXT can be opened and displayed directly on your computer's screen even without a word processor. CATASTRO.TXT is composed of 321 records and prints in excess of 160 pages of single-spaced type. General orientation to CATASTROREF is contained in CATASTRO.HLP. This file is ASCII text which can be displayed or printed easily. A friend of mine in Sidney, Montana has provided a special text search, text view and text print program called LIST.COM. You can use this program instead of your own word processor. It is much faster than a word processor in doing word searches.

Several people have caught the vision of CATASTROREF. They continue to submit abstracts to me. If you have literature which you want to abstract, I am accepting abstracts. The procedure for submitting abstracts is contained in CATASTRO.HLP. Catastrophism is alive and well; CATASTROREF is here to prove it!

For information on the database, including costs to obtain it, write:

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 Institute for Creation Research  
 P.O. Box 2667  
 El Cajon, CA 92021

### Cell Biology or "Cellular Intelligence"? A Reply to Dr. McCann's Rejoinder

#### Introduction

We appreciate Lester J. McCann's response (McCann, 1992) to our article (Lumsden et al., 1992) debating his "dual factor" paradigm (McCann, 1991) for biological development and variation, but find, with due respect, that it contributes little to the defense of his model. Merely reiterating a hypothesis does not increase its

currency. Nonetheless, such additional observations he offers and their interpretations, as well as his definition of our position, warrant further consideration and comment.

In developing his thesis, which minimizes the role of genetic information and its manifestations in favor of a quality he termed "cellular intelligence," McCann (1991) did not address the contemporary biochemistry, molecular biology, and principles of information theory that underlie embryogenesis, cytodifferentiation, phenotypic variation and the efficacy of gene function. In his rejoinder to the Lumsden et al. critique, McCann (1992) dismisses the principles of gene regulation and information transduction as (p. 69) "robotic" and "... no means for solving the kinds of non-chartable demands which we know living systems are able to handle." McCann (1992) states (p. 69) that "... genes are no more than dependent devices that need the presence of a living directorship." He notes (p. 69) that (1) "the nucleus [when removed from a cell] ... promptly withers"; while (2) the anucleate cell persists and can even divide (see his previous reference, in McCann, 1991, to Barth, 1964); and (3) upon shedding its nucleus in the process of maturation, the human erythrocyte continues to function as a (p. 69) "... metabolizing, process-controlling, living unit." With these red-herrings, McCann would lead us to his conclusion (p. 69) that genes "... do not serve as the control center of the cell," and that there is otherwise a discrete "living directorship" operationally involved in the "aggregative constructions" attributed to cells and, more broadly, in "... any work-demanding assembly process ..." As previously, McCann (1992) continues to identify this vitalistic principle as "cellular intelligence," the distinctions between intelligence and information heretofore reviewed (Lumsden et al., 1992) notwithstanding.

#### Cell Nucleus

To his first point, no contemporary cell biologist we know of, least of all Lumsden et al. (1992), has ever viewed the nucleus as self sustaining, and the fact that it is not has nothing to do with the role of genes in cell biology we reviewed. While the "withering" of the extirpated nucleus has more to do with osmotic changes than its separation from an extra-nuclear "life force," we note, parenthetically, that the proteins sustaining nuclear function and integrity, including the enzymes involved in genomic replication, are synthesized in the cytoplasm (Newport and Forbes, 1987). These proteins are then transported into the nucleoplasm via pores in the nuclear envelope (Dingwall and Laskey, 1986). To be sure, the nucleus is not an autonomous entity. However, it is no paradox to the serious student of cell biology that the genome itself predicates the mechanisms for its existence (as the informational source of, e.g., primer RNA and the deoxyribonucleotide polymerases), transcription (the ribonucleotide polymerases) and regulation (through the variety of gene products reviewed by Lumsden et al., 1992). Indeed, it is this circularity—the genome's dependence on the products for which it encodes and that these products exist because of genetic information—that intuitively defeats the abiogenesis hypothesis for a stochastic, strictly materialistic, totally naturalistic origin of the first genome(s), thence cells and living organisms.

In stating (p. 69) that Lumsden et al. "... believe that cells are put together by a non-living source . . .," McCann misunderstands our position. To be sure, genes, like all of the other molecules of the cell, are non-living entities, vs. the composite entity, the cell itself. The nucleus and other organelles are likewise non-living entities. Per Dutrochet (1824), **cells** are the *piece fondamentale* of living systems. However, that cells function according to the properties and interactions of their non-living components, according to biochemically definable, vs. arcanelly vitalistic, principles, is hardly a contradiction. It is no more or less than the manifestation of the physicochemical hierarchy underlying cellular organization! At the same time, however, it is precisely this *organization* that sets living systems apart from abiotic systems. In any event, we do subscribe to the dictum (Virchow, 1858, p. 25) *omnis cellula e cellula (ergo omni vita e vita)*. On the other hand, we find McCann's (1991) vitalistic paradigm lacking in scientific credibility, and without substance respective the evolutionary position he would contest (McCann, 1986). Nevertheless, we have no confidence either in the evolutionist's abiogenesis scenarios or the neo-Darwinistic explanation of biological diversification, as "materialistic and mechanistic" as the view we have of biochemistry and genomic function may be.

Strict materialists assert that life does not require for its understanding the acceptance of a supernatural, or divine origin, that a complete explanation is (or will be) forthcoming from a resolution of its wholly physical and chemical components and processes. Yet, for all its appeal to brute analytical science, neo-Darwinian theory has proven to be impervious to such reduction, its hypothetical mechanisms even contradicted by many of the contemporary findings from cellular and molecular biology. Among the many enigmas the materialists have yet to resolve is how the information which governs biological organization came into being. The Law of Universal Causality cannot be circumvented, nor the tenets of information theory ignored. Per Lumsden et al. (1992) and references therein, the only known and demonstrable source of information is intelligence, and the primary information governing cell structure and function is represented by the genome.

We have offered a creationist explanation, consistent with the known scientific facts, for the origin and operation of that genome (Lumsden et al., 1992, p. 68) within the concept of originally created kinds (i.e., *baramin*, per Marsh, 1972). We have credited (p. 68) the *living* God as the Creator of biological life, as well as the Intelligence that brought its governing information into being, and as the Author and Cause of the natural laws operating in biology at the present time—in sum, hardly a belief in a "... non-living source . . ." of cells or their manifestations! Meanwhile, it has been noted elsewhere (Lumsden and Lumsden, 1992) that (p. 103) "... the existence of a genome [operating] in the present by natural principles is *not* evidence of a purely materialistic . . . origin!" Its intricate structure and explicit function **are** evidence of **purpose and design**, the embodiment of an ordered creative event.

At that point, would individual cells require a distinct, on-going form of *intelligence* (vis-a-vis *information*) to account for their manifest structure and behavior? Was

the original design and construction of the hereditary mechanism, by which reproduction in kind would prevail, deficient? Thus requiring a *persisting* and *immediate* extra-genomic causality or "directorship"? McCann's "dual factor" paradigm for cell behavior would thus become an equivalent in microcosm of Immanuel Kant's belief in two discrete faculties of sensing and understanding, the former passive and the latter active. Quite a feat for cells, when the mind itself is no longer thought to operate that way!

Note, in making a case for the on-going structure and function of cells according to informational and physical principles divinely designed and implemented at creation, thence to be sustained through conservation, we do not imply that the Creator has become an absentee landlord of nature. As marvelous as they are, however, cells, as they exist in the present, are not miracles in the strict sense. Moreover, denying that *cells* have the capacity for deliberative, elective behavior per McCann's remarkably anthropomorphic interpretation does not reduce the *organism* to an automation, as McCann (1992) would suggest is inferred ("... when applied broadly", p. 69) by our model. Meanwhile, we do of course acknowledge that cells are capable of a degree of "problem solving," having noted (Lumsden et al., 1992, p. 68) that the genome is both initiative and *reactive* (per our reference to Felsenfeld, 1985, and discussion, p. 66). The operational principle is by no means abstruse. It is one commonly employed in the construction of computer programs—i.e., the writing in of sub-routines to accommodate a variety of parameters—and is clear evidence by analogy of intelligent creative design respective the origin of the genome. It is not a principle to be dismissed lightly by reference to simple robotic mechanics (McCann, 1992, p. 68).

### Anucleate Cells

We have already addressed McCann's second point; perhaps he overlooked our reference (see Lumsden et al., 1992, p. 64) to Gross (1967) explaining the *genetic* basis for merogone cleavage. [*Merogones* are experimentally enucleated frog eggs, which, under certain conditions can be induced to cleave, and the "cellular" progeny likewise up to a point (before they disintegrate) superficially resembling the embryonic blastula stage (Barth, 1964). This derives from the retention of morphogenic RNA's that encode the cytoskeletal structures involved in cytokinesis (among others) post extirpation of the egg nucleus (Gross, 1967)]. McCann's (1992, p. 68) statement that "... with nuclear genes absent . . . cells are capable of ordered divisions" is otherwise an unjustified generalization. We note that frog eggs are remarkably atypical in having, initially, 99% (quantitatively) of the total genomic information in the extra-nuclear compartment vs. 1-15% for cells generally (Alberts et al., 1989, p. 390), and that the cleavage exhibited by merogones is altogether an experimentally contrived event (Barth, 1964).

To his third point, it is hardly remarkable that the anucleate erythrocyte (red blood cell, rbc) maintains an energy generating metabolism that supports its energy driven functions, e.g., the  $\text{Na}^+/\text{K}^+$  ATPase pump in the plasma membrane (Skou, 1964; Hoffman, 1973), since the proteins that constitute the glycolytic enzymes

of the rbc and its various transport mechanisms, like the hemoglobin with which it is filled, were synthesized according to conventional, genetically prescribed mechanisms *prior* to divestment of the nucleus (Figures 1 and 2). Note, the de-stabilization of endogenous proteins is contingent on the presence of a functional ubiquitin-dependent pathway for proteolysis (Rech-Steiner, 1987), which is not operational in the mature rbc respective of these gene products; hence their persistence. For detailed reviews of erythropoiesis, including its developmental biochemistry, see Harris and Kellermeyer (1970), Goldwasser (1975), Wintrobe (1980), and Dexter and Spooner (1987). See Weissmann and Claiborne (1975) for reviews of erythrocyte membrane ultrastructure, its functional correlates, and derivation. The continuing presence and function of gene products are not contingent on the continuing presence (or transcription) of their genes! But how can that be construed as evidence for an “intelligence” operational at the cellular level? Note, when rbc’s are disrupted and fractionated, the extracted components (plasma membrane, hemoglobin, metabolic enzymes) continue to exhibit in isolation the same functional properties they do *in situ* (Altman and Dittmer, 1971; Hoffman, 1973; Plishker et al., 1976).

In any case, cells bereft of a functional nucleus are decidedly limited entities. Witness the fate of mero-gones (Lumsden et al., 1992, p. 64). And now, having pointed us to the example of the mammalian rbc, McCann should note that, without the nucleus/genome, there is no further development of the erythrocyte, no functional flexibility, no solutions to “non-chartable demands.” Consider, for example, the unvarying (literally “inflexible”) reaction of HbS erythrocytes to low oxygen tensions—i.e., to stiffen and “sickle” with attendant pathology, often times their own destruction (Barnhardt et al., 1979). Moreover, normal rbc’s have an existence that invariably terminates after approximately 120 days in circulation. This is due in part to a decay in cell surface electronegative charge density (Eylar et al., 1962) and the consequent interaction of senescent rbc’s with splenic macrophages (see, e.g., plate 23 in Porter and Bonneville, 1964) or phagocytes elsewhere. Red cells per se do not replicate, but are continually replenished by the erythropoietin- and interleukin 3-mediated proliferation of nucleated erythroblastic precursors (specifically the hematocytoblasts) and their subsequent genetically-directed differentiation (Suda, 1986) to rbc’s in the bone marrow.

Brute science may not answer all of our questions, but let us not ignore those it does (Lumsden, 1992). In decrying the factual answers we have provided to his questions of how and what re: cell biology as unsuitably “materialistic and mechanistic”, McCann (1992) continues to strive for an abstruse explanation of cyto-differentiation, etc., which even he is wont to provide, except to say that it lies—somehow—in “cellular intelligence.” This is, at best, a recondite principle in itself. The examples McCann (1991, 1992) would employ to demonstrate it *ipso facto* are demonstrably vain to his efforts, per Lumsden et al. (1992) and this communication.

Anecdotal, would-be examples aside, how productive is his argument in the first place? Instructing the reader that one attribute of intelligence is the ability



Figure 1. An early-stage erythroblast, at lower right, contains a nucleus in which much of the chromatin is in the diffuse euchromatic configuration (vs. more consolidated heterochromatin), hence transcriptionally active; in the cytoplasm are numerous polyribosomes, indicative of protein synthesis; the increasing density of the stroma reflects accumulating hemoglobin. The anucleate erythrocyte, at upper left, retains functional proteins synthesized during its prior ontogeny, including — besides the hemoglobin dense stroma — enzymes for energy-generating glycolysis and the physiologically active plasma membrane. Drawing based on electron micrographs, e.g. Porter and Bonneville's (1964) plate 19. Scale bar = 1 micron.

“... to control and direct energy” (McCann, 1992, p. 69) tells the reader little about how intelligence per se would apply to cell functions in development and variation, where the principles and mechanisms are otherwise explained by *information* and its transduction. As reviewed by Lumsden et al. (1992), the *ability* of cells to manage energy productively is demonstrably conferred by the prescriptive genomic information for the enzymes, their cohorts, and their structural and spatial organization within the cell. *What* would be the operational linkages between “cellular intelligence” and cell biology? Meanwhile, McCann would prove apples by oranges. Permit us an anecdotal analogy: that drivers, innately intelligent beings, sometimes intelligently operate motor vehicles, and thereby control and direct energy, does not make a case for a driving “cellular intelligence” in metabolism, for example, or the activities of the cytoskeleton. There is, after all, a dichotomy between how organisms function and how their constituent cells function.

### Cellular Intelligence

What “cellular intelligence” would there be to operate on a *cell-free* actin/myosin preparation the contractile properties of which mimic, in isolation, those of these

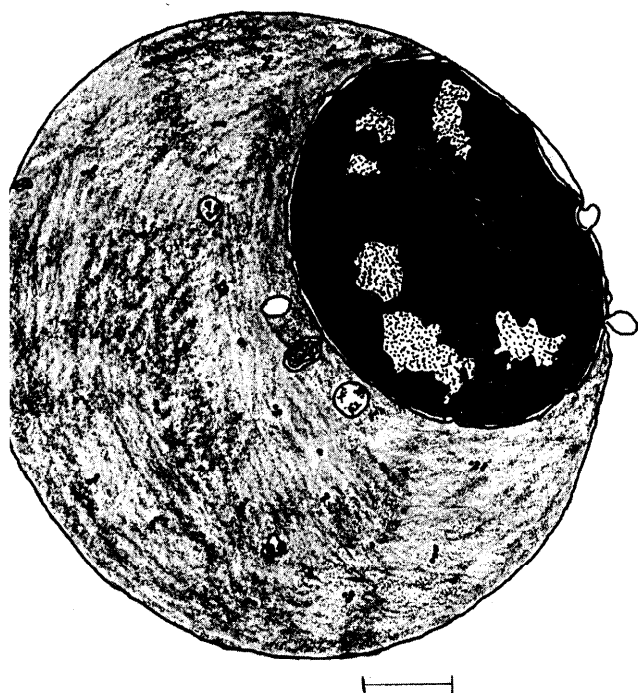


**Figure 2.** A late-stage erythroblast; the chromatin of the about to be extruded nucleus is condensing to the transcriptionally inactive heterochromatic configuration. Polyribosomal structures in the cytoplasm are indicative of continuing protein synthesis. Drawing based on electron micrographs, e.g. Fawcett's (1966) plate 7. Scale bar = 1 micron.

fibrils *in situ*? What "intelligence" is at work in the sustained metabolism of isolated mitochondria? Or, more specifically, in the electron transport coupled oxidative phosphorylation activity (a work-demanding assembly process—i.e., assembly of ATP—contingent on directed energy?) of isolated inner mitochondrial membrane preparations? In microtubule assembly (aggregative construction?) by cell-free extracts? Granted, these are the sorts of mechanistic examples McCann (1992) strenuously eschews, but—Dr. McCann, we have hands-on research experience with these systems and can assure you that the only identifiable intelligence or living agency (once the dells were disrupted) at work here was our own! Is it conceivable that these molecular complexes have an intrinsic quality of "intelligence," as McCann would purport for cells?

In such circumstances, we are reminded of the conclusion Thomas Graham drew in 1861 (as reviewed by Mason, 1991), that what is now recognized as the Brownian movement of cell-derived colloidal particles in suspension results from an intrinsic self-energy, that the distinctive features of native proteins, such as the catalytic activity of enzymes, reflects an internal life-force. We would be disabused of that interpretation, not *because* Graham's view "... conflicts with a materialistic and mechanistic view ..." (McCann, 1992, p. 69), but because it is patently *wrong*, as shown by competent science. McCann (1992), identifying life, ubiquitously it seems, with intelligence, cellular behavior with decision-making processes, and finding cells alive but genes inanimate, continues to press for a "living agency" otherwise at the heart of the cell. The

notion of vitalism dies hard, demonstrations to the contrary notwithstanding.

We do not wish in any way to hamper inquiry by McCann, or others of like persuasion, into issues of cell biology. We would suggest, however, that more than cavalier treatment of the *science* of the subjects under consideration is demanded for what would be identified as scientific publication. Further, we maintain that conclusions compelled more by rhetoric than data are scientifically invalid. We note that, historically, proponents of naturalistic vitalism have stood more at the periphery of scientific tradition than being productively engaged in its practice. We doubt that Niels Bohr (to whom McCann, 1992, refers, p. 70) was thinking of *vitalism* when he advocated seeking a higher level of understanding biology through new concepts and approaches. Rather, perhaps, Bohr was advocating synthesis, vs. reductionism, as the latter would be the way of contemporary physics aped by many molecular biologists (vainly, as Berlinsky, 1986, notes on pp. 213-217, pp. 250-254, pp. 288-290, et seq.). We must be careful when it comes to accepting semantic extrapolations, and what we would attribute to "... none other than Niels Bohr himself from his matchless experience with physical forces ..." (McCann, 1992, p. 70), especially when we are provided no specific, or contextual, reference. For a contemporary discussion of Bohr's own views of science, see Pais (1991). In any event, if there would yet be a viable argument for vitalism, it is not well served by McCann's efforts.

### Conclusion

A final word on our view of "intelligence" as manifested in biological systems would be to reiterate our agreement with Augros and Stanciu (1987) that it is an *organismic* parameter. Among which kinds of organism is debatable. We, like Augros and Stanciu (1987) and Morris (1984) tend to view it as a uniquely human quality. In any case, we find that as a presence, intelligence is *recognized* by its manifestations, but as a quality, intelligence is not altogether *defined* by them. Others may disagree. Fishbach (1992, p. 48) suggests that

If we agree to think of the mind as a collection of mental processes [reflecting, in a progressively reductionist mode, neuroanatomy, impulse circuitry, neurophysiology, and neurochemistry] rather than as a substance or spirit, it becomes easier to get on with the necessary empirical studies.

And, to a degree, certain heretofore inscrutables, including mental state, acuity, emotion, and memory, have bent, if not entirely fallen, to this approach (see, for examples, papers accompanying Fishbach's in the cited issue of *Scientific American*). But, so far, the molecules-to-mind technology has yet to explain the grand synthesis that we term intelligence, with its adjunctives of deliberative consciousness, a subjective sense of self-awareness, abstractive cognition and its communication, or to ascertain their physicochemical loci (if any). The analytical philosopher David Berlinsky (1986) has observed (p. 11) "... anyone who believes completely that beyond the material ... there is nothing, can hardly offer anything but a physical explanation for any perplexity whatsoever. What else is there?" In a field so far dominated by a non-theistic

mentality, the impasse neurobiology faces may herein be identified. God, an indisputably intelligent entity at least for those of the Jewish, Christian or Muslim persuasions, created man, uniquely in His image; thus do human beings possess the quality of intelligence, albeit of a decidedly lower order. Note, this view, which identifies God as the pre-eminent Creator, is *contra* Georg Friedrich Hegel's, where God is the Absolute Mind but "... a god coming to be himself [evolving?] through the development [evolution?] of human consciousness" (Gerhardt Niemeyer, 1977, p. 1).

Like the spirit with which humans are also divinely invested, intelligence remains a metaphysical concept, but nonetheless a reality. Claiming, however, that cells are imbued with intelligence would be wholly at variance with this principle.

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 \*Readers may wish to consult *Variation and Fixity in Nature* by Marsh (CRS Books).

### Reply by McCann

My article entitled *Is More than Gene Action Required to Account for Variation?* and a subsequent rejoinder are occasions for Richard Lumsden to launch two blizzards of rhetoric (see previous letter for references). He did this rather than giving us a focused analysis of the issues. I leave it to the reader to sort out his material and judge how much is germane. Perhaps, also, the question might be addressed of why he requires so much ink?

Possibly the most important issue with Richard Lumsden is this: Are the genes able to serve as the center for all cellular action, in addition to their recognized role as an information source? Briefly, is the genome the ultimate doer of the cell? Any engineer would insist that *doing* anything, even something destructive, requires energy. If an action is to be constructive, however, the energy has to be provided in exactly the right amount and at exactly the right time. Observation tells us that the natural control and directing of energy is a product of something alive.

If Dr. Lumsden has evidence that the right kind of controlled energy for a construction can come from the genetic material DNA, let it come out in print. The scientific world would be startled but impressed to know that something non-living can do this, and so would I. However, if he is unable to do this with assurance, he might consider ceasing to ridicule other efforts that hold some promise for being correct.

Dr. Lumsden seems to have trouble with intelligence as a practical reality; many of us do not. The Intelli-

gence Quotient test, for example, measures something very real. Admittedly, it may only be part of a much larger whole. Nevertheless, the great differences in the abilities of people to perform efficiently often correlates closely with IQ. Also, we sometimes see people failing to intelligently control the energy of an automobile. This often relates directly to a chemical dulling of the ability to exercise intelligence.

The acceptance of gravity and energy, as examples of realities, is based on their being quantifiable. Otherwise we know them only through their observed effects. All of this is true in some degree also with intelligence. Niels Bohr's suggestion regarding the need for biology to broaden its vision may relate to a tendency that causes biologists of the mechanistic type to ignore anything that cannot be segregated and mechanically managed. Obviously, not all realities are amenable to being isolated and maneuvered. A study is likely to be limited in the results it gets by the restrictions it places on itself. Dr. Lumsden tries to invest me with the old shibboleth of vitalism. Vitalism is an attempt to account for life on the basis of some unique property found only in living things. Nowhere do I try to account for life. This is a "bum rap," indeed. Dr. Lumsden also accuses me of anthropomorphism. Measuring all living phenomena in human terms is not good technique, as any biologist knows. But, when a certain currency of language best describes a phenomenon or situation, that in itself may have significance.

Dr. Lumsden does not like genes being described as dependent devices. Yet, when the chromosomes undergo a simple change in position during cell division, the cell provides a mitotic apparatus to do the job. How else can this be interpreted except as indicating a dependency?

Expecting to find some modicum of intelligence in cells has a basis in our experience with cells. They tend to show some evidence of most, if not all, of the properties seen in the multicelled body. This includes movement, self feeding, excretion, gas exchange, transportation, sensitivity, etc. It is reasonable to expect, therefore, that an individual cell will show some evidence of intelligence, if the total organism is intelligent. It would appear to be an exception if this were not true. Dr. Lumsden comes across as a militant mechanist. As such he seems bent on establishing a linkage between religion and cellular mechanistics. One is reminded of past attempts to do the same thing with Darwinism.\*

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\*Editor's Note: For a review of McCann's book, *Blowing the Whistle on Darwinism* see CRSQ 24:196.

## Studies in Creationism and Flood Geology\*

Over the last 15 years, I have engaged in intensive scholarship in scientific creationism, with which I would like to acquaint the lay creationist reader. Many questions and issues in flood geology have been given at least a tentative answer as a result of my little-known

\*Editor's Note: CRS Books is selling this book and we thought our readers might enjoy a synopsis of it written by the author. See page 61 of this Quarterly for ordering information.

research, which has been written for scientists, especially geologists. The purpose of this *Impact* article is to summarize my research in everyday language for the average reader.

In my "Causes for the Biogeographic Distribution of Land Vertebrates After the Flood" (*Proceedings of the 2nd International Conference on Creationism*, 1990, Vol. II, pp. 361-370), I explain why the animals on different continents are so different from each other if they originated from one point (Noah's Ark in the mountains of Ararat).

The interior regions of the continents were very cold for some time after the Flood, due to blockage of sunlight by volcanic aerosols released during the Flood, and animals did not freely spread in all directions upon their release from the Ark, but were shunted across narrow bands of land warm enough to support life. This ultimately caused very different animals to end up on different continents.

The postdiluvian peoples, after their post-Babel dispersion, probably introduced different animals to different continents (such as the Australian marsupials, South American mammals, and Madagascan primates). I point out that South America, Australia, and the island of Madagascar are all in direct line of maritime routes emanating from the Middle East, and hence are natural stopping points for the postdiluvian peoples.

Flightless birds on islands possibly resulted through microevolution (or, better, variation) from birds which had flown there. I present evidence that this can happen in a short time. Also because of this, we need not suppose that God created birds with useless wings.

In my "The Antediluvian Biosphere and its Capability of Supplying the Entire Fossil Record" (*Proceedings of the 1st International Conference on Creationism*, 1986, Vol. II, pp. 205-218), I refute anti-creationists who have claimed that the material found in the fossil record could not possibly all have been alive on a recently created earth. I prove that the world's coal, oil, fossil crinoids, Karoo vertebrates, limestone components, etc., could all have come from the remains of creatures having lived in the short time between creation and the Flood and then buried by the Flood.

In "A Diluviological Treatise on the Stratigraphic Separation of Fossils" (*Creation Research Society Quarterly* 20(3):133-185; December 1983), I examine, in great detail how one flood accounts for the fact that different fossils are found in different layers of rock. I test, using over 9,500 global locations of fossils, the tendencies of over 30 different types of fossils to overlies each other in rock. Then I propose and test a new mechanism to explain, through one flood, the relatively few cases where rocks bearing many different kinds of fossils overlies each other.

This mechanism, which combines biogeographic zones of living things with a tendency for crustal rock to downwarp also is used to explain why, in the lower layers of fossils, there are fewer fossil types that have any representatives still alive today. I demonstrate that evolution with geologic ages is not the sole (or even the best) explanation for this trend.

I address the fact that there are few, if any, human remains in lower fossiliferous rock. According to evolution, it is because humans did not appear until very recently. I provide a diluvian explanation for this, show-

ing through actual calculations that the antediluvian humans were so dispersed in the great volumes of sedimentary rock that it is extremely improbable that any of them ever would have been discovered. Alternatively, such discoveries are so infrequent that any such find could be easily ignored or discounted by evolutionists.

In "An Anthology of Matters Significant to Creationism and Diluviology: Report 2" (*Creation Research Society Quarterly*, 18(4):201-223, 239; March 1982), I discuss various topics, including further evidences against organic evolution, against the existence of ancient reefs in ancient rock, and against the usual claim of overthrusts (rock strata mechanically pushed over each other) to explain away instances of fossils overlying each other in wrong order, according to evolution. I also provide 200 examples of fossils occurring in "wrong" rock strata, according to evolution, and show that there usually is no evidence to support the usual evolutionary rationalization that these are situations where fossils from older rock were washed out and redeposited in younger strata.

In "The Essential Nonexistence of the Evolutionary—Uniformitarian Geologic Column: A Quantitative Assessment" (*Creation Research Society Quarterly*, 18(1):46-71; June 1981), I show, by overlying world maps of rocks attributed by evolutionary geologists to different ancient geologic periods, just how small a percentage of the earth's land surface has rocks of many alleged geologic periods all in one place. I also show, through calculations, that rocks of geologic periods supposed to have succeeded each other in time, rarely succeed each other as layers of rock.

In "An Anthology of Matters Significant to Creationism and Diluviology: Report 1" (*Creation Research Society Quarterly*, 16(4):209-219; March 1980), I cover many topics. For example, I document recent discoveries which show that many fossils once thought by evolutionists to have been restricted to certain layers of rock strata, have now been found in many other layers of rock. I also provide evidence against the usual claim of evolutionary geologists that certain processes, whose effects are seen in rock, must have taken a long time to happen.

In my "Radiometric Geochronology Reappraised" (*Creation Research Society Quarterly*, 16(2):102-129, 147; September 1979), I engage in a thorough and systematic refutation of the dating methods used by evolutionary geologists to support their claim that the earth's fossil-bearing rock formed gradually over hundreds of millions of years, supposedly indicating that the earth must be billions of years old. Whereas other creationists have questioned the assumptions underlying isotopic dating, I provide numerous geologic demonstrations of the invalidity of radiometric dating. This includes over 400 published instances of serious discrepancies

between isotopic age and the expected age of the rock based on its fossils, according to standard evolutionary thought. I also show that, contrary to intuitively held beliefs, internal consistence in dates obtained by these methods, and even agreement between results of different dating methods, are not proof for their validity.

I refute the claim that various dating methods agree that the earth is 4.5 billion years old. I demonstrate that there are gross contradictions in billion-year values from earth's rock, and that there are even some values obtained which are much greater than the 4.5-billion-year accepted age of the earth.

Most creationist research on the fallacies of evolution (for example, that of Dr. Duane Gish of the Institute for Creation Research) has focused on vertebrates. In "The Cephalopods in the Creation and the Universal Deluge" (*Creation Research Society Quarterly*, 15(2): 94-111; September 1978), I focus on a group of invertebrate animals which include the modern squid and octopus. This group of animals is used by evolutionary geologists to a greater extent than any other fossil animal, to subdivide rock strata into alleged different spans of time. I show, in detail, the fallacies of these practices, as well as the fact that there is an even greater absence of expected evolutionary transitions among cephalopods than is the case among the vertebrates surveyed by Dr. Gish. Finally, I demonstrate how the ecological differences among cephalopods explain why all the living and fossil cephalopods were buried by one flood in the order in which they are found in rock strata. A popular-level version of this work on cephalopods, entitled "Cephalopod Conches," appeared in *Ministry*, January-February 1980.

In "A Diluvian Interpretation of Ancient Cyclic Sedimentation" (*Creation Research Society Quarterly*, 14(4): 189-208; March 1978), I show how one flood explains the fact that most of the world's coal deposits occur in sandwich-like layers interbedded with rock, and that standard evolutionary geology has a difficult time explaining this. I then develop a model to show how vast sheets of rising and falling flood waters buried floating vegetation (which later became coal) in between layers of mud (later shale) and (later sandstone).

Currently, I am working on several creationist projects which I anticipate publishing in the future. I would hope that creationists will make full use of this research, and that it will serve as a springboard for further research by other creationist scholars. It is only through careful and intense scholarship that creationism can grow in explanatory power, which is the goal of all scientific research.\*

John Woodmorappe

\*This letter originally was an Institute for Creation Research *Impact* article (*Impact* No. 238, April, 1993). Institute for Creation Research, P.O. Box 2667, El Cajon, CA 92021.

### Quote

My views on the environment are rooted in my belief in Creation. I don't believe that life on earth began spontaneously or as a result of some haphazard, random selection process . . .

I am in awe of the perfection of the earth. This one small planet has the conditions necessary for life and is ideally situated in our solar system. If it were a little further away from the sun the entire planet would be one gigantic Antarctica; if it were a little closer, it would be one continuous Sahara Desert. Earth's placement is precise; and that, my friends, is not a result of chance.

Limbaugh, Rush. 1992. *The Way Things Ought to Be*. Simon and Schuster. New York. pp. 152-153.

# ON STELLAR STRUCTURE AND STELLAR EVOLUTION

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## Abstract

*Current stellar astronomy maintains a close relationship between the observed structure of stars and their supposed evolutionary history. An attempt is made to distinguish between stellar structure observations and theoretical stellar evolution. The physical laws believed to govern the macroscopic structure of nondegenerate stars are reviewed. From these laws, scaling relationships between several properties are derived. These scaling relationships hold independent of the source of stellar power, allowing for both gravitational contraction and thermonuclear fusion sources. With additional observational information and physical approximation, a synthetic Hertzsprung-Russell (H-R) diagram is presented. The synthetic H-R diagram bears some similarity to observed H-R diagrams.*

## Introduction

As noted by Faulkner and DeYoung (1991) in their thought-provoking article, most creationist work in astronomy has focused on the small scale (astronomically speaking) such as the solar system, and on the large scale (cosmological). There does not exist even a rough framework for creationist astronomy because the middle scale has not been adequately addressed. The middle scale would be referred to as stellar evolution by general astronomical parlance. The theory of stellar evolution is briefly reviewed in the article, which concludes that stellar structure and stellar evolution are so closely related as to make it difficult to accept one without the other. Faulkner and DeYoung (1991) used stellar evolution to mean stellar aging, but for this paper stellar evolution will be used exclusively for the multi-billion year history depicted in evolutionary astronomy.

Before continuing, consider the framework of a creationist astronomy. According to Genesis 1-2, God created all things in the heavens and the earth, forming their structures and filling them over a period of six days. The earth was formed first (days 1-3) and the stellar heavens were filled on the fourth day. The stars were created fully functioning, fulfilling the Creator's expressed purpose to give light on the earth, and to distinguish days, seasons, and years. Following early history in Genesis 3-11 leads to the conclusion that the earth and the stellar heavens cannot be more than several thousand years old. A creationist astronomy must be faithful to this framework.

In contrast, stellar evolution explains the origin and development of stars in a naturalistic manner (Iben, 1991). Contrary to the biblical framework, stellar evolution accepts the presumed geological age (4.5 billion years) of the earth, and includes stellar models whose lifetimes are comparable to this age. It is rather easy to find numerous statements in stellar structure textbooks that power for stars must be thermonuclear, since this is the only known energy source capable of lasting for billions of years. For example, Chandrasekhar (1938, p. 455) stated:

The order of the 'age' of the sun thus derived on the Helmholtz-Kelvin contraction hypothesis is found to conflict with other evidence which is essentially of a geological nature. . . . Hence, the geological evidence completely disproves the con-

traction hypothesis for the sun, and therefore also for the normal stars. We are thus led to seek a different origin for the source of stellar energy.

Also Clayton (1968, p. 43) explained:

This time (solar gravitational contraction time of about 30 million years) is much too short for a maximum lifetime of the sun. It is known that the sun has existed over 100 times longer than this, because the age of the earth itself is about 4.6 billion years.

It can be concluded that stellar structure and stellar evolution are closely related because evolutionary astronomers have made them so.

Stellar evolution implies more than just the aging of stars. It has relation to the cosmic scale as well as to the small scale. Evolutionary astronomy believes that stars transform the basic material that originated in the Big Bang. Without nucleosynthesis of elements heavier than helium in earlier generation stars, there can be no solar system with planets (Wilt, 1983; Rigutti, 1984). The time scale for nuclear transformation is the time scale for the lifetime of stars; millions to several billion years. In summary, stellar evolution requires an old universe.

Despite elaborate modeling of stellar evolution theory, observational data is limited. According to Clayton (1968), the observable large scale properties of stellar structure are *luminosity* (total radiant power, inferred from measured radiance and distance), *effective surface temperature* (inferred from spectral observations), *mass* (inferred from binary star motions), *radius* (inferred from surface temperature and luminosity, as well as from eclipsing binaries and direct measurement), and *surface chemical composition* (also inferred from spectral line observations). The classical observational tool for summarizing stellar observations is known as the Hertzsprung-Russell (H-R) diagram (Clayton, 1968; Abell, 1969). This diagram shows the relationship between luminosity ( $L$ ) and effective surface temperature ( $T_e$ ) for observed stars, with luminosity (ordinate) increasing upwards and temperature (abscissa) increasing leftward. Clayton (1968) notes that about 90 percent of observed stars fall into a diagonal band from the upper left (high  $L$ , high  $T_e$ ) to the lower right (low  $L$ , low  $T_e$ ), known as the main sequence. Much smaller numbers of luminous stars are found in the giant and supergiant regions to the upper right (high  $L$ , generally lower  $T_e$ ) region, while white

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dwarfs (comprising an estimated several percent of all stars) populate the lower left portion of the diagram (low  $L$ , high  $T_e$ ). The H-R diagram summarizes a wide body of laboriously collected observational data in stellar astronomy, and must be the starting point for discussions of stellar structure.

Evolutionary astronomers have developed stellar evolution to explain H-R diagrams for various stellar systems. For example, most stars are found on the main sequence because stars spend much of their supposed million to several billion year lifetimes on the main sequence. Similar to evolutionary geologists, evolutionary astronomers have taken the observable data (H-R diagrams, or in the geologist's case, the geologic column with its embedded fossils) and theorized about purely naturalistic development of stellar systems over billions of years to explain these observations. The system of stellar evolution in astronomy is the exact analog of the system of biological evolution over geological ages in earth history.

To develop a more comprehensive creationist astronomy, the H-R diagram observations must be accepted, along with the usual physical principles believed to govern the structure of stars. The focus in this paper will be on nondegenerate stars, which includes main sequence stars along with giants and supergiants, but excludes white dwarfs and neutron stars. The physical laws that govern this group of stars can be expressed as a set of coupled equations. Rather than evaluate numerical solutions to these equations for model stars, a simpler approach is taken. These equations can be reduced to simple and well known scaling relationships between several important stellar properties (some observable). With further approximations these scaling equations can be reduced to luminosity-effective temperature ( $L/T_e$ ) relationships which can be plotted on an H-R diagram, without any reference to stellar age or energy production mechanisms. It will be shown that the synthetic H-R diagram has some similarities to observed H-R diagrams. While scaling relationships do not constitute a full theory of stellar structure apart from stellar evolution, they do indicate the possibility of constructing an alternative theory of stellar structure for creationist astronomy without recourse to multi-billion year stellar evolution.

### Physical Laws Governing Stellar Structure

The physical laws governing stellar structure are well known (see Chandrasekhar 1938; Clayton 1968; Kippenhahn and Weigart 1990). Stars are assumed to be spherically symmetric objects in quasi-static equilibrium (meaning that there is little change in structure over several thousand years). Let the mass density (mass of stellar material per unit volume) for radius  $r$  be  $\rho(r)$  and the total mass within a sphere of radius  $r$  be  $m(r)$ . By mass conservation one derives:

$$\frac{dm}{dr} = 4\pi r^2 \rho \quad (1)$$

Direct integration of this equation yields the total mass  $M$  of the star:

$$M = \int_0^R 4\pi r^2 \rho dr$$

where  $M = m(R)$ , and  $R$  is the radius of the star's surface.

Consistent with the assumption of quasi-static equilibrium, it is assumed that each small portion of the star is in local thermodynamic equilibrium. For non-degenerate stars the gas pressure  $p$  (force per unit area exerted by the stellar material), temperature  $T$ , and mean molecular weight  $\mu$  (1 for pure neutral hydrogen), along with the mass density  $\rho$ , satisfy the ideal gas equation of state:

$$p = \frac{k}{m_H} \frac{\rho T}{\mu} \quad (2)$$

where  $k$  = Boltzmann's constant and  $m_H$  is the mass of a hydrogen atom. The mean molecular weight  $\mu$  depends on the mass fractions of hydrogen, helium, and heavier elements, as well as on the degree of ionization of the stellar material. Radiation exerts pressure on stellar material, but except for very high temperatures ( $T > 5 \times 10^6$  K), radiation pressure is orders of magnitude less than gas pressure.

The star is assumed to be in a high degree of hydrostatic equilibrium, meaning that there must exist an outward radial pressure force that balances the inward gravitational force. This does not mean that the radial structure of the star cannot change; only that any accelerations accompanying such changes must be orders of magnitude less than the gravitational acceleration. If  $G$  is the gravitational constant, then the hydrostatic equilibrium condition can be represented by:

$$\frac{dp}{dr} = -\frac{Gm}{r^2} \rho \quad (3)$$

The existence of a radial pressure gradient implies radial gradients of mass density and temperature (from equation 2). Temperature gradients in turn imply energy transport, which in general can occur by radiation, convection (mass motions), or conduction (microscopic motions). At the surface of the star, where the opacity (resistance of stellar material to the propagation of radiation) becomes small, radiation can freely escape to space. If  $L$  is the luminosity (total power) of the star, and  $T_e$  is the effective surface temperature, then:

$$L = 4\pi R^2 \sigma T_e^4 \quad (4)$$

where  $\sigma$  is the Stefan-Boltzmann constant; the star is assumed to radiate to space at its radius  $R$  like a black body of effective temperature  $T_e$ .

The steady loss of power from the star implies slow quasi-static changes in stellar structure, which are governed by the first law of thermodynamics:

$$C_V \frac{dT}{dt} + p \frac{dV}{dt} = -\frac{1}{4\pi r^2} \frac{dL}{dr} + \rho \epsilon \quad (5)$$

where  $C_V$  is the heat capacity at constant volume,  $V$  is the volume,  $t$  is time, and  $\epsilon$  is any internal energy generation (such as thermonuclear) per unit mass of stellar material. The first term on the left-hand-side is the change in thermal energy (proportional to  $T$ ) of stellar material; the next term arises if any contraction or expansion occurs, and is the gravitational energy term; the first term on the right-hand-side is the energy transport term.

Equation 5 implies that the luminosity varies throughout the star from zero at the center up to the total luminosity  $L$  at the star's surface (equation 4). As noted previously, energy transport can be by radiation, convection, or conduction. Because of the relatively low opacity of stellar material, most of the energy transport is by radiation, and can be represented as a diffusion process:

$$L = -4\pi r^2 \frac{16\sigma T^3}{3\kappa\rho} \frac{dT}{dr} \quad (6)$$

where  $k$  is the Rosseland mean absorption coefficient of stellar material. The star is a large reservoir of radiant energy (radiation energy density is  $4\sigma T^4/c$ , where  $c$  is the speed of light), confined somewhat by the opacity of stellar material, which slowly diffuses to the surface to be emitted to space. The opacity  $k$  is a function of mass density, temperature, and composition, and depends on four competing processes: electron scattering, free-free absorption, bound-free absorption, and bound-bound absorption. For the highest temperatures and relatively low densities, electron scattering dominates, for which  $k$  is independent of  $r$  and  $T$ ; for somewhat lower temperatures, free-free absorption dominates, which has a dependence of  $\rho T^{-3.5}$  (termed Kramer's opacity); for lower  $T$  and  $r$  strong bound-free and bound-bound absorption occur. For extremely low  $r$  near the stellar surface,  $k$  typically becomes small again. (See Clayton, 1968 and Kippenhahn and Wiegert, 1990 for more complete discussion.)

For this paper, the energy transport will be assumed to be by radiation. If the opacity  $k$  is not large, the temperature gradient required to carry the luminosity is usually less than the adiabatic. That is,

$$\frac{dT}{dr} = \frac{\gamma - 1}{\gamma} \frac{T}{p} \frac{dp}{dr}$$

where  $g$  is the ratio of specific heats at constant pressure to that at constant volume. Regions with temperature gradients larger than the adiabatic are unstable to convective motions. This occurs around hydrogen and helium recombination zones (approximate temperatures of  $5 \times 10^4$  and  $10^5$  K respectively). For these latter conditions, the actual temperature gradient follows the adiabatic one closely.

In summary, equations 1-6 constitute a basic set of laws governing the macroscopic structure of nondegenerate stars. Given the microscopic structure specified by  $\{m, k, e\}$ , the macroscopic equilibrium structure of  $\{p, r, T, m, L\}$  as functions of  $r$  can be determined from equations 1-6, subject to the boundary conditions of  $m(r) = 0$  at  $r = 0$ ,  $m(r) = M$  at  $r = R$ ,  $r \rightarrow 0$  and  $T \rightarrow T_c$  as  $r \rightarrow R$ . Thus the macroscopic structure is uniquely determined by  $m$  and  $M$  in nuclear powered stars (Russell-Vogt theorem).

### Scaling Relationships Between Major Properties

General scaling relationships can be derived from the governing equations presented in the previous section. For such relationships, all variables will be given in solar units (variables = 1 for the sun). This scaling analysis is well known in stellar structure theory (Clayton, 1968; Burrows, 1987; Kippenhahn and Wiegert, 1990).

The mass conservation equation (1) scales as:

$$\rho_c = \frac{M}{R^3} \quad (7)$$

where  $r_c$  refers to the mass density at stellar center. The equation of state (2) scales as:

$$p_c = \frac{\rho_c T_c}{\mu_c} \quad (8)$$

where again the subscript  $c$  refers to stellar center. The hydrostatic equation (3) scales as:

$$p_c = \frac{M \rho_c}{R} \quad (9)$$

The surface luminosity equation (4) scales as:

$$L = R^2 T_e^4 \quad (10)$$

while the interior energy transport equation (6) scales as:

$$L = \frac{R T_c^4}{\kappa \rho_c} \quad (11)$$

Using equations 8 and 9 gives an expression for the central temperature  $T_c$ :

$$T_c = \frac{\mu_c M}{R} \quad (12)$$

This important result states that the more massive the star, the higher the central temperature. If the composition is enriched with elements heavier than hydrogen (compared to the sun), the central temperature will increase also. Finally, any contraction of the star (decreasing  $R$ ) implies an increase in the central temperature.

Using equations 11 and 12 and eliminating  $r_c$  with equation 7, the important result follows:

$$L = \frac{\mu_c^4 M^3}{\kappa} \quad (13)$$

which is the mass-luminosity relation. Other quantities being constant, this expression implies a strong mass dependence of the luminosity. In fact, the implication of this relation is that stellar luminosity is only incidentally dependent upon stellar energy sources. Given mass conservation, ideal gas equation of state, hydrostatic equilibrium, and radiant energy transfer, equation 13 results are independent of how radiant energy loss is replaced over time.

To proceed further, a relation between the mass  $M$  and radius  $R$  is needed. This cannot be obtained from scaling analysis. It is either obtained from detailed stellar structure models, or from observation. This lack of closure in the scale analysis is equivalent to saying that over a wide range of densities, stellar structures described by the above scaling relations should be possible. An  $M$ - $R$  scaling relationship can be obtained from observations of main sequence binary stars (Bohm-Vitense, 1989):

$$M = R^{4/3} \quad (14)$$

over the range of .20 to 23 solar masses. The use of this mass-radius relation has many interesting implications.

The central temperature (equation 12) can be written as:

$$T_c = \mu_c M^{1/4} \quad (15)$$

so that the central temperature slowly increases as  $M$  increases. The central density (equation 7) can be written as:

$$\rho_c = M^{-5/4} \quad (16)$$

so that the central density decreases with increasing  $M$ . The  $r_c$ ,  $T_c$  scaling relations allow a crude estimate of the opacity dependence on mass. Using the opacity tables of Cox and Stewart (1970), for a reference central density and temperature and  $10^2 \text{ g cm}^{-3}$  and  $10^7 \text{ K}$  respectively, and an approximately solar composition, one can write very roughly:

$$\kappa = M^{-1} \quad (17)$$

As mass increases, central density decreases while central temperature increases, resulting in a decreasing opacity (it approaches the electron scattering minimum). As the mass decreases, the central density increases while the temperature decreases, resulting in an increased opacity (free-free absorption strongly dominates). It must be kept in mind that equation 17 is only a rough approximation.

To summarize, several scaling relationships between macroscopic properties of stars have been found. The system could be reduced only by using an observed MR relationship for main sequence stars, but these relationships show that some stellar structure properties are independent of the precise source of stellar power. After a discussion of stellar power sources, the implications of these scaling relationships for H-R diagrams will be presented.

### Stellar Power Sources

Stars are continuously emitting radiant energy. This radiant energy derives from the thermal motions of stellar material in the surface regions of a star. Such emission of radiant energy should cause local cooling in the star's surface layers, and to be sustained for any appreciable length of time, must be replenished. It is taken for granted by evolutionary astronomers that the power source of most stars is thermonuclear. Nuclear reactions in the central regions of the star produce surplus thermal energy. This thermal energy is presumed to diffuse towards the surface by radiative and/or convective transport processes. As noted in the introduction, the reason for choosing this power source is because it appears to be the only one that could power stars for hundreds of millions to billions of years. The other major power source is gravitational, but this is rejected by all evolutionary astronomers (except in the presumed approach to the main sequence in stellar birth), because this power source would be exhausted after an order of 30 million years, too short for the evolutionists.

The problem with the thermonuclear power theory is that it is apparently impossible to observationally verify in all stars except perhaps for the sun. Elusive subatomic particles known as neutrinos would be emitted from the presumed nuclear reactions occurring in virtually all stars, but the fluxes of neutrinos from these stars would not be easily detected on the earth

(with the exception of extremely rare events such as supernovas). Only from the sun might it be possible to observed neutrinos emitted during luminosity sustaining nuclear reactions. Both the quantity and energy distribution of the neutrinos would give clues concerning the composition and temperature in the sun's core, although it is not clear that a unique combination of  $\mu_c$  and  $T_c$  (see equation 12) would be associated with a unique neutrino flux. According to stellar evolution, the sun began 4.5 billion years ago with presumably cosmological composition (enriched somewhat in helium but especially in heavier elements left over from previous short lived stars). Burning hydrogen in the core would increase  $\mu_c$  slowly, increasing the central temperature (equation 12) and also the luminosity (equation 13). The deficit of observed neutrinos (about 1/3 of expected; see Bahcall, 1990; Smith, 1990; and Peterson, 1991) points out a potential problem with the evolutionary model of the sun, and therefore also with the evolutionary models of all thermonuclear burning stars.

A serious consequence of the solar evolutionary model is the increase in luminosity implied by equation 13. According to Newman and Rood (1977), over the supposed 4.5 billion year history of the sun its luminosity has increased about 25 percent. Present climate models are admittedly crude, but none (without significant modification) could sustain a 25 percent decrease in solar luminosity without leading to an ice-covered earth. This problem is called the faint young sun paradox, and contrasts sharply with the warmth of much of the presumed geological history of the earth (Crowley, 1983). Incredible enhancements of greenhouse effects are necessary to counter the faint young sun (Kiehl and Dickinson, 1987). All of these problems with evolutionary theories disappear if one accepts a young earth, which does not require exclusive thermonuclear power sources.

If thermonuclear power is not exclusively powering stars, they must be slowly contracting. Noting that in a hydrostatic ideal gas atmosphere the thermal energy is related to the gravitational potential energy by the virial theorem (Swihart, 1968), equation 5 can be written for the entire star as:

$$L = - \frac{KG M^2}{R^2} \frac{dR}{dt} + Q_n \quad (18)$$

where  $K$  is a dimensionless parameter of order unity (whose precise numerical value depends on the mass distribution), and where  $Q_n$  is the possible heat source by thermonuclear reactions. Evolutionary astronomers assume that for main sequence stars  $dR/dt = 0$ , and solve for stellar structure assuming  $L = Q_n$ . Assuming known composition  $\mu$  and mass  $M$  allows a unique solution for structure (Russell-Vogt theorem) including  $L$ ,  $R$ , and  $T_c$ . Stellar evolution models trace presumed tracks on the H-R diagram by adjusting  $\mu_c$  (to account for nuclear produced composition changes after a specified time), and recomputing the structure. However, as noted by DeYoung and Rush (1989), if  $Q_n = 0$  the value of  $dR/dt$  obtained for the sun is so small as to be presently unobservable. Therefore, it cannot be conclusively stated that the sun is not partly powered by slow gravitational contraction (and by inference neither for other stars as well).

It should be noted that the Russell-Vogt theorem is not valid unless the luminosity is generated exclusively by thermonuclear power. The theorem states that a star's structure is determined uniquely by its mass and composition (and indirectly its age) if powered by thermonuclear reactions. If stars are contracting, the theorem is no longer valid, and a star's structure is no longer uniquely defined by its mass and composition.

In conclusion, the source of stellar power cannot be determined by observations. Solar neutrino measurements are inconclusive. That solar neutrinos are observed at all suggests that some nuclear reactions are occurring in the sun's core, but these measurements do not agree with the predictions of evolutionary models. This suggests that these models are in error. Contraction rates necessary to power the sun are so small as to be unobservable. It is possible that stars are powered by *both* thermonuclear and gravitational sources in varying degrees, and exist in various states of contraction consistent with the governing equations of stellar structure.

### Synthetic H-R Diagram

The luminosity relation of equation 13, combined with the opacity relation of equation 17, yields a mass-luminosity expression independent of the radius:

$$L = \mu_c^4 M^4 \quad (19)$$

If  $Q_n$  is much smaller than  $L$  in equation 18, any radius  $R$  is possible within wide limits for a given luminosity, as the rate of contraction  $dR/dt$  will adjust accordingly. Let us modify the mass-radius relation of equation 14 to include a dimensionless scaling parameter ( $s$ ) that determines the state of contraction of the star. This parameter will be termed the size parameter; it takes a value of one for the main sequence. Thus equation 14 becomes

$$R = sM^{3/4} \quad (20)$$

Using the mass-luminosity relation of equation 19, along with the surface luminosity relation of equation 10, allows the derivation of a general H-R diagram ( $M - T_e$ ) relationship:

$$T_e = \mu_c \frac{M^{5/8}}{s^{1/2}} \quad (21)$$

Thus different values of the size parameter  $s$  give rise to different curves on the H-R diagram.

These results are summarized in Figure 1 which shows a synthetic H-R diagram. The mass-luminosity relation equation 19 specifies  $L$  for a given  $M$  and equation 21 specifies  $T_e$  for a given  $M$  and  $s$ , where  $\mu_c = 1$  is assumed. For  $s = 1$  a solid diagonal line from high  $L$ , high  $T_e$  to low  $L$ , low  $T_e$  is shown; masses from 25 to .05 are given at several points along the line. Effective temperatures range from about 42000 K to 1200 K over this mass range (using 6000 K for the sun), corresponding roughly to the spectral range from O to M main sequence stars. For various size parameter values ( $s > 1$ ), equivalent lines run diagonally across the upper right portion of the diagram; dashed diagonal lines are lines of constant radius. There is no upper limit to  $R$  from any of the scaling relations, but dynamical instabilities would probably limit  $R$  for very large stars.

The synthetic H-R diagram suggests that the main sequence could be stars of solar type contraction states

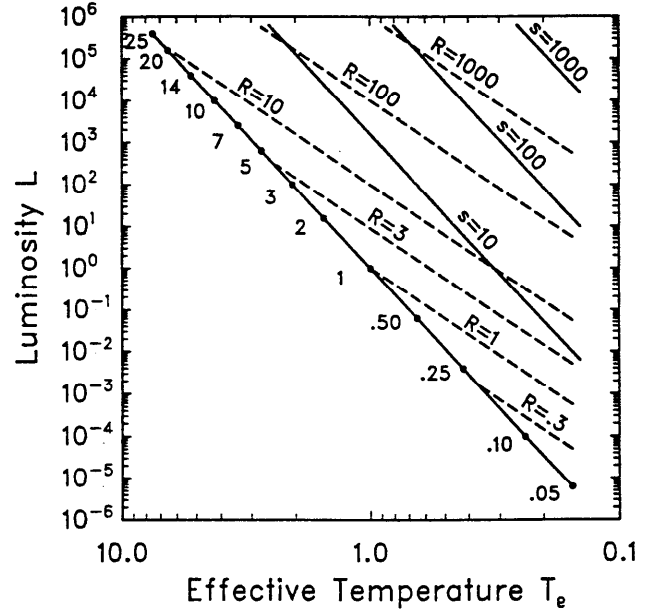


Figure 1. Synthetic Hertzsprung-Russell (H-R) diagram, based on scaling relationships for nondegenerate stars, in solar units.  $R$  is radius,  $s$  is size parameter, and stellar masses are shown for various points on the main sequence diagonal.

(partly, but not exclusively powered by thermonuclear reactions), of solar type composition with varying masses. Giants and supergiants in the upper portion of the H-R diagram would be stars much larger than their main sequence companions of the same mass, but with cooler effective temperatures. Equation 18 shows that if stars are contracting, giants and supergiants (large  $M$ , large  $R$ ) would be contracting relatively quickly compared to their main sequence companions of the same mass. It should be noted that stellar evolution theory postulates that giants have degenerate helium cores remaining from millions of years of thermonuclear fission. However, it is impossible to observationally distinguish such stars from those of uniform solar-like composition which are contracting towards the main sequence.

It should be noted that states of contraction for  $s < 1$  were not plotted in Figure 1. Using equation 20 for the mass-radius relation (with size parameter included), along with equations 7 and 12 for the central density and temperature respectively, yields:

$$\rho_c = \frac{M^{-5/4}}{s^3} \quad (22)$$

$$T_c = \frac{\mu_c M^{1/4}}{s} \quad (23)$$

The size parameter  $s$  cannot be made arbitrarily small, since the increase in central density and temperature would inevitably lead to intense thermonuclear reactions. The theorized reaction rates for the proton-proton cycle (Gibson, 1973) are proportional to the density and strongly temperature dependent. As  $s$  decreases below 1, the central temperature and density will rise dramatically, strongly suggesting that the leftmost edge of the main sequence could be a contraction limit maintained by thermonuclear reactions. This contrac-

tion limit is termed the zero age main sequence (ZAMS) in stellar evolution. Whether some stars are at the limit where  $dR/dt = 0$  in equation 18 cannot be determined observationally. The thickness of the main sequence band is interpreted by evolutionary astronomers as a result of aging of stars away from the ZAMS, but it could just as easily be interpreted as stars of either variable internal composition at creation ( $\mu_c$  variable), or stars which are not yet at the contraction limit for which  $L = Q_n$  in equation 18.

To summarize, the synthetic H-R diagram bears some similarity with observed H-R diagrams. The strong mass-luminosity relation is independent of power source. The radius of the star for a given mass effectively determines its position on the diagram through its effective temperature. Most nondegenerate stars fall into the main sequence diagonal band with giants and supergiants to the upper right. Limits to central density and temperature due to thermonuclear processes limit the diagram to the diagonal and right of the diagonal.

### Conclusion

Present stellar structure theory is closely related to stellar evolution theory by the requirement of an old universe, and a naturalistic origin of stellar systems. Stellar evolution theory interprets the observational data (in particular the H-R diagram) in terms of multi-billion year histories of stars. Yet observational data does not require an old universe. Given all the observational data it is not known for certain how old stars are. In a fashion analogous in earth history, evolutionary astronomers have interpreted the observational data consistently with the philosophical view of slow, naturalistic origins of stellar systems.

Using the basic physical laws believed to govern the structure of nondegenerate stars, simple scaling equations relating stellar properties were derived. It was shown that these scaling relations suggest, although they do not conclusively demonstrate, that the broad features of H-R diagrams can be explained by these physical laws, without recourse to accepting old ages of stars and the necessary evolutionary histories. Several issues discussed by Faulkner and DeYoung (1991) were not raised in this paper: H-R diagrams for star clusters, planetary nebulae, white dwarfs, neutron stars and

pulsars. Only further study and numerical work using the approach of this paper can demonstrate whether detailed creationist stellar models can more completely explain observed H-R diagrams.

### Acknowledgments

It is hoped that this paper has contributed to the discussion desired by Faulkner and DeYoung (1991). If it has in any way given honor to the One who knows every star by name, then the author is pleased.

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### Quote

It was once common to explain the lack of ancestors of many taxa by assuming that they had lived in areas that happened to be unknown. The deep-sea and the higher mountain environments are not well represented by fossils, for example, and if novel taxa had first evolved in such places their primitive members might never be found. However it is now clear, from studies of the adaptive significance of the characteristic features of taxa, that many of them evolved in some of the best-known ancient environments, such as on shallow seafloor. The "unknown environment" explanation cannot be applied generally.

Certainly, many early members of novel lineages may have been rare; the adaptive zone model certainly suggests that pioneering populations could be small. However, if it is assumed these early novel lineages evolved at the same rates as have lineages for which the fossil record is well known, then it would take many hundreds of millions of years to develop the great degrees of morphological difference that they exhibit. It is not reasonable to expect these lineages to have small population sizes (and certainly not to be poorly adapted) for such a long time. Furthermore, even a rare lineage, if skeletonized, should appear in the fossil record sooner or later if it persisted for such a long period. *We are forced to the conclusion that most of the really novel taxa that appear suddenly in the fossil record did in fact originate suddenly.* [Italics added.]

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# AN EVALUATION OF THE JOHN WOODMORAPPE FLOOD GEOLOGY MODEL—PART I

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## Abstract

*In a 1983 issue of the Quarterly, a creationist geologist published a carefully prepared and well-researched treatise on the stratigraphic separation of fossils (Woodmorappe, 1983, pp. 133-185).*

*In marked contrast to many previous Flood models which proposed mechanisms and processes that were rather simplistic and largely not compatible with the actual layout of the rocks and the fossils they contain, John Woodmorappe's concept appears to overcome most of these incompatibilities. It has been both surprising and disappointing that this model has been almost completely ignored by creation scientists and others, possibly because of its grand scope and consequent complexity.*

*This paper evaluates, simplifies to a limited degree, and elaborates on Woodmorappe's Flood concept and thereby hopes to encourage more debate and interest in the field of diluviology and geology, for unless creationists can suggest a reasonable and consistent explanation for the earth's rock systems and the undeniable separation of fossils, the evolutionary uniformitarian approach to geology will continue unchallenged in its domination of earth sciences. This paper (Part I) will discuss the precision of the geologic column. A later paper (Part II) will evaluate the Woodmorappe Flood model.*

## Introduction

There are two approaches to geology from a creationist point of view. The first and most obvious is to highlight the defects, weaknesses, contradictions, and serious problems which still persist in the uniformitarian or orthodox geologic paradigm. These difficulties form the first part of this paper along with a discussion of some of the elements which support the TAB model (Tectonically Associated Biological Provinces Model). The second approach is to present a reasonable and comprehensive alternative to the orthodox position, based on the concept of a global Flood of unique proportions, lasting approximately one year and with after-effects continuing on a much diminished scale over several thousand subsequent years. In the past, not enough emphasis has been placed on these after-effects and the impression has often been erroneously given that creationists believe that the whole global system was laid down in just one year. This incorrect view has been used by our evolutionist opponents to discredit diluviology. It is not enough just to criticize uniformitarian geology; Part II will reveal the positive side of the argument—a new way of thinking on geology.

When Morris and Whitcomb published their voluminous work (1961) little did they realize the tremendous implications for the post World War II creation vs. evolution controversy. Their epic work unleashed a surge of new interest in the subject of origins which still has not diminished but in fact has continued to grow. Since 1961 hundreds of creationist organizations have appeared, hundreds of books published, scores of university and public debates held, and thousands of journals printed containing articles and papers on origins. Many of these have been of excellent quality and some are really outstanding, but others have failed to impress because they have not, either directly or indirectly, coped adequately with one of the main problems facing creationism—the separation and positioning of fossil organisms entombed in the great rock systems of the world. Of course it can be argued that

organic evolution and creationism can be debated independent of geology and to a degree this is true, but there is no doubt that an apparently lengthy earth history is more favorable to the evolutionist case than it is to creationism.

Many previous attempts to find a suitable diluvial process have foundered because while sound principles have been invoked in support of rock and fossil positioning such as ecological zonation, mass burials, hydrodynamic sorting, and differential escape factors, these have not in themselves been enough to explain why fossils generally are so differentiated and often appear in certain definite patterns. For instance, none of the above factors by themselves or as a whole, explain why different types of reptiles appear in the strata all the way from Carboniferous rocks to the uppermost formations. Why do we not find mammal or bird fossils in what are undoubtedly rocks laid down at the bottom of the geologic column (Figure 1)? Why do the deepest layers contain so few fossil families that still exist today? Until we come to grips with questions like these, we will continue to fight a defensive battle.

It cannot be denied that there is a certain order in biostratigraphy and this fact must be faced. On the other hand, the precision of so-called fossil succession is much exaggerated and not nearly as clear-cut as we are led to believe. While it is true that many fossil beds contain an assemblage of totally extinct organisms, this does not mean that the only conclusion is that they lived long ago at a time when other forms had not yet come into being. As we shall see, there are other geological processes which can very effectively separate organisms from other forms which lived contemporaneously, and which can do this not once but many times and consistently give a similar pattern.

Woodmorappe's Tectonically Associated Biological Provinces Flood model (1983) is a noteworthy and reasonable idea which, when combined with the previously mentioned factors, goes a long way toward giving us the needed mechanism. A question which must be asked is whether the uniformitarian geologic column is as precise as claimed, and I will discuss

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| THE GEOLOGIC (STRATIGRAPHIC) COLUMN |                    |                    |                                                                |
|-------------------------------------|--------------------|--------------------|----------------------------------------------------------------|
| ERAS                                | PERIODS AND EPOCHS | BEGAN<br>( YEARS ) | APPEARANCE OF<br>LIFEFORMS                                     |
| CENOZOIC                            | QUAT. RECENT       | 10 000             | —                                                              |
|                                     | QUAT. PLEISTOCENE  | 2 MILLION          | HOMO (MAN)                                                     |
|                                     | QUAT. PLOICENE     |                    | HOMINIDS                                                       |
|                                     | QUAT. MIOCENE      |                    | PONGIDS (APES)                                                 |
|                                     | QUAT. OLILOCENE    |                    | MONKEYS                                                        |
|                                     | QUAT. EOCENE       |                    | HORSE TYPES                                                    |
|                                     | QUAT. PALEOCENE    | 65 MILLION         | PRIMATES                                                       |
| MESOZOIC                            | CRETACEOUS         | 135 MILLION        | WHALES<br>MARSUPIALS<br>MONOTREMES<br>FLOWERING PLANTS         |
|                                     | JURASSIC           | 190 MILLION        | BIRDS<br>MAMMALS                                               |
|                                     | TRIASSIC           | 220 MILLION        | DINOSAURS<br>CONIFERS                                          |
| PALEOZOIC                           | PERMIAN            | 280 MILLION        | CYCADS (TRUE PINES?)<br>MAMMAL-LIKE REPTILES                   |
|                                     | PENNSYLVANIAN      | 310 MILLION        | COAL PRODUCING FORESTS<br>PRIMITIVE REPTILES                   |
|                                     | MISSISSIPPIAN      | 350 MILLION        | AMPHIBIANS                                                     |
|                                     | DEVONIAN           | 400 MILLION        | SHARKS<br>JAWED FISH<br>FERNS<br>VASCULAR LAND PLANTS          |
|                                     | SILURIAN           | 420 MILLION        | INSECTS<br>MOSESSES                                            |
|                                     | ORDOVICIAN         | 490 MILLION        | JAWLESS FISH<br>CEPHALOPODS<br>GRAPTOLITES CRINOIDS            |
|                                     | CAMBRIAN           | 570 MILLION        | ANNELID WORMS<br>SPONGES<br>MOLLUSKS<br>TRILOBITES<br>STARFISH |
| PROTEROZOIC                         | (PRECAMBRIAN)      |                    | JELLY FISH                                                     |
| ARCHAEN                             |                    | 3 BILLION          | BACTERIA<br>ALGAE                                              |

Figure 1. The geologic column as depicted in many textbooks.

various difficulties and problems which detract from the validity of uniformitarianism.

### The Law of Superposition

No one with knowledge of earth sciences will deny this fundamental principle—in normal circumstances a layer of rock which is overlain by another, arrived in that position before the higher one. Apart from forces such as intrusions, folding or overthrusting, the Law of Superposition always holds true.

We shall be dealing almost exclusively with sedimentary layers—those strata which have been laid down in water; lake and stream beds, flood plains, seas or oceans. An example is the Grand Canyon where a number of formations lie atop one another like layers on a cake. One can clearly see the parallel lines which distinguish them.

### Deceptive Conformities (Paraconformities)

Because paleontologists often rely on the fossil content in a stratum to determine the geologic 'age' of the rock, they frequently find that a layer overlain by another, perfectly conformably, is much 'older' than it may first appear because of the differences in the fossilized organisms between the two. Without these fossils, the geologist would usually consider the two

were laid down contemporaneously. Yet because he 'knows' that certain organisms lived millions of years before others, he often assigns a date millions of years older to the underlying layer. Thousands of these cases are known globally and they present a possible weakness in the uniformitarian paradigm.

An excellent example of multiple paraconformities exists in the limestone formations near Nashville, Tennessee (Figure 2). Although all the layers are conformable, the top of the Pegram Limestone of alleged mid-Devonian age is separated from the parallel deposits of Chattanooga Shales (upper Devonian), by a supposed time-gap of over 15 million years. Underneath, the Pegram is separated from the mid-Silurian Lego Limestone by a supposed gap of 40 million years. Thus at a site where, to the eye, the strata were neatly deposited one upon the other quickly and without erosional relief, a total of nearly 60 million years' accumulation of deposits are allegedly missing, the reasoning being dependent on fossil data. Further, the Chattanooga Shales of the Upper Devonian lie flat and parallel on layers of many different 'ages' such as on Ordovician rock in central Tennessee—another gap of 90 million years, yet apart from fossils, no physical evidence indicates any long time-gap.

Science researcher Corliss finds this problem serious:

... large chunks of geologic history are missing, even though the strata on either side ... are perfectly parallel and show no evidence of erosion. Did millions of years fly by with no discernible effect? A possible though controversial inference is that our geological clocks and stratigraphic concepts need working on (1980, p. 219).

It is difficult to believe that millions of years could pass with no erosional effects at the interfaces. While it is true that in some cases there is obvious evidence of erosion, there are too many occasions where the evidence is totally lacking, except for the fossils. Now if we knew that evolution was true, it would be legitimate to accept the time-gap between the rock layers, but what if there was another reason for paraconformities? We shall examine this further in Part II.

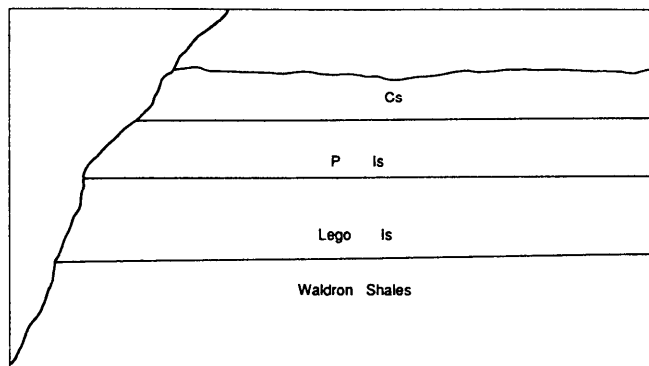


Figure 2. A simplified example of a double 'deceptive' conformity (paraconformity). Although there is a perfectly conformable contact between the Chattanooga shales (Cs) and the Pegram limestone (P ls), and between the Pegram and the Lego limestone (Ls), millions of years allegedly separate these formations, the only 'evidence' being the missing fossils (Whitcomb and Morris, 1961, p. 210).

### Intertonguing, Interbedding, Interfingering

There are quite a number of these interesting phenomena around the world. The terms are used to describe cases where rocks of different ages and/or texture interbed or interfinger with each other. We are not talking about genuine intrusives which often occur when hot magma is presumed to have been forced into older sedimentary rock. A notable example is found below the North Rim of the Grand Canyon and is well studied in the field and described by Waisgerber et al. (1987, pp. 160-167). According to orthodox geology there is a 155-200 million year time-gap between the base of the Mississippian Redwall limestone and the top of the Cambrian Muav limestone, where Ordovician, Silurian, and Devonian deposits are missing—it is one of the biggest deceptive conformities in the world.

Waisgerber, Howe and Williams examined and mapped a remarkable site on the North Kaibab Trail—a site where the ancient Muav of Cambrian age interbeds quite clearly with the much younger Redwall, not once but three times within less than 50 feet vertically. Waisgerber et al. comment,

We found however, that beds of both (Cambrian Muav and Mississippian Redwall) were deposited in exactly the same horizontal fashion and there were no signs of the Muav having eroded before the Mississippian Redwall Limestone was laid down. In one place, Muav and Redwall clearly graded laterally into each other and they also manifested a vertical intertonguing at other localities (p. 162, emphasis added).

There is no sign of any faulting in the area, and no metamorphosed rock, and the authors state they could find no evidence of relief such as undulating channels (p. 165). Their conclusion is that—"The unconformity supposedly separating the Redwall limestone from the underlying Muav limestone *does not exist*. Consequently there cannot be any 200 million year hiatus" (p. 166, emphasis added). The question is, how can solid rock from two formations 155-200 million years apart be interbedded with each other unless both formations were deposited at approximately the same time? Australian geologist Snelling studied this site recently and reports that "... the actual observational evidence in the field supports the contention that *continuous deposition* occurred as the Redwall limestone was deposited on top of the Muav limestone ..." (1992, p. 34, emphasis added).

Another good example of interbedding is illustrated in *The Genesis Flood* by Whitcomb and Morris (1961, p. 202). Here we see undisturbed Cretaceous chalk interfingering with Pleistocene glacial till twice in one area. To the eye there is no question of unconformity and the naive view is that once again, this great bed was laid down as one. The claim of geologists is that glacial action transported great segments of the ancient Cretaceous chalk on top of much younger Pleistocene till, but the undisturbed condition of the chalk with its horizontal lenses of flints does not support this idea. The fact that the chalk intersects the till twice also makes such a claim unreasonable. Therefore creationists are entitled to deny the orthodox explanation and to insist that there is no physical evidence of a 70

million year hiatus. The whole deposit was laid down at the same time, just the way it looks. These are only two of the many serious objections to historic geology and its corollary, organic evolution.

### Fossils, Subjectivity and Taxonomy

The key to orthodox/historic geology is of course the correlation of fossils—locally, regionally, and globally, but accurate correlation depends on absolute objectivity when determining just what is a fossil species or a fossil genus. If we have great difficulty now in accurately defining living species and genera, how much more difficult it is when the objects of paleontologists' attention are the osteological remains of extinct forms of which we have no direct knowledge. The point is, how do we know that a species of gastropod found in so-called Triassic beds is the same as (or different from) those found in some other fossil location of a later/earlier time?

The paleontologists must rely on anatomical comparison; there is not much else to guide them. Naturally the authorities themselves sometimes publicly recognize this handicap, especially when working over long geographical distances. Woodmorappe has documented a considerable number of these admissions (1978, pp. 100-101). One example given is that of Shaw who radically advocated that the designation of fossil species be abandoned and replaced with a stratigraphy of morphological attributes because the designation of fossil species depends on what individual paleontologists consider as significant (1969, p. 1085).

Woodmorappe notes that in the case of fossil genera the problem is even worse: "It is not uncommon for genera to be recognized, named and allowed to define (time) zones on the presence of but *single* specimens. . . ." (p. 100, emphasis added).

He indicates that "Twenty years of study have reduced the number of Lower Lias (Jurassic) ammonite genera from 106 to 76" (p. 100). There is case after case where dubious theories of descent have led to unnecessary multiplication of generic names. In another instance 70 ammonoid species of the genus *Sonninia* have been now reduced to only two (Donovan, 1973, p. 2). The practice of taxonomic hair-splitting is not uncommon where tiny differences in form or structure turns one species or genus into several, thus establishing more time-zones and making generic successional order rather exaggerated both in precision and repetitive consistency.

Woodmorappe cites Koch who wrote "The published fossil record has significant bias in favor of common and biostratigraphically important taxa . . ." (Koch, 1978, p. 367). Woodmorappe also says that "Simultaneously, there is an artificially high diversity of short-range taxa caused by taxonomic oversplitting by stratigraphers" (1983, p. 136). When one considers that correlating these forms over far-flung areas is the means by which stages and time-zones are established, one is entitled to be skeptical of such methods. In most cases, unless the osteological comparisons reveal that two or more fossils are identical, *we cannot tell* whether we are dealing with juvenile/adult, macroevolution, variation, or simply sexual dimorphism in any particular instance. Paleontology by its very nature must in-

elude a large element of subjectivity. If we found a group of fossils as diverse as the modern breeds of dog, we would not recognize that they were all of one species. This degree of bred-diversity would not be generally expected under non-controlled conditions.

Redfern in his 1983 work on the Grand Canyon admits (p. 86) that

Geologists commonly must interpret the environment and age of sedimentary rocks from imperfect fossil fragments . . . moreover, geologists commonly have to segregate the cluster of *extraneous* fossils from those which are pertinent to the strata being investigated (emphasis added).

This means that no fossil can be accepted at face value; if it does not fit in with the successional dogma, it must be rejected by the expert and the implications are obvious. Creationists are not bound by this dogma and can accept fossils at face value unless it can be shown beyond doubt that some other influence was at work, such as reworking. Sometimes identical, but 'out-of-place' fossils are given different names. Not uncommonly, geochronological 'stages of strata' (evolution over time), are little more than abstractions not dependent on the occurrence or the absence of any particular species, but only 'recognized' by the general grade of evolution as a whole. That is, although the particular fossil species are not present, it is assumed that evolution must have occurred.

Further, there are many cases where the stratigraphic range of an index or chosen fossil is found with further exploration to be more than originally believed and therefore it loses its significance in correlation and time value. The art of correlation, whether by index fossils alone or by the type of fossil assemblage found at various sites is indeed a tricky one. In the case of index fossils, where short stratigraphic range and geographically wide distribution is essential, some degree of circular reasoning is unavoidable because fossils are relied upon to indicate a geologic age, yet age is accepted as a criterion in determining taxonomic status.

While some degree of fossil separation and correlation is useful in local areas, the process becomes very subjective and less precise in large-scale and/or global proportions. As geologists move from local to regional, to continental, and then global concepts ranging over hundreds of thousands of kilometers, the exercise becomes more and more doubtful and complex, and becomes more dominated by preconception. The process becomes less empirical and more conceptual because of progressively greater differences in the lithology; in the local fossil succession; and in the overall faunal character.

The key to this process is not based primarily on empirical superposition but rather on the *conceptual basis* which links the so-called index fossils as time equivalent. To put it another way, correlation by index fossils has meaning only if they arose (evolved) at a certain definite time and became extinct at an equally certain definite time over a widespread area (Figure 3). Woodmorappe, in his voluminous research (1978, 1980, 1982, 1983, 1986), found that fossil horizons have regional and local correlation value and this is independent of whether the organisms evolved or were

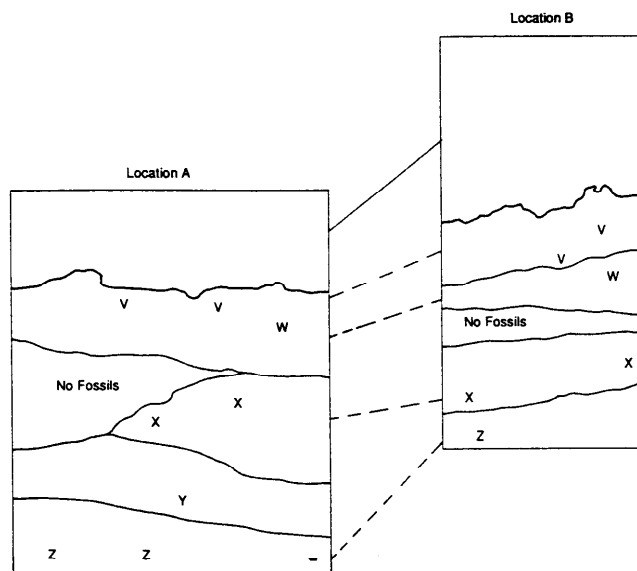


**Figure 3. A simplified diagram of correlation by fossils between two different locations. The examples v, w, x, and z are assumed to be time-equivalent. In Location B no 'y' fossils are present and thus it is assumed that the particular formation was never deposited or if it was, it has since been eroded completely away.**

created. In Part II we shall see the reason for this from a creationist perspective.

Woodmorappe agrees that there is an artificially high diversity of short-range taxa (the index fossils), and that taxonomy is biased towards producing the short-range 'species' and 'genera' (1983, pp. 135-136). He cites Harper as stating that ancestor-descendant lineages should be constructed which leave "... fewer or shorter stratigraphic gaps" (1978, p. 96). Yet despite this, large gaps between the higher categories such as family level and above are virtually universal, no matter what the stratigraphic position. Matthews makes it clear that while lithologic correlation is useful at the local level, when it comes to global scale, only biostratigraphy is reliable; i.e. total dependence on fossils (1974). He states "The basic book-keeping unit of biostratigraphy is the range of the species" (1974, p. 96). But if these forms attained their position in the rocks by a means other than long-term evolution, their value as time indicators is zero.

### **The Actual Stratigraphic and Successional Tendencies of Fossils**

To avoid possible bias in using fossil species or genera, Woodmorappe based his approach at the family level of fossil organisms. A further excellent reason is the virtual lack of transitional forms and/or lineages between families, and between the even higher categories such as orders, classes and phyla, except for a handful of disputed or doubtful types. From his study of 2617 fossil families covering the entire Phanerozoic Era (Cambrian to Quaternary), Woodmorappe found that the fossils are indeed highly differentiated stratigraphically, yet he also found that many fossils overlap many geologic periods. In fact, a small minority of all fossil families span the entire column. For example 2.5 percent of all recent families are also represented in Cambrian rocks, 29 percent of Carboniferous families

are represented in Cretaceous beds, and 25 percent in Tertiary deposits. In all cases, from Cambrian to recent, the highest percentage of fossil families in common was found in adjacent periods such as Cambrian/Ordovician, and Triassic/Jurassic.

One-third of all fossil families span three or more of the geologic periods and furthermore, one third of families are stratigraphically confined to only a single geologic period. From this it can be seen that the great majority of fossils are useless as rock-time indicators. Because in most cases 'older' periods have more of their forms in common with 'younger' periods than the 'younger' ones have in common with 'older' ones, Woodmorappe believes that the trend, going stratigraphically upward, is the addition of 'new' forms rather than the disappearance of 'old' organisms. This may be because stratigraphic conflicts are usually resolved by allowing stratigraphically older taxa to range into younger strata in preference to the reverse. This then means that more fossil groups appear later in the column, helping the evolution cause and distorting the actual stratigraphic differentiation.

#### **Do the Fossils Really Overlie One Another?— The Question of Juxtaposition**

To research this in detail, Woodmorappe went to the enormous length of pinpointing every location on the earth where each of the index fossils is found (Table I). These 'time-marker' fossils range from six groups of Precambrian fossils to six types of Ordovi-

**Table I. Some of the 34 index fossils used in Woodmorappe's TAB Model to establish actual locations where fossils of different Periods superpose or juxtapose within the 320 kilometer diameter areas allowed. Numbers in parentheses indicate number of fossil sites involved in each Period. Total = 9560 sites (Woodmorappe, 1983. pp. 138-139).**

| Geologic Period           | Index Fossil Types                                |
|---------------------------|---------------------------------------------------|
| Precambrian (250)         | Miscellaneous Invertebrates                       |
| Cambrian (528)            | Trilobites, Archaeocyathids                       |
| Ordovician (1560)         | Trilobites, Graptolites, Brachiopods, Conodonts   |
| Siluro/Ordovician (205)   | Echinoderms                                       |
| Silurian (303)            | Brachiopods                                       |
| Siluro/Devonian (502)     | Graptolites, Fish, Trilobites                     |
| Devonian (910)            | Floras, Ammonoids, Coelenterates, Brachiopods     |
| Carboniferous (421)       | Ammonoids, Fusulinaceans                          |
| Permo/Carboniferous (767) | Floras, Corals                                    |
| Permian (884)             | Fusulinaceans, Brachiopods, Ammonoids, Ectoprocts |
| Permo/Triassic (255)      | Reptiles                                          |
| Triassic (304)            | Fish, Ammonoids                                   |
| Jura/Triassic (244)       | Floras                                            |
| Jurassic (440)            | Ammonoids/Belemnites                              |
| Jura/Cretaceous (188)     | Dinosaurs                                         |
| Cretaceous (499)          | Ammonoids/Belemnites                              |
| Tertiary (1013)           | Mammals, Foraminifers                             |

cian graptolites, five genera of Devonian ammonoids, right up to the Tertiary mammals and foraminifers. The total number of genera involved is 182, covering 9560 fossil sites over the whole of the column. Woodmorappe then constructed locality maps for each type of fossil and superimposed the maps over a light table to determine the actual superpositions of these fossils. He was generous on the side of evolution to eliminate bias and allowed fossils occurring several tens of kilometers apart but in different strata levels to be recognized as superposed. At some sites fragments were allowed, even if they were questionable as true index fossils.

From this information Woodmorappe then constructed a table covering all the index fossils and sites over the whole of the Phanerozoic. Using 34 index fossils (about three from each geologic period), he found that only small percentages of all localities of any given fossil directly overlie, or are overlain by, others belonging to another period. In other words, the index fossils tend to be not found juxtaposed or superposed; i.e. they 'shun each other' geographically. This is an empirical finding and has quite serious ramifications for evolutionary geology. It can be seen from the list of index fossils used by Woodmorappe in his comparison (Table I), that overwhelmingly they are marine forms, even in the higher (younger) strata of the upper Mesozoic and Cenozoic.

An interesting result was that in the geologic periods comprising the Paleozoic era, juxtapositioning of the fossils was much more evident than it was in the Mesozoic and the Cenozoic. Some examples are given in Table II. The results are not unusual: Of the 478 Tertiary foraminifer fossil locations, less than five percent overlie locations containing Triassic ammonoids. This is remarkable, given that the resolution of fossil localities is several tens of kilometers. In the Mesozoic and the Cenozoic, hardly any localities overlie other older locations.

We see then that when comparing geologic periods, the fossils of those periods tend to 'shun each other geographically,' i.e., they are not usually found juxtaposed or superposed biogeographically, especially so in the upper portion of the column. Although there are more cases of juxtaposed and/or superposed fossils in the lower half, the number of instances is still quite small. This established fact could be considered as evidence that fossils are to a high degree ecological and/or biogeographic equivalents, thus negating concepts of long ages of geologic time. This interesting geographical incompatibility of index fossils makes mechanisms of fossil separation (for those few juxtapositions that do exist), amenable to a diluvial explanation which will be discussed in Part II.

So far we have been concerned only with cases of singular types of index fossils relative to each other. When we turn to multiple types of fossils, there are only 59 regions of possible juxtaposition around the globe, i.e. cases where only seven of 34 index fossils occur in the same regions. These regions have diameters of about 200 miles (320 kilometers). Even so there are only a handful of instances on earth where over 10 of 34 index fossil types are possibly juxtaposed and not one case where half of them are possibly juxtaposed.

**Table II. Some examples of superpositioning by index fossils. Percentages in parentheses indicate proportions of total sites where superpositioning is actual. Note that more index fossil sites overlie others in the Paleozoic (over 10X), than in the Cenozoic (less than 5%). Also note that overwhelmingly the sites do not superpose at all (Woodmorappe, 1983. pp. 152-153).**

| Era       | Fossil Types                              |
|-----------|-------------------------------------------|
| PALEOZOIC | Silurian brachiopods<br>over              |
|           | Ordovician graptolites<br>(More than 10%) |
|           | Devonian ammonoids<br>over                |
|           | Ordovician conodonts<br>(More than 10%)   |
|           | Devonian brachiopods<br>over              |
|           | Ordovician nautiloids<br>(5-10%)          |
| MESOZOIC  | Triassic fish<br>over                     |
|           | Permian ammonoids<br>(Less than 5%)       |
| CENOZOIC  | Tertiary foraminifers<br>over             |
|           | Triassic ammonoids<br>(Less than 5%)      |

These findings are of great import in viewing the so-called geologic column as having real physical properties, at least as far as preciseness and exactitude are concerned. Nobody doubts that there are such things as lower and higher rocks and fossils which are stratigraphically differentiated, but the fact remains that the so-called column is a broad concept and is lacking in the fine detail claimed by evolutionists. Sometimes this fact is acknowledged. Bell (1983, p. 111) admitted, "For approximate correlation of the larger stratigraphical units, fossils prove satisfactory; the difficulty appears when fine detail is needed." This of course makes the task of the Flood geologist much easier; he has only to find a mechanism which would account for this broad trend.

Woodmorappe was able to demonstrate that the "... evolutionary/uniformitarian geologic column does not correspond to reality ..." (1981, pp. 46-71). He drew attention to the plain fact that "... geologic periods tend to be absent, inconsistent in their stratigraphical successional order, from place to place, and all exhibiting some tendency to rest directly on Precambrian basement" (p. 46, emphasis added). Thirteen percent of the earth's land surface has five geologic periods represented, irrespective of their order or identity and less than one percent has all 10 periods in place.

A significant portion of every geologic period's rocks do not overlie rocks of the next older period. About 23.2 percent of Ordovician rocks, and 18.6 percent of Devonian rocks rest directly on Precambrian basement. Even of the most recent rock, the Tertiary, 4.39 percent rests directly on very ancient Precambrian rock. An orthodox geologist would claim that the intervening 'missing' rocks either were eroded away or were never

deposited in the first place. This claim really begs the question of whether or not these missing period rocks ever existed.

Of course there are a few places on the earth's land surface where portions of all 10 geologic periods can be found, in Poland for example. But when we remember that 47 percent of the earth's land surface has Cambrian rock alone (the oldest of the Phanerozoic), 31 percent has both Cambrian and Ordovician, and 21 percent has Cambrian, Ordovician and Silurian, one is entitled to be very skeptical of the physical reality of the column. Therefore we are equally justified in looking for more plausible mechanisms and processes which can explain the stratigraphic separation of fossils. If the physical geologic column was indeed a reasonable reality we should expect that the so-called index fossils should not shun each other geographically all over the globe, but rather should be much more compatible. The 'different age' fossils are overwhelmingly incompatible and this must be faced. The geologic column appears to be a misinterpretation of the actual facts.

### Two Principles

While showing all the things which tend to reduce the physical reality of the column, and why we are scientifically free to consider the column as a mixture of reality and conceptualism, we must still be prepared to accept the validity of two principles. 1. Most fossils are highly differentiated stratigraphically. 2. The deeper we go in the rock systems, the more different are the fossils generally from those in the higher rocks.

Unlike the evolutionist who is tied to one concept of organic transformation over hundreds of millions of years, the creationist is at liberty to accept fossils at face value and to offer alternatives as to how they got where they are. The uniformitarian geologist cannot do this. If he finds fossils which are (to his mind) out of place, he must insist that they are reworked from another place whether or not there is any physical evidence to support him, as was openly admitted by Redfern (1983, p. 86). If geologists often have to resort to removing extraneous fossils from those pertinent to the strata being investigated, then creationists are conversely free to accept all the fossils at a site, at face value, and as being pertinent to the strata, unless there is good evidence that the "extraneous" fossils are the result of reworking. Woodmorappe has given over 200 cases where fossils are misplaced and his list is by no means exhaustive (1982, pp. 210-214).

We are also entitled to accept so-called paraconformities at face value while the uniformitarian must insist that these conformities are deceptive. That is, even though the conformable state of the interface is fully consistent with a short time-frame of deposition, many millions of years must have elapsed before the deposition of the uppermost strata on the lower. The same goes for interbedding, intertonguing, and interfingering. The orthodox geologist must deny the physical evidence while the creationist can easily accept that there is no problem if the bulk of the sedimentary strata was laid down more or less concurrently.

There is a further problem: Historical geologists assure us that in most parts of the world they know the biostratigraphic history very well and this knowledge is based overwhelmingly on the placement of ancient

fossil biota. If this precision is so high, why do the rocks yield *only a disputed handful* of all the untold transitional forms and lineages that surely must have existed at some time in that long past? How can the past life history be both so precise and yet lacking so much? Why do mostly the same fossil forms keep appearing all the time?

Turek et al. wrote in 1984 (p. 13), "One of the basic tasks of paleontology is to present a comprehensive picture of the evolution of the organic world." I would maintain that such a task requires much speculation and imagination because a page earlier, the same author wrote—

... the exact determination of fossils is often fraught with difficulties. None of the biological systems is as yet completely unified and universally accepted, so that the classification of fossils is still exceedingly unstable. Not infrequently, *the same species* has been placed by contemporary authors in different genera, or *the same genus* in different families. (emphasis added).

This indicates just how conceptual the art really is.

### A Diluvial Perspective

So far we have dealt with flaws and deficiencies in the standard uniformitarian paradigm and endeavored to illustrate the scattered and fragmentary nature of the so-called geologic column. All these factors must be kept in mind at every stage as we turn to the positive side of Woodmorappe's Flood model, especially the fact that the index fossils, the chief (but not the only) basis of the uniformitarian geochronological concept, very rarely actually overlies one another but really are geographically incompatible (Figure 4).

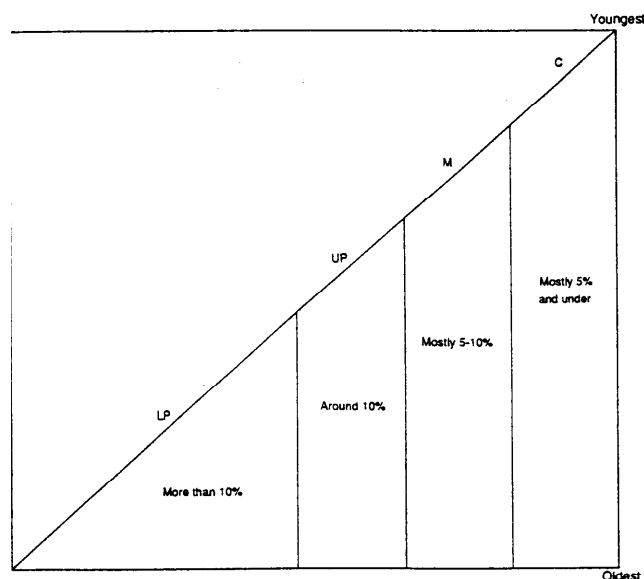


Figure 4. Actual compatibilities and incompatibilities of index fossils—juxtapositional tendencies. In the Cenozoic (C), only 5 percent or less of index fossils directly overlie fossils of 'earlier' ages; 5-10 percent of Mesozoic (M) index fossils directly overlie those of previous periods. In the geologic periods of the Lower Paleozoic (LP), the tendency for superpositioning of index fossils is mostly over 10 percent. It is therefore clear that the important index fossils shun each other geographically, particularly when it is recalled that Woodmorappe allowed considerable lateral scope—up to tens or hundreds of kilometers (Woodmorappe, 1983, Table III, p. 152).

Apart from the standard evolutionary hypothesis, there are a number of other mechanisms, working alone or together which can cause fossils to become stratigraphically differentiated:

- Pure chance
- Preservation bias
- Ecological/biogeographical
- Tectonic factors
- Hydrodynamic sorting
- Differential escape factors

Evolutionary 'turnover' is thus only one of a number of possibilities affecting the positioning of fossils in the rock record. We shall briefly examine these before advancing to Woodmorappe's main theme.

#### (i) Indeterministic factors—chance

Although many would consider this rather mundane, Woodmorappe points out that it would indeed be odd if organisms buried by a great Flood were equally present at every stratigraphic horizon. Mirroring the fact of index fossils' geographic/geologic incompatibility, note that there is only one instance where all three fossils occur in the same stratigraphic section (the third column of Figure 5, Case 1—Fossils' N, P, and S). That is, one out of 20 instances. In the other 19 cases only one or two coexist in the same section. Taking two at a time, the only combinations possible are N/P or P/N, S/N or N/S or P/S or S/P.

Now if there were many mutual juxtapositions of these fossils, then all six combinations would occur and therefore there would be no global biostratigraphic differentiation. However as actual juxtapositions are very rare it may happen that one or more of the six possibilities may never occur solely by chance. We can apply the statistical principle that artifactual or apparently significant trends can occur if the sample is small enough. And because the sample is small (few juxtapositions), chance can play a considerable role. In Figure 5, Case 1, rare mutual stratigraphic occurrences generate apparent stratigraphic incompatibilities, and the combination of N/S never occurs, purely by chance. In Figure 5, Case 2, we allow the Flood to occur again hypothetically, and now the combination P/S is the one that never occurs. Keeping in mind that in global reality the index fossils do shun each other, we see in both cases there are few opportunities for any two index fossils of different 'ages' to mix with each other—because in Case 1, N/S never occurs due to the rarity of cases where fossils N and S occur in the same location, and in Case 2 the same goes for P/S.

The key is that if many organisms are ecologically separated from each other then only occasionally will they have the chance to mix during the Flood and chance has a stronger role to play than otherwise would be the case. As paleontologists and stratigraphers note (in Case 1) S always appears higher than N, they conclude that this is the 'natural' order of fossil succession relative to each other. The conclusion then follows that the two are 'chosen' or index fossils relative to each other and thus they delineate different short spans of geological time. We shall see later just how this works. Since P can occur in any combination (P/N, S/P, S/P/N, P/S, etc.) it is considered an overlapping or stratigraphically extended fossil of longer time frame and has no time significance and thus becomes rejected as an index fossil.

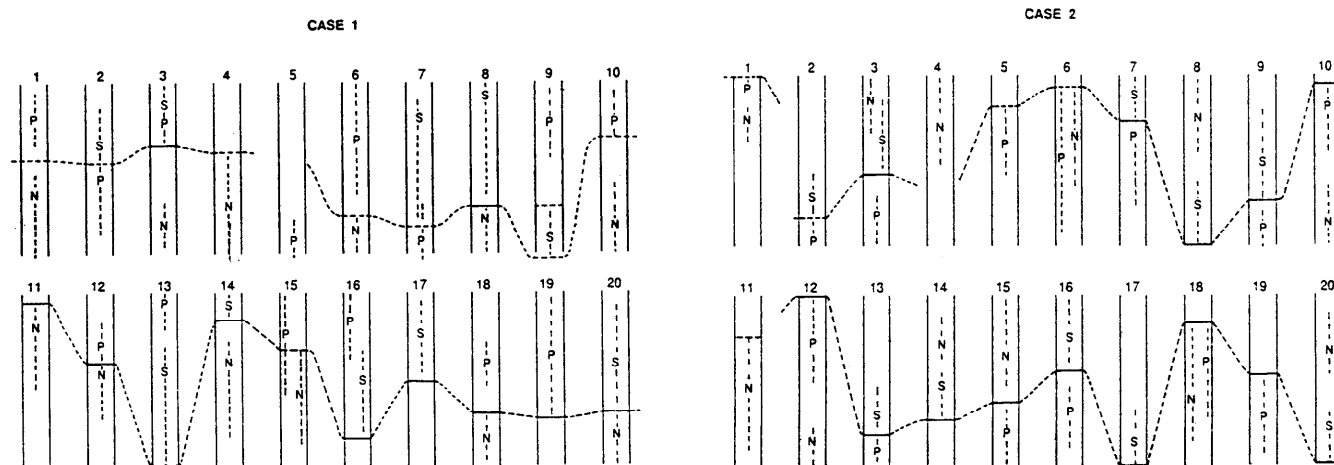


**Figure 5.** The effects of chance on stratigraphic ranges and positioning of fossils. The 20 columns in Cases 1 and 2 represent various possible combinations of fossils P, N, and S at different locations. The incompatibilities of fossils P, N, and S are only 'apparent' because of chance—i.e., N/S never occurs in Case 1 and P/S never happens in Case 2. The chance positioning is misinterpreted by uniformitarians. N and S in Case 1 and S and P in Case 2 become regarded as short-range index fossils. The dotted horizontal lines indicate how a uniformitarian would establish time-equivalents between locations. Dotted vertical lines represent stratigraphic range of the fossils. Further explanation is in text (Woodmorappe, 1983, Figure 2, p. 159).

In Case 2, S and P become the index fossils and N has no time significance as it can appear in any combination. Taking this a step further, a 'time horizon' is then drawn and the geologic sections are time-correlated. In Case 1, where N and S occur, a solid line can be drawn between them but in the case of only one being present, the time horizon can only be drawn either under S or above N but not with exactitude. In Case 2, the line can be drawn between S and P—always below S and always above P while N has no time value.

We have so far restricted the examples to just three index fossils for simplicity, but the principle can be extended to much larger numbers. It can be seen how index fossils could occur or rather be interpreted, in such a system with each index fossil being restricted to a small stratigraphic range within its geologic period. All over the globe, a given index fossil will always be interpreted as being in an Upper Silurian deposit, while another will be considered as belonging to a formation of the Lower Silurian, thus allowing a world-wide correlation. Of course this is a very simplified example and the final determination would be influenced by a number of other factors including ecological zonation, sorting, preservation bias, etc., and we shall shortly see how it would all fit together.

In cases of faunal/floral assemblages, as in Riversleigh, Australia, the total biota including plants and animals are all or part of a Tectonically Associated Biological Province or TAB as Woodmorappe describes it. A typical TAB province could include for instance, bovids, grasses, carnivores, trees, insects, and some reptiles. Most stratigraphic occurrences of 'index' fossils are solitary, but once any particular fossil is considered to be a chosen or index fossil, its stratigraphic confinement is largely due to circular reasoning. Woodmorappe (1983, p. 152) quotes Potapenko and Stukalina: "The crinoids found . . . rule out a Precambrian or Cambrian age for the host limestone because no reliably identified primitive crinoids have ever been found in Paleozoic rocks older than Early Ordovician." Thus the above periods are ruled out by the fact that such crinoids

have never been found there! The circularity of reasoning is obvious, and it is quite frequent. In this particular case, those crinoids should have been allocated stratigraphically to the Precambrian or the Cambrian.

Sometimes index fossils are found in common with others in an assemblage and these are usually 'unique' as a whole in much the same fashion as a single index fossil. A Devonian bed may include several fish remains and other amphibians or plants believed to have lived at a particular time, and will not contain say mammalian or avian fragments; this will be explained further when we come to the TAB principle.

## (ii) Stratigraphic differentiation and separation of fossils

So far we have dealt with chance combinations and non-combinations within a geologic 'period,' but what about the larger stratigraphic rock-time units such as eras and suberas? Woodmorappe's research showed that adjacent periods (e.g., Cambrian-Ordovician), have around 50 percent of fossil families in common with each other stratigraphically. When examining the apparently natural eras of the Phanerozoic, (Paleozoic, Mesozoic, and the Cenozoic), it becomes obvious that more deterministic mechanisms are necessary to account for their stratigraphic fossil differentiation. Woodmorappe now turns his attention to how the ecological, physical, and biogeographic properties of organisms have led to their biostratigraphic differentiation with emphasis on possible connections between the biogeography of pre-Flood animals and plants, and the associated tectono-sedimentary environments.

I digress slightly here to make two points before proceeding. One third of all fossil families span three or more of the geologic periods and only one third of all fossil families are restricted to just one period, while a small percentage of families cross all or most of the periods—e.g., 14 percent of Ordovician fossil families are also found in Tertiary deposits. This contrast between geologic period overlap and the restriction to just one period separation must be explained. Uniformitarian geology does not account for it.

While the creationist has to account for stratigraphic differentiation, the uniformitarian must make use of special pleading when using some fossils as time markers (index fossils), but not the majority which span large portions of the column. We recall that so-called long-ranging fossils are useless as time markers for the uniformitarian. If he finds a fossil type which is commonly located both well above and below that particular level also, he must obviously dismiss it as having no time value. The diluvialist faces no such dichotomy in this regard because time has no significance nor has the fossil separation. He only has to find a suitable mechanism to account for the separation.

In examining the Woodmorappe TAB concept, we must remember the two principles, stratigraphic overlap and nonsuperposition of the index fossils. Woodmorappe gives an example of how deterministic factors such as differential escape could have an effect on the indeterministic factor of chance, previously explained. Let us suppose that when in the same geographical area, fossil S has a 70 percent chance of being buried later than fossil N due to sorting or escape capabilities. Because S and N so rarely coexist, this enables the 30 percent tendency of N/S never to occur by chance (Figure 5, Case 1). In Case 2 the 30 percent situation does occur where N/S but in this case they are not regarded as index fossils relative to each other because they are perceived as long-ranging and overlapping forms and there is no time significance. Now the sorting and escape factors in Case 2 cause a burial bias where fossil P is buried before S, say 80 percent of the time, the same bias having been thwarted by the 20 percent chance in Case 1. Thus we see that factors like sorting and escape need not be excessively efficient to generate fossil differentiation.

### (iii) Ecological zonation

Woodmorappe believes that another factor is of more importance in fossil separation than sorting; ecologic zonation. For instance in Figure 5, Case 1, fossil N occupied a lower habitat than S. The combination of S/N would then occur if say N was benthic (bottom dwelling) while S was say a pelagic (open ocean) form; or, if N was either benthic or pelagic while S was planktonic or free floating; or again, if N lived on low ground while S dwelt on high ground. Because S and N rarely coexist geographically, ecological zonation only needs to work consistently several times for a S/N stratigraphic relationship to be established.

It would be unusual but not impossible to have benthic forms buried directly beneath a pelagic, low ground or high ground form; all would depend on the tectonics of the area and the flows of the sedimentary material, thus the incompatibility factor. Woodmorappe considers that this zonation played a major role in total biostratigraphic differentiation but it would also cause this type of biotal incompatibility within any geologic period. We know that facies fossils are not generally used as index fossils because they are restricted to a particular lithology and therefore would be misleading, yet in some cases these units do have great stratigraphic significance.

The true graptolites, for example, especially those of the Lower Paleozoic, are apparently very rarely found as fossils in limestone (Woodmorappe, 1983, p. 154). They occur in large quantities in other types of sedi-

mentary rocks such as black shales and chert, and appear to have been restricted to what are called graptolite zones, with each 'zone' characterized by the presence of a particular species which were adapted to life at specific marine levels—so it is believed. One would expect that being open sea organisms, they would be very common in limestone. Therefore they obviously were ecologically controlled and may have little significance as index fossils. In view of this ecological dependence of such important and widely used index fossils, there is no reason why the role of zonation cannot be extended beyond faunal differences within alleged time-horizons, to differences between geologic periods.

### (iv) Divisions between eras, a new way for geology?—

#### The stratigraphic column

Assuming for argument's sake that the broad geologic column really exists, we can see that as far as fossil-bearing rocks are concerned, the Phanerozoic breaks rather naturally into four segments: the Lower Paleozoic, the Upper Paleozoic, the Mesozoic, and the Cenozoic eras. Woodmorappe's concept for biostratigraphic differentiation is based on the fact that sedimentation from the Cambrian to the Tertiary has been strongly influenced by tectonic activity and also on the fact that fossils are not only ecologically zoned but biogeographically zoned also. If all these factors can be linked together then biogeographic provinces could be superposed consistently, thus resulting in the stratigraphic separation we undoubtedly see in the rocks.

Woodmorappe found a major trend of changes in tectonic activity as one moves stratigraphically upward in the Phanerozoic layers, and this trend could well be independent evidence supporting his TAB concept. Before examining this trend, Woodmorappe considers the role of biogeography in the fossil record. It is pointed out that many factors cause biogeographic zonation and such zones are not necessarily large in area. The Tuvaella brachiopod fauna is a distinctive Silurian biogeographic zone and is restricted to only Mongolia and closely adjacent parts. Fossil organisms of all geologic periods are divided into paleobiogeographic provinces. The uniformitarian will note for example that Ordovician trilobites differ markedly in different global deposits and he will ascribe these differences to paleobiogeographic provinces such as the bathyurid province and the remopleuridid province. At the same time, the differences between trilobites from so-called Ordovician and Silurian deposits are ascribed to evolution and geologic time. Why should this be so?

Creationists, on the other hand, can reject this dualism and ascribe these differences between and within periods to biostratigraphic processes. As there is considerable differentiation within geologic periods, there is nothing to prevent us from postulating the same basic processes to account for faunal differences between periods. There is a difference between ecological zones and biogeographic zones or faunal provinces. The latter however, may be ecologically controlled and the definitions strictly speaking may overlap.

First, the term ecological zonation refers to organisms that are mutually proximate but do not live together because they occupy different habitats or have different environmental tolerances; second, biogeographic zonation refers to organisms that are geo-

graphically separated, irrespective of whether or not they occupy the same ecological niche. The term biome could apply to organisms that are both ecologically different, such as those possessing different climatic tolerances, and biogeographically zoned. When organisms are members of the same ecological niche but geographically zoned, then they could live together were it not for their geographical separation and any geographic barriers which enforce that separation.

In summary it can be seen that the preciseness of the standard geologic column must be considered as quite doubtful. When other processes such as ecological zonation and the TAB concept are taken into consideration, a new way of looking at geology arises, in which Diluviology can provide many answers to the present problems.

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## PANORAMA NOTES

### Catastrophism — Dam Breaching in the Rocky Mountains

#### Introduction

I had the pleasure of visiting Rocky Mountain National Park in September, 1992. When traveling eastward on the Trail Ridge Road, I stopped at Rainbow

Curve Overlook (elevation, 10,829 ft.). While viewing the spectacular scenery, I was surprised to see an alluvial fan in the valley below (Figure 1). As Osterwald (1989, p. 118) explained:

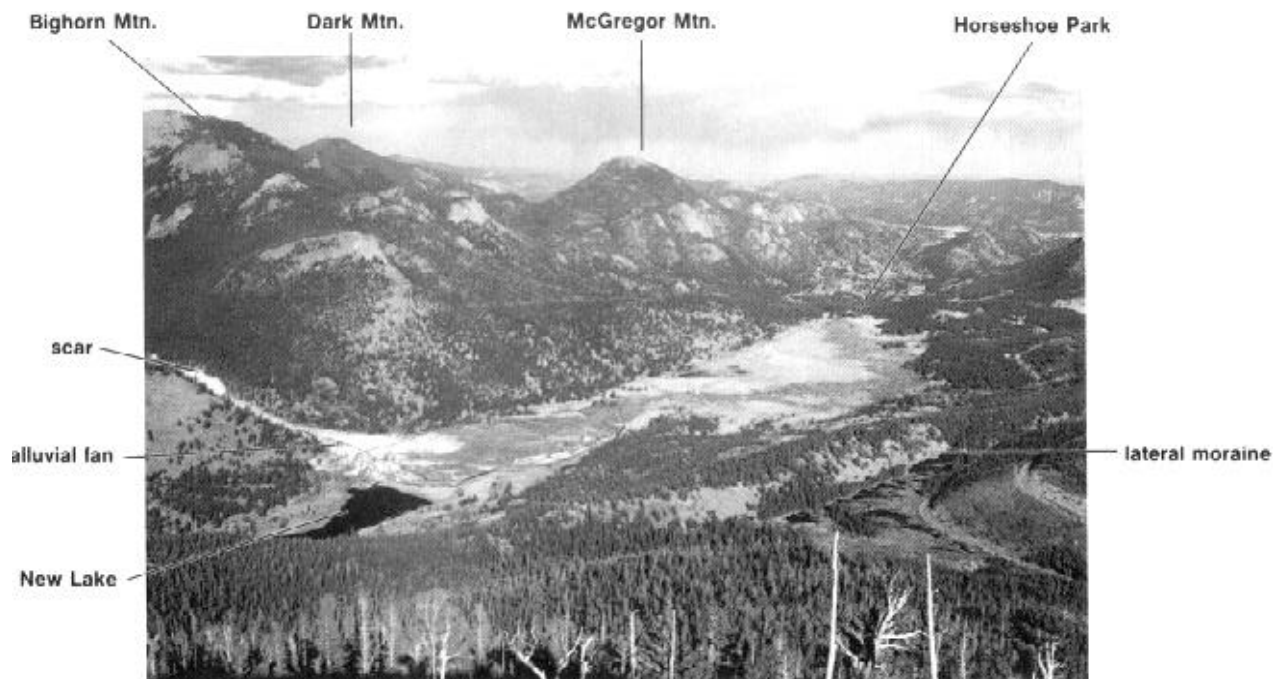


Figure 1. Looking east from Rainbow Curve Overlook, Rocky Mountain National Park, scar and alluvial fan can be seen on the lower left of the photograph.

The scar and alluvial fan, deposited *almost instantly* on July 15, 1982 when Lawn Lake dam failed, are on the northern side of Horseshoe Park valley . . . (Emphasis added).

Later she stated (p. 151) that:

Lawn Lake Dam failed because water seeping through the earth fill around the outlet pipe . . . began washing away fine-grained material from the body of the dam, creating a channel through which water, mud and rocks eventually poured.

This dam failure was caused by a mechanism similar to piping as the lake water made a path through the dam, not overtopping it. Austin (1991) postulated the failure of natural dams on the Colorado Plateau after the Flood as a means of providing surging waters which formed several canyons including the Grand Canyon. His proposed mechanism of dam failure is piping (pp. 69-91). Also see Williams, et al., 1991; 1992a; 1992b; Oard, 1993.

### History

Osterwald (1989, p. 150) briefly discussed the history of the catastrophe.

Lawn Lake, a natural lake, was enlarged in 1903 to hold irrigation water for farmland on the Plains. When the dam failed, a wall of water 25 ft. to 30

ft. high rushed down Roaring River. . . . Large trees and huge glacially-rounded boulders in the path of the flood were washed away. The debris was dumped along the steep slope and against the lower side of Horseshoe Park when the flood water slowed as it reached the flat valley floor. Rubble and debris in the alluvial fan is as much as 44 ft. deep. Huge boulders, weighing up to 452 tons, were carried several miles down Roaring River before they were deposited in the fan. Finer-grained sand, silt and soil were carried outward from the fan and deposited on the floor of Horseshoe Park.

In a sign placed by the National Park Service at the alluvial fan, the power of moving water in relation to this event is graphically portrayed. Some of the description is quoted:

Some 300,000,000 gallons of water smashed down the five mile length of Roaring River. The water snapped trees like matches, tossed boulders like playthings, and filled the air with its awful roar.

For several fearful hours the water tore at deposits of glacial debris, then disgorged its chaotic load onto the floor of Horseshoe Park.

The town of Estes Park, CO suffered greater than \$26 million property damage and the National Park about \$5 million because of the flood resulting from

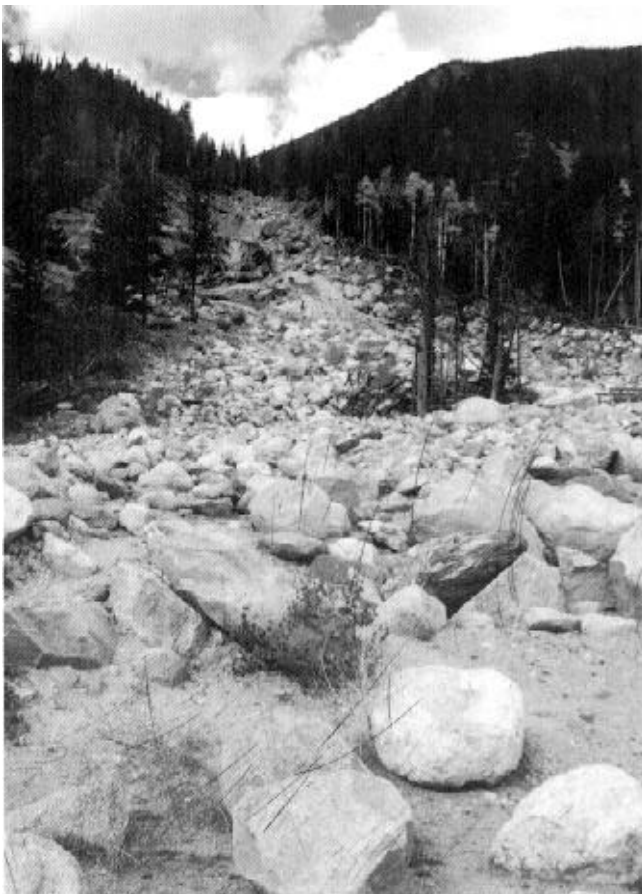


Figure 2 a. Looking up along scar from the alluvial fan, the size of the boulders can be determined if you note the size of the hikers in the center of the photograph.

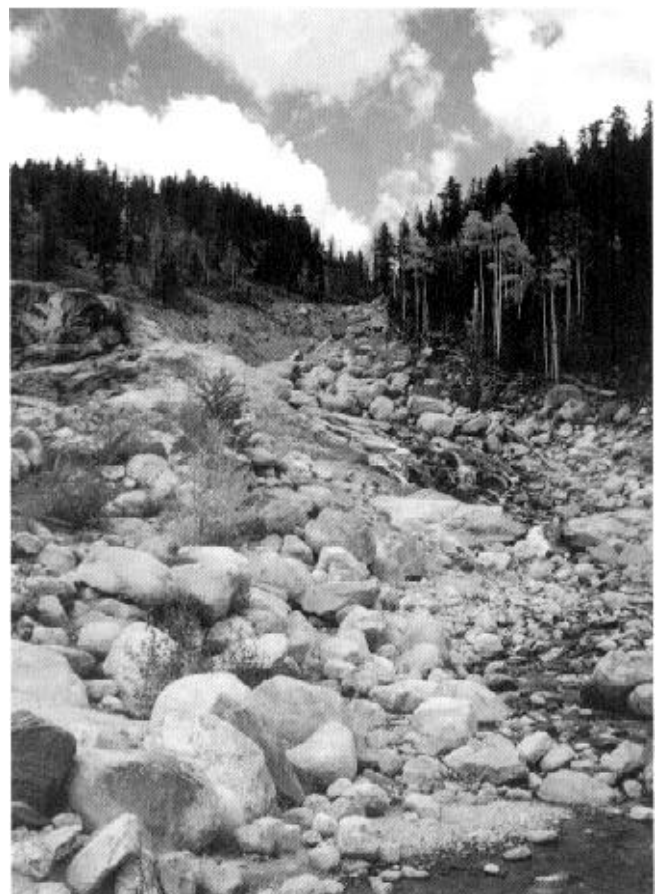


Figure 2 b. Another view of the scar and the present size of Roaring River (September, 1992). It can be seen that the wall of water in 1982 cut into glacial debris forming the scar.



**Figure 3 a. Boulders in the alluvial fan; size of boulders can be estimated by the automobile in the upper left of the photograph.**

the breached dam. Lawn Lake was at an elevation of 10,987 ft. The town of Estes Park is at an elevation of about 7,589 ft. Unimpeded water could have struck the town at speeds of up to 468 ft/s if all of its potential energy were converted into kinetic energy. Likely the speed of the water was less than this maximum possible flow rate but it gives an idea as to how much force could be involved in such rapidly moving water. The damage potential is enormous.

#### **Resulting Alluvial Fan**

The elevation of the alluvial fan where the wall of water dumped much of its debris is 8560 ft. Maximum water speeds from the failed dam may have been in the range of possibly 100 ft/s.\* The force of high-speed water containing massive boulders and abrasive particles is capable of considerable scour and gross erosion as well as rapid deposition where the water drops its debris load. The National Park Service did not remove the deposited boulders, sand, and other debris. Figures 2-4 taken in 1992 show some of the existing deposits in the alluvial fan at Horseshoe Park.



**Figure 4 a. As large boulders were dumped first when the wall of water struck Horseshoe Park in 1982, when you move further away from the scar, the size of the boulders decreases in the alluvial fan.**

\*Unimpeded water could have rammed into this area at speeds up to 395 ft/s if all of its potential energy were converted into kinetic energy.



**Figure 3 b. Another view of boulder field in the alluvial fan; note the dead trees still standing in the alluvial fan.**

#### **Formation of a Lake**

Some of the flood deposit in the alluvial fan dammed Fall River forming a small lake (Figures 1 and 5). Trout and beaver populations quickly established themselves in the new pond. Eventually this dam likely will be breached and the lake emptied.

#### **Catastrophist Implications**

Dam breaching appears to be a common occurrence in earth history (Costa and Schuster, 1988) often resulting in catastrophic consequences. Steve Austin's postulation of dam breaching on the Colorado Plateau is quite reasonable. The Lawn Lake dam breaching episode can be used as a small-scale model of the postulated events proposed by Austin. Rapid erosion and deposition is possible. Flowing water, particularly when moving from higher to lower elevations, is capable of vast erosion damage. Moving boulders and abrasive matter can scour large areas of land quickly.

Deposits such as the alluvial fan in Horseshoe Park, but of greater magnitude, could block existing river flow creating another dam which could fail later. Also



**Figure 4 b. Note transported section of tree had bark and roots removed by water and abrasive matter. If all of the trees had been buried in a silica-rich debris, many standing and transported dead trees could have been silicified and subsequent study would have revealed both autochthonous and allochthonous origins for the resulting silicified stumps. See Williams (1993).**



**Figure 5. A view of the new lake created by the debris from the Lawn Lake dam breaching episode that blocked the flow of Fall River.**

many post-Flood dams, created by landslides in unconsolidated strata during times of tectonic activity, could have been breached after their formation releasing water and abrasive sediments that would scour the landscape, forming many canyons. Then the matter eroded from these canyons could have formed other dams upon deposition across lower elevation rivers with the same results to follow.

These speculations offer a possible model for rapid post-Flood canyon formation and dam formation with breaching events occurring in a chain reaction sequence as time passes. The damage potential would decrease toward the end of the postulated sequence as the amount of water available becomes less and less because of decreasing precipitation and the consolidation of Flood sediments which would increase the resistance to erosion. This is offered only as one means of rapid post-Flood canyon formation.

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## Antarctic Glacial Chronology and Biostratigraphy in a Muddle

Although the West Antarctic ice sheet is claimed by some to be unstable, the East Antarctic ice sheet is said to have existed in its general configuration for about the last 14 million years of geological time. However, this view of the East Antarctic ice sheet has been under challenge for the past 10 years. The controversy started when many types of microfossils from the Cretaceous to the Pliocene Periods of geological time were found mixed together in the Sirius Formation on the Transantarctic Mountains (Harwood, 1983, 1985; Webb et al., 1983, 1984). *Nothofagus* (southern beech) leaves and pollen, suggesting a cool temperate climate like in southern South America, are also found in the formation (Sugden, 1992). The Sirius Formation appears to be a glacial till high on the mountains. The fossils were found as high as 2500 meters throughout a 1300 kilometer stretch of the Transantarctic Mountains.

The Pliocene marine diatoms are the most disconcerting because they imply either: 1) the Transantarctic Mountains rose as much as 3000 meters in the last three million years, or 2) the East Antarctic ice sheet was small in Pliocene time. The authors favor the second suggestion, in which case a marine seaway crossed Antarctica along the east flank of the Transantarctic Mountains. Then sometime in late Pliocene time, the East Antarctic ice sheet grew larger than its present dimensions, scooped the marine fossils out of the seaway, and then lifted them up and over the Transantarctic Mountains. Late Pliocene diatoms are also found below Ice Stream B that flows from the West Antarctic ice sheet, suggesting there was no West Antarctic ice sheet at that time either (Monastersky, 1993).

A greatly diminished East Antarctic ice sheet with a marine seaway through the continent poses a great difficulty for evolutionary scientists. It throws the evolutionary glacial chronology of Antarctica in disarray. The results also indicate that geochronology and biostratigraphy are arbitrary. The reason for this latter assertion is because many pieces of evidence have shown that the East Antarctic ice sheet has changed little in 14 million years of evolutionary time. For instance, geomorphological arguments indicate prolonged polar conditions that are incompatible with temperate forests during Pliocene time (Sugden, 1992). Some of these arguments are based on dating of volcanic ash up to 14 million years old (Sugden, 1992). A second line of argument comes from deep-sea cores off Antarctica that are dated by biostratigraphy, oxygen isotopes, and other methods. A third line of reasoning, suggesting long-term stability, is glaciological modelling that indicates a temperature rise of 20 to 25°C would be necessary to remove the ice from the interior of East Antarctica (Sugden, 1992). Furthermore, a warming of 5°C would likely cause more precipitation and a larger ice sheet. So, a slightly warmer Pliocene Period should have caused a thicker ice sheet, not a greatly diminished ice sheet.

The best way out of the dilemma is to simply redate the Miocene and Pliocene microfossils in the Sirius Formation. These ages were determined by biostratigraphic methods, but were questioned by some investigators. However, the Pliocene diatoms have recently been found associated with a volcanic ash in a deep-sea core in Ferrar Fjord, East Antarctica (Barrett et al., 1992). The ash was dated by the K-Ar and  $^{40}\text{Ar}/^{39}\text{Ar}$  methods at about three million years old. The Pliocene age of some of the diatoms in the Sirius Formation is considered solid. Thus, there is a serious geochronological and biostratigraphic contradiction.

Furthermore, Barrett et al. (1992) indicate the new date of three million years for the volcanic ash associated with the diatoms was obtained by a roundabout and questionable method. First, the K-Ar ages of the bulk volcanic ash were found to vary from 12 to 23 million years old. This suggested "contamination" by old feldspar from basement detritus (i.e. the assumed age was not obtained on the first try). Sure enough, by separating various grains in the ash, plus other manipulations, the authors determined that a volcanic endmember with an age of three million years old had mixed with a basement endmember of 445 million years old.

This example of manipulation of supposedly solid biostratigraphic and radiometric ages is similar to the dating of the east African KBS Tuff reported by Lubenow (1992, pp. 247-266). In the latter case "firm" dates from several different dating methods agreed with each other, only to be radically changed because the results contradicted ideas about early man. I do not believe the dating problems reported here and by Lubenow (1992) are unique.

As far as the creationist interpretation of the fossils in the Sirius Formation is concerned, these could easily be Flood deposits raised high at the end of the Flood during mountain building. Glaciation of the Transantarctic Mountains at the beginning of the post-Flood period would then simply erode and redeposit the material as glacial till. As ice accumulated rapidly on Antarctica, the focus of glaciation shifted from the mountains to the lowlands. Eventually the ice melted on the Transantarctic Mountains.

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## Functional External Ear Muscles

In William Paley's remarkable work *Natural Theology* (Paley, 1986), he quotes from the *Philosophical Transactions* of the year 1800 concerning the acquisition of function of the external ear muscles in an individual who had lost the use of his membrana tympani. He states that

... the use here assigned to that membrane, of modifying the impressions of sound by change of tension, was attempted to be supplied by straining the muscles of the outward ear. The external ear had acquired a distinct motion upward and backward, which was observable whenever the patient listened to any thing which he did not distinctly hear: when he was addressed in a whisper, the ear was seen immediately to move; when the tone of voice was louder, it then remained altogether motionless (p. 48).

We may have here an example of latent potential utility manifested in response to need, rather than an example of a vestigial organ.\*

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\*Also see "*Vestigial Organs*" *Are Fully Functional*, a title published by Creation Research Society Books.

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## Reprinted CRSQ Volume 13

### 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 1-12 and have appeared in the previous 12 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.

### Dendrochronology

Sorensen's brief article (1976, pp. 5-6) offered several problems with using the rings of bristlecone pines as a dating method. He stated that "the ring width patterns in bristlecone pines are not sufficiently distinctive" and at that time the chronology was "The work of one laboratory, the director of which has refused to allow the critical study of the raw data" (p. 5). Wiant (1977, pp. 206-207) noted that in dendrochronology:

Double, multiple or false rings may occur when suitable growth periods are interrupted by droughts, defoliation by insects or late frosts or other unusual conditions.

### Radioactive Decay

DeYoung (1976, pp. 38-41) discussed the precision of nuclear decay rates and what influences can cause a change in the rates. He questioned if decay rates are

always exponential. In a mathematical study of radio-carbon dating, Hanson (1976, pp. 50-55) named several problems inherent in the method. They are as follows:

1. Numerical sensitivity of the computed age on the decay measurement
2. Improper constitutive equations
3. Prejudicial calibration of the relation of historical and radiocarbon ages
4. Failure to set the initial conditions in the light of the present specific productivity and specific activity.

### Astronomy and Weather

Velikovsky's catastrophic theory of the solar system was critiqued and modified by Keister (1976, pp. 6-12). His frank appraisal considered gravitational forces as well as electromagnetic effects. Thompson (1976, pp. 82-86) developed a catastrophic model for the origin of the asteroids and the rings of Saturn. He considered that his model was superior to that of nebular condensation. Many of the assumptions of the model for the pre-Flood earth vapor canopy were questioned by Kofahl (1977, pp. 202-206). He suggested some guidelines to follow when developing any canopy model.

### Education

In his usual thorough manner, John Moore wrote concerning a university course on origins (1976, pp. 46-49). He presented a tentative outline for a creationist position. Rodabaugh (1977, pp. 183-184) discussed audience response on whether the creation model should be taught along with the evolution model in schools.

Fleeming Jenkin's critique of *Origin of Species* was reprinted to show that his points still have not been countered by evolutionists (Siegler, 1976, pp. 111-114). Davidheiser (1976, pp. 115-116) briefly explored some of Darwin's mistakes, particularly in the area of variation.

### Chemistry

Larry Helmick (1976, pp. 14-22) considered amino acid racemization in marine sediments. He developed a teleological model for the data based on a recent creation, degeneration, world-wide Flood and a young earth. This interesting article deserves serious study. Brine mixing was the subject of a research report by Wilcox and Davidson (1976, pp. 87-89). This area is of interest because of the possible rapid formation of so-called fossil reefs.

### Geology

Another research report (Williams and Herdtklotz, 1977, pp. 192-199) presented conditions under which cave-like calcium carbonate formations could form rapidly. A tentative model was offered for:

1. The rapid deposition of limestone
2. The rapid formation of caves in limestone
3. The rapid deposition of stalactites and stalagmites.

Several areas were investigated to form a core of evidence to support the model. Cox (1976, pp. 155-161) offered a mechanism he labeled rock disintegration for the formation of caves.

Cox (1976, pp. 25-34) challenged the present theory of glaciation. In discussing the zonation theory, Burdick

(1976, pp. 37-38) claimed that the so-called geological column does not exist. Honeyman (1976, pp. 58-62) postulated that Mt. Ararat erupted and was formed under water. Also he reasoned that the continents are sinking. His model is based on what might have occurred during and after the Flood. The elliptical formation in the Tendurek Mountains in Turkey, shaped like the hull of a ship, was studied by Shea (1976, pp. 90-95) and Burdick (1976, pp. 96-98). The so-called Heart Mountain thrust fault was examined by Burdick. He (1976, pp. 207-211) carefully offered evidence for a normal or vertical fault rather than a thrust fault.

### Fossil Record and Transitional Forms

Morrell (1976, pp. 56-58) showed that the evidence for the evolutionary hypothesis, particularly for supposed transitional forms, is lacking. The "fact of evolution," as referred to by the popular press, is actually propaganda. In the same vein Moore (1976, pp. 110-111) documented the absence of transitional forms in the fossil record. Rodabaugh (1976, pp. 116-119) performed a probability study on transitional forms and concluded "... if transitional forms ever occurred they were exceedingly rare" (p. 119). Lubenow (1977, pp. 185-190, 230) discussed reversals in the fossil record. This problem makes attempts to resolve the order of strata by supposed evolutionary changes in fossils very questionable.

### Biology

#### Zoology

The symmetry of eggs laid by the Mourning Cloak butterfly was viewed from a design perspective by Keithley (1976, pp. 13-14). Human population growth studies were presented by Holroyd (1976, pp. 63-65) and Rodabaugh (1976, p. 65). Both men developed their data employing a young-earth model. The prey-predator relationship was realistically examined by Smith (1976, pp. 79-81). He questioned the evolutionary assumption that predation eliminates inferior prey. Much evidence to the contrary was offered by the author. Hamby (1976, pp. 106-107) briefly noted some recent research on the effects of varying magnetic fields on living organisms. He suggested that a higher earth magnetic field strength in the past could be correlated with greater lifespans. Kaufmann (1977, pp. 214-216) wrote on the phylogenetic development of adipose tissue in animals. His observations were opposed to a macroevolutionary model of improving quantity and quality of tissue with "evolutionary advancement."

#### Abortion

Quarterly writers, [Liley (1976, pp. 98-103); Nicholas and Howe (1976, pp. 103-105)] objected scientifically to the propaganda concerning the "foetus." The unborn child is human from the *moment* of conception. The horror thrust on our society by a pseudoscientific media and spiritually blind judges staggers the imagination.

#### Natural Processes

A creation model for natural processes based on a physical science foundation was offered by Williams (1976, pp. 34-37). Observable processes are either conservation or degeneration. Improvement (macroevolutionary) processes are neither observable nor possible. Natural selection and survival were discussed within

the framework of the model. Tinkle (1976, pp. 131-133) outlined artificial and natural selection and noted Darwin's faulty logic on the subject.

### Archaeology

von Fange (1976, pp. 133-149) exhaustively examined the use of metals by ancient man. He suggested that such divisions as stone, bronze and iron ages are an oversimplification and possibly erroneous. Seaman (1976, pp. 150-154) provocatively asked "Who came before Columbus?" He postulated world-wide travel very soon after the dispersion at Babel.

### General

Howard Holroyd (1976, pp. 42-43) argued against rigid deterministic factors in nature, whereas Tinkle (1976, pp. 44-46) explained the value of scientific laws. Both men offered comments within a creationist framework. Armstrong (1976, pp. 108-110) discussed theistic evolution and offered objections to the concept. Considering the fields of the origin of life, mutations, natural selection, absence of transitional forms, stratigraphic position of fossils and supposed ancestors of mankind, Haines (1976, pp. 162-171) questioned the macroevolutionary hypothesis. Worrall (1977, pp. 199-201) offered evidence that the premise of uniformitarianism does not work. Ingram (1977, pp. 211-214) discussed the importance of creation in the Christian message. This mammoth volume of the Quarterly also contained 40 notes as well as many book reviews and letters to the editor.

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### Quote

The dominion over nature that God has assigned to man (Gen. 1:26; Ps. 8:6) entails human sensitivity to the Creator's moral and spiritual purposes for our planet. It is this biblical emphasis on human dominion that secular theories have unjustifiably blamed at times for the plunder and exploitation of natural resources. Christians may indeed not always have fully implemented ecological responsibilities but they have at least identified the moral framework that objectively motivates conscience and action. Naturalistic morality on the other hand can neither summon nor vindicate fixed ethical principles of any kind. If *homo sapiens* is essentially but an animal he can hardly be expected to subordinate self-interest to the good of the community. For that reason, even as Christians have brought to the *ad hoc* concern of secular nature-lovers a depth and permanence of protest against cosmic pollution that mere humanism cannot sustain, so now they must also speak up against the littering of outer space by satellite and missile debris.

Henry, C. F. H. 1986. The God of the Bible and moral foundations. In Burke, T. J. (editor). The Christian vision: man and morality. Hillsdale College Press. Hillsdale, MI. pp. 9, 10.

# THE PROBLEM OF EXTINCTION AND NATURAL SELECTION

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## Abstract

*The problem of animal extinction was reviewed, finding that the literature shows that little evidence exists to conclude that extinction occurs because of Darwinian evolution, i.e., the least fit are more apt to become extinct than the better fit. Researchers have been able to find few consistent differences in biological fitness of animals which become extinct and those that have not. Today, a clear tendency exists for the so-called higher organisms to become extinct, as shown by an evaluation of endangered species lists and a study of animals which have become extinct in recent history. Most types of animals that have become extinct in the past are generally not less fit than surviving types, are very similar to many extant types, and any differences are often irrelevant to survival. The reasons for extinction are either chance or unknown, not a pruning of the inferior species as biological evolution predicts.*

## Introduction

During the last decade, most westerners have read or heard about the problem of animal extinction. Of those animals which are threatened with extinction almost all are on the higher end of the so-called evolutionary tree (Colinvaux, 1978). The animals that our conservation programs are aimed at helping are likewise at the highest end of the so-called evolutionary hierarchy, primarily mammals, including several groups of primates (Kohm, 1991). Little concern is expressed over bacteria, houseflies, viruses, fruit flies, or any of the myriads of micro-organisms and other "lower" forms of life becoming extinct. Actually, it is taxing our resources just to keep the population of many of the animals at the bottom of the tree under control.

The many organizations that support programs designed to help prevent various animals from becoming extinct focus on whales, dolphins, and many members of the cat family as well as numerous types of primates, supposedly our closest relative. One group, after claiming that many types of whales are "dangerously close to becoming extinct," noted that the brain of the sperm whale is perhaps, "the most complex brain ever evolved on earth." To illustrate how these complicated "highly evolved" brains are used for intelligent, complex communication, the brochure claims that whales can communicate with each other by sending a series of high pitched noises which sound like singing, and can be heard as far as 200 miles away in open waters.

A major reason why many animals now become extinct is partly because of the technologically advanced complex hunting techniques of humans, and because of human caused *environmental changes*, the very factors that are supposedly responsible for their existence. Yet, most all "lower level" water and land animals are surviving quite well in spite of our enormous efforts in the opposite direction. For many other animals, such as the panda, we are rightfully concerned that they cannot survive without us and the help of our best DVM's and biology Ph.D's.

The ratio for the various groups of phyla and classes confirms an inverse relationship between supposed evolutionary developmental level and survival, the opposite of what is expected if survival of the fittest

somehow propels animals to a "higher" level of "fitness." The 1991 US Department of Interior Endangered Species List contains only 21 insect species out of almost 1,000,000 identified (0.000021%) compared to a whopping 337 mammals. A total 699 mammals, birds and fish are on the list, or almost 0.2 percent of all known varieties (36,000). They are thus over 9,000 times more likely to be threatened with extinction than insects. An order which is far less likely to be bothered by chordate predators than most is birds, and they would therefore appear to be highly resistant to extinction, yet 240 are on the list. One-hundred and two fish, 107 reptiles, 19 amphibians, 11 snails, 10 crustaceans and, ironically, 41 mussels plus 3 arachnids are listed. Many of the animals that have already become extinct are mammals, including the Badlands Bighorn (which became extinct in 1910) the sea mink (1890) and the Eastern Elk (1880). Well known birds which have become extinct include the Heath Hen (1932), Carolina parakeet (c. 1920), the Passenger Pigeon (1914), the Solitaire (c. 1760), and the Dodo bird (*Didus Ineptus*) (c. 1681)—see Masckenzie (1977).

The endangered species list is a useful, but not infallible, method to determine extinction threats for several reasons. Including an animal on the list is an involved process requiring public hearings, petitions, and much detailed research (Kohm, 1991). Once an animal or plant is added, it is eligible for costly federal aid, protection programs, and research funds. The government for this reason endeavors to insure that an animal included clearly belongs. Up to 1973, only vertebrates were eligible, and possibly for this reason more vertebrates are on the list. A negative correlation would still exist, though, even if four or five times the number of insects, for example, were found to meet the criteria. Future research and investigation may add more non-vertebrates, but if past trends continue, many more vertebrates will also likely be added. In addition, although most all vertebrates have been classified by scientists, some estimate that more than twice the number of insect species as currently identified may actually exist. The reason few lower animals are on the list is because many insects and other small "simple" organisms are extremely resistant to extermination, as the millennial long human efforts to control the insect population have proved (Norton, 1986).

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### Extinction and Evolutionary Fitness

The fact of extinction is well-known; the why is not. As noted by Douglas (1978, p. 233) “. . . surprisingly little is known about just what causes a particular species go extinct. Aside from the cases of extinction for which mankind was directly responsible, it has proved extremely difficult to determine the specific biological cause for most of the rest” of extinction cases (Gould, 1989a; Kaufman and Mallory, 1987). The best-known set of massive extinctions—the whole dinosaur world which consisted of dozens of reptile types, both land and water, large and small—has generated many conflicting hypotheses. None has been proved so far, and most border on science fiction. Another mass extinction, which some estimate to have occurred at the end of the Cambrian, caused fully two-thirds of the trilobite families to disappear. But, the most massive extinction is generally claimed to have occurred at the close of the Permian when an estimated *one-half* of the then known animal species disappeared from the Earth forever. The dinosaur extinctions are believed to have occurred at the close of the Cretaceous age.

Biologists have found that the larger an animal's physical body, the more likely it will become extinct. Many of the species now endangered are quite large, and the same was true in the past; the dinosaurs are a superb example. This view, though, is the opposite of what evolution predicts: size itself is explained as a result of selection success, and this trait often enjoys the best support of any natural selection pillar, holding up more than its share of the theory's weight. Why largeness should cause extinction is not clear: it often seems to confer on the animal a major survival advantage in its conflicts with other animals (Colinvaux, 1978).

Animal extinctions generally are not a result, or even related to, most of the classical survival of the fittest factors, such as inferior physical structures that result in their having less ability to compete for food, water and space. The hypotheses suggested to account for extinctions, especially the mass variety, are events such as germ-carrying comets destroying life in certain areas, supernovas showering the earth with bursts of high energy radiation (and since water is an effective shield against many types of radiation, it is theorized that land organisms were more affected than marine types) rapid climatic changes (and except those caused by glaciers, many are difficult to document), mountain building, sea level fluctuations, extensive flooding or a hypothetical biological instinct that causes behavior calculated to lead to extinction.

Curry-Lindahl (1972) concluded from his study that the variety of extant animals has not been increasing, but *declining* with time. Since the 1600's, an estimated over 500 species and subspecies of native once extant biota have become extinct in America, and the government is continually adding new animals to their endangered species list. Usually only after expensive and heroic national efforts are any removed from the list (Reffalt, 1991). In prehistoric times, the rate of extinction is estimated to have been one species per 10,000 years, by 1600 the rate was one per thousand years, and today it is over one per month. Evolution predicts an *increase of diversity* with time—but instead of more types of animals (specifically more higher taxa, phyla,

class and orders), what has in fact been occurring is the exact opposite. Sullivan, et al. (1980, p. 168) note that although evolutionists teach that extinction is the eventual outcome of all species as newer and better forms “win the survival battle,” the *rate* of extinction appears to be dramatically increasing, and no new forms whatsoever are appearing, to say nothing of better forms. A major cause of this increase are the changes that humans have caused, but many other reasons exist. This rapid total loss of various species creates serious problems, including a reduction in the total gene pool, a loss which scientists will never know the total consequences because of the difficulties in measuring the uses an extinct species might have achieved (Sullivan, et al., 1980). Penicillin, a drug which has saved millions of lives, is derived from penicillin mould, and who would have thought of championing the cause of this green mould? Numerous minor and seemingly “worthless” plants and animals exist that have proved extremely valuable to human medicine and other sciences (Kaufman, et al., 1983).

A major explanation for extinction is simple weather changes: “Extinction is the fate of *most species*, usually because they fail to adapt rapidly enough to changing conditions of climate or competition” (Gould 1977, p. 90). Severe weather changes, such as ice ages, although often alleged to cause evolution of at least some creatures, actually tend to extinguish *all* plants and animals. If drastic climate changes were a longstanding occurrence, it would seem that mechanisms would surely have evolved via selection for at least a few of the millions of types of animals that would effectively help them to withstand extreme cold and live for long periods of time without food. If more animals survived the colder temperatures, more food would exist for the carnivores, thus even more would survive, limiting the driving force that climate has on evolution. Yet, few animals are equipped to survive much temperature and climate variations, and many kinds, especially mammals and even more so the higher primates, have extremely little tolerance for much climatic variation (Sheppard, 1959; Milne and Milne, 1969).

For these reasons, although both the fact of extinction and its commonality is an important aspect of evolution theory, little evidence exists that most extinct animals were less fit than those that survived (Gould, 1989a). Gould's study on the Burgess shale found that the fossils of lower life show an incredible diversity, far greater than previously imagined. He has also found that the vast majority of these creatures died, leaving no survivors that exist today. Because they were not superior in any obvious way, Gould concluded that whether an animal becomes extinct or survives is most often not a matter of being more or less fit, but luck. Trilobites were probably one of the most successful living forms, once outnumbering all other forms of animal life, yet they became extinct. Their remains are among the most common of all fossils found today. These crab-like creatures lived in the bottom of the sea, seemingly well equipped to survive, and although speculation abounds, we have no plausible reason why they became extinct.

Some creationists also have had a difficult time dealing with extinction. Historically, many have maintained that extinction could not, and did not, happen because

species extinction was viewed as inconsistent with God's goodness and perfection (Gould, 1977, p. 82). Animals which were believed to be extinct, they argued, were actually not, and if we looked long and hard enough, living examples would be located. The fact that some animals have become extinct, and many are threatened with such today, requires a response. The creationists' best answer is whether or not the Creator allows species or kinds to become extinct is a theological question related to the nature of God, but both the *fact* that certain species have become extinct and the factors involved are scientific questions. In many cases, only minor types have become extinct, certain types of deer for example, while the deer family itself God may not allow to be lost. Others argue that the Scriptures teach that God has assigned us the responsibility of being earth's caretaker, and if we abuse that privilege, God may grieve, but it is our fault and our problem. It is not the builder's fault if the owners wreck their own house. From this view, whole animal families may become extinct from human abuse. This view is the basis behind the Christian ecology movement, a theology that teaches humankind is the official caretaker of the earth and must exercise a high level of responsibility over it. It may be God's earth, but as we live on it, we must take care of it; and if we abuse it, God usually will not intervene (which seems obvious to an historian). Of course, one cannot know the degree of intervention that may have occurred (and speculation on this topic is on tenuous theological ground).

### What Selection Actually Does

Natural selection seems to operate primarily to counteract downward evolution and functions to *maintain* the species at the same quality level, not to improve or "cause" a higher level of development (Howe and Davis, 1971). Birth defects which cause what are known today in medical parlance as "monsters" or "chimeras" are generally fatal to those so afflicted. A body mechanism in the mother serves a fetus quality control function to cause rejection, and often spontaneous abortion, regardless of whether the defects are genetically or environmentally caused. The fact that only the more "fit" or the healthier survive serves primarily to reduce the number of undesirable characteristics that may be passed onto one's offspring, not to evolve the race. It does not eliminate, but only lowers the number of misfits or less developed organisms, whether they are caused by genetic or structural defects—ensuring that the race as a whole stays at about the same quality level (Howe and Davis, 1971). In Tinkle's (1964, p. 148) words, it maintains a "lower limit, in the kinds of plants and animals." In a study by Lammerts (1984, p. 104) no evidence was found for any type of evolution and that "... natural selection at best only maintains the status quo."

An example of this is the phenomenon called "Siamese twins." Identical twins, those which develop from a single egg fertilized by a single sperm, must separate early in order to develop normally. If these early cells divide "imperfectly" and some type of embryo attachment remains, the children will be physically connected at the back, abdomen, chest or, occasionally, even the top of the head. Most are born dead or die shortly after birth. Drimmer (1973, p. 46) notes that: "Most oddities

of this kind, like most conjoined twins, are stillborn. Nature chooses this way to rectify her gravest mistakes." The fusing may be such that only a small portion of the two bodies actually physically connect, and thus can be surgically separated without much difficulty. If larger portions or vital organs connect, surgery is usually very risky.

In eliminating or reducing those creatures that deviate from the norm, natural selection actually serves both to help ensure that the animals are able to survive year after year, and also to retard any change or evolution. Korshinsky (1969) added that the struggle for existence and the natural selection connected with it are biological agencies that tend to restrict the development of existing forms by *preventing* or reducing biological variations. They never contribute to the production of new forms, but are actually a mechanism that is antagonistic to evolution. Only new forms which possess a radically new structure that is *completely developed*, or at least highly functional, can result in a survival advantage—and except possibly the sickle cell anemia and Tay-Sachs traits (which are beneficial only in the heterozygous forms) not a single beneficial macroevolutionary change has ever been shown to have resulted from a documented mutation. Even if positive, small changes would rarely confer a selection advantage because most slight structural variations are of little survival advantage. Generally, only large, extremely complex and *complete* biological innovations would result in a clear survival advantage.

Many other systems also exist which serve to reduce the deterioration of organisms. A typical example is a repair mechanism in the cells of all living organisms which identifies most mutations when they occur, and then cuts out the mutated DNA section with *excision enzymes*, and finally repairs the damage. One type of mutation occurs during the DNA replication, causing a mistake in base pairing which results in the incorrect A-C pair instead of the proper A-T pair. Repair enzymes in the daughter cell, if they recognize the mismatch (which depends on an intact allele), will excise the incorrect bases and replace them with the correct ones. If the base in the daughter DNA is replaced, then the resulting base pair is identical to the original pair—see Audesirk and Audesirk (1986, p. 212). Interestingly, the human disease called *zeroderma pigmentosum* results from malfunction of the excision repair mechanism. The result of this mechanism's inactivity is a disease that is most often fatal. Differential survival and *excision enzymes* are but a few of the many systems which serve to prevent or reduce the rate of an organism, and also a race's deterioration and deevolution. They do not cause its evolution, as Berg (1969, p. 63, 64) notes,

... it doubtful whether mortality in natural conditions possess selective value, i.e., contribute to evolution; as a rule, individuals approaching the standard survive, and those which deviate therefrom perish, no matter whether their distinguishing characteristics are retrogressions giving no promise of being able to advance [the species].

### Do Only the Fittest or Strongest Survive in Nature?

The Darwinian view of survival of the fittest, which has pictured nature as being characterized by fierce struggles, has now dominated our view of the natural

world for over a century. According to this position, nature ruthlessly eliminates those creatures who are, for whatever reason, "less fit" to survive, or in some way weaker than their competitors. Pictures of ferocious lions devouring helpless antelopes, or even ruthless bacteria ravishing the bodies of innocent lambs, have dominated not only our view of the natural world, but also our culture and even our scientific research. Darwin (1962, p. 42) stated: "What a book a devil's chaplain might write on the clumsy, wasteful, blundering, low, and horribly cruel, works of nature." Evolutionist Teller's (1972, p. 2) description is:

Evolution knows no moral feeling. The earth is a gory battle-ground, where the weakest animals [die] . . . in a pitiless struggle of tooth and claw. Evolution, century after century, repeats its own follies, by bringing into existence billions of the lowest types of life when it might produce only the highest; continues the production of useless and harmful organs; turns out beings, some of which live only a day or an hour, or sometimes for only a few seconds. It is a ruthless, blundering, non-moral process, without a glimmer of guidance behind it.

This belief is reflected even in literature. In Jack London's novel *The Sea Wolf* is the following statement made by Wolf Larsen, the main character, about a ruthless sea captain:

Life? . . . Of the cheap things, it is the cheapest. Everywhere it goes begging. Nature spills it out with a lavish hand. Where there is no life, she sews a thousand lives, and its life eats life till the strongest and most piggish life is left. (1903, p. 48)

The struggle for existence idea has been extended or applied to almost every level of the living organism—from molecular, to biochemical, to molar. Roux (1881) in his theory of body conservation, suggests that the struggle for resources even results in one's own body organs struggling with each other over nourishment! Weismann (1892) taught that germ plasm particles were also in constant conflict. Many modern biochemists go further, concluding that *molecules* within each organism are competing with each other (Fox, 1988). E. O. Wilson's (1975) social biology theory adds that while individuals compete with each other, they also unite into groups which in turn compete with other groups. Pendell (1977, pp. 89-09) states selection in this way:

. . . ordinarily we give little thought to how evolution works. The *modus operandi* might be called 'selective victimization,' which can be illustrated by the story of the dogs that Spanish sailors left on a barren island populated by hearty, native goats. Only the fastest dogs managed to catch the slowest goats, so the slow dogs died of starvation. Relentlessly and inevitably, the average speed of goats and dogs increased with each generation.

The only problem with this assumption is that there is no evidence that the average dog runs faster today due to being placed in such conditions. Of course, selection can "breed" certain characteristics, such as achieved with dogs, cows, horses, etc., but in natural conditions a number of factors work against this; the fastest dogs

may catch the slowest goats, but the entire pack of dogs usually share the catch. A common human reaction to this view of selection described by Carrighar (1965, p. 138) as follows:

For many a child the knowledge of nature's food chains comes early, when he learns that in real life the dear little woodfolk of his storybooks *eat* one another. . . . The older child . . . may absorb the idea that every wild animal lives in terror of instant death. Plants destroy other plants, usually by taking over their living space when the seeds of a stronger species fall among those that are weaker; animals eat plants, animals also eat other animals. . . . The relation between living things is seen as universally one of malice, a view which can furnish the basis for lifelong cynicism.

This view of life violates a core value of humanity, that of caring for the sick, the weak, and the less advantageous. Macbeth (1971, p. 57) notes that "after the implications to racism and genocide of 'survival of the fittest' became apparent, especially relative to social programs, the emphasis on struggle was played down." Instead of being obvious and self-evident, he concludes that it became almost invisible. Conversely, Simpson (1967) argues that this view of natural selection plays practically no role in the modern view of evolution. "Struggle is sometimes involved, but it usually is not, and when it is, it may even work against rather than toward natural selection." He (1967, p. 138) advocates the "differential reproduction concept" which has the advantage that it is usually a peaceful process in which the concept of struggle is often irrelevant. It more often focuses upon such things as better integration into the ecological situation, maintenance of balance of nature, more efficient utilization of available food, better care of the young, elimination of inter-group discords, especially those struggles that might hamper reproduction, and the exploitation of environmental possibilities that are not the objects of competition, or are less effectively exploited by others.

### Selection as a Tautology

Many biologists have discussed the conclusion that "we must have survived because we were the fittest, and we are obviously the fittest because we were the ones that have survived" is a tautology (Maddox, 1991). This circular reasoning is oversimplified but, as Macbeth (1971, p. 69) notes, although a certain amount of harmony exists between the organisms and its environment (fish need water, mammals need air, and all animals and plants need food), this does not mean that living species are generally well adapted, or that extinct species were generally ill adapted. Simpson's (1967) conclusion that the amoeba survived because it adapted, but that the dinosaur died out because it did not, is true only in a very limited sense.

A study of the many animals that have become extinct finds that it is very difficult to correlate extinction with the possession or lack of some specific selection advantage. The passenger pigeon, although at one time one of the most populous birds in the country (over twenty-billion strong) became extinct. Yet, most biologists cannot pinpoint what structural inferiority caused their extinction and only pigeon experts can

often even tell the difference between them and the other, still thriving, kinds of pigeons. The differences between the extinct Badlands Bighorn and other Bighorns, the sea mink and other minks, the Carolina parakeet and their cousins who are still around, often serve mostly to distinguish types, and are usually of little or no survival value. When various types of animals are compared, it is no easy matter to list the specific evolutionary survival advantages of most of the differences between them. Modern attempts to explain the usefulness of organs and structures "in terms of natural selection has proved so disastrous that most modern biologists are 'too sophisticated' to fall into such errors. They have learned that it is not wise to try to explain why" (Macbeth, 1971, p. 75).

An example is the explanations of the major distinct difference between the African and Asian elephant, the size of the ears and the degree that the head is held. Evolution theory has failed to explain why *such differences* exist in terms of survival advantages. The difference in ears is not great enough to result in significantly improved hearing, and their floppiness may actually impede their effectiveness in windy weather. Why did the woolly mammoth become extinct, but not the elephant and many other very similar animals? The differences between the mammoth and the mastodon are minor, chiefly body hair, teeth and tusk variations. The mastodon's tusks were curved upward, their bodies covered with hair, and they were probably slightly larger than elephants. In spite of extensive research, it is not known *why* only the woolly mammoth became extinct (Williams, 1966). It was obviously *not* the cold weather where woolly mammoths lived—they survived in it quite well for eons (as similar animals do today) and could have migrated south during the ice age as many other animals do today. Commonly found in Arctic Siberia, Alaska, and even in New York and Europe, if they were able to survive in the far north, surely they could have continued to survive in Europe during the Ice Age.

The fact that animals at the so-called higher end of the evolutionary scale are more likely to become extinct indicates that evolution does not, as many of its supporters claim, constantly finely tune animal's survival skills, pushing development to a higher, more complex level, with the result that the animal is even more impervious to survival impediments. It is also true that many living animals are poorly adapted—thus the reason for the real fear of the impending complete extinction of hundreds of the so-called higher animals. Only through concerned care by humans can many mammals avoid extinction (Stanley, 1987; Ehrlich and Ehrlich, 1981).

### The Case of Tusks and Antlers

Many animals possess elaborately designed structures which could be very helpful in improving their survival, and yet they are rarely used. Macbeth provides the example of the gorilla, which is supposedly perfectly designed for swinging from bough to bough. Yet they rarely climb trees, and usually scrounge for a living on the land (see also Ardrey, 1963, pp. 112-113). The fact that their excellent brachiation skills have little visible utility argues against the selectionists' theory which concludes that animals with elaborate structures were

selected because of the structure's survival advantage. Good examples are the enormous tusks of the elephant which, as a whole, burden it with many more disadvantages than advantages. Elephants without tusks survive quite well—although almost all African males and most females have them, many Asian males and nearly all Asian females do not. Both groups are now having a difficult time surviving, but this is primarily because of human exploitation. The tusks are large and bulky, and impede movement, especially running. Their tusks are rarely used for fighting, and although they occasionally can be useful, they probably mostly hinder the elephants in combat. The fact that elephants have no enemies except germs argues against the evolution of *any* fighting system, especially tusks (Endler, 1986). Mankind has found animals with tusks very useful for moving logs and other heavy objects, and the tusks help the animal to dig out plants for food, but the trunk is a far more used and also a useful food gathering organ.

The fact that the tusks keep on growing as long as the animal lives can be a problem, especially with the older elephants. An elephant burdened with very large tusks may actually have to abandon the family herd. Their weight may prevent them from *keeping up*, a serious problem for social animals which protect and support each other. Since tusks are as a whole not a survival advantage, evolution would not favor larger tusks, and most animals with these structures have become extinct partly, it is claimed, because of their tusks. The tusks of mammoths and mastodons were more than 250 pounds and as long as 12 feet in length. It is hypothesized that selection caused their upper lip to gradually grow longer and droop while concurrently the 'eye teeth' begin to sprout into tusks, a development which reached its height in the glacial era mammoth. Tusks and antlers are highly resistant to decay, and thus are quite effectively preserved in certain burial locations for long time spans, yet *no* evidence exists of antlers or tusks evolving, or even slowly becoming larger in response to selection.

Rensch (1959) and others tried to explain the large antlers by the concept of *allometry*, the conclusion that because the body is a unified, integrated system, an increase in body size will cause a relative increase in the size of every organ, including the antlers. Huxley even used the Irish Elk to argue for natural selection. His conclusion, as Gould (1977, pp. 85-86) stated, "was based on no data whatsoever. Aside from a few desultory attempts to find the largest set of antlers, no one had ever measured an Irish Elk." To remedy this lack, Gould measured 79 Irish Elk skulls and antlers from museums and homes in Ireland, Britain, continental Europe, and the United States. He found that antler size increased two and half times *faster* than body size, disproving the allometry theory in this case. The antler size may be due more to proportion requirements that result from the animal's genetic design. Nonetheless, an antler increase rate of two and half times faster than body size would seem to contradict the "elementary hypothesis" that a one-to-one correspondence exists, i.e., huge deer would have huge antlers, and in the same proportion as smaller deer. Gould (1977, p. 88) admits that the opposite interpretation is also possible: selection operated primarily to increase antler size,

thus increased body size occurred only as a secondary consequence. Those with larger antlers were more likely to survive, and thus larger bodies survive because of the larger antlers that they possess. Explaining the growth of the antler is especially problematic if they are useless or worse.

The real concern is, why would natural selection select for antlers? Some authorities assume that the antlers are used primarily to frighten animals with smaller antlers to achieve dominance. Most animals, though, are not frightened by size alone; smell is often more important. As to rival suitors, it is hard to imagine how this behavior furthered the evolution of anything except that of antler size. This theory seems a last resort to fill in the well-founded doubts about the usefulness of antlers for weapons. The authors also postulate that the antlers must have somehow been involved in courtship, and demonstrating that female deer were much more likely to mate with animals with larger antlers would provide direct evidence for sexual selection in this case. At most, it seems that they are used purely for ritual display in order to gain herd leadership, and are not used for reproduction dominance.

Many animals possess mechanisms which sometimes aid their survival: the smell of a skunk, the quills of a porcupine, the leg strength of a kangaroo, the camouflage and mimicry of insects are all good examples. One cannot argue from this that these features *significantly* aid in survival because many almost identical animals without these traits do very well, and many animals with similar traits have become extinct. The survival advantage of one feature such as camouflage does not even begin to explain how the extremely wide variety of techniques and structures designed to help the animal see, hear, eat, move, or protect itself arose from evolved variations of a *common* ancestor to facilitate survival—see Bergman and Howe (1990).

Most animal types live very close to the same lifespan length and have a similar average number of offspring as their parents, thus only one of these myriads of adaptation techniques do *not* seem to affect survival greatly (Kohm, 1991). Most animals which do not have fancy techniques for fighting or scaring enemies, such as rats (which mankind in their wisdom has been unable to eradicate) and rabbits (which, although both vulnerable to attackers and possess many enemies—most meat eaters from humans to dogs) are doing extremely well. A rabbit's acute hearing is certainly an assistance, and a porcupine's quills surely should be helpful, but except for germs it has few, if any, enemies. According to natural selection, all animals would eventually evolve a *similar, best type* which could survive in a wide variety of environmental situations.

As Macbeth (1971, p. 41) notes, "The early Darwinians thought that every aspect of every animal, right down to the number of spots or bristles, was determined by natural selection and was therefore 'adaptive,' i.e. important for survival." Research has now found clear biological functions for almost every *internal organ* of plants and animals, but the same is *not* true with many external structures (Bergman and Howe, 1990). Exactly why animals have certain colors, feather designs, scales, horns and muscle and bone structures which seem to affect the outward appearance only has

proved elusive. It is difficult to correlate many, if not most, of these external features with survival. This immense variation in color, texture, design and physical shape may be largely for the purpose of variation, similar to the purpose of the variety found in the external appearance of automobiles or houses. The hypotheses that they *must* have some survival benefit is forced. Structures may simply exist, like the tail fins on a 1957 DeSoto because the designer put it there in an effort to be creative and not because they possess a survival function. Even if a survival function were found for every external biological feature, this would not prove evolutionism, but would support the design view. The creationist is in the enviable position of not being forced by his theory to locate a survival function for every external detail, only a purpose. These problems are noted by Gould (1989b) in a discussion of a new theory of evolution called the **neutral theory**:

Kimura has never denied adaptation and natural selection, but he has tended to view these processes as quantitatively insignificant to the total picture—a superficial and minor ripple upon the ocean of neutral molecular change, imposed every now and again when selection casts a stone upon the waters of evolution. Darwinians, on the other hand, at least before Kimura and his colleagues advanced their potential challenge and reeled in the supporting evidence, tended to argue that neutral change occupied a tiny and insignificant corner of evolution—an odd process occasionally operating in small populations at the brink of extinction anyway.

#### A More Peaceful View of Nature

Another, far different view is now emerging from research: cooperation, not competition seems to be the dominant mode of animal interaction. Lewis Thomas (1974), argues that *the overwhelming tendency in nature is toward symbiosis, union, and harmony*. Thomas concludes that the Darwinian view of life as a constant murderous struggle, as immortalized in Tennyson's "tooth and claw" view of nature, is simply not accurate. Even Leakey and Lewin (1978) have concluded that it is often the organisms that *cooperate* which are the ones that are more likely to survive, adding another whole new facet to the word competition.

Widely traveled nature enthusiasts often notice that animals are at peace with both each other and the world around them for the vast majority of time. Even the stereotypic predators—lions, tigers, wolves, and other large carnivores—spend most of their time lazily lying in the sun, tending their young, sleeping or playing (Colinvaux, 1978). True, it is occasionally necessary for all carnivorous animals to hunt, and many do so aggressively, but when a victim is killed, it typically provides enough food for days, during which time the lions are at peace with nature (Tinkle, 1969). Custance (1976, p. 181) concluded:

It must be apparent to millions of ordinary people who had any firsthand knowledge of nature that the picture proposed by Darwin of a state of chronic warfare was completely unreal. Obviously, nature has not essentially changed since Darwin's time, so the behavior we see in the open country . . . is what it was in those days. And we do *not* see

animals constantly battling with each other. The supposed "struggle" for existence is comparatively mild. Animals establish their territories with enthusiasm rather than viciousness.

Carrighar's (1965, p. 139-140) own research supported the data gathered by Adolph Murie who

... observed the large carnivores, leading their normal lives, as intimately as any living biologist. Of wolves, which feed almost entirely on caribou in some parts of the North: 'Generally, the caribou seem not to be worried much by wolves unless chased. I frequently noted caribou bands watching the wolves when they could have been moving away to a more secure position. ... All day the caribou had been in the vicinity of the [wolves] den, but the resting wolves did not molest them. ... Once the black male galloped hard after a herd but stopped to watch when he was near it.' ... The kills are made 'quickly,' many times with a bite on the neck. The victims are almost invariably the young animals, the diseased, or those too old to make a speedy escape.

Most carnivorous animals hunt only for what they need to live, and even then the kill is most often quick and relatively painless. Thomas (1979, p. 105), relying both upon his own hospital experiences and the published research on persons who were clinically dead and then revived, concludes that when death is imminent, the brain apparently realizes that pain is no longer useful as a warning or as an alarm to spur escape, and therefore "turns off" pain sensations, producing what he terms a "blissful surrender." This agrees with the numerous reports that conclude both human and animal sensations before death are very "peaceful experiences." As Thomas (1979, p. 105) added "If I had to design an ecosystem in which creatures had to live off each other and in which dying was indispensable part of it, I couldn't think of a better way ... ." Hunting is also necessary to maintain balance in the natural world: if predators such as lions and wolves were destroyed in large numbers, many animals would reproduce at such high rates that they would soon use up the food supply and die anyway, or natural mechanisms would reduce their numbers long before this point was reached.

Instead of an animal species taking a niche by an open struggle with those in it, extinction or other means often opens niches which it can then fill. A good example is, when ichthyosaurs became extinct, porpoises and dolphins for some still unknown reason took over what was evidently now an open ecological niche. Such cases are common in the biological world. When rabbits were brought to Australia by the British, they rapidly multiplied, taking over what was evidently an empty niche for some time. Many similar empty niches now exist, and even if certain animals were brought to another area, they could easily exterminate certain of its residents. Struggle is not always important, and in the long run may actually be relatively unimportant.

Several studies have confirmed that, by far *the most important factor* in whether a specific animal is eaten (or eats) is *chance*, not superiority (Smith, 1976). An anteater throws his tongue out and catches a few ants. Those that do not escape the tongue are usually *not* the

ones that run the fastest or can hide the most effectively, or are stronger, bigger, or have the worst taste, but those who *happen to be in the wrong place at the wrong time*. Although some biological factors are affected by natural selection so as to facilitate survival in very limited set of circumstances (such as the famous example of the peppered moth in England), these examples are few and far between, and tend to be related to such factors as camouflage and others which do *not* tend to alter the species, but merely modify the *most common* form. In English history, when heavy black soot pollution existed, the darker moths were more common, but as the pollution became less and consequently the tree trunks became lighter, the whiter moths again became more common. The *moths* themselves never changed, only the ratio of dark to light moths had shifted (Williams, 1986).

Rather than being the source, intensive natural selection often actually slows or stops microevolution. The Cichlids (fresh water fish) are found in almost all the the great lakes of Africa. Where predators are common, such as in Lake Albert, only four species are present, but where few predators live, as many as 50 species exist. This inverse relationship of variety and selective pressure is the norm; the greater level of selection that exists, typically the smaller the variety of animals that live in that particular location. Less selective elimination allows the results of normal gene reshuffling, and thus more combinations to survive, producing greater variety (Williams, 1977).

The symbiosis of the *Nudibranch* (a sea slug or snail) and the *Medusa* (a jellyfish that lives in the Bay of Naples) illustrates this. The medusa lives permanently on the snail, parasitically attached to it near its mouth. It then reproduces there, and its offspring later become normal adult jellyfish. In the meantime, the snail produces larvae which are in turn consumed by the baby jellyfish as they grow. The ingested snails, though, are not digested, but begin to eat the jellyfish as soon as they enter its entrails—usually beginning at its radial canals. The snail progressively consumes the jellyfish until they outgrow their host, at which time they leave. The jellyfish then once again becomes a tiny parasite which now lives off of the snail! The whole cycle, which Thomas (1979) calls an "underwater dance," is endlessly repeated. Life, in other words, is often not a matter of "to eat or be eaten" but a balance between being both eaten and being an eater. Which particular creature ends up being eater or eaten depends greatly on chance, not organ or organism superiority (Fisher, 1958). Thus, as Scott and Fredericson (1951, p. 273) noted:

Fifty years ago it was the fashion to picture the life of animals in nature as a constant battle for survival, with intense individual competition for food and hungry predators waiting around every corner, ready to snap up the unfit. We have since found that highly competitive situations occur very rarely except in populations which have become disorganized as the result of overcrowding or a disturbed social situation. ... As for predators, they often lead lives which are the opposite of the bloody, slaving animals of fiction. We can watch the behavior of coyotes for days without ever seeing them kill a single living thing, and when

their stomachs are examined it is evident that a coyote has to eat almost anything that it can get hold of: carrion from animals which have died of disease, garbage, old scraps of leather, and even berries. They do occasionally capture small rodents and sometimes are able to find an unprotected newborn fawn. One of the few cases in which coyotes have actually killed an adult deer is so remarkable that it has been written up as a special scientific paper.

Kropotkin (1955, p. 7) in an extensive study found that in areas where little pressure from numbers existed, little natural selection occurs. He found that in *most* areas of the world, *most animals* actually have relatively few enemies, and *small* populations exist compared to the area's potential. Even animals that reproduce rapidly, such as rabbits, seem to exist in considerably fewer numbers in land areas which could reasonably support much larger populations. For this reason, in most places little selection pressure exists and most living animals appear well and healthy. In locales where large numbers of animals co-exist, such as in the hot jungles of Africa, Kropotkin (1955, p. 7) concluded animal life is in abundance:

on the lakes where scores of species and millions of individuals came together to rear their progeny . . . in all these scenes of animal life . . . I saw mutual aid and mutual support carried on to an extent which made me suspect . . . [this was] a feature of the greatest importance for the maintenance of life and the preservation of each species . . .

This "mutual aid" he concluded is a source of evolution that is far more important than the individualism survival of the fittest model. He also found that struggle, when it occurred due to such factors as local famine, tended to have the effect of *impoverishing* the animal involved: "No progressive evolution of the species can be based on such periods of keen competition" (1955, p. 7). Although competition for food exists, Kropotkin (1955, p. 7) concluded that in reference to Darwin, "We find [in a study of nature] . . . none of the wealth of proofs and illustrations which we are accustomed to find in whatever Darwin wrote." Kropotkin and others have also shown that many of the specific examples which Darwin used to support or illustrate his natural selection theory were in error (Allee, 1938)

In summary, it is not necessarily the animal that runs the slowest, or is somehow "least fit" that becomes prey to predators. Typically, *chance* is a major—if not the most important—factor. It is often the animal that happened to be in the wrong place at the wrong time that becomes a meal for another animal. In hunting, it is place and time, not "fitness" that are by far the most important factors, and both of these elements are highly influenced by chance. The extremely weak or the physically ill may sometimes be more prone to being caught, but many animals will not attack the obviously sick or lame, and many, or even most, ill adult vertebrates die before being caught by predators. What differential elimination of the sick does occur at most serves to assure that the species stays at the same level of quality; it rarely "advances" the species. *Selection seems to be a major mechanism primarily for preserving the status*

*quo, and not causing so-called evolutionary advancement* (Howe and Davis, 1971).

### Cooperation Is The Rule

In the natural world, cooperation and not competition is not only much more prevalent, but actually what is *labeled* competition may be a misunderstanding of *behavior that is truly cooperation*. The key to the whole science of ecology is *balance*, not competition (Ardrey, 1976). The implications that animals do *not* increase their gene pool, expand their population in direct proportion to their ability to "eat and avoid being eaten" or outdo their competitors are clear: the entire Darwinian view of life is not only inaccurate, but a serious distortion of reality. Yet, as Genoves (1970) noted, survival of the fittest natural selection was seen by Darwin, and to a great extent by his followers, as the *main element of evolution*. He concludes that Darwin placed exclusive emphasis on the part played by competition and struggle, neglecting cooperation and mutual aid as though the survival of the fittest always results in a victory for the strongest and the elimination of the unfit. Many animals are aggressive because their behavior is modified by conditioning and for these there is not much evidence of innate aggressiveness, contradicting Ardrey who endeavors to make a case for the view that war and acquisitiveness are part of "animal" nature.

### Natural Checks

A crucial element in the theory of evolution is maintaining a high level of reproduction so that selection can work to keep these levels "in check" by preserving the best and thereby improving the species. Even many of the weaker animals survive long enough to at least reproduce, and most have natural internal mechanisms that serve as population checks. Darwin's reading of *Malthus'* ideas about *populations* increasing in *geometric* proportions, and *food* in *arithmetic* proportions was a major influence in his evolution speculations. This idea, though, is not valid for most higher level living things. Wynne-Edwards (1968, Ch. 22) found that many animals *can and do rigidly limit their own population* to far below over-population levels, often even below Carr-Saunders "optimum number." They use many diverse mechanisms to achieve this. The idea that an almost constant state of excessive fecundity exists and therefore a high level competition for survival is omnipresent, although valid for some lower animals, is largely invalid for many higher animals. Wynne-Edwards (1968) notes that during the history of most animal populations, periods existed during which natural or other events resulted in a heavy death toll. The survivors normally compensate by starting to breed at a high rate so as to restore their numbers to the previous level as rapidly as possible. In a completely isolated laboratory population, the growth almost always stops at some consistent ceiling density, and then remains at that level as long as the environment is constant. In wild populations, the same usually occurs even if the mortality rate is not abnormally high. In other words, a mechanism exists which causes the animal population density to remain close to a certain level, and if it rises too much above this, reproduction slows, and if it goes below this ceiling, it increases (Smith, 1970; 1976; 1985).

An example of an internal factor which limits population growth was discovered by Christian (1956). In the early 1950s he studied the Sika deer population of James Island, a half of a square mile of territory located in Chesapeake Bay. Five Sika deer were originally imported to the Island in 1916. Forty years later, when Christian began his field work, the herd had grown to about 300. Two years after his arrival, the deer began dying off in astonishing numbers for no apparent reason; over half died within just three months, and by the middle of 1959 only 80 deer were left (Christian and Davis, 1964). Then, as mysteriously as the deaths began, they ceased. Research into the cause of these deaths included an examination of their feeding habits, the possible presence of disease, etc. None of the reasons that he researched could explain either the starting or the stopping of the deaths. A detailed study of their internal organs revealed that *only one difference existed* between the deer that died during the massive deaths in 1959 and those that perished from natural causes: an enlarged adrenal gland. In some cases, it was nearly twice as large as in those deer that had died at other times. The researchers concluded that the deer had died due to *psychological overcrowding*.

The deer were not overcrowded from our viewpoint—each had over an acre of space. But that was evidently enough “overcrowding” to produce the conditions which caused the enlargement of their adrenal glands which in turn flooded the deer’s systems with adrenalin hormones, causing hemorrhages in the brains and kidneys. Because deer are non-aggressive animals and cannot reduce their number by fighting, their only response to “overcrowding” is an innate physical mechanism which lowers the population until it reaches a certain number. As this level is well above the animal’s survival requirements, this mechanism would not be a result of natural selection:

. . . considerable evidence [exists] both from the field and the laboratory that crowding in higher vertebrates results in enlarged adrenal glands, which are symptomatic of shifts in the neural-endocrine balance that, in turn, bring about changes in behavior, reproductive potential, and resistance to disease or other stress. Such changes often combine to cause a precipitous “crash” in population density. For example, snowshoe hares at the peak of density often die suddenly from “shock disease” that has been shown to be associated with enlarged adrenals and other evidence of endocrine imbalance. In the cyclic insects . . . on the upswing of the cycle, tent caterpillars (*Malacosoma*) build elongated tents that are shifted about, and the individuals are active in moving out into the foliage to feed. At peak density the caterpillars become inactive . . . feed less, and are more subject to disease. . . . Such adaptation syndromes would certainly seem to be mechanisms for ‘dampening’ oscillation so as to prevent too great a fluctuation that might damage the ecosystem and endanger the survival of the species (Odum, 1971, p. 195).

The tendency to expand to a certain population level per square mile, and then having something trigger an internal mechanism to drastically reduce the population, may at first seem non-functional, but is

necessary for the animals to achieve a certain *quality of living*. It is assumed that a mechanism such as this is “nature’s way of controlling the population.” A creationist would see this response as the Creator’s way of insuring, not just survival, but adequate survival for the remaining animals, not just life, but “the good life.” While an acre could easily support many more than one deer, it generally does *not* insure a quality life style, but many thin, slightly undernourished, yet adequately surviving animals. This mechanism helps to insure *healthy, well-fed, strong animals*. How common this mechanism is, is not yet known, but it is evidently present in many non-aggressive animals—see Smith, 1970; 1973; 1985.

### Mass Suicide

The self-preservation instinct is perhaps the most basic drive found in all living things. Yet, some creatures such as lemmings frequently commit mass “suicide,” evidently for reasons similar to those which cause Sika deer to commit physiological suicide. When food is plentiful, these mouse-sized rodents with long silky fur, lead quiet, peaceful lives high in the mountains in the icy regions of northern Scandinavia. They flourish on reindeer moss and various roots, and live in cozy underground nests. McFarland (1976, p. 119) noted:

. . . every few years the lemming population grows so large that their food supply can no longer sustain them. Then all the lemmings leave their burrows. . . . Like an army heading for a great battle, they swarm out of the highlands and rush downward over the sloping plains. Normally, lemmings fear and avoid water. But, during their mass march . . . after running for weeks, the lemmings finally reach the seashore, and then, row upon row, plunge headlong into the water! For a short time the frantic rodents remain afloat, breasting the rough tide like millions of tiny rowboats cutting into the surf. But soon the creatures tire, and one by one sink to their doom. During a lemming migration, the bodies of the animals can completely cover the surface of the water. One steamer off the Norwegian coast reported that for a full hour the ship had to cut its way through a thick shoal of lemmings swimming out to sea—swimming out to die!

Why they respond this way is still being debated, but such population control behavior is a major reason why “. . . very few parts of the earth are in any way crowded with animals”—see Custance (1976) and also Carrighar (1965). Calculated by weight, only a few pounds of birds live in an acre large area, and the density of individual birds per square mile is typically well below the land’s support level. When seen as a flock, flying south for the winter or on an island which serves as a stopping or resting place for animals, it appears that millions of birds live in crowded places. These animals normally live in a very large area. Although in some areas animal and plant life is “crowded,” this seems to be primarily because of human interference. Humans have cut down forests, set up farms and cities, and spread like wildfire throughout the earth—and historically (at least in modern history) this has probably been the major disrupting factor in the natural

world (Curry-Lindahl, 1972). Observing that thousands and sometimes millions of birds live in a very small area, rarely fighting and displaying little overt competition for food, is common.

If the population increases beyond a “comfortable” level, the animal often may simply spread out to a wider area. When this cannot be accomplished, the animal may slow down its reproduction level or, for the reasons discussed above, many will die. This mechanism results in maintaining a certain level of animals living within a given area:

An ironic turn in the history of science took place when both Charles Darwin and Alfred Russell Wallace found their inspiration for natural selection in Malthusian doctrine, a thesis which sooner or later must be accepted as in large part false. . . . Darwin and Wallace saw in the Malthusian doctrine a natural law which must apply to all species, and so they deduced that through competition for a limited resource, food, selection must take place between fit and unfit. The Malthusian logic seemed inarguable . . . And undoubtedly supply of food places a theoretical limit on animal numbers, just as there must be cases in which deficiencies of quantity or quality of food contribute to a limiting effect. Yet [research in] the new biology provides no proposition more demonstrable than that of the self-regulation of animal numbers. Rare is the population that has ever expanded until it reached the limits of food supply. Rare are the individuals who directly compete for food. An infinite variety of self-regulatory mechanisms, physiological and behavioral, provide that animal numbers—except in the case of climatic catastrophe—will never challenge the carrying capacity of an environment. Birth control is the law of the species (Ardrey 1970, pp. 200-201).

Evidence that areas can support a far greater number of animals than usually exists is also demonstrated in the domestication of animals. Farmers have been able to graze horses, cattle, and sheep comfortably on an area of land at a density level that one would rarely find in nature. The fact that most areas can support far larger populations of animals than are usually found in the wild clearly demonstrates that the numbers of many types of animals are often *not* necessarily being held down by competition. Nor does nature normally overpopulate, but the number of animals is for many reasons typically far less than a given area could support.

Except for humans, animals which tend to fill land space far more than others are often not more advanced or much different than other animals. Mice, gophers, and rabbits exist in comparatively large numbers per square mile, whereas far fewer anteaters and porcupines usually live in the same space, yet no evidence exists that the animals which are more numerous are in anyway physically more evolved or more evolving as would be expected. All other factors being equal, the larger the population, the more opportunities exist for mutations to occur and thus Darwin’s evolution. Yet, those animals blessed with far greater numbers do *not* seem to be more capable of survival or outwitting their enemies when compared to animals which have less dense populations per square mile.

### The Problem of Crowding

Admittedly, some examples of aggressive animals exist which fit the picture that Darwin felt nature as a whole exhibited (Harlow and Woolsey, 1958). Even the better examples, such as rats, though, provide at best mixed evidence. Both human caused overcrowding and the condition of cities have influenced this rodent to behave “unnaturally.” Rats living in the country do not exhibit the aggression typical of city rats. Even so, such crowding and the accompanying viciousness that they exhibit is characteristic of very few animals in the wild, even in crowded conditions (Genoves, 1970). This research also has direct relevance to the effects of stress on humans (Selye, 1955).

Studies of animals forced into unnatural situations by humans, such as the thousands we crowd in stockyards together before slaughter, have found that they tend to physically align themselves in rather ingenious ways so as to reduce conflict. For example, many birds position themselves quite evenly with respect to the other animals, and those towards the periphery face outward so as to utilize the “facial distance” in front, and also provide more facial distance to those animals towards the center of the pen. Another method is to “truce,” as described by Krutch (1961, p. 571):

. . . when two wolves threaten one another the less aggressive often turns his cheek. This is not a signal to the other one to move in for the kill. The wolf who turns his cheek asks for a truce, and though the snarling continues, the truce is always granted. Turning the other cheek, the wolf teaches us, is not abject surrender but an honorable way to prevent a fight and save the species.

### The Concept of Adaptation

As Sterns and Sage (1980, p. 65) noted, biologists are increasingly modifying the whole concept of biological adaptation:

Field biologists commonly assume that the organisms with which they deal are well adapted—even optimally adapted—to local circumstances. [They have] . . . de-emphasized the role of gene flow in preventing large scale geographic differentiation and local adaptation. This paper documents a case in which gene flow may have prevented small scale local adaptation in one population of mosquito fish, *Gambusia affinis*. It carries two messages: field-workers should check the assumption that their study organisms are adapted to the local environment because that assumption does not always hold, and there are limiting cases involving high dispersal rates over short distances in which gene flow can overwhelm local selection pressures.

Sterns and Sage then assert that adaptation exists only in degrees: all animals could be more perfectly adapted to their environment, and all “suffer” from lack of perfect adaptation. If the *mean* temperature of a certain area is 23°C and a certain insect can live within plus or minus five degrees of this value, it could be said to be fairly well adapted. If, on the other, even though the summer mean may be 23°C, and the temperature occasionally drops to ten or lower, insects able to survive in this wider range of temperature are

adapted to a *greater* degree to the environment. Natural selection judgments as to why this flexibility exists tend to be naive in that a great deal is unknown about specific adaptation and selection pressures (Horn, 1971). It is clear, though, that adaption to the widest temperature range possible is very advantageous. An excellent summary of these problems is supplied by Endler (1980, p. 76).

All too often in evolutionary biology we are led to speculate or infer the mode of action of natural selection; we usually do not know why some individuals are more adaptive than others. Very often attempts to measure natural selection are unsuccessful, leading to heated arguments about the relative importance of selection, genetic drift, and epistasis in evolution (Lewontin, 1974). Until we know more about how and why natural selection occurs, attempts to measure it are quixotic, and discussions of its importance are theandric. It is of no coincidence that most of the successful studies of natural selection have dealt with animal color patterns; it should be obvious which color patterns are more adaptive in the presence of visually hunting predators. The adaptive significance of warning coloration and mimicry of distasteful species has been worked out. . . . But, most species are neither distasteful nor memetic; most have inconspicuous or cryptic color patterns in their natural habitats.

In many discussions of selection, this mechanism has been highly over-simplified (Huxley, et al., 1954). Endler (1980, p. 76) notes that "Most field and experimental studies have shown that the overall color or tone of inconspicuous species matches or approximates the background. . ." Animals that are able to blend in with the background can better "hide themselves" the theory goes, and are thus less apt to be destroyed by predators. On the other hand, animals which *contrast* with their background are also often avoided, the opposite of what one would expect given the common natural selection argument. Krebs (1979, pp. 14-16) concludes, as summarized by Corliss (1980, p. 1) that:

Darwin believed that many male birds are brightly colored because females prefer flashy finery and thus puts evolutionary pressure on the development of these characteristics. A large-scale study by Baker and Parker indicates that Darwin erred and that the evolutionary pressure comes instead from predators avoiding brightly colored targets. Instinct tells the predators—incorrectly in many cases—that colorful prey taste bad or are noxious. The remarkable (possible strange) aspect of bird coloration is the incredible external similarity of unrelated birds occupying similar habitats . . . the American eastern meadow lark closely resembles the African yellow-throated long claw. . . . How do the genes orchestrate this amazing convergence in response to environment factors? Why was evolution not equally clever in equipping predators with countermeasures to see through these ruses?

Attempts to explain the existence of many structures and behavioral traits by natural selection often become ludicrous. Macbeth (1971, p. 75) relates to the assump-

tion that bright colors and natural selection have produced a variety of conflicting explanations, noting that flowers, the theory says, develop distinct colors to attract bees, wasps develop colorful black and yellow stripes to "warn" enemies of their sting, and partridge birds develop camouflage to help them escape detection by the hawk, yet the peacocks have a *bright plumage* so that they are more visible and can stimulate their mates yet this color *also* attracts enemies. Simplistic assumptions such as these have been challenged in recent years. Flowers' distinctive colors also attracts predators, the animals which consume them. The wasps' black and yellow stripes also make them much *more* visible to enemies, and the partridges' camouflage which hides them from enemies also makes them *less* visible to potential mates.

Another major problem with natural selection is that most insects and many other animals progress through two stages, an infant or larvae stage followed by an adult stage. The classic examples include the metamorphosis such as from the tadpole to the frog, or the caterpillar to the butterfly. Behavior which facilitates survival at the first stage may not be helpful, and could well be harmful, at the adult level or vice versa. And a favorable characteristic for an adult individual would be unlikely to develop unless it is *equally favorable*—or at least neutral—when the individual is young and an extremely high mortality rate is common.

### The Struggle for Life and Evolution

The major evidence against the natural selection theory is the total lack of correlation between the amount of, for example, competition, and how high the animal is on the evolutionary scale. If competition causes evolution, we would expect that it would be higher and more intense at the "higher" end of the evolutionary scale. This is rarely found, but the opposite often is. Animals which are biologically closest to humans, such as the orangutan, the gorilla (actually usually a very gentle, "family" creature), and the chimpanzee, usually do not fight with one another, even for territory. This factor has been studied extensively because of the concern over whether or not aggression in humans is innate, and evolutionists believe that one way of answering this question is to research animals believed to be evolutionally closest to us. Aggression is sometimes severe between monkeys and apes living together in captivity, but is far less so in natural conditions. Part of the reason for this is because psychological abnormalities appear far likelier to develop in animals born and raised in captivity (Harlow and Woolsey, 1958; Ardrey, 1976).

The claim that a primary aspect of competition is often not one animal against others of different species, but within the species so that the most fit within it survive, also faces a number of problems. In the classical research on territorial fighting, it was assumed that the stronger usually wins. Many animals fight for territory and, aside from physical fitness and size, territory is a major survival factor—and this would seem to insure only that the existing population is physically fit and would not select for the "fittest." The courage of the defender to defend is most often far greater than that of the trespasser. The same phenomenon is found in human society; a person who is right and knows it

will usually work much harder than one who is wrong. Studies of chipmunks, squirrels, and other animals has revealed that they have a “geographical center” in their territory. When near it, the defender is full of valor—and conversely, his enthusiasm wanes as he chases the trespasser farther away. As he travels farther away from his center, the valor of the other animal increases as it travels toward its own geographical center. When the two are roughly between their two geographical territories, the animals often part and go home. This is comically shown when two chipmunks chase each other furiously across their territorial “boundary”—and the chipmunk which was formerly being chased will now chase the other with equal vigor until the “boundary” is again crossed. Sometimes this chasing will repeatedly alternate, producing a seemingly nonsensical comical spectacle (Ardrey 1966, p. 90).

Obviously, this mechanism facilitates animals maintaining a *living distance* from others without doing violence to them by reducing crowding and facilitating survival at a “quality level” norm. It also reduces fighting, because territories produce guidelines that control behavior, resulting in safer areas. Another result is that animals do not crowd into a territory because the territorial imperative drive often results in an animal population existing well below the point where much survival competition is able to occur—and at a low level so that often far more food than is necessary exists (Ardrey, 1966). A squirrel, for example, probably only needs a few dozen square feet to survive adequately—but most have scores more, primarily because of the territorial imperative and not food needs. If size and fight were the major factors, we would expect that in areas where much fighting over territory occurs that these animals would evolve into physically larger and stronger types compared to similar animals elsewhere. In these highly competitive areas, deer would eventually evolve to be as large as elephants, and continue growing until many were as big as dinosaurs—changes which no evidence exists to support. All things being equal, larger size would *seem* to have an adaptive advantage (Endler, 1986). When the evolutionary history is plotted, the animals at the “higher” level, and thus only the more recent evolved parts of the standard evolution tree, tend to be larger in size. The putative horse and primate evolution are the best-known examples. A set of conditions exist which made it more difficult for some larger animals to survive. Size may even account for the disappearance of the dinosaurs, an event which numerous wild theories have been proposed to account for this so far unexplained historical occurrence. The limited evidence explaining dinosaur extinction is why a great deal of conjecture and speculation is required to build a theory, often one that is obviously not amenable to several important aspects of the scientific method, such as replication.

### The Clowns, Craftsmen, and Wizards

Macbeth (1971, p. 72) has divided adaptation into three levels: *clowns*, *craftsmen*, and *wizards*. The clowns appear to fit poorly into nature. The *craftsmen* use a utilitarian ingenuity to fit themselves in with a consummate art (and from this group come most of the examples of evolutionary adaptation). The *wizards* use nature as their clay, less to adapt to it than to rise above it. Macbeth (1971, p. 73), concludes

How do these different groups fare in nature? Strange to say, they *all* seem to get along in much the same way. The clowns do not die out, although a few examples such as the mammoths and the Irish Elk are gone. The *craftsmen* do not take over the earth, and the *wizards* maintain their places with no apparent gain or loss.

Darwin observed that the numbers of a given species actually remains more or less constant, and this has been confirmed by later students. McAtee (1932) concluded after analyzing reports on the contents of about 80,000 birds' stomachs that, with a few exceptions, animals were eaten by the birds largely according to the *proportion of their availability*. The famous peppered moth—the most commonly cited example of evolution ever, although only an example of microevolution—is a major well known exception (Johnson, 1991).

All animals abound with structures which do not seem to help them be as “fit” as possible—all living creatures have parts that ostensibly *seem* dysfunctional, and many that are obviously not beneficial. Darwin himself noted, according to Eiseley (1958, p. 142), “I did not consider sufficiently the existence of structures, which as far as we can . . . judge, are neither beneficial nor injurious, and this I believe to be one of the greatest oversights as yet detected in my work.” The *only* effective way of determining the survival value of any factor is to observe, over long periods of time, the animals with the trait in question compared with those which are identical *except* they lack the trait. One can then determine after several generations whether the trait difference affects survival to a significant degree. Even this technique is limited because conditions in the natural world *change*, and a set of conditions which are beneficial in one area may be less useful or even an impediment to survival in a different environment. Many factors which at first appear to aid survival turn out to be unimportant. Porcupines removed of their quills have survived in many areas of the natural world quite well (Tributsch, 1984).

Even the few examples given to support selection break down under scrutiny (Mosher and Tinkle, 1970). Extensive observation of the males who display elaborate dances *seemingly* to gain the favor of the female often finds that the females are either absent, not watching, or busy pecking at food. Further, research has found that many supposedly “admiring females” are color-blind (Macbeth, 1971, p. 83). Mating with defeated animals in some cases occurs as readily as with the victors—see Mathiessen (1967). Tinbergen (1963) concludes that the function of brightly colored patches of skin around the genital aperture of female baboons and chimpanzees is to help guide the male to the female's copulatory organs. Macbeth (1971, p. 75) calls this “arrant nonsense” because it assumes that baboon and chimpanzee males at one time needed more guidance than most other primates—all of whom seem to do quite well at finding the female aperture. Anthropomorphic rationalizations such as these are precisely what brought Darwinism contempt by some scientists before the turn of the century—see Stebbins (1950).

Ardrey (1966) concludes that most animal fighting and aggression are concerned with territory, not females, shattering the importance of sexual selection

theory, one of Darwin's strongest arguments. And territory establishment is clearly counter to evolution; it does not help the species as a whole because it reduces the number per unit of area, and for many animals it may not even increase their survival likelihood if their successfully established territory is a poor area for food or shelter. Ardrey (1963, 1966) also notes that some animals seem to fight for no apparent reason; they are non-territorial and are obviously not fighting for females. The cuckoos do not homestead territory, but are parasitic and do not build nests. Neither does his conquest result in romantic ends—when the fighting has finished and the real estate property apportioned, the embattled mate will amicably share his bride with other cuckoos!

Darwin was thus incorrect in applying certain principles from population demographics to selection—as was Malthus. Although Malthus' ideas may have some validity in certain limited human economic situations, Darwin's application of it to animals is often invalid. As Medawar stated (1957), fallacy of this Malthusian syllogism "lies in its major premise. . . . Far from producing a vastly excessive number of offspring, most organisms produce just about that number which is sufficient and necessary to perpetuate their kind. . . ." And for animals that do reproduce in larger numbers, such as the proverbial rabbit and certain kinds of birds, the evidence is that these *do not evolve or change faster than other animals*.

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## FOSSIL WOOD FROM BIG BEND NATIONAL PARK, BREWSTER COUNTY, TEXAS: PART II — MECHANISM OF SILICIFICATION OF WOOD AND OTHER PERTINENT FACTORS

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### Abstract

*A theoretical mechanism for the silicification of wood is presented. Possible rapid burial and silicification are discussed within the framework of a young earth model. Laboratory means to implant silica in wood are reviewed. Autochthonous and allochthonous deposition of woody material in various locations is explored.*

Key Words: Silicification, Silicic Acid, Fossil Wood, Autochthonous Deposition, Allochthonous Deposition.

### Introduction

The formations in which the fossil wood specimens were found in Big Bend National Park were discussed in Part I (Williams and Howe, 1993). The importance of bentonite deposits in relation to the silicification of wood also was presented. Applications were suggested within a tentative catastrophic model. This part discusses: how wood is petrified, how rapidly it silicifies, and the process by which the material is carried to its burial site. In mentioning time estimates, I am quoting the opinions of the various workers involved. I do not subscribe to the standard geologic timetable.

### Petrification of Wood

For readers who do not wish to wade through the technical aspects of the petrification of wood, a brief but accurate discussion of the process can be found in Barghoorn (1987).

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One of the most remarkable mechanisms by which the remains of extinct organisms are preserved in the fossil record is the process of petrification. In petrifications (though chiefly in the case of plants rather than animals) the original shape and topography of the tissues, and occasionally even minute cytological details, are retained relatively undeformed (p. 250).

Through the years there has been controversy as to whether the organic matter of wood is replaced molecule-by-molecule with mineral matter (replacement) or whether the mineral infiltrates the cellular structure and is deposited from solution (infiltration). The latter process is thought to be more likely and the details of that model will be elucidated.

Common agents involved in petrification are silica (SiO<sub>2</sub>) and calcium carbonate (CaCO<sub>3</sub>, in the form of calcite). Occasionally phosphate minerals, pyrite and hematite are involved in petrification. Where silica is the major agent in petrification, the process is called

silicification and generally, "the most perfect preservation of original structure is found in siliceous petrifications" (Barghoorn, 1987, p. 250).

### Silicification of Wood and Other Organic Matter

Silica is found in many living plants—for a specific example, see Howe, et al., 1987. Scurfield et al. (1974a, p. 211) claim that a previous study "... lists 440 species distributed over 144 genera and 32 families as forming wood in which silica occurs ..." Thus one could reach the conclusion that some plants either have an affinity for silica, readily absorb it or utilize the compound in their structure. Scurfield et al. (1974a) examined 32 species of woody perennials employing scanning electron microscopy to determine the location and form of silica in the plants. They assumed that  $\text{SiO}_2$  entered plants as monosilicic acid ( $\text{H}_4\text{SiO}_4$ ).<sup>\*</sup> The form in which silica is transported in trees was not detected. However they claimed that it is deposited in wood in an amorphous form (a colloid such as a gel). Later the silica gel, deposited on the inner surfaces of the plant cells, continually dries and hardens as water is lost.

In a classic study on 24 specimens of silicified wood and one of calcified wood, Ruth St. John (1927, pp. 729-739) reached the following conclusions concerning how the process of petrification may occur:

1. Infiltration of mineral matter into the cell cavities and intercellular spaces, with the vegetable tissue preserved.
2. Complete replacement of the plant tissue, but this may be due to the spaces being filled first, and later the tissue being replaced.
3. Complete replacement of portions of the mass and filling only of cavities in the other parts (p. 739).

How wood petrifies in the presence of mineral matter is not completely understood but as stated earlier, the mechanism of infiltration appears to be the presently accepted one. However in 1944, Kryshtofovich wrote that:

True petrifications are plant remains where the original carbonic plant matter is intimately replaced more or less posthumously by mineral matter and by a penetration of silica or carbonates into the interstitial tissue (p. 62).

Schopf (1971, p. 523) in an investigation on silicified Antarctic peat made the following observations:

Comments on the nature of siliceous permineralized plant materials also may be of interest because so many geologists have been taught that petrified wood, well represented in the peat of this deposit, is a result of siliceous "replacement" True mineralogic replacement of plant tissue in a pseudomorphic sense is possible, but, when the plant structures are preserved with marvelous fidelity, one may be confident that permineralization rather than replacement is responsible. Pseudomorphic replacement probably is incapable of more than crude replication of microscopic tissue structure. In permineralized tissue the cell lumens, intercellular spaces, and the cell-wall structure itself are

penetrated ("permeated") by microcrystalline mineral matter, often without visible disturbance of either the tissue or the interpenetrating microscopic crystal patterns.

He postulated three stages of silicification in the preservation of the peat (p. 541). First, a chalcedonic mineralization which preserves the tissue structure; second, another chalcedonic step which lithifies the deposit; and third, clear quartz is deposited in the remaining fissures and cavities of the peat. This latter operation is evident in some of the specimens we collected except that most of the silica was milky in color (Figure 1).

Buurman, et al. (1973) in an investigation of plant material recently silicified in acid sulphate soils (pH 3-4),<sup>\*</sup> concluded that thin coatings of silica were present on former cell walls of the plants. "Structures formed this way are in fact replicas, and replica-like fossilizations of what was perhaps epidermis tissue ..." (p. 121).

After an extensive study of petrified woods from Australia, Scurfield, et al., (1974b, pp. 389-396) offered the following model for silicification.

1. The process takes place under acid conditions suggested by the "frequent association of iron oxide and silica" (p. 395) in silicified woods.

2. Polyphenols in plants may encourage the deposition of  $\text{SiO}_2$ , (i.e., silica accumulates in lignified cell walls).  $\text{SiO}_2$  may attach itself to lignin in pores of water soaked wood.

3. As the wood decays or is attacked by microorganisms,  $\text{SiO}_2$  may further deposit in the recently generated empty spaces.

An exchange between the authors and a reviewer is revealing (p. 396).

Reviewer V: Does this study indicate that because of their chemical similarity, the carbon molecules are replaced one at a time by silica during the petrification process; or is the silica just precipitated on the cell wall as a coating?

Authors: No, atoms and molecules are not the same thing. We cannot conceive of silicon (not



**Figure 1. Pieces of silicified wood that have disintegrated from a recently exposed log in the Dawson Creek region of Big Bend National Park. Light areas are fairly pure (~97%) silica that probably filled cavities within the log. Photograph by Glen Wolfrom.**

<sup>\*</sup>Possibly wood is silicified rapidly in an acidic environment.

<sup>\*</sup> $\text{H}_4\text{SiO}_4$  is referred to as orthosilicic acid in Nebergall, Schmidt and Holtzclaw (1976, p. 733).

silica) atoms replacing carbon atoms. The structures of cell wall polymers are entirely different from those of silica.

Schopf (1975, pp. 27-53), in an article on the modes of fossil preservation, gave a history of the theories of petrification. He briefly developed the molecule-by-molecule replacement concept, then called the scheme "hypothetical and essentially fictitious" (p. 31). He argued that the smaller inorganic molecules assume a different geometry from the larger organic molecules they are supposed to replace. Then he stated:

Many silicified fossils are essentially pseudomorphs in which external detailed appearance is faithfully preserved, but *not* by molecule-by-molecule replacement . . .

Cellular permineralization is the most faithful to life of any mode of fossil preservation that is known (p. 31).

He reiterated that the mechanism of permineralization is not completely understood.

Probably the most respected work on the mechanism for the silicification of wood was performed by Leo and Barghoorn (1976, pp. 1-47). They formulated a fairly complete model for the process. Of interest to Flood geologists is the emphasis of water action as needed for silicification.

The role of water in petrification is of paramount importance. Water is a necessary agent for ash alteration and mineral diagenesis. Saturation of the sediment serves to exclude oxygen, thereby inhibiting deterioration of tissue structure, through the maintenance of reducing conditions. Water-logging dispels entrapped air, and maintains the wood in a swollen and plastic state, thereby maintaining maximum permeability (p. 27).

Leo and Barghoorn (1976, pp. 16-22) postulated a physical model for the silicification process. In the early stages, silica deposits upon readily accessible cell surfaces such as "the perimeter of the lumen and on the lining of the pit chamber" (p. 17) and builds outward to fill empty spaces. Apparently some  $\text{SiO}_2$  goes into the cell walls and deposits within the organic material. They felt that wood acts "as an active template for silica deposition during petrification" (p. 19). As the process continues the organic template deteriorates, leaving more space for further  $\text{SiO}_2$  deposition. Obviously they considered that petrification occurs in a sequence of steps. The natural processes of wood removal and silica deposition should not be considered perfect. The distribution of  $\text{SiO}_2$  through a petrified wood can vary. As can be observed in field work, specimens from any "area containing petrified wood" vary as to structural retention and some specimens may not show any wood structure preserved.

Leo and Barghoorn summarized the discussion as follows:

Petrification is fundamentally a process of infiltration and impregnation, wherein wood substance serves as an active template for silica deposition (p. 21).

In considering the chemistry of the silicification operation, these authors suggested that molecular silicic acid likely was involved. The initial chemical bonding might be hydrogen bonding (pp. 22-23) between the wood tissue molecules and molecules of silicic acid. As the acid concentrations in the wood increase, its molecules could polymerize "forming siloxane bonds" (p. 23) along with the removal of water. As the polymer extends, it forms a film over the surface of cells. After studying silicified wood from the Petrified Forest National Park, Sigleo (1978) said that her study indicated "that silicification is an impregnation (void-filling), not an organic replacement process" (p. 1404).

Knoll, in an investigation of the silicification of photosynthetic organisms in carbonates and peats (1985, pp. 111-122), considered the model proposed by Leo and Barghoorn satisfactorily explained his observations and added that,

. . . a limited degree of decomposition (of organic material) may actually increase chances for long term preservation by providing abundant sites for hydrogen bond formation as well as microcracks and holes through which ground water can percolate (p. 115).

He emphasized the need for high concentrations of sedimentary organic matter to encourage silicification. From the standpoint of Flood geology, the water of the Flood should have been "loaded" with a variety of organic materials.

Jefferson (1987, p. 242), in his work on fossil conifer wood, employed the silicification model of Leo and Barghoorn. He proposed that: "The process . . . for the Alexander Island fossil woods involves permineralization of the cell wall structures rather than replication . . ." (pp. 240, 242). He suggested that "early decay" of the wood promoted hydrogen bond formation of silicic acid with hydroxyl groups in the molecules of the cell wall. He visualized silicification as occurring in two major stages; (1) formation of a silica film over cell wall structures, (2) a later and slower "cavity-fill process, in which silica filled the cell lumen . . ." (p. 242). Also Jefferson considered that Murata's view (1940) on the production of free silica by the devitrification of volcanic tuff (see Williams and Howe, 1993, pp. 47, 50) and later formation of silicic acid was applicable to the silicification of the Alexander Island wood. Chapman and Smellie (1992, p. 165) indicated that the fossil wood samples they studied from Livingston Island, Antarctica were silicified within ash-flow tuffs supporting Murata's suggestion. Also the initial preservation of the wood (silicification of cell walls) was similar to that as postulated by Jefferson (1987). See Chapman and Smellie (p. 170).

### Rapid Burial Necessary

Rapid burial is necessary to preserve the wood before decay and deterioration destroys much of its structure. Leo and Barghoorn (1976, p. 4) stated that in order to preserve any fossil wood, it must be isolated from an oxygen supply. Referring to Murata's article (1940), they noted that, "The initial stage for many of the fossil woods that are preserved as silicified woods appears to be rapid burial in volcanic ash . . ." (p. 5). Also see Dorf, 1964, p. 111; Jefferson, 1982, p. 705. Ransom (1955, p. 15) claimed that:

If a tree is submerged in water it becomes water-logged, and like a deadhead in a present day lake, it sinks to the bottom. Here, deprived of oxygen, decay of the tissues may be retarded indefinitely.

For instance Leo and Barghoorn (1976, pp. 4-5) noted that:

Water-logged wood "mined" from stagnant lake bottoms after a hundred or more years of submergence was found to be perfectly sound . . . Wooden stakes driven into anaerobic muds over 4,500 years ago, when recovered and examined, were found to be histologically intact and recognizable as to botanical taxa . . .

However these latter samples had a greatly reduced holocellulose content yet all of the lignin content was retained but "chemically modified" . . . (p. 5). Thus lignin resists degeneration as compared to holocellulose under anaerobic conditions. Allison (1988) stated that, "Anoxia retards decay but does not halt it" (p. 341). As a comparison he explained that generally ". . . chitin will persist in sediment longer than muscle . . . cellulose will persist for even longer . . . and lignified cellulose for even longer still . . ." (p. 341).

Consider the conditions mentioned above from the standpoint of a Flood model, (remembering that catastrophic conditions are suggested i. e., the removal of the woody material to a place where it can become waterlogged [flooding] then later covered with volcanic ash or silica-rich sediment). Obviously abundant water necessary to waterlog trees is available in a universal Flood. Also the power to transport large quantities of logs, etc. is available. In post-Flood times as the waters receded from the land, waterlogged trees could have been stranded on shore and covered with volcanic ash when considerable volcanic activity occurred. Also assuming a high rainfall climate after the Flood (Oard, 1990) as well as the presence of many post-Flood lakes (particularly in the western U. S.), severe local flooding possibly occurred. Logs could have been washed into areas to be covered by ash or silica-rich sediments.

Continuing rain and local flooding could have provided the water necessary to devitrify volcanic ash or chemically alter silica-rich sediments thereby releasing orthosilicic acid for later petrification of any buried, waterlogged wood. This tentative model deals with postulated conditions during the Flood and hypothetical conditions viewed as after-effects of the Flood.

#### **Rapid Silicification of Wood and Other Organic Matter**

Interestingly, it has been determined that the silicification of wood is a rapid process. Murata (1940, p. 590) reported from another study ". . . that wood immersed in the siliceous hot springs of Yellowstone Park becomes partly impregnated with silica in a few months." Buurman, et al. (1973) noted that plant remains were silicified in acid sulfate soils ". . . within the last centuries" (p. 123). Again a quote from Scurfield et al. (1974b) concerning an exchange between the authors and a reviewer is illuminating.

Reviewer IV: On the basis of the rate of chemical exchange, can you estimate the time required to produce "petrified wood"?

Authors: We suspect tens, perhaps hundreds, rather than thousands of years in view of the reported finding of a nail embedded in a specimen of petrified wood (p. 396).

Sigleo (1978, p. 1404) quoted other sources and claimed that ". . . silica nucleation and deposition can occur directly and rapidly on exposed cellulose surfaces." Note the following comments by Leo and Barghoorn (1976, p. 4):

Fossilization, with preservation of histological detail, apparent or real, is restricted to a limited number of geological situations with suitable biogeochemical histories. The environmental parameters of such situations are essentially those which arrest or curtail microbial activity, particularly that of lignin-digesting fungi. Among the more important of these parameters are (a) moisture, (b) temperature, (c) aeration, (d) pH, and (e) sedimentary setting. Time appears to be of consequence only in reference to the duration of operation of one or more of the aforementioned factors when functioning adversely in effect.

Later in discussing the chemistry of silicified wood ". . . from the Upper Devonian to the past century in age" (p. 8) the authors note: "There is no consistent time (geological age) correlation with either the amount of wood or its state of preservation" (pp. 8, 9). In the last section of the paper, Leo and Barghoorn (1976, p. 29) say "In terms of geologic time, the emplacement of silica in wood, as a molecular film, probably occurs rapidly." Then they felt that from this state to formation of an opaline state "probably requires a much longer time" (p. 29). Finally they postulated:

The ultimate fate of all silica is transformation to low quartz. Under conditions normally present at or near the surface of the earth, this conversion may require millions of years . . . In the presence of organic matter, however, crystallization to quartz may be appreciably accelerated . . . (p. 29).

Supporting the concept of rapid petrification of wood, many investigators have "artificially" caused silicification of wood in the laboratory. Some of these studies will be reviewed. Drum (1968a, pp. 175-176; 1968b, pp. 784-785) was able to silicify portions of woody tissue within 24 hours by soaking the plant material in a solution of sodium metasilicate. Oehler and Schopf (1971, pp. 1229-1231) developed a technique to silicify blue-green algae. They employed a solution of colloidal silica and later exposed the "fossil" gel to slightly elevated temperatures and high pressures to crystallize the  $\text{SiO}_2$ . A temperature of  $150^\circ\text{C}$  and pressures of 2000-3000 bars for two to four weeks produced the best results. They claimed their laboratory technique was ". . . analogous to processes involved in the deposition of natural bedded cherts" (p. 1231). The artificial silicification process of Leo and Barghoorn (1976) employed solutions of ethyl silicate in water with the wood being submerged for time intervals from a few days to a year or more.

It appears that the silicification process does not require vast intervals of time to accomplish the permineralization (petrification) of wood. Thus the operation could conceivably function within the restrictions of a young earth model.

### Transportation to Burial Site or In-Place Burial?

There has been considerable discussion in the scientific literature as to how plant material was deposited at its burial site before petrification, i. e., buried at place of growth (autochthonous) or transported by water (allochthonous). It appears that the vast majority of cases support allochthonous origins but there are reported instances of autochthonous origins.

Penhallow (1907, pp. 93-113) in investigating specimens of fossil wood from east Texas stated:

They all gave evidence of water transportation at a time preceding silicification, which I assume to have taken place subsequently to deposition in the locality where found. The evidence of such transportation appeared in the very advanced condition of decay presented by many of the specimens, and more particularly in the rounded and water-worn surfaces and ends, an abrasion which was accomplished prior to silicification (p. 93).

He proposed two possibilities, either (1) deposition of the wood by southward flowing rivers or (2) abrasion in lakes or lagoons from wave and wind action if the wood were of local origin. As you can see he equivocated somewhat and managed to leave room for either allochthonous or autochthonous origins.

Moore (1958, pp. 401-402) claimed that fossil woods in the Petrified Forest National Park were carried many miles to their present location. Leo and Barghoorn (1976, p. 7) believed in an allochthonous origin for this fossil material and Dorf (1964, p. 107) agreed with this conclusion. Ransom (1955, p. 12) stated that most petrified forests, particularly the petrified forests of Arizona, show evidence of being washed into place. Jefferson (1982) gave evidence in his paper on the fossil forests of Alexander Island, Antarctica that supports the concept of in-place burial at this location.

Probably the most famous example cited as evidence of trees buried in place is the petrified forests of Yellowstone Park. Earling Dorf (1964), in his well-known work on these forests, said:

On a steep bluff overlooking the Lamar River a few miles above its confluence with the Yellowstone River . . . no fewer than 27 distinct layers of petrified trees have been exposed by erosion (p. 107).

A beautiful drawing of the cliff is given on page 110 of the 27 layers of volcanic sediment with entombed logs. Interestingly some logs are shown in horizontal positions, others in differing angles to the horizontal as well as vertically positioned stumps. This has led investigators to offer interpretations other than in-place burial. Fritz (1980a, p. 312) mentioned that:

Besides vertical stumps . . . , logs that are parallel and diagonal to the bedding also occur in abundance . . . In all sections, with the exception of several small intervals in the Specimen Ridge section, fossilized horizontal logs are most abundant and make up 60% to 100% of the total.

Fritz postulated that volcanic flows from stratovolcanos saturated with water moving downward into the narrow valley (through which the Lamar River flows) “. . . uprooted trees growing in high-elevations, cool-temperate habitats. . . . During transport, roots and

branches were broken off” (p. 312). Geological evidence was offered to support this view. Thus the author considered that the petrified forests of Yellowstone had an allochthonous origin. Later Fritz (1980b, pp. 586-588) used field evidence of mud flows from the 1980 Mount St. Helens eruption to show how the same type of action could have produced vertical fossil stumps at Yellowstone in the past. He devoted a chapter in his well-written *Roadside Geology of the Yellowstone Country* (1985, pp. 9-26) to his interpretation of how the trees were entombed in the Lamar River and Sepulcher formations.

Yuretech (1984, pp. 159-162) accepted the mudflow concept of Fritz but claimed that “. . . there is no evidence that the upright stumps have undergone transport” (p. 159). Likely there will be continual sparring in the geological literature over autochthonous vs. allochthonous deposition of erect tree stumps as well as other features in the geologic record. Many geologists who prefer uniformitarian concepts may realize the connection between allochthonous deposition and the Noachian Deluge (i.e., Gastaldo, 1989, p. 1).

Harold Coffin (1976, pp. 539-543) has done considerable work on the Yellowstone petrified forests. In his excellent book *Origin By Design*, he devoted an entire chapter (1983, pp. 134-151) to the subject. He offered evidence that favors the transportation hypothesis against in situ burial. These evidences are categorized as abrupt root terminations, overlapping levels of the tree layers, orientation of vertical and petrified trees, ecological diversity of fossil trees, bands of organic matter in various “soil” levels, arrangement of the organic matter in the levels, evidence of water sorting, type of organic matter in “soil” layers, geochemistry of layers, nature of the sediments in which the trees are contained and a discussion of the vertical flotation of trees. Interested readers should consult this treatise. Also since the petrified forests are preserved in a National Park, they offer research opportunities for creationists interested in this topic.

Steve Austin (1986, p. 4), in his work on the Mount St. Helens explosion of 1980, discussed finding upright deposited logs in Spirit Lake. As he noted (p. 4):

The landslide-generated waves on Spirit Lake stripped the forests from the slopes adjacent to the lake and created an enormous log mat. . . . Careful observation of the floating log mat indicates that many trees float in upright position with a root ball submerging the root end of the trunk while the opposite end floats out of the water . . . These trees, if buried in sediment, would appear to have been a forest which grew in place over hundreds of years . . .

Also Austin related the results of sidescan sonar and scuba diving work in surveying the lake bottom (p. 4):

Hundreds of upright, fully submerged logs were located . . . Extrapolating from the small area of lake floor surveyed to the entire lake bottom, we estimate more than 15,000 upright stumps existed on the floor of the lake in August 1985. The average height of an upright deposited stump is 20 feet. Sonar records and scuba investigation verified that many of the upright deposited trees have root masses radiating away from the bases of the trunks.

Concerning the fossil woods from our study of the Dawson Creek area of Big Bend National Park, all observed material appears to have been washed into place from a distant source. No specimens that exemplify in-place burial were found. More discussion of this allochthonous origin will be presented in subsequent parts of this report. For a possible situation where examples of both autochthonous or allochthonous tree stumps could have been present if transported and standing stumps would have been buried by silica-rich material and later silicified, see Williams, 1993, particularly Figures 3b, 4a and 4b.

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### Quote

... every system of thought has its own concept of ultimacy, and, in all, the locale of ultimacy is also the source of determination, for ultimacy requires it. In Biblical theology, all things are created, predestinated, and governed by the sovereign God. Predestination is an inescapable concept; it is simply a declaration that somewhere an ultimate law, force, cause, power, or direction governs all things. If this be denied to God, predestination then accrues to some other agency. The results are various: doctrines of Karma, fate, dialectical materialism, naturalistic determinism, and so on. If one form of the doctrine is denied, it is implicitly in favor of another form. In the modern form, it usually means total planning by the sovereign state. Whereas a theistic transcendental predestination is internal and non-coercive the immediate determinism of the state is external and coercive. It means that the state competes with man for control of the same ground.

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## BOOK REVIEW

*The Creationists* by Ronald L. Numbers. 1992. Alfred A. Knopf. New York. 458 pages. \$27.50

Reviewed by David J. Rodabaugh\*

Few books about creationists can expect glowing endorsements from both evolutionists and creationists but, judging from the jacket of this book, it has precisely that. For this reason alone, it would deserve to be read. It is a scholarly book written by an evolutionist (p. xvi) who wishes to be fair in his recording of the view and activities of the creationists. Science historian Ronald L. Numbers received a Ph.D. from the University of California at Berkeley. For this book he received both a Guggenheim Foundation Fellowship and a National Science Foundation Scholar's Award. Numbers' interest is "scientific creationism" or "creation science." He defines this explicitly by citing the 1981 Arkansas act and notes that this is "... essentially biblical creationism stripped of explicit references to God, Adam, and Noah. . ." Incidentally, he notes that a 1991 Gallup poll found that 47 per cent of the American people believe that God made man in his present form within the last 10,000 years.

The author sees Flood geology as synonymous with creation science. The chief architect was George McCready Price in his book *New Geology* (1923) whom the author erroneously states was alone in this view until 1961 when Henry M. Morris and John C. Whitcomb, Jr. published *The Genesis Flood*. Until then the prevailing views even among fundamentalists was either day-age or gap, both allowing a very old earth. Numbers includes in his definition of science the criteria of falsifiability, testability, tentativeness, and naturalness. We should note here that the criteria of naturalness forbids any explanation that would posit a supernatural origin. *Webster's New World Dictionary* (1984, Second Edition) gives as the first definition of supernatural, "existing or occurring outside the normal experience or knowledge of man; not explainable by the known forces or laws of nature; specifically, of, involving, or attributed to God or a god." Since the big bang explanation of the origin of the universe fits this definition, then it is a supernatural explanation! No one is suggesting that this explanation is not scientific; yet, it is not 'natural.' What seems to appeal to the evolutionists is that it avoids the forbidden 'g' word!

The author struggled on the way to becoming an evolutionist. Raised as a Seventh-day Adventist, he was taught Price's version of the subject. He remained a strict creationist until he attended a lecture on fossil forests in Yellowstone Park. He does not tell us what was said that was so convincing but somehow he was led to believe that the earth was at least 30,000 years old. He states, "Having thus decided to follow science rather than Scripture on the subject of origins, I quickly, though not painlessly, slid down the proverbial slippery slope toward unbelief" (p. xvi). He goes on to mention that he was accurately tagged an "Agnostic" (in a deposition for the Louisiana creation-evolution trial) and

that he felt uncomfortable (p. xvi). This testimony on the author's part proves that creation is indeed fundamental to biblical Christianity. If we cannot trust the first chapters of Genesis then there is no rational basis for trusting the rest of Scripture.

Not surprisingly, an entire chapter is devoted to the contributions of Price. Some of the reasons for his Flood geology are related to his being an Adventist. Numbers suggests that Price may have been the greatest of the antievolutionists, though not the last as suggested by Martin Gardner in *Fads and Fallacies in the Name of Science* (1957). Price had very little formal scientific training; he studied the subject of evolution and concluded it was essentially based on geology. He reasoned that if its geology were true then the rest would seem reasonable. Price found his 'flood geology' answers in the writings of E. G. White, the founder of the Adventists. Price and other Adventists correctly reasoned that the Sabbath command required the days of creation to be literal.

Harry Rimmer, a popular opponent of evolution prior to World War II, was very strong in his support of the gap theory. He offered a financial reward to any who could find a single scientific flaw in the Bible. He was challenged in the courts and won on two occasions. Numbers asserts that one of the cases was won on the technicality that the respondent was not responding to an ad that Rimmer placed. If that is the case, then there are two things to note: The first one Numbers explains is that Rimmer could not really claim on that case to have been vindicated in the courts. The second note that Numbers does not make is a question, "Why didn't the respondent refile in response to an ad that Rimmer did place?"

Numbers' bias peeks through in the chapter on The Religion and Science Association (RSA) where he refers to the Adventists and conservative Lutherans as reading the Scripture in a 'hyperliteral' manner (p. 106). Apparently, within RSA, although Price and Dudley Joseph Whitney were committed to Flood geology, the president of RSA, L. Allen Higley was a gap-theorist. In addition, Higley had impressive scientific credentials and was well-placed at Wheaton College. At that time, Wheaton was viewed by some as THE COLLEGE FOR FUNDAMENTALISTS. Irreconcilable differences between various views ultimately brought the downfall of RSA. It had published the first creationist journal, *Creationist*. But, it also pointed out the very real differences in the camp of the anti-evolutionists. The RSA died in 1937 after only two years. The Deluge Geology Society (DGS) was founded in 1938 and began publishing the *Bulletin of Deluge Geology and Related Sciences*. Numbers considers this journal to have been a vast improvement over the *Creationist*. While DGS included mostly Adventists, it also attracted several nonadventists who would later be very influential in creationist circles including William J. Tinkle (1892-1981), Henry M. Morris, and Walter E. Lammerts.

Several proteges of Price are mentioned. The first, Harold W. Clark ultimately became the first Adventist with an advanced degree in biology. Price readily accepted his *Back to Creationism* (1929) even though

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Editor's note: An earlier review of this significant book was written by Jerry Bergman. 1993. CRSQ 29:204-206.

Clark parted with Price on glaciation and suggested that hybridization led to new species. But, when Clark announced to Price that further study had convinced him that the geological column was accurate, Price was then opposed to Clark. Another Price protege that joined Clark in accepting microevolution within the originally created kinds was Frank Lewis Marsh (1899-1992), who earned a Ph.D. in botany. At first, Price did not much appreciate certain views of Marsh, but when Marsh and Clark had a rift, Price sided with Marsh and 'anointed' him as his successor. Some within DGS did not appreciate Marsh's thesis and felt he had succumbed too much to the evolutionists in his book *Evolution, Creation and Science* (1944). Interestingly, Dobzhansky, the famous evolutionist geneticist, considered Marsh's book to be a sensibly argued defense of special creation (p. 131). Dobzhansky did not accept Marsh's rejection of macroevolution, but did refer to him as "the only living scientific anti-evolutionist" (p. 132).

In discussing England, Numbers infers that Philip Henry Gosse originated the idea that God created the earth recently with the "appearance of age." Another apparent first was the application by Robert E. D. Clark of the second law of thermodynamics (the law of entropy) as an argument against evolution and in favor of special creation. Clark included this work in his book *Darwin: Before and After* (1948). Apparently this argument bothers Numbers for he says that Clark, "... put the entropy argument in the hands of a generation of antievolution warriors who used it with abandon—and usually without Clark's sensitivity to the scientific issues involved" (pp. 156-7). It is strange that Clark preferred membership in a society that fostered theistic evolution rather than membership in the clearly creationist Evolution Protest Movement (EPM). Apparently he was embarrassed by what he saw as lack of scholarship. He wrote of the "very strange" utterances of the president of EPM whose belief in special creation was for religious and not scientific reasons. To the reviewer, this is a troubling assertion. First, it is valid to believe something because it is right (which for some is based on their belief in God). Second, it is a matter of principle that you join with those who are right and try to move them toward a position which is more 'valid' or 'palatable.'

In 1941 the American Scientific Affiliation (ASA) was formed by evangelical scientists concerned about the quality of the Christian witness on science and religion. Numbers correctly noted that they devoted more energy to appraising than opposing evolution. As he correctly claimed, they shifted from strict creationism to progressive creationism and theistic evolution. Indeed, this shift forced strict creationists to go elsewhere in the 1960s. A real problem faced the ASA over the issue of Flood geology. The scientist who finally brought the issue of Flood geology to a head was J. Laurence Kulp. He had moved from a six literal day gap-theory universal Flood position to teaching that Genesis only taught there was a Creator. Of particular importance to later developments was Kulp's opposition to a paper Henry M. Morris had submitted to the ASA. Kulp dismissed the idea of a 6000 year old earth as foolishness. Unfortunately, by 1948, many in the ASA followed Kulp. In the move toward a more liberal position, several things developed. One was the expres-

sion that they should approach evolution "not with a chip on our shoulder but in the spirit of inquiry." Another was the call by Kulp for *examining* the faith rather than *defending* the faith. Proof of ASA's abandonment of strict creationism was provided by the publication of *Evolution and Christian Thought Today* (1959), edited by Mixter. The liberal element in the ASA regarded strict creationism as "pseudoscience" and a menace to the Christian faith. The problems within ASA spilled over to problems at Wheaton. This caused no small concern to those who had seen Wheaton as once supporting creationism. (This reviewer lost interest in a teaching position at Wheaton because of what he perceived as duplicity on this topic.)

An influential book during this time was Bernard Ramm's *The Christian View of Science and Scripture* (1954). He attempted to steer his readers into progressive creationism. Ramm, who was close to the leaders in the ASA, saw himself as a leader among the "new evangelicals" who asserted that they had "responsible" scholarship and shunned being negative. This book was well-received by the neo-evangelicals, including Billy Graham. Ramm was particularly critical of Rimmer and Price. While Ramm's book was a solace to some, it stirred others to action. John C. Whitcomb, Jr. saw the local flood proposed in Ramm's book as "final proof of the logical absurdities to which one is driven as an evangelical by following uniformitarian geology" (p. 187). Two years later, Whitcomb devoted his Th.D. dissertation to answering Ramm and defending the position of Price. In 1957, he had completed his 450 page dissertation, "The Genesis Flood," and became interested in rewriting it for publication as a book. Eerdmans apparently succumbed to pressure from ASA to not publish it. Moody Press decided to publish it in spite of the criticism from the ASA. They did, however, feel that the book would be more effective if the scientific parts were checked or written by a Ph.D. in science. Ultimately, Henry M. Morris was to provide the scientific parts to supplement Whitcomb's theology. Moody Press apparently had second thoughts about publishing this book partly because of its insistence on literal creative days and a concern over its reception. (It is interesting to note the pressures on even conservative publishing houses, against publishing a book that we identify with the conservative viewpoint.) Through the influence of Rousas J. Rushdoony, it was published by Presbyterian and Reformed Publishing Company. To extend its appeal, Price is referenced only a few times and denominational affiliations of early contributors to Flood geology are omitted.

While Numbers sees nothing new conceptually in the book, *The Genesis Flood* sold tens of thousands of copies during its first decade and provoked a furious debate among evangelicals. Strict creationists loved it while others denounced it. Numbers finds it significant that some who praised the book still accepted either a gap theory or day-age theory, even though these approaches contradict clear implications of the book itself. To this reviewer, that is not surprising at all. Certainly, in history, one might admire a work of another while not buying all of the conclusions.

The leaders of the neo-evangelicals rejected the book. This is not really surprising. A clearly overdue ASA review questioned both its theological and scientific

assumptions and called them the “Price-Morris-Whitcomb catastrophic geology” (p. 207). Numbers asserts that Whitcomb and Morris refused to be drawn into a strictly scientific debate. Instead, they insisted that the central issue was what God had revealed in His Word. They argued that presuppositions shaped conclusions and faith shaped the presuppositions of each side. Numbers agrees that the discussion involved competing cosmologies. Whitcomb and Morris asserted that both sides viewed the world through distinctive “sets of spectacles” that uniquely color everything. Mainstream scientists agreed, but insisted that science could also determine the spectacles. The scientists in ASA never did deal adequately with the issues of the scriptures.

Numbers next describes the birth of the Creation Research Society (CRS). Walter Lammerts proposed to Whitcomb the formation of an informal association of persons interested in Flood geology. There was concern that it might be dominated by the Adventists or some other special interest group. Lammerts and William J. Tinkle in 1961 assembled a “Team of Ten” which became the nucleus for the CRS, which Numbers sees as the leading creationist organization of the late twentieth century. Numbers pictures Lammerts as a man with sterling scientific credentials but, in some ways, not the typical conservative Christian. Tinkle invited eight to join his and Lammerts’ effort: Henry Morris, Frank Lewis Marsh, Molleurus Couperus, Edwin Y. Monsma, R. Laird Harris, Duane T. Gish, Philip V. Livdahl, and Edward L. Kessel. Couperus had second thoughts and requested his name not be on the proposed letterhead. Kessel turned out to be a theistic evolutionist. Livdahl declined to join the group, leaving seven.

Finally, the 10, now called the Creation Research Advisory Committee included Tinkle, Lammerts, Morris, Marsh, Gish, Harris, Monsma, together with John J. Grebe (1900-1984), John W. Klotz and Wilbert H. Rusch. Five of these had doctorates in biology, one had a Ph.D. in biochemistry, and one had a master’s in biology. It is interesting to note that while it took over a year to obtain this select group of ten strict creationists (fall of 1961 to February of 1963), there were 50 by the end of 1963. CRS was formed in June 1963, and the statement of belief was adopted. Voting membership was limited to scientists having an M.S. (or equivalent) but nonscientists could join as nonvoting members. Eight others joined as charter members: Karl W. Linsenmann (1900-1990), John N. Moore, David A. Warriner, Harold S. Slusher, Thomas G. Barnes, Willis L. Webb, Clifford Burdick, and Paul A. Zimmerman. Numbers notes that six were Missouri Lutherans, six were Baptists, and two were Seventh Day Adventists.

CRS has always emphasized education and research rather than other activities. Its emphasis has been books and journals rather than public meetings. By 1973, CRS had 1,999 members with 412 voting members; current voting membership is about 628. Early in its history, biologists George F. Howe, Bolton Davidheiser and H. Douglas Dean joined the Board. Numbers reports various matters of infighting and denominational concerns. He also reports the cooperative arrangement between CRS and the Bible Science Association, headed by the Lutheran Pastor Walter Lang.\*

\*Editor’s Note: No such arrangement existed.

By 1970, the terms “creation science.” and “scientific creationism” were used to denote Flood geology. These terms arose in a specific educational and legal climate. Nell Segraves, a mother concerned with what her children were being taught, together with Jean Sumrall petitioned the California State Board of Education that evolution be designated a theory in all state-approved biology texts. (This battle at the moment appears lost as our culture moves more toward humanism.). Numbers admits that some of the claims made against the tactics of creationists were true as well of the evolutionists. We list a few examples: Creationists found some refuge in the definitions of science found in the dictionary and in the works of Karl A. Popper and Thomas S. Kuhn. The American scientific establishment, ignoring the fact that “science” and “religion” had often been unified, declared them separate. They asserted that evolutionists had changed their opinions while creationists had never changed their opinions. As Numbers correctly asserts, this is simply not the case.

There have been charges by non-creationists that creation scientists have not done a good job of punishing systemic deception. Numbers asserts that there is some truth to the charges but not to the extent claimed. He also points out that some of the most telling criticisms of creation science have come from creationists and appeared in their own journals. Numbers mentions the lack of geologists among the strict creationists. He, however, lists some men who are qualified geologists: Stephen A. Austin (Ph.D., Pennsylvania State University), Douglas A. Block (M.S., University of Iowa), Kurt P. Wise (Ph.D., Harvard). Although Numbers is not a creationist and admits to being agnostic, his book is valuable. This reviewer has not been in the inner circles long enough to evaluate details he presents. But, his book gave me a tremendous sense of gratitude that I have benefited from the 1961 book by Whitcomb and Morris and the creationist revolution it spawned. And it makes me appreciate the efforts of those in any organization which supports what Numbers calls “strict creationism.”

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### Quote

Strauss also said that “the fundamental modern project” was “man’s conquest of nature for the sake of the relief of man’s estate;” or, as he also put it:

According to the modern project, philosophy or science was no longer to be understood as essentially contemplative and proud but as active and charitable; it was to be in the service of the relief of man’s estate; it was to cultivate for the sake of human power; it was to enable man to become the master and owner of nature through the intellectual conquest of nature.

Schram, G. N. 1987. Strauss and Voegelin on Machiavelli and modernity. *Modern Age* 31:261.

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