TREE-RING DATING AND MULTIPLE RING GROWTH PER YEAR

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Abstract

There presently exist several long dendrochronologies, each comprised of about 10,000 individual growth-rings. These are examined for the possibility of multiple ring growth per year in their earliest portions due to unusual climatic conditions following the Flood. It is found that the tree-ring/radiocarbon data are contrary to the suggestion of multiple ring growth. Since it seems that the Flood must have occurred before the oldest rings of these series grew, the implication is that the Flood must have occurred more than 10,000 years ago.

Introduction

In recent decades dendrochronological (i.e. tree-ring dating) research has produced two, long, continuous tree-ring series, each containing about 10,000 individual growth-rings (Ferguson and Graybill, 1983; Pilcher, et al., 1984).** The first of these derives from the White Mountains of California and is constructed from living trees and dead remnants of bristlecone pine. The second derives from Europe and is composed of oak. A third long dendrochronology is currently under construction from Tasmania (Barbetti et al., 1990). This will be the first long tree-ring series from the Southern hemisphere.

These tree-ring chronologies are of considerable interest to creation scientists attempting to accurately reconstruct a detailed history of the earth from Creation to the present. If they have been correctly assembled, and if each ring represents a single year's growth, then the oldest rings (from the longest series constructed to the present time (Becker, et al., 1991)) date to near 9300 B.C. This would, obviously, seem to restrict the date of Creation to something strictly greater than 11,000 years ago. More pressing, however, is the potential impact of these dendrochronologies on our concept of the Genesis Flood. The existence of such long, continuous tree-ring series, if valid, implies that either: 1. the Genesis Flood was a relatively tranquil affair which did not disrupt tree growth significantly in at least three widely separated geographical regions, or 2. that the Genesis Flood occurred more than 11,300 years ago, before the oldest tree-ring, not 4,500 years ago as traditional Biblical chronology might suggest.

Historical Background

In 1968 C. W. Ferguson published a report on the bristlecone pine chronology in *Science* (Ferguson, 1968). At that time this chronology was comprised of a continuous series of 7,100 tree-rings. Walter E. Lammerts discussed this dendrochronology in 1983 in a paper entitled "Are Bristlecone Pine Trees Really So Old?" (Lammerts, 1983). Lammerts showed in a series of experiments in which the growth environment was artificially controlled that bristlecone pine seedlings could be induced to grow an extra ring by subjecting them to a two or three week drought late in the growing season followed by a resumption of normal watering. He suggested that such climatic conditions may actually have occured 50% of the time in the White Mountains for the first 3000 years following the Flood and noted that, on this basis, "the presumed 7100 years of age postulated for these trees by Ferguson would be reduced to about 5600 years" (Lammerts, 1983, p. 115).

Recent creationists were not the only ones to have questioned the results of this long dendrochronology, however. In fact, no less eminent a scientist than the Nobelist, W. F. Libby, had raised similar concerns to those of Lammerts 20 years earlier (Libby, 1963). Libby's concern had stemmed from the discrepancy between radiocarbon and tree-ring dates in the approximate range 1000 to 1600 B.C. In 1963 there were no tree-ring dates available earlier than about 1600 B.C. Libby suggested this discrepancy might result from multiple ring growth per year and a consequent inaccuracy in tree-ring dating. Libby, however, was only trying to explain an apparent three percent discrepancy; he was not suggesting that the trees might grow three rings every two years as Lammerts later did.

Libby's concerns were taken seriously by tree-ring dating scientists and deliberate research was initiated to objectively test the postulate of multiple ring growth per year. The results appeared a decade later in a paper entitled "Accuracy of Tree Ring Dating of Bristlecone Pine for Calibration of the Radiocarbon Time Scale" by LaMarche and Harlan (1973). This meticulous and elaborate study demonstrated in a number of different ways including direct observation of bristlecone pine ring growth in their native habitat in the White Mountains over an 18 year interval that these trees were not growing multiple rings per year under modern climatic conditions.

My investigation of the radiocarbon dating methodology and the recent calibration of radiocarbon dates using the long dendrochronologies led me to suggest in 1990 that these long tree-ring chronologies were valid and that the Flood should be dated prior to their oldest rings (Aardsma, 1990). Humphreys (1990) responded by reiterating Lammerts' suggestion (1983) that climatic conditions *soon after the Flood* may have given rise to multiple ring growth per year in the earliest portions of these dendrochronologies, thus significantly shortening the actual number of years which they span. Also see Wiant (1977). This is an important suggestion, unique to creationist theorizing, and it deserves careful consideration. If it is correct, then major adjustments to conventional thinking about

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**Editor's Note: Normally these continuous series of rings are pieced together from several different tree specimens to construct the entire sequence.

the validity and extent of these long dendrochronologies are mandated. If it is incorrect, then it appears that one of the two implications for the Flood mentioned above must inevitably follow.

Testing the Hypothesis

It is possible to test the hypothesis of multiple ring growth per year in the earliest portions of these long dendrochronologies by exploiting the radiocarbon measurements which have been made on them. Very precise measurements of the radiocarbon content of decade or bi-decade tree-ring samples have been made over the entire length of these long tree-ring series for the purpose of providing a calibration for radiocarbon dating. Figure 1 shows the results of one such set of measurements on tree-rings from the long European oak dendrochronology (Stuiver and Kra, 1986). It can be seen that the radiocarbon age does not agree with the tree-ring age over most of the calibration. The measured radiocarbon 'age' is systematically too young relative to the tree-ring count for all times prior to about 1000 B.C. (i.e. for all tree-ring numbers greater than 3000). I have discussed the possible significance of this long-term trend to the Flood model of earth history elsewhere (Aardsma, 1991). For our present purposes it is only the small, short-term, century-long fluctuations discernable on this graph which are of interest. The well-defined inverted peak apparent near ring number 2700 is an example of the sort of short-term structure which is of interest here.

In Figure 2 I have caused this short-term structure to be more clearly displayed by subtracting a least squares fit, degree six polynomial from the data of Figure 1. This effectively removes the long-term trend in the data. What is left is the residual radiocarbon age.* It is seen that these short-term fluctuations cause radiocarbon dates to diverge from the long-term radiocarbon behavior by as much as ± 200 (radiocarbon) years. Visual analysis of this figure reveals a number of inverted peaks. I selected 13 of these for detailed analysis. These 13 peaks are numbered on the figure. These particular peaks were selected because they are the largest and most clearly defined peaks in Figure 2. Only one large peak (midway between peak #9 and peak #10) was not included in this selection. It was excluded only because its baseline was difficult to determine from the available data making it difficult to analyze reliably.

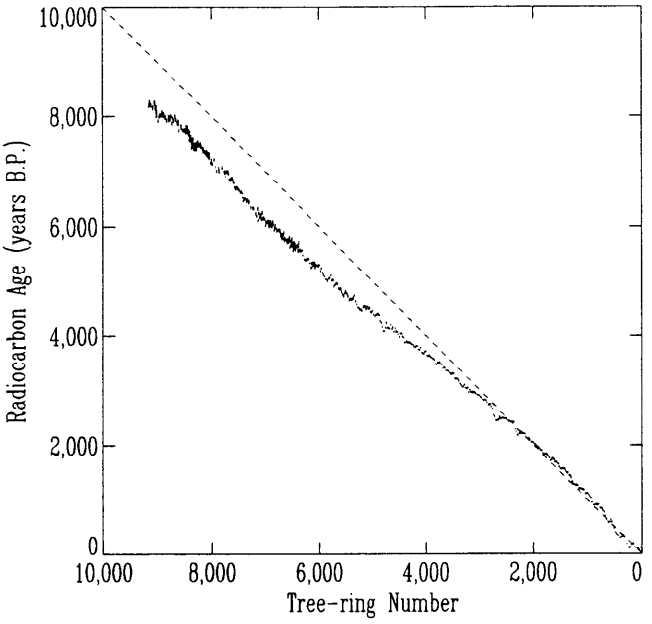

Figure 1. Radiocarbon measurements on tree-rings. The dashed line corresponds to the case of exact agreement between radiocarbon and dendrochronology. The radiocarbon age of each tree-ring sample measured is plotted as a vertical line indicating its one sigma range of error.

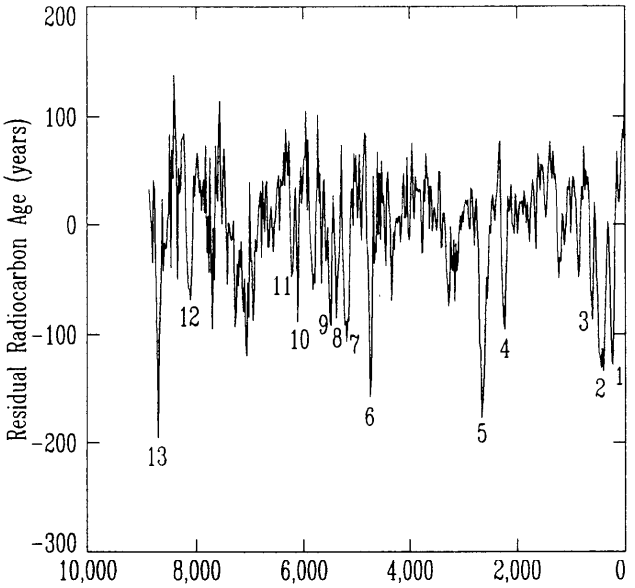

Figure 2. Short-term deviations in radiocarbon age showing numerous inverted peaks due to periods of relative solar quiescence.

These peaks are not due to random measurement fluctuations. They are much larger than the errors in the measurements which comprise them, as is illustrated for peak #5 in Figure 3. Also, the same peaks can be demonstrated from both of the long dendrochronologies. Figure 4 shows a comparison of radiocarbon measurements on North American Douglas fir and Sequoia trees with Irish oaks for the period A.D. 1400 to A.D. 1850. These results from separate continents and different tree species were obtained by independent research groups using two different measurement techniques (liquid scintillation versus gas counting) (Stuiver, 1982, p. 14). More recently, at the 14th International Radiocarbon Conference, Stuiver reported in an oral session that no significant difference in radiocarbon age is discernable between the long dendrochronologies back to 6000 B.C. Thus, it is apparent that these inverted peaks are not due to

*Editor's Note: Young earth creationists generally differentiate between the equilibrium method of obtaining radiocarbon ages and the nonequilibrium method or a radiocarbon age vs. real time. The latter yields ages to a maximum of approximately 5400 years. See Brown, R. H. 1992, "Correlation of C-14 age with real time," *CRSQ* 29:45-47. Also for a further discussion of past creationist work on radiocarbon dating, see the review by Robert Whitelaw in this issue.

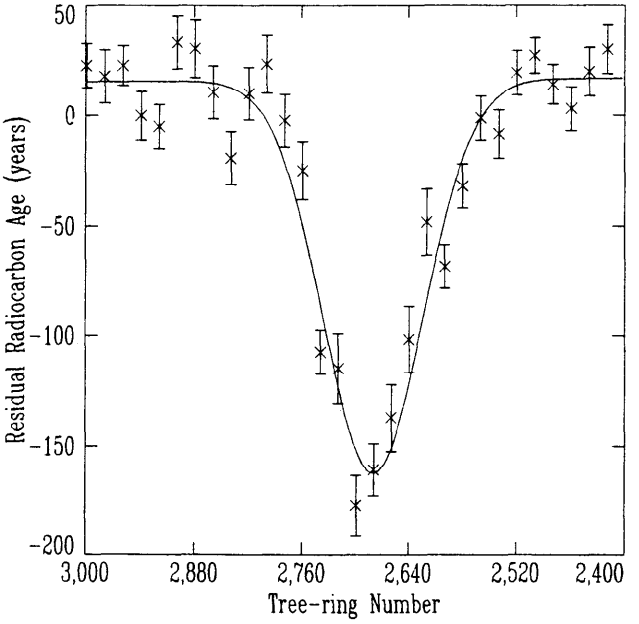

Figure 3. Radiocarbon measurements on tree-rings spanning growth-rings between numbers 2,400 and 3,000. The inverted peak corresponds to peak #5 of Figure 2. The solid line is the result of a least squares fit of a Gaussian plus linear background.

random measurement uncertainty, but must be due to some globally active physical phenomenon which impacts the atmospheric concentration of radiocarbon from time to time.

The explanation of these peaks (Stuiver and Quay, 1980) is as follows. From time to time the sun goes into a relatively quiescent mode of operation for a number of decades. During such periods few sunspots are seen and the intensity of the solar wind surrounding the sun is reduced. This allows a greater flux of cosmic rays to penetrate the solar system with the result that a greater amount of radiocarbon is produced by cosmic rays in the earth's upper atmosphere. Organisms such as trees which are living during such episodes will incorporate this larger than normal amount of radiocarbon in their tissues. Because of this excess initial radiocarbon, such organisms will yield a younger radiocarbon date than they should when analyzed subsequently. This is why the peaks in Figure 2 are inverted, indicating radiocarbon ages for these specific tree-rings which are relatively too young.

The best known of such solar episodes is the historically delineated so-called "Maunder minimum" in solar output between about A.D. 1645 and A.D. 1715 (Eddy, 1976). During this period sightings of sunspots and the related phenomenon of aurora were rare. The Maunder minimum corresponds to the most recent inverted peak in the radiocarbon calibration data (i.e. peak #l of Figure 2). It is also clearly seen in Figure 4. The next most recent inverted peak (i.e. peak #2) corresponds to another historically discernable minimum in solar activity known as the "Sporer minimum." It lasted somewhat longer than the Maunder minimum. It can also be seen in Figure 4 as the rapid decline in radiocarbon age near A.D. 1500.

Method

This brings us to the main purpose of this paper—how one might objectively test the hypothesis of multiple tree-ring growth in the earliest portions of these long dendrochronologies.

All recent-creationist scientists of which I am aware grant the general validity of dendrochronology and radiocarbon back to 1000 B.C. Biblical and secular data of all kinds bearing on chronology seem to harmonize very well in this time period. In Figure 2 five inverted peaks are easily distinguished in this most recent 3000 year time span. Figure 5 shows a plot of the full-width at half-maximum of these five inverted peaks versus time. (These widths were obtained by fitting a Gaussian plus linear background to the radiocarbon calibration data at each of the inverted peaks using least squares procedures. An example of such a fit is shown by the solid line in Figure 3. While the physical processes which give rise to these peaks imply that a Gaussian does not model their behavior precisely, Figure 3 certainly demonstrates that a Gaussian is a satisfactory choice for the present study which requires only a reasonably accurate, objective measure of the width of these peaks.)

The data of Figure 5, while somewhat sparse, suggest nevertheless that there are two types of inverted peaks. We can classify these as Sporer-like (wide) peaks having half-widths of about 100 years and Maunder-like (narrow) peaks having half-widths of about 50 years. The existence of these two types of solar oscillations having different periods has been previously noted by other researchers (e.g. Stuiver and Braziunas, 1989).

It seems highly probable that the characteristic periods of the solar oscillations which give rise to these peaks should have remained constant since the time of the Flood. There is no theoretical motivation for assuming otherwise of which I am aware. Another example of a solar oscillation is the well-known 11 year sunspot cycle. Direct observational data covering the past few hundred years shows no significant alteration in this 11

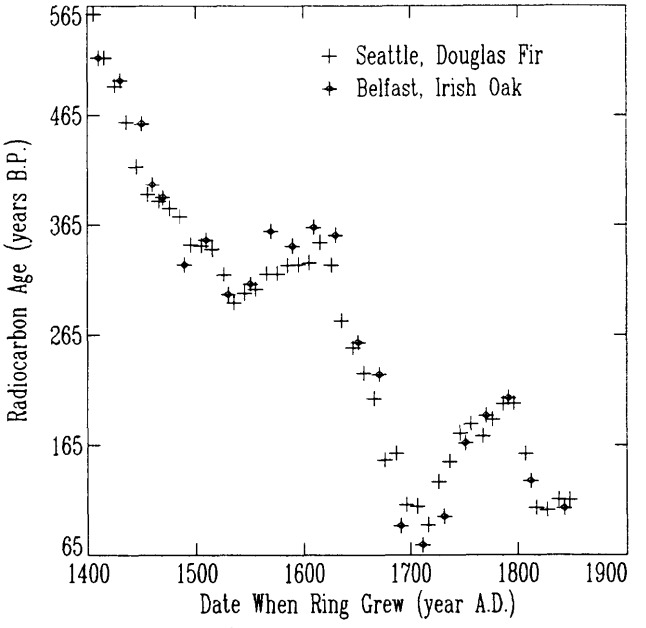

Figure 4. Comparisons of radiocarbon measurements on tree-rings which grew between A.D. 1400 and A.D. 1900 from independent American and European dendrochronologies (After Stuiver, 1982, p. 14).

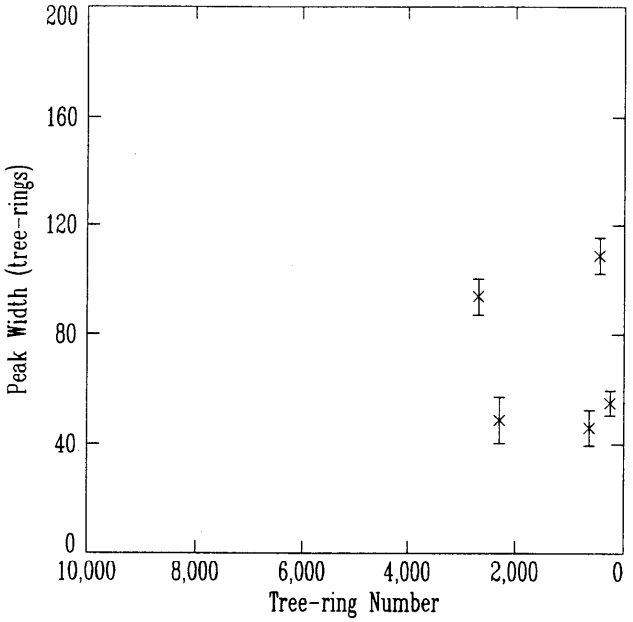

Figure 5. Peak widths of the five most recent peaks in Figure 2 spanning the interval from 1000 B.C. to the present.

year solar period. Furthermore, the data of Figure 5 are obviously not consistent with any significant alteration in the periods of these two types of solar oscillations for the past 3000 years.

Given the constancy of these two periods since the Flood it follows that multiple ring growth per year at any time prior to 1000 B.C. should be discernable as a broadening of these inverted peaks. To illustrate this quantitatively consider the Maunder-like events—the narrow peaks which have a characteristic half-width of about 50 years. If a Maunder-like event were to occur on the sun and thereby give rise to a terrestrial depression in radiocarbon age having a characteristic duration (i.e. half-width) of 50 years during a period of time in which terrestrial trees were growing 2 rings per year on average, then the radiocarbon/tree-ring record of this event would have a half-width of 100 rings. Since it is the number of counted tree-rings which serves as the ordinate in Figure 2 (not counted solar years), it follows that multiple ring growth per year should be discernable as systematically wider peaks in Figure 2 during any periods of multiple ring growth. A plot of the width of these peaks versus tree-ring number should show a distinct trend.

Figure 6 helps to clarify and quantify these ideas. The data plotted in this figure is the same as that which is shown in Figure 5. The dashed lines shown are theoretical predictions of how the peak widths should behave given the various hypothetical Flood dates shown in the figure. These predictions result from the following assumptions:

1. Continuous tree-ring series containing up to 11,300 growth rings (Becker, et al., 1991) do exist.
2. Unusual climatic conditions following the Flood gave rise to multiple ring growth per year in these tree-ring series.
3. The average number of growth rings per year decreased exponentially after the Flood toward an asymptote of 1 ring/year.
4. By 3000 BP these trees were adding only one extra ring per century.
5. The inverted peaks observed in Figure 2 are due to solar oscillations of constant (i.e. time independent) average period. (The average width of the five peaks shown is 70.5 years. This is drawn as a horizontal solid line in Figure 6.)

While it is possible to construct other theoretical models by making alternate assumptions, the assumptions which I have made above seem to me to be the most plausible ones. I have deliberately chosen them in such a way as to allow the most recent Flood date possible. The resulting theoretical curves shown in Figure 6 should be fairly representative of other possible recent creation models.

Results and Discussion

All 13 peaks are plotted in Figure 7. From this figure it is apparent that the measured peak width data does not support any chronologically significant multiple tree-ring growth per year. Rather, this data seems only supportive of single ring growth per year back at least as far as 9,000 BP (c. 7000 B.C.).

It might be argued that these long dendrochronologies have not been pieced together correctly from the individual tree specimens of which they are comprised, so that a significant fraction of the rings simply grew in the same year on different trees. One could imagine, for example, that two separate trees which actually grew concurrently were mistakenly incorporated into the dendrochronology one after the other, thus lengthening the tree-ring series as a result of assembly error. However, given the length, number, and degree of overlap of the individual tree specimens available for constructing the bristlecone chronology, it does not seem possible that it could be incorrectly assembled. (I have in my possession a very typical bristlecone pine

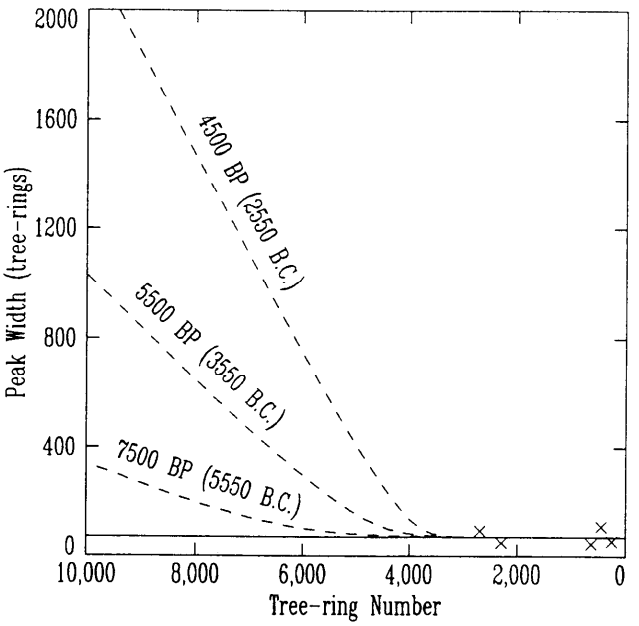

Figure 6. Peak widths of the five most recent peaks in Figure 2 together with the theoretical predictions from a multiple ring growth per year model at various hypothetical Flood dates. The solid horizontal line shows the average of the five data points.

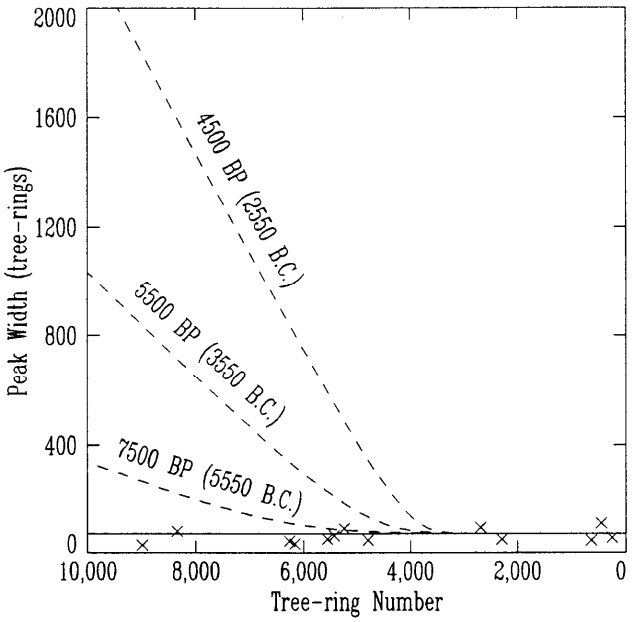

Figure 7. Peak widths of all 13 peaks indicated in Figure 2 together with the theoretical predictions from a multiple ring growth per year model at various hypothetical Flood dates. The solid horizontal line shows the average of the most recent five peaks only.

core which is 26 cm long and contains 597 rings. I have seen a bristlecone pine slab which was over a meter long and contained approximately 3500 individual rings. I have heard reports from a reliable source (Henry N. Michael, personal communication, 1991) of a second specimen from a single dead tree which contains approximately 6000 rings.) Furthermore, the fact that the radiocarbon calibration curve changes more or less monotonically with time (i.e. the radiocarbon ages of Figure 1 do not suddenly repeat themselves or show any discontinuities) and the detailed correlation of even the short-term radiocarbon structure from independent dendrochronologies on separate continents (e.g. Figure 4) seem to me to completely rule out this possibility. It appears that the growth-rings comprising these long dendrochronologies really did grow in succession.

Thus, these long dendrochronologies appear to consist of true annual rings for at least the past 9000 years. This is an extremely important result which, in my opinion, warrants critical scrutiny by all recent-creationist scientists. As pointed out above, it implies that either: 1. the Genesis Flood was a relatively tranquil affair which did not disrupt tree growth significantly in at least three widely separated geographical regions, or 2. the Genesis Flood occurred probably more than 10,000 years ago, not 4,500 years ago as traditional Biblical chronology might suggest. Given the explicit statements affirming the global nature and year-long duration of the Flood in the Biblical narrative (Genesis 7-8), the first of these options seems extremely improbable. It seems certainly much less probable than the second option. But the second option—lengthening the chronology back to the Flood—poses significant challenges of its own. The most obvious is how to integrate the additional time required with the numerical information provided in Genesis 11 in association with the genealogy from Noah to Abraham. The specific numbers given in this chapter for the age of begetting of the next patriarch in line vary in different Old Testament manuscripts, but add to only about 1500 years in the most extreme case. This is considerably shorter than the four or five thousand years absolute minimum for this same time period implied by the current analysis.

Green (Newman, 1977, pp. 105-123) argued persuasively over a century ago, using principally Biblical data, that there were probably generations missing from the genealogy of Genesis 11, so that the sum of these numbers should only be regarded as a minimum figure for the elapsed time from the Flood to Abraham. Green's arguments are certainly buttressed by the foregoing tree-ring results. However, the implied gap or gaps in this genealogy are surprisingly large. Furthermore, one is left with two looming questions. First, where exactly do these gaps fall in this genealogy? Secondly, what is the significance of the numerical information given in Genesis 11 if it is not to be used for direct chronological reckoning?

However, the magnitude of these questions does not negate the fact that continuous tree-ring series containing on the order of 10,000 growth-rings do exist, and any credible model of earth history must be able to give a reasonable account of why this should be the case. For myself, the explanation which seems least objectionable is that the Flood probably occurred at a much more remote date than traditional Biblical chronology has led me to believe, and that there must exist some other legitimate way of understanding the Biblical numerical data in Genesis 11 which has yet to be discovered. I have previously been driven to the same conclusion in the process of constructing a quantitatively functional model for radiocarbon within a Flood model of earth history (Aardsma, 1991). In this previous work I found that both the extent of the long dendrochronologies and the presently observed global radiocarbon disequilibrium seem to suggest that the Flood occurred within a few thousand years of 12,000 B.C. (Aardsma, 1990), a result which is consistent with the present findings. If this approximate date is correct, then current secular dates within the Holocene can probably be accepted as generally reliable, and efforts to model any dynamical process from the Flood to the present (such as post-Flood climate stabilization, or sub-species diversification) should meet with considerably more success if the Flood is assumed to be closer to 15,000 than 5,000 years ago.

Conclusion

The extent of the presently available long dendrochronologies argues forcefully for a Flood date in excess of 10,000 years ago. Efforts to overturn these long tree-ring chronologies and thereby allow for a more traditional Flood date have not proven successful when examined quantitatively. By far the most hopeful suggestion was that unusual climatic conditions soon after the Flood may have given rise to multiple ring growth per year in the trees comprising these long dendrochronologies. This suggestion has, in the present paper, been shown to be contrary to the evidence provided by the small amplitude, century scale fluctuations in the atmospheric radiocarbon concentration recorded by the individual tree-rings when they grew. The failure of this suggestion seems to

imply that the Flood must, in fact, have occurred more than 10,000 years ago.*

*Readers may be interested in other C-14 dating-dendrochronology articles (as well as more bristlecone pine studies) in the Quarterly other than the Lammerts and Wiant papers. Problems with the dendrochronology method can be noted in Armstrong, H. L. 1980. Insects can affect tree rings. *CRSQ* 16:228; Clementson, S. P. 1974. A critical examination of radiocarbon dating in the light of dendrochronological data. *CRSQ* 10:229-236; Gladwin, H. S. 1978. Dendrochronology, radiocarbon and bristlecones. *CRSQ* 15:24-26.

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THE MUMMIFIED FORESTS OF THE CANADIAN ARCTIC

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Abstract

Large accumulations of desiccated wood exist in Tertiary age sediments of the Canadian Arctic islands. It would have been physiologically impossible for such forests to survive under present polar environmental conditions, and plate tectonics is considered an explanation for the existence of such forests. However, the preservation and the type of plant populations suggest a catastrophic origin for such deposits.

Introduction

There still exist many geologically exciting areas that invite speculation and investigation, and in recent years the renewed interest in origins has also brought a new interest in aspects of uniformitarianism and catastrophism. Creationists have been especially sensitive to catastrophic occurrences in geology. Examples exist of geological models that remain somewhat enigmatic, yet perhaps supportive of those who feel uncomfortable with the usual uniformitarianism examples for most geological events. Any discussion of evidence for a universal Flood must involve these principles.

Field Studies

The writer encountered such circumstances while conducting field studies in the Canadian Arctic regions, where an interesting geological problem was encountered. In working across the Arctic and making surface rock collections for reference purposes on Ellef Ringnes, Amund Ringnes, Axel Heiberg, and Ellesmere islands (Figure 1), accumulations of fossil wood were encountered at nearly every collecting site in an area roughly between 70° and 80° north latitude. Assuming these to be the fossilized remnants of forests once blanketing this frozen land during warmer climates, the collections included apparent *in situ* trees. Surprisingly these specimens burned readily, and examination of the collections revealed that they were not fossilized in any traditional sense of petrification or replacement. They were simply dried, and "mummified" might best explain their condition. Lemonick (1986) noted that the Canadian geologist, James Basinger used "mummified" to describe similar wood on Axel Heiberg Island that burned and which he was able to saw. The major area of this study has been on Ellef Ringnes Island (Figure 1) and the specimens collected from the Beaufort Formation at surface exposures on Reindeer Peninsula on the northwestern coast of the island.

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Wood-Bearing Sediments in the Arctic

The presence of unconsolidated, wood-bearing, alluvial sediments containing plants of temperate climates has been recognized for many years by students of the Arctic. Hills and Ogilvie (1970) of the Canadian Geological Survey have reviewed such occurrences in the Arctic islands, the characteristics of the sediments, and the fossil floras. The presence of similar accumulations of plant material has been long known in northern Siberia, where references have been made to the coastal bluffs of the island of New Siberia as the "Wooden

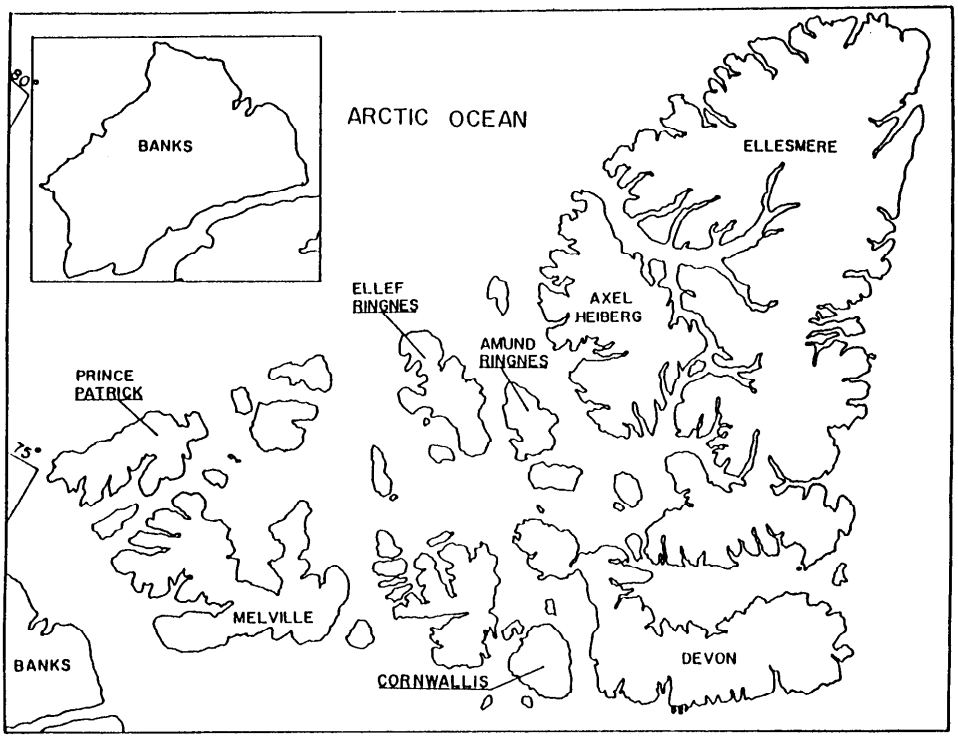

Figure 1. Index Map of the Canadian Arctic Islands.

Hills." In the Canadian Arctic most of these plant bearing beds are dated late Tertiary to Quaternary in age. Some of the more prominent of these alluvial sediments are assigned to the Beaufort Formation, which includes extensive terrain of the Arctic coastal plain from Banks Island and isolated deposits on Prince Patrick, Ellef Ringnes, Melville Islands and on western Ellesmere Island. Canadian geologists have noted the abundance of wood in the Beaufort Formation and the fact that it still burns and has not been subjected to diagenesis. Lemonick (1986) has reported on the work of the Canadian geologist, James Basinger, who has unearthed up to 19 layers of such mummified wood on Axel Heiberg Island. On Banks Island the Beaufort Formation ranges up to 135 meters in thickness and consists of unconsolidated cross-bedded sand, gravel, and silt. The sands are well sorted and quartzose. Geologists in the area of study commonly regard the wood as being driftwood and derived from distant sources to the east and southeast. However, a driftwood origin is not substantiated for all occurrences since many specimens are upright stumps with apparent undisturbed root structures. Basinger (Lemonick 1986) reported hundreds of such stumps apparently in place on Axel Heiberg Island. No attempt was made to determine the percentage of trees upright. But, it was a common occurrence to find stumps with roots apparently intact, and Basinger reported apparently in-place specimens as being numerous. The age is still debated with probable Pliocene or early Pleistocene most widely accepted, but in any event it is considered to be preglacial. However, Hills (in Hills and Ogilvie 1970) is of the opinion that the Beaufort Formation on Banks Island is most probably late Miocene or early Pliocene in age.

It is generally accepted by many geologists that these plant remains represent species that grew in what is now a barren, treeless land, and the pollen assemblages indicate a climate much warmer than that of the present. Palynomorphs I have identified in these deposits from northern Ellef Ringnes Island are pollen of *Pinus, Picea, Tsuga, Alnus, Betula, Salix, Acer,* and various Ericaceae. Hills and Ogilvie (1970) described *Picea banksii* from the Beaufort Formation and noted some 300 spruce cones in such excellent preservational state as to be moist when collected and dispersing their seeds upon drying. Oard (1990) has indicated a much warmer climate in the area right after the Flood and brought on by the removal of the sea icecap of the Arctic Ocean. This would help explain the many temperate entities occurring in the pollen populations.

Light Requirements

The plants do create some problems, however, for if the present physical arrangement of the islands had been established for the Arctic by the time the Beaufort Formation was deposited, such forests as presently lie in ruins could not have existed. We must assume an earth oriented much as at present, and today it would be physiologically impossible for any forest flora to exist in the northern regions, regardless of temperature. As photosynthetic organisms, problems exist for plants in the Arctic. For instance, at Resolute on Cornwallis Island, where most expeditions outfit, the long winter night begins on November 4, when the sun does not rise, and ends February 5, when the sun again rises over the horizon. The first thawing temperatures normally occur in mid-May in the southern islands and early June in the northern

islands. The Arctic summer begins about mid-June and continues until late August. It certainly is not conducive to any plant growth.

Plants also vary in their light requirements. Consequently, three continuous months of sunlight would not necessarily compensate for the deficiency of the long night, but might actually have a deleterious effect on some plants. Light is one of the most potent factors in plant growth, and light sensitiveness varies greatly between species. Light has different effects on seed germination and flowering, while temperatures combined with light are often intricately related. The effect of photoperiodism is varied in any explanation of circum-polar, temperate-flora. The photoperiodic categories of long-day, short-day, long-short-day, day-neutral, and cold-requirement plants considered in reconstructing a fossil flora must be considered in any explanation. How then, does one explain the existence of complex light requirements in plants and how they existed at the polar latitudes?

Catastrophism

If the plant remains were fossilized in a more temperate situation and moved to their present frigid environment, how do we account for the mummified condition? If death and subsequent preservation occurred in a more temperate climate, then decay and varying degrees of fossilization such as mineralization, compression/impression, and cast/mold, would be expected. However, their condition is one of desiccation only. Plate tectonics would appear to satisfactorily explain this evidence of temperate vegetation in the harsh environments of the Arctic. The plants simply grew elsewhere and were moved to their present localities, but plate tectonics does not provide satisfactory answers. It is generally regarded, in theorizing on plate movements, that in the Cenozoic the continents had drifted to the positions occupied today, with the mid-Atlantic rift propagating into the Arctic Basin. It would appear that the Arctic islands have been in their present positions since well before Beaufort Formation time.

If conditions leading to fossilization would prevent the type of preservation presently found in the Arctic, then one must assume that the land movement occurred while the plants were alive. However, the desiccated state suggests that death may have occurred uniformly, even very quickly. Palynology studies have revealed exceptional preservation of pollen in other areas as well as the Beaufort Formation, in sediments where such good preservation was not anticipated. Such deposits were composed of sorted, quartz grains, all well rounded. These deposits would be subject to water percolation and weathering, conditions that normally contribute to decay and degradation. Such deterioration of the plant materials is not evident and the evidence again is of a rapid suspension of the natural deterioration processes before traditional fossilization occurred.

Whether or not one accepts the idea, there is some evidence for a catastrophic termination of the abundant temperate forests that once covered areas that are now the barren Arctic plains. If the destruction of the forests was the result of Pleistocene glaciations and conditions too cold to support plant life, the desiccated unfossilized preservational state would not be expected. A gradual, progressive destruction should have destroyed these forests, not preserved them in their present mummified state. The unconsolidated, well sorted, fluvial deposits should have permitted oxidation of the palynomorphs, not the exquisite preservation now present in the unconsolidated sands. The most apparent explanation is that the cold preserved them, but such floras could not have thrived in such temperature and light conditions as characterizes present polar latitudes. Of considerable importance is the time of this deposition, that is, whether these remains represent Flood deposits or are post-Flood in origin. The evidence thus far tends to best support a post-Flood occurrence. However, most importantly, these unique forests demonstrate the occurrence of a catastrophic event of the magnitude of a universal Flood.

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QUOTE

Beginning with the self, Gnosticism teaches that the form of man is essentially insight or enlightenment, for to be truly man is to be gnostic. And it of course follows from this axiom that only those who are in a state of enlightenment are truly human, that those who are not fail of the very definition of man. Hence the unborn, who cannot have had any significant experience of illumination, and the very old, who are beyond it, lose their claim to be considered persons. Furthermore, since a real being is one that experiences and can be experienced and is therefore a collection of impressions, the unborn fail of personhood on a second ground. They die in the darkness of the mother's womb, and though their parts and pieces are seen as these are recovered or discharged, they are not experienced as persons. Indeed young animals, seals with soulful brown eyes, succeed in the gnostic definition that to be is to be experienced and to experience better than the unborn. Citizens of modernity cannot perform that task which the vulgar of the Middle Ages routinely accomplished: we can seldom rise above the realm of accidents to see that a newly fertilized egg is a person in essence and by nature, as are the defective and the old. If a person is those experiences we consider valuable, the terminally ill and the defective, as well as children in the womb, fail of any claim to existence. Their fate is sealed.

Patrick, J. 1987. Modernity as Gnosis. *Modern Age* 31:227-228.

PANORAMA NOTES

Mammal-Like Reptile Found in Upper Paleocene of Alberta

The mammal-like reptiles are a large group of animals that are assumed missing links leading to mammals. This is in spite of these animals meeting the main diagnostic property of reptiles—that is one ear bone and multiple jaw bones. According to evolutionary belief, mammals developed in the late Triassic, while their ancestors, the mammal-like reptiles, became extinct in the middle Jurassic, 160 million years ago. Now a group of researchers has found a jaw bone containing three teeth from a mammal-like reptile in an upper Paleocene Formation near Calgary, Alberta, Canada (Fox, Youzwyshyn, and Krause, 1992). This doubles the range of these unique creatures and makes them 100 million years younger, according to the evolutionary time frame. An accompanying news and views article in *Nature* described this time extension as extraordinary, highly unexpected, remarkable, and attracting lively debate (Novacek, 1992).

Fox, Youzwyshyn, and Krause (1992) have anticipated the uplifted eyebrows within the evolutionary community. They seem to have done their anatomical homework. The fossil was found among numerous mammals diagnostic of the Paleocene Period. This poses a very serious question to the evolutionary establishment: Why have not mammal-like reptiles been found for the intervening 100 million years, especially in the age of the reptiles? Fox, Youzwyshyn, and Krause suggest four reasons for this anomaly: 1) their rarity, 2) their small size, 3) their possible presence in only northern localities, 4) limited sampling of small terrestrial vertebrate fauna. For a 100 million year time gap of a once prosperous group of animals, the first three suggestions are far-fetched. The fourth is of interest as far as what else has been overlooked. I would suggest a fifth possibility: The 100 million years never existed.

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Fox, R. C., G. P. Youzwyshyn and D. W. Krause. 1992. Post-Jurassic mammal-like reptiles from the Paleocene. *Nature* 358:233-235.
Novacek, M. J. 1992. Wandering across time. *Nature* 358:192.

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Deep Water Taphonomy

Studies of the process of fossilization have demonstrated repeatedly the high probability of destruction of animal and plant remains. Most research to date has been with accessible terrestrial and shallow-marine ecosystems. The discovery of a whale skeleton in 1,240 meters of water in the Santa Catalina Basin, off California, has extended the range of modern-day depositional environments investigated (Allison et al., 1991).

The whale, thought to have died between 3 and 34 years ago, has already undergone considerable change. No soft tissues remain, and all the bones are disarticulated. Many bones are corroded so that the inner "spongy" texture is visible. Despite low oxygen levels, a variety of encrusting organisms are attached to the bones—bivalves, limpets, gastropods, and worms. Plenty of evidence is seen for microbial activity, as well. Those surfaces which are covered by sediment have some protection, but all exposed bone is being steadily scavenged.

The report serves to reinforce the thesis that animal and plant remains are rarely preserved because there are so many influences which tend to their destruction and loss. Rapid or catastrophic burial appears to be an essential first step in the fossilization process, deserving a much higher profile in all palaeoenvironmental reconstructions involving fossiliferous sediments.

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Conodonts Identified as Vertebrates

Conodonts are tooth-shaped fossils, usually less than a couple of millimeters in size, which have been used by paleontologists as index fossils. For example, Harris and Miller (1958), in studies needed to construct their geologic map of the Duffield quadrangle, southwest Virginia, relied on professional opinions of U.S. Geological Survey paleontologists W. H. Hass and A. J. Boucot. Hass studied conodont fauna as well as brachiopod fauna to identify rocks north of the Hunter Valley thrust fault as part of the early to middle late Devonian system.

The Hunter Valley thrust, pictured on the cover of the June, 1990, *Creation Research Society Quarterly (CRSQ)*, is part of a whole family of supposed thrust faults in southwest Virginia. These involve rock sheets supposedly shoved for miles from southeast to northwest (Chaffin, 1990). Thus, the Hunter Valley contact involves Cambrian strata on top of Devonian strata.

In spite of these hypothetical massive movements, the contacts between the sheets show no breccia (broken-up and re-cemented rock), gouge, slickensides, or other indications of the large, grinding forces that would have been involved. This is evident in the June, 1990, *CRSQ* cover photographs of the Hunter Valley contact line.

This line is identified as a thrust contact merely because of the fossil studies which indicate that the older strata are situated above the supposedly younger strata. Thus, these field data, which are inconsistent with uniformitarian geology, are rather more consistent with the idea of ecological zones being responsible for the various deposits during the Genesis Flood.

Now an article has appeared (Sansom, et al., 1992) reporting microstructure studies which have identified tissue types in conodont fossils. Sansom, et al. state that these studies of conodonts provide "unequivocal evidence for their vertebrate affinities." This identification of fully developed vertebrates in Cambrian rocks, some 40 million years older (in the evolutionary time

scale) than the earliest previously known vertebrates, exposes yet another gap in the fossil record. Furthermore, the hard tissues of the conodonts were highly specialized, containing "cellular bone, enamel-like tissues, and cartilage but no dentine." Since dentine is usually regarded by evolutionists as more primitive than cellular bone, these findings cast "doubt upon the assumed evolutionary primacy and functional origin of dentine."

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Sansom. I. J., M. P. Smith, H. A. Armstrong, and M. M. Smith. 1992. Presence of the earliest vertebrate hard tissues in conodonts. *Science* 256:1308-1311.

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Tool-use by Aquatic Snails

Having neglected my aquarium too long, a significant level of acidity had built up. I changed charcoal and filter, and stirred the gravel in the bottom, getting the tank back into shape. My son was interested in the snails in the tank, so I took a couple of them out for him to see closely. One had a shell which had presumably been thinned by the high acidity of the water. During handling, a piece of shell was damaged, clinging partially to the remainder of the shell and also to the snail's flesh. Some reddish discoloration of the water was visible immediately around the wound for a short time after I dropped the snail back into the tank.

The snail did not right itself, but "picked up" two pieces of rock/coral from the bottom of the tank and remained lying on its side. The pieces were manipulated by the snail's foot until they were on each side of the broken shell fragment. I watched as the snail (at the proverbial snail's pace, of course) performed clockwise rotations of the rocks holding the shell fragment, stopping several times to rearrange the rocks, or to stretch, evidently trying to break the fragment loose. On the fifth turn, at the end of a long stretching motion, the snail finally worked the fragment free, righted itself, and went about its normal activity. Immediately I retrieved the two small pieces of rock from the tank and found the shell fragment stuck to them by "slime." Total time was about 11 minutes.

Since it appeared that the snail utilized the rocks in a deliberate fashion as tools, I decided to experiment with several other snails to determine if this is indeed a repeatable incident. If so, tool usage by so small a creature is certainly an indication of the design of God in His natural world. Snails displayed a variety of repair techniques when small portions of their shells were damaged. One snail "picked up" one small coral/rock from the bottom and manipulated it to the area of the injured shell. With only a few movements, the shell fragment was severed when the snail used its fleshy foot to deliberately pull it across the rock. Another snail dragged its broken shell fragment along the rough, rocky bottom of the aquarium. Soon the broken piece of shell was left attached to a bottom rock.

Morris (1990, p. 146) lists only two invertebrates that exhibit significant tool usage, the weaver ant and the digger wasp. He seems to determine tool usage to be a manipulation of a "tool" as an extension of the animal's body. Scott, 1972 contains a reference to tool usage by a wasp *(Ammophila urinaria),* and by an unspecified spider that draws back the center of its elastic web, then releases it to ensnare a passing insect. The author tries to downplay the significance of tool use in lower animals by writing, "However, in both these cases there is every indication that tool using is simply an extension of regular patterns of behavior of the species rather than arising as a solution to a problem" (p. 166). One could take exception to Scott's attempt to "sweep under the rug" the significance and complexity of tool usage among his examples. The snail's use of stones/ coral described above is certainly not an extension of "regular patterns of behavior" and is clearly a solution to a problem that occurs only to a small percentage of any snail population. Perhaps a creationist biologist could further investigate and more thoroughly document this apparent usage of tools by a most unlikely creature.

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Buckyballs

Some of you who were college students in the late sixties and early seventies, when the modern environmental movement was born, may remember the name R. Buckminster Fuller ("Bucky"), the late architect and engineer who designed the geodesic dome. His name has become associated with a new class of similarly symmetrical, soccerball-shaped, large carbon compounds (C60, C70), the fullerenes.

Discovered in the mid-1980's, the C60 molecule, aptly termed buckminsterfullerene or buckyball, was named 1991 "Molecule of the Year" by *Science* (Koshland, 1991). During that year, its unique structure and physical properties opened up whole new fields of chemistry and materials science as described in numerous journal articles.

What is it about this new class of chemicals which resulted in 175 research papers during the first six months of 1991, and packed scientific sessions which sometimes lasted into the early morning hours (Woods, 1992)? Structurally, the soccer ball-like appearance of buckyball or buckminsterfullerene (C60) results from a cluster of 60 or more carbon atoms "joined with a mixture of single and double bonds arranged in 20 hexagons and 12 pentagons" (Koshland, 1991). It represents the third major form of pure carbon; the other two being graphite and diamond. Chemically, it is extremely versatile, reacting with alkali metals, halogens, free radicals, and Grignard reagents. It is soluble in organic solvents, but the addition of amino acid adducts makes it soluble in water. Physically, it has lubricating and superconducting properties. Theoretical calculations predict that C60 is stiffer and more resistant to compression than diamond. Expectations are that this is only the beginning.

Until recently, the fullerenes were known only in the laboratory. Now they have been discovered in nature in shiny black rock associated with Precambrian strata in northeastern Russia near Finland (Busek, et al., 1992; Amato, 1992; Pennisi, 1992). Pennisi (1992) also described the discovery of fullerenes in microscopic debris from the collision of a small meteorite with a satellite, but none of the other references mention such a finding.

Why should such a discovery "puzzle," "surprise" or "baffle" scientists? It seems that uniquely specific conditions are needed to synthesize fullerenes in the laboratory; conditions which are not known to have occurred on earth. For example, temperatures are required which exceed those found in natural environments, except under extreme conditions such as lightning strikes and the interiors of stars. Furthermore, oxygen, nitrogen and other non-inert gases in the atmosphere appear to inhibit the synthesis of fullerenes. One would not in any case expect to find fullerenes in such abundance and in such a pure crystalline form.

Are there as yet undiscovered geological processes which may have been responsible for synthesis of the fullerenes? Or, are there other, "natural" means to produce buckyballs which scientists may then apply to their laboratory methods? We shall anxiously await the outcome.

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Koshland, D. E., Jr. 1991. Molecule of the year. *Science* 254:1705.

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Ph.D. Theses Feature "Creation"

The creation movement has provided research material for a vast number of graduate theses. Few are particularly friendly to the creation cause. Some studies show good insight, while others are an embarrassment to the author and the degree-granting institution.

I have surveyed theses on the creation theme using the database services of University Microfilms International. Some of the secular studies are intriguing. For example, in an M.A. thesis, Stacey (1989) investigated whether support for creation among teachers resulted from deficiencies in the teachers' scientific training. No such correlation was found!

The following representative dissertations are listed for interested readers. All are U.S. doctoral theses from the 1980's and 1990's.

Cavanaugh, M. A. 1983. A sociological account of scientific creationism: Science, true science, pseudoscience. University of Pittsburgh.

Duke, W. C. 1982. The American Scientific Affiliation and the Creation Research Society. Southwestern Baptist Theological Seminary.

Eglin, P. G. 1983. Creationism versus evolution: A study of the opinions of Georgia science teachers. Georgia State University.

Grine, J. D. 1985. A study of creationist pressure: Strategies against evolution instruction in the public schools. University of Pittsburgh.

Klope, D. C. 1991. The rhetorical constitution of the creationist movement. University of Utah.

Larson, E. J. 1984. Public science versus popular opinion: The creation-evolution legal controversy. University of Wisconsin, Madison.

McIver, T. A. 1989. Creationism: intellectual origins, cultural context, and theological diversity. University of California, Los Angeles. [See DeYoung (1992) for a review of this thesis.]

Morgan, E. W. 1983. A biblical and theological critique of scientific creationism. Southern Baptist Theological Seminary.

Prince, R. W. 1985. An examination of Henry M. Morris' interpretation of biblical creation. Southern Baptist Theological Seminary.

Sparks, L. 1982. A study of major court cases and the implications for teaching the origin of man 1925-1982. East Texas State University.

Tourney, C. P. 1987. The social context of scientific creationism. University of North Carolina, Chapel Hill.

There are many foreign, M.A., M.S., and Ed.D. studies which are also interesting, but they are so numerous that their titles alone would fill this entire Quarterly. A private compilation of theses on creation, including those from the Institute for Creation Research, is also available (Lazar, 1988).

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Lazar, E. 1988. Creation/evolution bibliography/directory. 1324 G Street #4, Sacramento, CA 95814-1543.

Stacey, W. A. 1989. The effects of education on creationist beliefs among high school science teachers. M.A. Thesis. University of Texas, Arlington.

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Double Standard

A recent advertisement for a DNA/RNA synthesizer (Science, 1992, p. 170) compares it to the hummingbird: rapid and efficient in handling liquids, extremely flexible in operation. Pictured in the ad is a beautiful hummingbird hovering near a flower. High-speed photography has captured the bird in magnificent detail. Although the hummingbird is infinitely more complex and awesomely designed than the laboratory instrument featured in the ad, many people seeing the ad would attribute the synthesizer's design to an intelligent maker, and that of the hummingbird to an accident; a random, purposeless process called evolution. The contradiction in logic should be apparent to any thoughtful person.

Reference

Science. 1992. 257:170. For an interesting short article on the remarkable design of hummingbirds see Keithley, Willis E. 1977. Hotrod helicopter. *Creation Research Society Quarterly* 14:3-4

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The Evolution of the Eye-Fact or Fiction?

The visual sense in organisms ranges from those with a primitive light response to the superb acuity of the eagle's eye. In most cases this faculty plays a dominant role over the other senses. In humans about 38 percent of the total sensory input comes through the eyes (Bruesch and Arey, pp. 631-635).

In some animals, for example reptiles, other senses do overshadow that of vision. In snakes, Jacobson's organ in the roof of the mouth interprets odoriferous particles from the air or ground brought to it by the flicking tongue. Nocturnal snakes which have particularly good olfactory powers can follow and strike their prey without using their vision, which, in snakes generally, is not very acute. The Kiwi, with small myopic eyes, is an exception among birds, in that it is dependent more on smell than vision. Its nostrils are situated near the end of its long probing beak instead of at the base.

In fish generally, visual acuity is probably poor but there are exceptions. Organs of tactile sense and hearing of high acuity are present in most species, with a row of vibratory receptors arranged in a line along each side of the fish's body. These several senses are of particular importance in turbid water or at depths where light is minimal or absent. Two curious fish anomalies are anableps and the archer fish. The former, with eyes on the top of its head, skims along just under the calm surface of the water. The eyes are half above the surface and half below, which permits air and water vision at the same time. This is achieved by two most intricate anatomical and refractive systems in the same eye.

The archer fish exhibits an amazing ability to judge distance. While swimming it can eject a stream of water at an insect flying up to three feet above the surface, bringing it down to water level and devouring it. Good spatial judgments are observed in schools of fish which, in their darting movements, do not collide with one another.

Birds and mammals have the most highly organized eyes of all, with the former exceeding the human eye in acuity. It is only because of the great complexity, organization and function of a three-pound brain that the total visual faculty in humans excels. Duke-Elder writes (1958, p. 256):

> The eye of man cannot be considered as representing the acme of efficiency as an optical instrument; it is to the unique and transcendent development of the associated cerebral centres that it owes its functional predominance.

When evolutionists survey the range of eyes in nature they have a formidable problem in trying to fit them into comprehensive theories. It is not surprising therefore that there is a paucity of evolutionary speculation and writing on this subject. Charles Darwin was equally puzzled when he acknowledged that evolution of the eye was contrary to common sense, but nevertheless he managed to convince himself that it could happen by natural selection over long ages (1979, p. 217):

> To suppose that the eye, with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have formed by natural selection, seems, I freely admit, absurd in the highest possible degree. Yet reason tells me, that if numerous gradations from a perfect and complex eye to one very imperfect and simple, each grade being useful to its possessor, can be shown to exist; if further, the eye does vary ever so slightly, and the variations be inherited, which is certainly the case; and if any variation or modification in the organ be ever useful to an animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, can hardly be considered real.

It is interesting that in the sixth and final edition of *On the Origin of Species* in 1872, Darwin appeared to give up his belief in the power of natural selection by reverting to a kind of Lamarkism (Hedke, pp. 34-38).

Lipson wrote in *New Scientist* (1981, p. 452):

> Darwin's book — *On the Origin of Species* — I find quite unsatisfactory: it says nothing about the origin of species; it is written very tentatively, with a special chapter on "Difficulties on Theory"; and it includes a great deal of discussion on why evidence for natural selection does not exist in the fossil record.

The nearly infinite variety of eyes in nature can be considered in two great divisions, invertebrates and vertebrates. In the first class, the range of eyes with different design and function is almost limitless. Included are the simplest organisms where a few nerve cells enable light perception only, followed by a range of more organized though simple structures. Compound eyes as in insects, and the highest group of which the octopi are representative, where the eyes somewhat resemble those of vertebrates, although quite inferior overall, complete the picture. Of this great assemblage, Duke-Elder says (p. 178):

> The curious thing, however, is that in their distribution the eyes of invertebrates form no series of contiguity and succession. Without obvious phylogenetic sequence, their occurrence seems haphazard; analogous photoreceptors appear in unrelated species, an elaborate organ in a primitive species or an elementary structure high in the evolutionary scale, and the same animal may be provided with two different mechanisms with different spectral sensitivities subserving different types of behaviour.

The eyes of vertebrates almost without exception resemble a camera in structure and they function in a similar manner. Focusing mechanisms differ somewhat but they direct light to the retina which registers the image. The retina is a highly differentiated nervous layer which changes light to electrical impulses which reach the brain via the optic nerves. Here perception and interpretation of the environment take place.

What does Duke-Elder say about the evolution of the vertebrate eye? In summation he writes (p. 247):

> It would seem therefore, that despite the considerable amount of thought expended on the question,

> the emergence of the vertebrate eye with its inverted retina of neural origin and its elaborate dioptric mechanism derived from the surface ectoderm, is a problem as yet unsolved. Indeed, appearing as it does fully formed in the most primitive species extant today, and in the absence of transitional forms with which it can be associated unless by speculative hypotheses with little factual foundation, there seems little likelihood of finding a satisfying and pragmatic solution to the puzzle presented by its evolutionary development.

He writes further (p. 238):

> The apposite remark of the great German anatomist Froriep (1906) that the vertebrate eye sprang into existence fully formed, like Athena from the forehead of Zeus, expressed the frustration of the scientists of half a century ago to account for its appearance; today we are little the wiser.

Belief in the evolution of the eye in nature is based on faith with little or no evidence to support an empirical succession from simple to complex. What is found in organisms is that their visual requirements are exquisitely satisfied by the design of their ocular equipment in each case. In fact, in some examples the efficiency seems to be in advance of their needs as far as we can know. This is another factor which mitigates the effectiveness of natural selection in evolutionary theory as no change in excess of that required for a small improvement would be expected.

The whole panorama is the expression of the ideal design and manifestation of the visual organs in his creation by an omnipotent and omniscient Creator.*

*Several other articles on vision have been written by Dr. Hamilton from a creationist perspective. Consult the following bibliography: Hamilton, H. S. 1985. The retina of the eye—an evolutionary road block. *CRSQ* 22:59-64. [Errata 22:101].

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> Nature has perfections, in order to show that she is the image of God; and defects to show that she is only his image.
>
> Blaise Pascal

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Introduction

The *Creation Research Society Quarterly* has been published since 1964 (29 complete volumes). In an effort to make these volumes available many of the missing issues have been reprinted. Brief synopses have been written on volumes 1-10 and have appeared in the previous 10 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.

Philosophy

The June 1974 Quarterly began with a series of philosophical articles on the relation of Christianity and science. John Moore (1974, pp. 3-5) presented a collection of definitional formulations to initiate the series. Throughout his career, Dr. Moore attempted to precisely define terms often employed in the creation-evolution origins debate. He realized that many people used terms that meant different things to other individuals and tried to cure the problem. T. Robert Ingram (1974, pp. 6-8) showed how there could not be true science without true religion. Part of his conclusions are (p. 8):

> Christian thinkers, then, should agree generally that philosophy may be understood to be the activity of right reason, and science may be said to be the knowledge of things knowable to sensory perception (direct or indirect), and that these cannot be studied without reference to religion, but must serve religion which is Christian truth and life. "In Christ are hid all the treasures of wisdom and knowledge." (Colossians 2:3)

Harold Armstrong, (1974, pp. 10-13) in a much needed discussion, distinguished between religion, philosophy, science, and history. Note his summary (p. 10):

> Philosophy involves one in the study of all things, and creation and origins would rank only as one area of study among many. Science is organized knowledge and methods of investigation of the natural environment. Therefore, creation, origins, and evolution cannot be studied scientifically. History is developed from written records. The "fossil record," then, cannot be considered as history.

In a more practical vein, Emmett Williams and George Mulfinger (1974, pp. 8-10) outlined a biblical framework for a course in physical science. These men explained how the limitations of science and teleology could be woven into the subject matter. The discussion of origins (creation vs. evolution) could be introduced in the classroom as well as brief biographies of Christian men of science. This discussion centered about the textbook, *Physical Science for Christian Schools* that they authored. In a later Quarterly, Tilney (1974, pp. 104-107) wrote a theological essay on beginnings. The origin of the world and humanity were two of his topics.

Young Earth

An extensive selection entitled "Time Upside Down" by von Fange (1974, pp. 13-27) considered data that could be offered in favor of the young earth hypothesis.

Some interesting points covered include the rapid origin and influx of life on Surtsey Island, decay of the earth's magnetic field, the rapid formation of stalagmites and stalactities under certain conditions and the possible rapid petrification of wood. Camping (1974, pp. 39-45), in defending a young earth position, used the amounts of various minerals dissolved in sea water and the time it would have taken them to accumulate. Knowing the present rate of mineral influx into the oceans and using the venerated "present is the key to the past" principle, he showed that the oceans could not be as old as is claimed.

Biology

General

Moshe Trop (1975, pp. 183-187) asked, "Was evolution really possible?" and then answered in the negative in his article. The impossibility of life from non-life was discussed. Supposed different atmospheric conditions in the ancient world and natural selection were reviewed with the conclusion that there is no substitute for creation by God. Evidence for the existence of an intelligible genetic code was presented by Quinn (1975, pp. 188-198). Discussing the DNA and RNA research to that time, he carefully noted many teleological circumstances as well as built-in safeguards against evolution in the genetic system. Also included were sections on protein synthesis as well as Kendrew wire models of polypeptides. The latter illustrated the complexity of molecules in living organisms.

Glen Wolfrom (1975, pp. 198-201) examined the recapitulation myth. Even though it is rejected by many biologists, it is still presented in textbooks. For instance, some authors refer to fish-like gill slits in mammalian embryos. An interesting article (Cairney, 1975, pp. 211-213) featured lichens as a dilemma for the evolutionary model. Naturalistic theories fail to explain the origin of the association between a fungus and an alga. Variation and fixity in nature was a topic explored by Frank Marsh (1974, pp. 60-68). He was an expert in this field. Advocates of Darwinism would predict unlimited variation, but Dr. Marsh showed that this was not true. Using paleontology and DNA research, he noted that stability, not unlimited change, can be verified in living organisms which is a tenet of the creation model.

Botany

Corn was used by William Tinkle (1974, pp. 37-39) to discuss hybridization and heterosis. He claimed that hybrid corn was developed employing human intelligence and the limitations of hybridization were explained. He mentioned Darwin's mistake in thinking that hybridization involved natural events. Using botanical examples Tinkle (1974, pp. 139-141) speculated that God's personality is revealed by nature. This article is typical of many short selections written by this very thoughtful Christian geneticist.

Zoology

The ear size in male and female frogs in relation to the origins debate was discussed by Smith (1974, pp. 46-47). He considered the larger ear size in the male is needed to detect the territorial call of other males and this acts as an intrinsic population control mechanism. Kaufmann (1974, pp. 91-94) employed physics concepts to show design in the human body. The complex muscle and joint systems in the human body never could have evolved by brute natural processes. Siegler (1974, pp. 94-97), exploring the kind concept in the creation model of science, used the family Canidae as an illustration. Interesting discussions of dogs, jackals, wolves and foxes were provided before the author summarized the data.

Anthropology and Archaelogy

Harold Clark (1974, pp. 115-120), in discussing fossil men, concluded that the Genesis account of creation and the Flood are a better interpretative framework for "ancient" man. Certain ancient "races" are not evolutionary in nature, but actually degenerative. This article contains many interesting insights. Some possible construction features of the Ark were briefly noted by Schmich (1974, pp. 120-122).

Employing the Lebzelter principle, Custance (1974, pp. 157-159) claimed that early human remains reflect conditions faced immediately after the Flood by man in his subsequent rapid dispersal throughout the earth. The fascinating subject of Egyptian chronology was explored by Courville (1975, pp. 202-210). Errors in the pottery dating scheme, reports of Jericho, Ai, Schethem and Samaria were weaved into the arguments. The author supported biblical archaeological dates as opposed to the so-called astronomically fixed dates. The same author (Courville, 1974, pp. 47-56) claimed:

> The first few hundred years after the Flood are critical years for anyone who believes in a young earth; for in that time populations had to increase and disperse, and the arts and crafts of civilization had to be taken up again after the destruction of the former order (p. 47).

He gave evidence that the time between the Flood and the dynastic period in Egypt could have been no more than 200 years. Also he noted that there was a milder, wetter climate in the predynastic era which is in line with a post-Flood ice age with greater precipitation in certain places on earth. The author's conclusions deserve serious consideration. Strickling (1974, pp. 97-101) presented some legendary evidence for the confusion of tongues at the tower of Babel from non-biblical accounts, Josephus and various Indian tribes.

Geology

Clifford Burdick (1974, pp. 56-60) discussed field work and evidence for and against overthrusting at the Lewis thrust-fault in a follow-up to a previous study (Burdick 1969, pp. 96-106). Walter Lammerts (1974, pp. 101-103) performed a small-scale study on the formation of beaches and rounded (eroded) stones at San Luis Reservoir in California where strong winds can generate waves five feet high. Based on the field evidence at this site, he noted that beaches and terraces have formed rapidly. Johnson (1974, pp. 108-110) claimed that during the Flood God stayed within the boundaries of natural law that he had established at creation.

Three possible models for the origin of the fossil record were compared by Grimm (1974, pp. 111-115). He reached the conclusion that the creation model is superior to the other two although each has to be accepted by faith. In a brief note Wiant (1974, p. 142)

made a quantitative comparison of the carbon in the biomass and in the coal beds of the world. Daly (1974, pp. 213-217) continued his series on the ice age as a result of the Flood.

Chemistry and Physics

Probability arguments were employed by Trop and Shaki (1974, pp. 28-29) to illustrate that the molecular evolution of a protein chain of 100 amino acids is unlikely in the extreme. There was not enough amino acids or time available for the postulated natural event to occur. Don DeYoung (1974, pp. 32-36) reviewed the geochemistry of some stable isotopes and presented some creationist applications. Radiocarbon dating errors, the origin of evaporites, continental drift and isotopes of the moon and meteorites were examined from this perspective.

Much media hype about the comet Kohoutek and the subsequent "flop" elicited a paper from Steveson (1974, pp. 68-71) entitled "Kohoutek, Comets and Christianity." Supplying some general information on comets, the author noted that the continued existence of comets is an embarrassment to the old-earth position. The late Roger St. Peter (1974, pp. 143-155) examined the big bang hypothesis. His Newtonian calculations indicated that the "so-called primordial fireball would vigorously collapse rather than violently explode" (p. 143). Thus this popular hypothesis cannot explain the supposed expansion of the universe. More opinions on whether the degenerating effects of the second law of thermodynamics operated before the Fall of man were expressed in this volume (pp. 175-179).

Conclusions

Besides the various subjects mentioned previously, there were 48 technical notes, 18 book reviews and 11 letters to the editor dealing with several scientific disciplines in this volume. The diversity of creationist opinion can be studied as it developed from the pages of this volume of the Quarterly.

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Quotes

Jerusalem is shown to possess a unique climate on earth in the sense that it has the highest normal rainfall among stations with an abundance . . . of solar radiation as well as the highest value of annual sunshine hours among the stations with similar or higher normal rainfall . . . This characteristic of having both copious amounts of solar radiation as in subtropical deserts but still have enough rainfall to be quite far from desert or semi-arid conditions is related to Jerusalem's special blessing by the author of the book of Psalms.

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I think that after the story's told, when the history of our time is written, we will see that the theory of evolution—which has invaded every single discipline within the whole structure of Western thought which is itself based upon this theory—was one of the most brilliant coups of the devil's. Of course it's complete nonsense, but it has captivated the Western mind. The belief that this theory is absolutely true is so borne in upon the educated that you can't reach them. I find it incredible.

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