

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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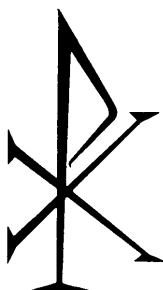
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COVER ILLUSTRATION

The illustration on the front cover shows the butterflies *Hylephila phyleus*, a male on the left and a female on the right, on flowers of *Lantana camara*.

Study shows that these butterflies exhibit a very considerable degree of efficiency in their foraging, avoiding useless stops and unnecessarily long flights. A Creationist can view this as another provision of the Creator, Who made these creatures well suited to their way of life.

Mr. Joseph M. Rea provided this picture, and carried out the studies during which it was taken. His work is described in an article elsewhere in this issue of the *Quarterly*.

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ELECTION RESULTS

In the annual election, held earlier this year, the following persons were elected to the Board of Directors, for a term of three years, 1981-1983.

Clifford L. Burdick	John R. Meyer
Wayne Frair	John N. Moore
George F. Howe	George Mulfinger, Jr.

DEDICATION TO WILBERT HENRY RUSCH, SR.

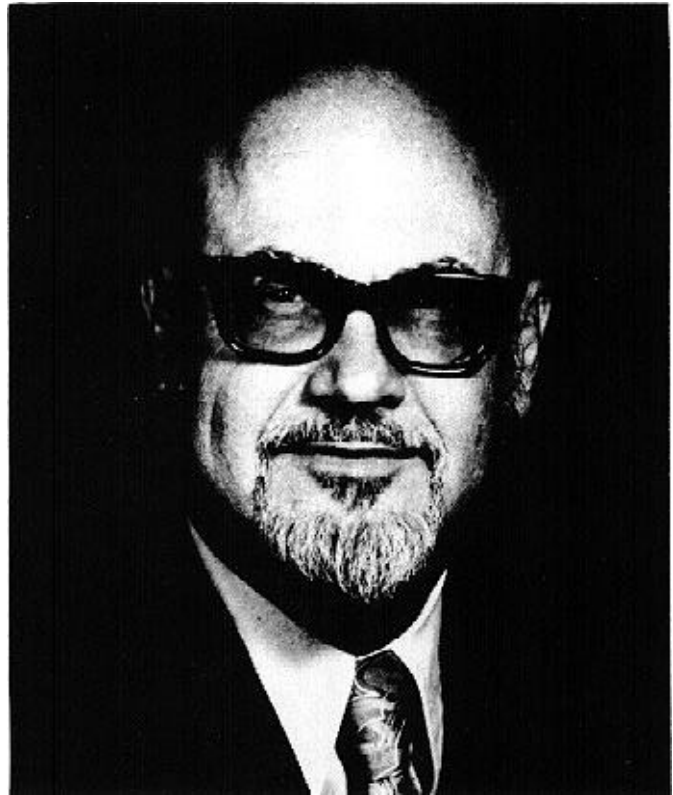
The Creation Research Society is pleased to dedicate its 18th Annual Issue to its most recently-elected fellow, Wilbert Henry Rusch, Sr., who is the only person who has been serving continuously as an officer of the society since its inception in 1963. His tenure began when John Grebe handed him a check for \$500. From 1963 through 1967 he served as treasurer-membership secretary of the C.R.S.; and since 1968 when responsibilities of his office were divided, he remained as membership secretary. His extensive duties in this capacity have included maintaining the membership roll, receiving dues and membership applications and mailing the quarterlies. Also, since his name and address are listed prominently on applications, he serves as the main interface of the C.R.S. officers not only with C.R.S. members, but also with those outside the society. Consequently he receives most of the mail to the society and over the years has had to deal with numerous difficult questions and problems.

Son of a River Forest, Illinois, college professor, Bill Rusch was born in Chicago, 19 February 1913. He was educated at Grace Lutheran School and Concordia High School, River Forest (1929 graduate); Concordia Teachers College, River Forest (diploma, 1931); Illinois Institute of Technology (B.S., 1934); U. of Michigan (M.S. in biology, 1952); Eastern Michigan U., Ypsilanti (Sp.S., 1969). He has studied at a number of universities including Purdue and U. of Nebraska, the latter for graduate work in geology. In 1975 Concordia Seminary in Saint Louis awarded him the Doctor of Laws degree.

Dr. Rusch's teaching career began in 1932 when he was instructor of music and mathematics at Concordia Teachers College, Seward, Nebraska. He has a stint in the U.S. postal service, graduate studies in chemistry, and taught at the Junior Military Academy, Chicago, 1936-1937. For the next 20 years he was on the faculty of the old Concordia College, Fort Wayne, Indiana, teaching mathematics, physical sciences and biology. During this time he moonlighted at the Purdue University Extension Services and Lutheran Hospital School of Nursing, Fort Wayne. After another six years at Concordia in Seward, this time as a biology, physics and geology professor, he transferred to what now is Concordia College in Ann Arbor, Michigan, where since its beginning in 1963 he has served as a professor of biology and geology and as head of the Science and Mathematics Division. Also he has been alternately Acting President and Academic Dean there for several years in the 1970's. In 1980 he became Professor Emeritus.

In 1937 Dr. Rusch married Margaret Kogge of Chicago; and they have five children and eleven grandchildren.

Bill Rusch's activities have included membership in the National Association of Biology Teachers 1952-1979; and he was their Nebraska State Membership Chairman 1959-1963. He was a member of the National Science Teachers Association 1958-1963 and served on the planning committee for a regional convention in 1961. Also while in Nebraska he was a



member of the Nebraska Academy of Science and served as a member of the Board of Directors 1960-1963. From 1964-1980 he was a member of the National Association of Geology Teachers.

Dr. Rusch has published in the *Creation Research Society Quarterly* three book reviews and six papers including: "Analysis of So-called Evidences of Evolution", "The Revelation of Palynology", "Recapitulation", "Human Footprints in Rocks", "Poor Bill's Almanac", and "Darwin's Last Hours". Also he has written chapters on creation (Darwinism, Human Fossils, and Analysis of Evidences) for three Concordia books. He published his *Tree Key for the Great Lakes States* (2 editions).

He has presented talks on creation in many places including campuses of the U. of Michigan, U. of Arkansas, South Dakota State, U. of South Dakota, and U. of Oklahoma. Also he has participated in large public United States creation conventions including the first in Los Angeles in 1963 as well as subsequent ones in Milwaukee, Wisconsin, 1972; Anaheim, California, in 1979; and River Forest, Illinois, in 1980.

People talk about the days when one man could understand the totality of science. This kind of person becomes rarer with passing years, but Bill Rusch is one of the best examples I know of who exemplifies this type of person today. His interests are broad, his knowledge encyclopedic, and his administrative and scholarly capabilities noteworthy. Currently Dr. Rusch is serving as editor for a revised C.R.S. high school biology textbook.

Contributed by Wayne Frair

DESIGN IN NATURE: THE FIERY SKIPPER BUTTERFLY *HYLEPHILA PHYLEUS* (DRURY) AS AN EFFICIENT FEEDER ON FLOWERS OF *LANTANA CAMARA* L.

JOSEPH M. REA*

Received 1 August, 1980

The Fiery Skipper butterfly Hylephila phyleus Drury forages efficiently on flowers of Lantana camara L. Hylephila phyleus feeds preferentially from florets of L. camara likely to contain nectar. While foraging on a small artificial patch of flowers of L. camara, H. phyleus chooses the closest flowers 80% of the time. Analysis of foraging bouts on the artificial patch of 3 flower visits in sequence revealed a frequency of revisitation lower than that expected from a random foraging model. This small butterfly demonstrates a neurological program, endowed at the creation, for efficient foraging.

Biological literature is replete with examples of morphological features of animals that contribute to survival. However, structural features alone do not insure survival. Appropriate animal behavior, within each ecological context is also essential for survival.

Since the biosphere was created by an infinitely wise God we can expect that he has programmed the nervous system (via genes) of His creatures with the ability to make decisions that result in incurred benefit. This seems obvious with respect to man, but perhaps not so obvious in insects.

Optimal foraging theory states that animals will make foraging decisions that maximize net intake of food per unit of foraging time. Optimal foraging theory has received much attention in the literature. Experimental tests have been reported by Dixon,¹ Wolf,² Charnov,³ Cowie,⁴ Pyke, Pulliam, and Charnov,⁵ Pyke,⁶ and Waddington,⁷ and models have been proposed by MacArthur and Pianka,⁸ Emlen,⁹ Rapport,¹⁰ Royama,¹¹ and Charnov.¹² Each study and model contain the same basic tenet: animal fitness† is positively related to foraging efficiency, hence foragers that maximize energy intake per unit foraging time should have more surviving offspring.

Nectar in nature is not spatially or temporally uniformly distributed. Because creationists believe God has endowed His creatures with the requisite behavioral repertoire for survival the possibility exists that butterflies can sense the discontinuity of nectar availability in flowering plants and make foraging decisions that increase foraging efficiency. Heinrich¹³ commenting on foraging strategies noted that profits or potential rewards to flower visitors decisively affect their behavior, and that the Lepidoptera acquire a "search image" during foraging as they learn to respond to stimuli associated with their food items. According to Baker¹⁴ flowers visited primarily by butterflies produce copious amounts of nectar and are consistently rich in amino acids. Swihart and Swihart¹⁵ reported on the ability of the butterfly *Heliconius charitonius* Linn. to learn to modify feeding preference through conditioning to feed preferentially at certain colors of artificial flowers that contain honey and the B-vitamins. Dronamraju¹⁶ reported that butterflies preferentially visit yellow flowers of *Lantana* and Barrows¹⁷ reported

that yellow flowers of *Lantana* contain nectar, but by the time the flowers turn reddish-orange (a different variety of *Lantana camara* than the present study) they contain no nectar.

The Fiery Skipper *Hylephila phyleus* feeds at high densities on *Lantana camara* plants, hence is suitable for a study of foraging behavior. *Lantana camara* has an indeterminate panicle inflorescence with many salverform, slightly zygomorphic florets per flower head. (See the front cover, which is also Figure 1 of this article.) Maturation is centrifugal with young florets at the center and older florets around the outside of each head. First-day, or newly opened florets are yellow in color with an orange center, second-day florets are lavender in color with an orange center, and third-day florets are all lavender in color.

Within the context of optimal foraging theory I will examine the following questions concerning the feeding behavior of the Fiery Skipper on flowers of *Lantana camara*: 1) Does *H. phyleus* avoid feeding at florets that are void of nectar? 2) How far does *H. phyleus* move when going from flower head to flower head within a patch? 3) Does *H. phyleus* actively avoid visiting flowers at which it has recently fed?

Methods and Material

Data for this study were collected at *Lantana* plants in suburban Phoenix, Maricopa county, Arizona, from 6:00 a.m. to 4:00 p.m. on sunny days with little or no wind during the months of June, July, and August of 1979.

Floret Color Choice

The presence or absence of nectar in yellow and lavender florets was assessed by slicing open the floret with a scalpel and looking for nectar inside with a dissecting microscope. In most cases the nectar, if present, was in sufficient quantity to be seen with the

†Fitness here is used by the above mentioned authors in a macroevolutionary context. According to Neo-Darwinism fitness refers to the number of genes an organism contributes to the next generation. However, this definition of fitness does not violate any principle of the creation model of origins. Certainly, survival of creatures is important to the Creator, and macroevolution is not intended by the author. Verifiable, empirical, scientific data cannot contradict the creation model of origins. Creation scientists necessarily disagree with the evolutionists on interpretation and extrapolation, not on observation.

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unaided eye. Floret color preferences were documented by observing the number and color of all florets probed (proboscis extended into a floret) per flower head by foraging skippers and recording the number of yellow and lavender florets on each flower head.

Flower Distance Choice

To evaluate flower choice by foraging skippers an artificial patch was constructed to contain flower heads fixed in position in 2 dimensions. The artificial patch was constructed on a 24" square of plywood with 25 holes 3/4" in diameter in 5 rows and 5 columns with 5" between any 2 holes of any row or column. Each hole contained a "flower vase" made of pipe (1/2" inside diameter) 6" long capped at one end with an 1/2" pipe cap on the underside of the plywood. Each "flower vase" position on the artificial patch was given a number (Figure 2). Prior to each foraging bout 1 freshly cut *Lantana* flower with a 5" stem was placed in each vase. Distances travelled on the artificial patch by foraging skippers are reported in relative units where 5" equals 1 unit. Note that diagonal distances are greater than 1 and are reported as such.

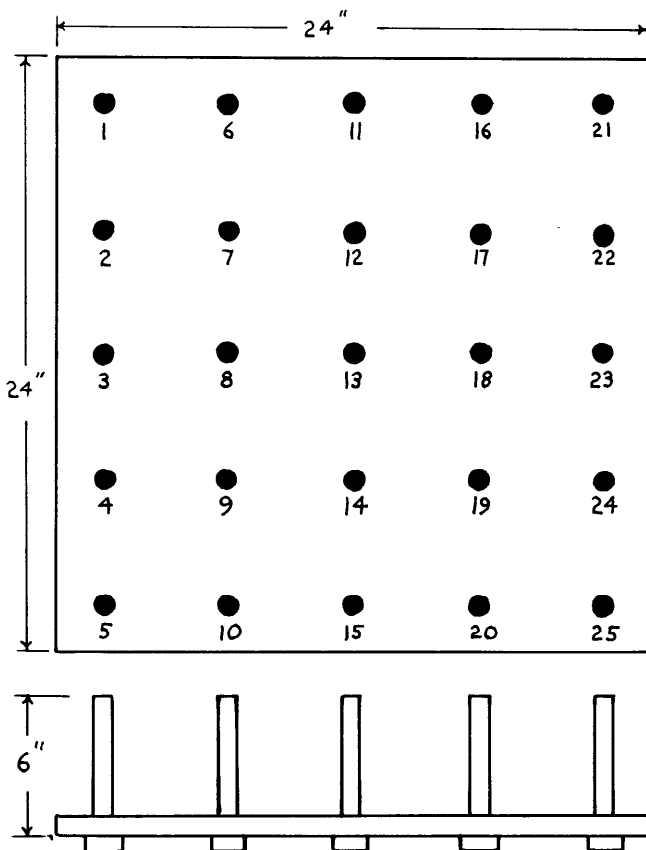


Figure 2. This is a drawing, in plan and front elevation, of the artificial flower patch, with the flower vases. The vases were pieces of half-inch pipe, six inches long, fastened to the piece of half-inch plywood with half-inch pipe caps. The unit distance, e.g. between vases 1 and 6, is 5 inches; note that the diagonal distance between vases, e.g. between 1 and 7, is 1.41 times the unit distance.

Flower Revisitation Frequency

Skippers often visited more than one flower on each visit to the artificial patch. Maps were made from tape recorded verbal records of the number of each flower position visited on the artificial patch to determine the probability of revisiting the initial flower in a 3-stop sequence. One hypothesis of optimal foraging theory is that the efficient forager should not cross its own path during a foraging bout.¹⁸ Thus if insects are foraging efficiently, they should forage in a pattern that reduces the likelihood of revisits to flowers. Heinrich¹³ noted that most bees visit most florets on an inflorescence without revisiting empties, which suggests that they can "remember" florets they have already visited. With this idea in mind, data were collected on 1745 foraging bouts of 3 or more flower stops on the artificial patch.

Results

Description of Behavior of Skippers on *Lantana*

Skippers arrive at *Lantana* plants shortly after sunrise. Males arrive first. Activity shortly after arrival at *Lantana* plants consists mostly of sunning; males rest with the hind wings spread at right angles to incident solar radiation with the forewings nearly closed so as to present minimal surface area to incident solar radiation. Apparently this behavior is common for males in the genus *Hesperia*.¹⁹ On July 23 and 24, from 7:30 to 8:30 a.m. 10 heads of *Lantana* received skipper visits from 30 males, 9 females, and 3 sex unknowns. Sex ratios were approximately equal at 11:30 a.m. New florets of *Lantana* begin to open within a half-hour after sunrise. During this time skippers are inactive on *Lantana* leaves. As soon as the new florets open skippers begin to feed. Skippers land on a head of *Lantana* and center their heads over a yellow floret. Next, the legs are bent bringing the head closer to the floret in order to push the proboscis into the bottom of the floret tube. There is a short hesitation as nectar is imbibed. The legs are then extended, the proboscis extracted and coiled, and the skipper moves to the next floret. Imbibing duration per head seems to be related to nectar quality and quantity per floret. Yellow florets of *Lantana* were spiked (solution added to floret via pipet) with distilled water and various concentrations of sucrose. The mean feeding time by skippers in seconds per unspiked head of *Lantana* was 6.95 ± 4.22 ($n=19$). In heads where yellow florets were spiked with distilled water (control) mean feeding time in seconds per head increased only slightly to 8.81 ± 8.18 ($n=14$). However, mean feeding time in seconds per head increased to 194.27 ± 181.67 ($n=11$) seconds when spiked with 2.0M sucrose. In each case only flower heads with 6 yellow florets were used.

Floret Color Choice

Eighty percent ($n=50$) of yellow florets that were examined contained nectar, whereas only 19% ($n=50$) of lavender florets contained nectar. Skippers probed nearly 75% ($n=84$) of yellow florets per head but probed less than 2% ($n=84$) of lavender florets per head. Skippers preferred yellow over lavender florets.

Distances Travelled Within the Artificial Patch

Figure 3 is a histogram of the results of data on flower distance choice from maps of tape recorded verbal accounts of foraging paths of skippers on the artificial patch (see figure 4). More than 60% of all visits on the artificial patch were to adjacent (distance = 1) flowers. Over 80% of all visits on the artificial patch were to flowers either adjacent (distance = 1) or adjacent-diagonal (distance = 1.414).

Flower Revisitation Frequency on the Artificial Patch

Figure 4 shows a few typical foraging patterns of skippers on the artificial patch. Examination of these patterns suggested that foraging skippers pursue a non-random foraging "strategy" to reduce revisitation frequency. Sequences of 3 consecutive flower visits were examined to compare expected vs. observed revisitation frequencies. In a 3-stop sequence, what would be the probability that the third flower visit was the same as the first in the sequence? The expected frequency is a function of where the skipper is at the second stop. If at a corner the skipper has only 3 choices assuming adjacent or adjacent-diagonal visits only: to the first flower visit in the 3-stop sequence (a revisit) or to one of the

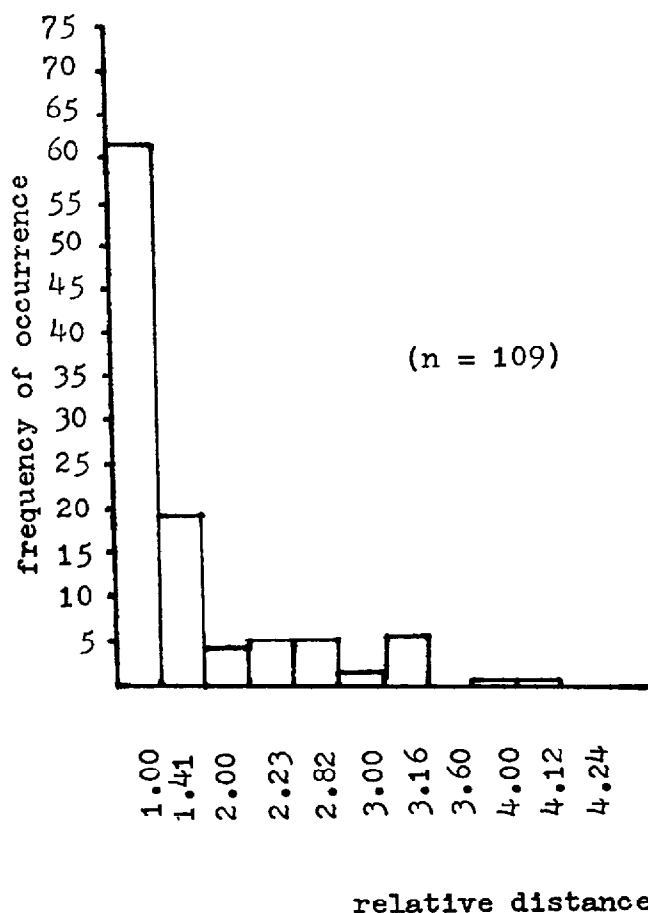


Figure 3. This shows the frequency of occurrence of flights of various lengths, from one flower to the next visited, in the artificial patch.

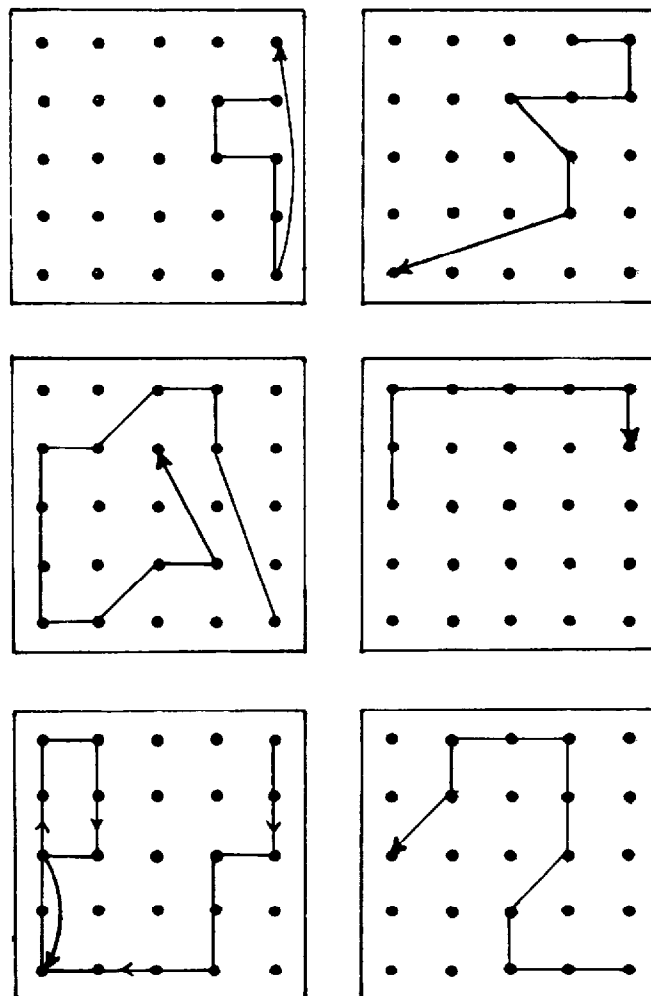


Figure 4. Some of the foraging patterns of *H. Phyleus* observed on the artificial patch are shown here.

other 2 flowers (not a revisit). If skippers are foraging randomly it is expected that 1/3 of all 3-stop sequences in which the second visit is to a corner will involve a revisit. By similar reasoning, it is expected that 1/5 of all 3-stop sequences in which the second visit is to an edge flower will involve a revisit. Similarly, assuming random foraging, it is expected that 1/8 of all 3-stop sequences in which the second visit is to a central (non-edge, non-corner) flower will involve a revisit.

Table I compares expected and observed foraging revisit frequencies for 3-stop sequences on the artificial patch. The data summary is based upon 467 foraging bouts involving all 3 of the previously discussed locations. Revisitation frequency was significantly less than expected for all 3 foraging locations.

Conclusions

Floret Color Choice

H. Phyleus appears to feed preferentially at florets likely to contain nectar. It is clearly to the advantage of foraging skippers to major on yellow florets in terms of

an energy budget, maximizing return per unit foraging time. It is most likely skippers "choose" yellow florets over lavender florets based upon a visual perceptual system. Color vision in butterflies has been demonstrated in *Heliconius erato hydara* by Crane.¹⁹ Floret color change within 20 hours in *L. camara* induced by pollination was reported by Mathur and Mohan Ram²⁰ and Schemske.²¹ According to Heinrich¹³ insect pollinators avoid flowers void of nectar based upon corolla color change. These observations suggest that corolla "choice" by pollinators is color mediated.

Foraging on the Artificial Patch

Given the artificial foraging situation of non-random spatial distribution of flowers fixed in 2 dimensions *H. phyleus* usually "chooses" the closest flower heads of *L. camara*. Observation of *H. phyleus* foraging at *L. camara* bushes suggest the presence of this same behavioral trait. The design advantage is obvious: shorter flight distances require less energy.

With regard to spatial foraging patterns Heinrich¹³ noted that visiting flowers in a sequence rather than at random reduces the possibility of revisiting empty florets and that foraging along specific paths occurs in butterflies. Analysis of foraging patterns of *H. phyleus* on the artificial patch suggested that this insect forages efficiently by actively avoiding previously visited heads of *L. camara*.

Pyke²¹ has formulated a model of movements for foraging bumblebees. The model supposes that bumblebees choose the next flower to fly to by aiming their departure in some direction relative to the direction of arrival at the present flower. Von Frisch²² reported the use of the sun as a compass by foraging honeybees. Crane¹⁹ noted that the butterfly *Heliconius erato*

hydara would not feed on cloudy days, and that butterflies became inactive in dull weather. If foraging skippers use the sun as a point of orientation for foraging directionality within a patch, this would in part explain observations of the curious behavior of skippers when a cloud suddenly obscures sunlight: skippers either cease to forage and remain motionless or seek the cover of low vegetation until the sun reappears. In both cases skippers are much less easily provoked to a flying departure by a human hand. However, there are possible alternative explanations for the lull in foraging activity by skippers when clouds obscure the sun. Clouds frequently portend inclement weather. Also, there is some evidence that nectar flow in flowers decreases with reduced sunlight.^{23,24} The behavioral trait of skippers to avoid previously visited heads of *L. camara* is clearly advantageous in that it results in an increase in nectar obtained per unit foraging time.

I believe that the behavior of the Fiery Skipper with respect to color choice, distance choice, and foraging pattern demonstrate part of the neurological program of this insect, endowed at creation, to insure increased foraging efficiency. It is my hope that this paper will be an inspiration to creation biologists to further expound upon design in nature, and God's wisdom as expressed in animal behavior.

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TABLE I. Results of analysis of expected vs. observed foraging revisit frequency, 3-stop sequence, on the artificial patch.

Third stop to previously visited corner, 3 alternatives	Third stop to other than previously visited head: not a revisit
observed	34
expected*	24.7
n = 37	
X ² = 10.53**	
edge, 5 alternatives	
observed	211
expected	184.8
n = 231	
X ² = 18.57	
central, 8 alternatives	
observed	194
expected	174
n = 199	
X ² = 18.2	

* For corner location expected frequency based on 1/3 n. For edge location 1/5 n. For central location, 1/8 n.

** 0.05 level of significance at (r-1) (c-1) = 3.841

(Continued on page 26)

THE EPISTEME IS THE THEORY†

RANDALL HEDTKE*

Received 27 June, 1980.

The real purpose of evolution theory is not the scientific one of explaining the origin of life; for it is impossible to do that, utilizing only natural laws and phenomena. Rather, the theory is dedicated to a philosophical goal: to "ungod the universe". The tool by which that is to be accomplished is what is known as the positive science episteme.

A delusion exists, widespread and deeply rooted; it is the grand delusion regarding the creation-evolution controversy. It is the popular false belief that evolution theory is the result of pure, unadulterated, objective science. Nothing could be further from the truth. Alternative points of view about origins such as creation, theistic evolution and even monstrous births were widely discussed among Charles Darwin's contemporaries. Today the only point of view given serious consideration in textbooks and most periodicals is atheistic evolution, perpetuating the grand delusion. Atheistic evolution became orthodox, not because it was proved and the other disproved, but because of two opposing epistemes that exist concerning scientific methodology.

An episteme is the "historical *a priori* that in a given period delimits in the totality of experience a field of knowledge . . ." In other words, a point of view for a particular period of time. An episteme is similar to, but broader than, Thomas S. Kuhn's paradigm which is "a synthesis of sufficient scientific merit to draw practitioners away from rival theories and which functions as a source of future methods, questions, and problems."¹ The two epistemes in question are the creation science episteme and the positive science episteme.

The creation science episteme emphasizes mind, purpose and design in nature, while the positive science episteme holds that scientific knowledge is " . . . the only valid form of knowledge and is limited to the laws of nature and to processes involving 'secondary' or natural causes exclusively."² The positive science episteme "avowedly and purposely ungod[s] the universe."³ Gillespie describes the rivalry between the two sciences as follows:

Those who argue that there was no real warfare between science and religion in the nineteenth century ignore the presence of these two sciences. The old science was theologically grounded; the new was positive. The old had reached the limits of its development. The new was asking questions that the old could neither frame nor answer. The new had to break with theology, or render it a neutral factor in its understanding of the cosmos, in order to construct a science that could answer questions about nature in methodologically uniform terms. Uniformity of law, of operation, of method were its watchwords. The old science invoked divine will as an explanation of the unknown; the new postulated

yet-to-be-discovered laws. The one inhibited growth because such mysteries were unlikely ever to be clarified; the other held open the hope that they would be.⁴

Unfortunately for the positive science proponents, there are simply too many creationist scientists in the history of science who have made many discoveries and contributions to scientific knowledge to support the assertions in the above paragraph.

By the way, this article began as a review for the *Quarterly* of the book, *Charles Darwin and the Problem of Creation* by Neal C. Gillespie;¹ but because the book dealt with subject matter that I was in the process of researching, it turned out to be an article incorporating a review. Although Gillespie does not point this out, his book confirms what I had previously suspected, that the positive science episteme is the theory of evolution. The positive science episteme is simply a polite way of describing a prejudice against any belief in the supernatural. In other words, evolution theory does not exist to explain the origin of life, rather it exists to make prejudice respectable and acceptable.

Positivists would like to have us believe that the positive science episteme benefits science. The purpose of science, within its limitations, is to investigate and make truth statements about our environment. As to the origin of life, unless someone observes a plant or animal having evolved into another kind of plant or animal, evolution must remain a theory. But, by insisting upon excluding special creation or any other alternatives, the positive science evolutionists have destroyed the objectivity and the very purpose of science itself as it relates to the question of the origin of life. Positive science is really a biased policy of exclusion that limits the investigative powers of science and the education curriculum to a belief in evolution.

If, in reality, the episteme is the theory, then that would explain the unscientific techniques that are employed to support evolution theory, such as the extravagant use of analogies, which really have little scientific value, the insistence upon having natural selection conceived metaphorically rather than literally—metaphors, of course, are outside the realm of science—extrapolating microevolution as macroevolution, the overriding bias in all of the interpretations of the evidence for the origin of life, and the technique of immunizing evolution theory against disproof by mongering-in subsidiary hypotheses to explain away and neutralize conflicting facts. As, for example, efforts to explain away the absence of intermediate fossils, a fact that was recognized even before the *Origin of Species* was written.

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†As is explained in the text, this item began as a review of *Charles Darwin and the Problem of Creation*, by Gillespie, Reference 1, and developed into an article.

The Victorian Era

Proevolution authors seem to make a point of omitting consideration of socio-economic conditions at the time of the publication of the *Origin of Species*. Readers are given the impression that the social matrix of the times was irrelevant and that the positive science episteme is the result "of pure reason untouched by the world."⁵ I am convinced of quite the opposite—that the scientific and technological revolution that the Victorian era was experiencing was of paramount importance to the development of the positive science episteme. I would go far as to say that evolution theory and positivism, which it requires, are a direct product of what today is generally referred to as the industrial or scientific revolution. The industrial revolution made public attitude amenable to a prejudiced episteme. The success factor for evolution theory was not the invincible evidence or the soundness of the theory, but the utopian dream of a new world wrought by science. This dream that nearly everyone shared placed the public in an ingenuous frame of mind; was not evolution theory delivered to us under the auspices of science? Are not scientists the great benefactors of our time? Is not the scientific method infallible? Seldom in the history of mankind had the power and the prestige of a fraternal group risen so rapidly and to such dizzying heights as that of the scientific community. The impressions of Macaulay, the noted English historian, are described as follows:

Macaulay was full of admiration for the scientific revolution he was witnessing in the early nineteenth century, and in this, as in so many things, he typified his age. For him as for others, then and now, "science" meant only partly empiricism, a method of looking at data. More immediately, more tangibly, "science" meant the secondary results of the method: the products of technology. During the long reign of Queen Victoria, "science" transformed many of the conditions of people's lives. The first railroad was built in England in 1825, when Victoria was a little girl; before that, the maximum speed of land travel was for up-to-date Englishmen as it had been for Caesars and Pharaohs—the speed of the horse. But before the Queen and Empress died, almost all of Britain's now existing railroads had been built: "science" had begun that liberation of man from animal muscle, that acceleration toward inconceivable velocities which is so characteristic of our own age and is still as impressive to us as it was to the Victorians.

Impressive: "science was *doing* things, making things *work*. The practical, empirical, positivistic British temperament was fascinated. While Victoria occupied the throne, transatlantic steamship service was begun; power-driven machines revolutionized industry; the telegraph became a practical instrument and the telephone was developed; the electric lamp and the automobile were produced. Eight years before the *Origin*, the Victorians celebrated *Progress* at the first world's fair, in the fabulous Crystal Palace, where Macaulay felt as reverent as at St. Peter's. "Science" was making

things happen; it could predict their occurrence; its success precluded doubt. It seemed to many, at the time, final and unambiguous. One could depend on it.⁶

The sociologists immediately recognized the philosophical implications of the theory and began introducing it to the public on that basis. The question of the scientific validity of the theory became and remains, for most people, lost in its philosophical consequences.

Evolution theory supposedly arose by science and by science it must stand or fall, and yet it soon happened that the theory became instead a popular ethical, social and philosophical concept that soon permeated nearly every aspect of Western culture:

Persuasive because "science" was persuasive, evolution became a watchword to the late Victorians. By the end of the century, hardly a field of thought remained unfertilized by the "new" concept. Historians had begun looking at the past as "a living organism"; legal theorists studied the law as a developing social institution; critics examined the evolution of literary types; anthropologists and sociologists invoked "natural selection" in their studies of social forms; apologists for the wealthy showed how the poor are the "unfit" and how Progress, under the leadership of the "fit" was inevitable; novelists "observed" their creatures as they evolved in an "empirical" way; and poets hymned a creative life-force.⁷

The social Darwinists had become an unexpected and powerful ally to the evolutionists. The social, ethical and philosophical selling points propagated by evolution theory and enforced by the Victorian's overriding awe of science became the chief defenses for evolution theory. George Bernard Shaw candidly stated that:

Never in history, as far as we know, had there been such a determined, richly subsidized, politically organized attempt to persuade the human race that all progress, all prosperity, all salvation, individual and social, depend on an unrestrained conflict for food and money, on the suppression and elimination of the weak by the strong, on Free Trade, Free Contract, Free Competition, Natural Liberty, Laissez-Faire: in short, on "doing the other fellow down" with impunity . . .⁸

Charles S. Pierce arrived at a similar conclusion that Darwin's hypothesis was nowhere near to being proved, but its favorable reception "was plainly owing, in large measure, to its ideas being those toward which the age was favorably disposed, especially, because of the encouragement it gave to the greed-philosophy".⁹

The theory had become, to a large degree, removed from accountability to the scientific community that had spawned it. Evolution theory rode to acceptance on the coattails of the positive science episteme. The new materialism of the age required a materialistic explanation for the origin of life. Consequently no matter how many facts contradict evolution, it still had to be accepted because the alternative was creation, and creation was contrary to positivism. In other words, evolutionists have the mental capability to be true to positivism, while being unfaithful to science and all the

while giving the impression that they are the great defenders and lovers of science. For example, "Joseph LeConte believed in evolution despite what he took to be the adverse verdict of geology because regularly occurring 'secondary causes and processes' were all that science knew, and that meant evolution."¹⁰ In other words, he believed in evolution because he believed in positivism, which of course, begs the question as to how life originated. I would venture to guess that LeConte's attitude is typical of many present-day evolution proponents.

The Bias of the Founders of Evolution Theory

There is evidence that the main attraction to evolution theory for some of the founders was not the "scientific-ness" of it, but the negative effect it has on organized religion. Evolution theory was seen as a way to advance their philosophy while diminishing the influence of religion.

Edwin G. Conklin, late professor of biology at Princeton, frankly admitted that "The concept of organic evolution is very highly prized by biologists, for many of whom it is the object of genuinely religious devotion, because they regard it as a supreme integrative principle. This probably is the reason why severe methodological criticism employed in other departments of biology has not yet been brought to bear on evolution speculation."¹¹

T. H. Huxley may serve as a case in point. Huxley was the self-proclaimed teacher of the theory in England. He took it upon himself to introduce the theory to the public with a series of articles and lectures. Personally he regarded Darwin's theory as merely a "working hypothesis," which is a rather low status; an hypothesis being considered something less than a theory. Yet, he reportedly tells his wife that "By next Friday evening, they will all be convinced that they are monkeys."¹² Why the contradiction? Why the desire to convince an awestruck public that the status of the theory is anything more than a "working hypothesis"? Perhaps his thinking was influenced by his well-known religious animosity.

John Dewey, one of the founders of the progressive education movement, recognized that "the new logic of Darwin's forswears inquiry after absolute origins and absolute finalities in order to explore specific values and the specific conditions that generate it. This has been the most common philosophical import of the *Origin*."¹³

Exclusion of theology and the concept of special creation was looked upon by some as the great virtue of evolution theory. Julian Huxley, grandson of T. H. Huxley and one of the chief spokesmen for the theory, declared "that he was an atheist and that Darwin's real achievement was to remove the whole idea of God as a creator of organisms from the sphere of rational discussion."¹⁴ In the same vein, Ludwig Plate, a German advocate of the theory, explains that "Darwin's greatest service in his opinion is in the fact that he saw to explain organic finality out of natural forces to the exclusion of any metaphysical principle operating with conscious intelligence."¹⁵

Ernest Haeckel, the German promoter of the theory, reacted similarly when for him "Christianity had been superseded by a worship of humanity in general combined with enthusiasm for the enlightened minds of classical antiquity and hatred against the ecclesiastical reaction . . ."¹⁶

Finally, John A. Moore, present-day spokesman for evolution, (not to be confused with John N. Moore, a well-known creationist) seems to echo the founders regarding the positive science episteme when, in an article in *The American Biology Teacher*, he laments the statistics that indicate: "Among 16 to 18-year-olds, 71% believe in ESP, 64% in angels, 28% in ghosts."¹⁷ He seems to think that it is the responsibility of secondary education to root out belief in the paranormal or supernatural and that the public schools have failed in this responsibility. Moore's regrets are contrary to reality. I do not think a majority of parents are concerned about having their children disbelieve in the supernatural. Nor do a majority of educators think it is their responsibility to indoctrinate students into believing only that which is scientifically explainable. Perhaps evolutionists' concern about the supernatural is that as long as some people believe in it there will also be some who will believe in creation.

I do not mean to imply that everyone who accepts evolution theory as an explanation for the origin of life shares the same animosity toward theology that Haeckel and Huxley shared, but I do believe that most of them are convinced that the positive science episteme is justified and consequently their objectivity is jeopardized. The point of all of this is that a scientific theory should stand or fall on its scientific merits and should not be maintained on its philosophical ramifications or a prejudiced episteme.

Sometimes positivism is described under the misnomer of the Doctrine of the Neutrality of Science. Chauncey Wright, an occasional professor of mathematics at Harvard, is credited with this idea. He became interested in evolution shortly after the *Origin* was published to the extent that he carried on a personal correspondence with Darwin and published articles in defense of the theory. Wright's "neutrality" doctrine called upon investigators to be free from the domination of *a priori* systems at all times keeping ethical sentiments separate from scientific knowledge. Thus Darwin's system was a scientific theory of biology, a hypothesis which had no necessary causal effect on religious, philosophical, or social matters. Also, evolution theory was to be presented "with no regard for any considerations that might produce unnecessary and unwarranted 'conflicts' with religion."¹⁸ At first glance, the neutrality concept seems like an acceptable bit of logic until one realizes that, if we cannot consider origins theistically, then we must, from lack of choices, consider it only materialistically. The Doctrine of the Neutrality of Science is really a license to consider scientific evidence for the origin of life only from an *a priori* belief in evolution.

Evolution Dogma

Perhaps it would be well to demonstrate how positiv-

ism biases the evidence and the curriculum. Let us analyze comparative anatomy, one of the studies which is supposed to supply the hypotheses that make up the theory, and perhaps one of the most impressive when considered exclusively from an evolution bias. Comparative anatomy means to compare body parts and, according to the evolution belief, this means that any-time similarities are observed among plants or among animals it is taken to indicate that they had a common evolutionary ancestor. It is quite convincing to see pictures of the skeletal similarities of a turtle and the human being, for example, and interpret the similarities to mean they evolved from a common ancestor. What the student often fails to realize is that one may compare body parts down to the molecular level, but it will never ever tell us how these organisms originated. In other words, comparative anatomy is convincing only so long as the observer *a priori* assumes evolution. There is no test to prove the evolution interpretation of comparative anatomy. Other nontestable hypotheses in the congeries of hypotheses that make up evolution theory are geographic distribution, embryology, and vestigial parts. Evolutionists, like pioneer natural philosophers in the past, fail to make a distinction between testable and non-testable hypotheses. Darwin himself, in a letter to Asa Gray, admitted: "I am quite conscious that my speculations run quite beyond the bounds of true science."¹⁹ The history of science reveals a long struggle between those who would neglect and de-emphasize experimentation to test hypotheses and those who would give emphasis to it.

Ritterbush, describing eighteenth century naturalists, reports that "Although the authority of science was invoked on their behalf, the concepts reflected an improper understanding of organic nature, far exceeding the evidence given for them, and too often led naturalists to neglect observation and experiment in favor of abstract conceptions."²⁰ He also describes them as preferring unlimited explanation based upon speculation rather than limited explanation relying upon experimentation. In a similar vein, Nordenskiöld notes that, "During the reign of romantic natural philosophy, conditions were different, the representatives of that school, who imagined that they could solve all the riddles of existence by speculation, deeply scorned experiment, which they considered led to fruitless artifice."²¹

On the other hand, Leonardo da Vinci, noted for his scientific as well as his artistic accomplishments, insisted upon experimentation: "If experience fails to confirm the hypothesis, it must be abandoned; and apart from positive experimental confirmation it has no value."²² Rene Descartes, seventeenth century science reformer, insisted that hypotheses "... must receive a completely cogent demonstration before they can properly be admitted as scientifically valid conclusions."²³ Roger Bacon "... saw clearly the value of the experimental method as the only route to certainty."²⁴ Bacon lived in the thirteenth century and was a pioneer advocate of experimentation to test hypotheses. (Sometimes critical observation—not speculation—is a sufficient experiment or test.) Advancing to the present time, Dellow states that "... experiment is the final

arbiter."²⁵ Thus we see a unity of thought spanning some seven hundred years.

Finally, Sir Karl Popper advances the issue further by pointing out the obvious: "A theory which is not refutable by any conceivable event is nonscientific." And "... the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability."²⁶ He also urges investigators to "Try again and again to formulate the theories which you are holding and to criticize them. And try to construct alternative theories—alternatives even to those theories which appear to you inescapable; for only in that way will you understand the theories you hold. Whenever a theory appears to you as the only possible one, take that as a sign that you have neither understood the theory nor the problem which it was intended to solve."²⁷

We have learned, then, that nontestable hypotheses are not even in the realm of science and that alternative hypotheses should always be considered. Alternatives will introduce skepticism, the forerunner to objectivity. But if nontestable hypotheses are non-scientific, what is their status? What they must be are statements of belief based upon a certain set of facts influenced by the investigator's personal philosophy, religion, or intuition. Others with a different philosophy, religion, or intuition may view the same set of facts entirely differently.

Alternative creation interpretations for the evidence would serve to remove the theory from the realm of scientific dogma. Why not consider creation? The creation reply to the evolution interpretation for comparative anatomy could be: What if similarities are observed? One would expect similarities among organisms under the *a priori* assumption of creation. One would not necessarily expect each kind of organism, all living in the same biosphere, to be unequivocally different in every detail from every other kind of organism. There is no test for either the creation or evolution interpretation for comparative anatomy; consequently, it proves nothing in that it is supportive of both beliefs. Can the creation interpretation be faulted, when the evolution interpretation is obviously just as much a matter of personal belief?

Darwin's Confusion

Probably no one was more confused about the question of the origin of life than Charles Darwin. He, of course, rejected the idea of creation and even went so far as to formulate "tests" which, to him, disproved creation. For example, God would only have created distinct species; he would not have made hybridization a possibility.²⁸ God would not have created rudimentary organs.²⁹ God would not have created orchids with such an "endless diversity of structure" simply for achieving fertilization.³⁰ God would have created the blind cave animals of Europe and America, because of their identical conditions to life, to resemble each other closely; instead they are not closely allied.³¹ God would not have created plants to be so prodigal in the amount of pollen they produce—only a small amount of which is utilized in fertilization.³² Well, all that these quaint "tests" tell us, of course, is how Darwin would or would not have created. Apparently the positive science

episteme does after all allow consideration of creation, but only if it is considered in a negative context.

Darwin also rejected theistic or designed evolution, the idea held by some of his contemporaries that the evolutionary process was somehow under the direction of God. His reason for rejecting theistic evolution was that it "was but a disguised form of special creation."

I entirely reject, as in my judgment quite unnecessary, any subsequent addition "of new powers and attributes and forces"; or of any "principles of improvement," except insofar as every character which is naturally selected or preserved is in some way an advantage or improvement, otherwise it would not have been selected. If I were convinced that I required such additions to the theory of natural selection, I would reject it as rubbish . . . I would give nothing for the theory of Natural Selection, if it requires miraculous additions at any one stage of descent.³³

Theistic evolution had to be rejected by Darwin because it ran contrary to the positive science episteme in that it failed to "ungod the universe." Also, it made his mechanism for evolution, natural selection, superfluous. If variations and/or selection was preordained, there was no point in even considering the mechanism. Evolution simply became a slowed-down version of creation.

Rejection of special creation and theistic evolution leads us to the one remaining option—chance or atheistic evolution, which is what is taught in the typical textbook. One would think that this must be where Darwin stood. But, no, we find that he also rejected chance. In a letter to Asa Gray he wrote:

I grieve to say that I cannot honestly go as far as you do about Design. I am conscious that I am in an utterly hopeless muddle. I cannot think that the world as we see it, is the result of chance; and yet I cannot look at each separate thing as the result of Design.³⁴

Late in his life, in a conversation with the Duke of Argyll, who commented to Darwin that "it was impossible to look at the numerous purposeful contrivances in nature and not see that intelligence was their cause," Darwin "looked at (him) very hard and said, 'Well, that often comes over me with overwhelming force; but at other times,' and he shook his head vaguely, adding 'it seems to go away.'"³⁵

Having rejected creation, theistic or designed evolution, and atheistic or chance evolution, Darwin seemed to have been in a hopeless muddle on the question of the origin of life. Gillespie concluded that he died with some vague notion of theism. It seems reasonable that, if Darwin's theory is taught, his confusion on the subject should also be part of the curriculum.

Present-Day Attitudes

The Victorian generation has long since passed away and this generation has become the jaded inheritor of a scientific revolution, some aspects of which inspire fear and dread rather than the old confidence. Science and technology are now viewed through the baleful eyes of those who have discovered their "hidden worms,"

mainly in the form of environmental degradation and health hazards. The new public attitude toward science and technology is plainly noted in a recent issue of *Science*:

Important to the future of science and technology is the fact that the public has somewhat lost confidence in the ultimate value of the scientific endeavor. It is not that they hold pure science or scientists in any less esteem. But they are less certain that scientific research will inevitably yield public benefit.

For the first time in centuries, there are thoughtful persons who are not morally certain that even our greatest achievements do, indeed, constitute progress. To some philosophers it is no longer clear that objective knowledge is an unquestioned good.³⁶

In a *Time* magazine essay entitled "*Science: No Longer a Sacred Cow*," the author called the moon explorations the grand finale in the continued rise of the prestige of science. Contrast excerpts from the *Time* essay with Macaulay's description of science and technology cited earlier:

Sure enough, down it (prestige) went. And in its place has risen a new public attitude that seems the antithesis of the former awe. That awe has given way to a new skepticism, the adulation to heckling. To the bewilderment of much of the scientific community, its past triumphs have been downgraded, and popular excitements over new achievements like snapshots from Mars seem to wane with the closing words of the evening news. Sci-Tech's promises for the future, far from being welcomed as harbingers of Utopia, now seem too often to be threats. Fears that genetic tinkering might produce a Doomsday Bug, for example, bother many Americans, along with dread that the SST's sonic booms may add horrid racket to the hazards (auto fumes, fluorocarbons, strontium 90) that already burden the air.

The new skepticism can be seen, as well as heard, in the emergence of a fresh willingness to challenge the custodians of our technical know-on their own ground. It is most conspicuously embodied in the environmental crusade and the consumer's rebellion, but is also at play across a far wider field. It applies to public light and political heat to Detroit's automotive engineers, who for generations had dispatched their products to an acquiescent public. It encompasses protests against the location of dams massively certified by science, to open disputes about the real values of scientifically approved medicines, and the increasing willingness of patients to sue physicians to make them account for mistakes in treatment. Sci-Tech, in a sense, has been demoted from a demigodhood. The public today rallies, in its untidy way, around the notion that Hans J. Morgenthau put into words in *Science: Servant or Master?*: "The scientists' monopoly of the answers to the questions of the future is a myth." The fading of this mythology is the result of Americans' gradual realization that science and

technology's dreamy wonders sometimes turn out to be nightmarish blunders. Detergents that make dishes clean may kill rivers. Dyes that prettify the food may cause cancer. Pills that make sex safe may dangerously complicate health. DDT, cyclamates, thalidomide and estrogen are but a few of the mixed blessings that, altogether, have taught the layman a singular lesson: The promising truths of science and technology often come with hidden worms.³⁷

The Role of Education

The time has come to dispel the grand delusion and reject the positive science episteme. It is time for education to establish its own criteria upon the evolution curriculum. Darwin as scientist does not qualify as Darwin as teacher. The criteria that Darwin used to develop his theory are not up to par as the criteria used to teach the theory. In other words, positivism in education means indoctrination.

Following are some of the curriculum objectives that I have developed over a period of ten years. They serve to remove evolution theory from the realm of scientific dogma so that one may teach rather than indoctrinate. To begin with, the congeries of hypotheses that one finds in the typical textbook, and most of which Darwin used in the *Origin*, should be categorized into testable or nontestable hypotheses. The basic hypotheses would then be categorized as shown in Table 1.

An educator need not teach any particular account of creation, which would probably require the teaching of all accounts of creation. Creation should be considered only in relation to the scientific evidence presented for evolution, without any theological elaborations. When this is done, it becomes obvious to students that the textbooks are biased and that the nontestable hypotheses may be interpreted satisfactorily for creation. A creation consideration of the nontestable hypotheses immediately removes the theory from the realm of scientific dogma. It is, of course, contrary to the positive episteme, because it no longer ungodly the universe, but education must reject positivism.

Concerning the testable hypotheses, one must consider the unthinkable—does evolution theory pass or fail tests? In most cases the test is simply a critical observation of our environment. For example, Darwin never observed natural selection and was forced to use imaginary examples in the *Origin*. If natural selection is not observed, why isn't it?

To ask whether or not evolution theory passes tests is based upon the following alternative: To use the vernacular, the bottom line in evolution theory is that chance can create an intelligent design; this is what is taught in

the typical textbooks. The alternative is that our ability to reason as human beings is the result of creation rather than chance. Remember, also, that science is basically a reasoning process. If that is true, it would mean, then, that any scientific theory that denies the existence of God would have to be unreasonable, unscientific, and in some way or ways subject to disproof. The creation alternative requires that we ask ultimate questions—evolution or dogma does not.

Conclusion

Space does not permit an analysis of the hypotheses. The point that I wish to make is that a distinction is made between testable and nontestable hypotheses which allows for consideration of creation. My personal experience of including a creation alternative indicates that parents have rejected positivism and its biased policy of exclusion. Educators must be prepared to do likewise. The old convoluted logic of positivism that evolution must be accepted because it is forbidden to consider alternatives has no place in education. For those who are philosophically committed to evolution theory, the problem is obvious—they must decide whether or not they can place professional standards above personal beliefs.

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- ⁴*Ibid.*, p. 53.
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(Continued on page 26)

Table 1. Testable and non-testable hypotheses contrasted.

Testable Hypotheses	Non-testable Hypotheses
natural selection	comparative anatomy
artificial selection	geographic distribution
mutations	embryology
fossil record	vestigial organs

A PHYSICIST LOOKS AT EVOLUTION†

H. S. LIPSON*

Darwin's book, *On the Origin of Species*, was published in 1859. It is perhaps the most influential book that has ever been published, because it was read by scientist and nonscientist alike, and it aroused violent controversy. Religious people disliked it because it appeared to dispense with God; scientists liked it because it seemed to solve the most important problem in the universe—the existence of living matter. In fact, evolution became in a sense a scientific religion; almost all scientists have accepted it and many are prepared to 'bend' their observations to fit in with it.

What has this to do with physics? Is it not biology? Perhaps so, but I believe strongly that physicists should be prepared to turn their minds to any problems to which they can make contributions. The work of Perutz and Kendrew on the structures of haemoglobin and myoglobin, and of Hodgkin and Huxley on nerve and muscle, shows that physical scientists can make important contributions to biological research.

I have always been slightly suspicious of the theory of evolution because of its ability to account for *any* property of living beings (the long neck of the giraffe, for example). I have therefore tried to see whether biological discoveries over the last thirty years or so fit in with Darwin's theory. I do not think that they do.

Darwin himself had considerable doubts; his book contains a chapter called 'Difficulties on theory'. Of particular interest to the physicist are his remarks about the eye: 'To suppose that the eye, with 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 been formed by natural selection, seems, I freely confess, absurd in the highest possible degree.' Nevertheless, he goes on to suggest how an eye *could* have developed from a simple light sensitive organ, but there is no evidence that it *did* develop in that way.

Relevance of Recent Research

In 1859 the general principles of the body were understood. The functions of the various organs were known but not the details of their operation. In the last thirty years we have learned a great deal about life processes (still a minute part of what there is to know!) and it seems to me to be only fair to see how the theory of evolution accommodates the new evidence. This is what we should demand of a purely physical theory.

To my mind, the theory does not stand up at all. I shall take only one example—breathing. Darwin knew,

of course, that we draw air into our lungs, that the oxygen in it is somehow incorporated into our blood, and that the heart pumps the blood round our bodies so that the oxygen can perform its required services. He had no idea how complex the whole operation is. We know that it involves a complicated chemical, haemoglobin, the molecule of which contains several thousand atoms. Thanks to the work of people such as Perutz and Kendrew, we now know how the molecule is constructed and we know the conditions under which the oxygen molecules are held and released. We still do not understand the nature of the forces; they are necessarily very delicate, and for this reason a large molecule is needed.

Darwin says 'If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications my theory would absolutely break down.' I know that haemoglobin is not an organ but the principle is the same; I do not see how the haemoglobin molecule could have evolved. It is true that haemoglobins in different animals are not identical, but they are all about equally complicated. (Personally, I cannot envisage the evolution of even a simple organ such as the heart, but no doubt other people have better imaginations than I!)

Thermodynamical Considerations

The beautiful and meticulous system which we call a living being is an ordered one; each atom must be in its right place. Generally systems tend to disorder—maximum entropy. Living beings seem to disobey this rule.

There is however a well known phenomenon that does defy the rule—crystallisation. It may be thought that this is a simple analogue from which the principles of life may be developed. We know, however, that crystallisation occurs because entropy S is not the deciding factor; internal energy U is also important. The quantity that must be minimised is the free energy. ($U - TS$), and U is small for a crystal because the atoms are carefully packed together. As the temperature T increases, S becomes more important, and the crystal first becomes liquid (usually) and then gaseous.

Therefore, if we wish to regard the birth of an animal as regulated by the principles of thermodynamics, we must believe that the developing arrangement of atoms is that of lowest internal energy. My mind boggles!

Alternative to Evolution

If living matter is not, then, caused by the interplay of atoms, natural forces and radiation, how has it come into being? There is another theory, now quite out of favour, which is based upon the ideas of Lamarck: that if an organism needs an improvement it will develop it, and transmit it to its progeny. I think, however, that we must go further than this and admit that the only acceptable explanation is *creation*. I know that this is anathema to physicists, as indeed it is to me, but we must not reject a theory that we do not like if the experimental evidence supports it.

*H. S. Lipson, CBE, F. Inst. P., FRS, is at the University of Manchester Institute of Science and Technology. He has asked us to make it clear that he wrote this article for scientific purposes. We agree that it is legitimate, and useful, to discuss the matter as a point of science.

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An animal—particularly the human animal—is a beautiful example of a carefully contrived and subtly engineered design. The word 'design' comes naturally even in evolutionist books. The Designer must know infinitely more science than we shall ever know. He started off with a few simple examples and, learning from them, introduced new and improved species. He gradually incorporated new properties, imagination and free will being the latest ones. He is probably learning that these are not enough, since they seem to cultivate a propensity to selfdestruction.

I find these ideas comforting, for if we do destroy ourselves, a superior model will be created, whereas according to the theory of evolution we are doomed.

I should be happy to know what my fellow physicists think of these admittedly extraordinary ideas. In putting them forward I can claim to be in good company. According to Darwin, when Newton put forward his theory of gravitation, Leibnitz accused him of introducing 'occult qualities and miracles into philosophy.' What was this gravitation? How could two inanimate

bodies attract each other? Newton replied laconically 'Hypotheses non fingo'. When I am asked to describe my ideas of the Creator I also say 'Hypotheses non fingo'!

Darwin was fond of the quotation 'Natura non facit saltum' (Nature does not make jumps). I wonder what he would have thought of the quantum theory!

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A PRE-MAIN-SEQUENCE STELLAR MODEL APPLIED TO CLOSE BINARY STAR SYSTEMS

JON K. WEST*

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The study of the stars would be very difficult if there were no binary systems. We can be glad that the Lord provided over half of the stars in our part of the universe as binary or multiple star systems. By studying the motion of binary stars, much can be learned about the stars considered individually.

The Study of Binary Star Systems

If Kepler's law is applied to the motion of eclipsing binaries, it yields an absolute determination of the total mass, and the stars' separation. If the spectrum of an individual star can be discerned, then the velocities of each component star can be determined from the Doppler frequency shift of specific spectral lines. The individual stellar velocities being known, the individual masses can be determined from the total mass. Finally, by studying the variations in the light emitted by the binary system, the actual radius of each star can be found.

Now, the problem becomes that of relating the light output of the star to its distance. For only a very few stars near the earth can direct measurement of their distance be made by triangulation (i.e., parallax). Distances to the rest of the objects in the universe must be found by indirect means. Two of the most reliable of the indirect methods come from studying binary stars.

The first of these indirect methods applies the inverse-square law of light. The color of an eclipsing binary can be determined by studying the stellar spectrum. This yields an effective surface temperature. If the individual

stellar radius has been found from the light-curve analysis, then the light-emitting surface area is known. This gives an absolute luminosity (or magnitude) from classical thermodynamics. If we compare the observed luminosity with the calculated luminosity, then the distance can be estimated fairly well.

The second method is called dynamical parallax. The calculated binary separation can be compared with the observed angular separation. The base line of this triangle is the distance to the system.

There is, of course, much more to the study of binary stars than could be covered in this brief discussion. As a matter of fact, most of the data available on stellar temperatures, masses, radii, luminosities, and distances, come from a handful of eclipsing binaries. See Reference 6 for more information.

The Hertzsprung-Russell Diagram

See Reference 1 for a good discussion of the distribution, characteristics, and spectral classification of stars. Work by E. Hertzsprung and H. N. Russell led to the general relationship between the spectral type (color or surface temperature) and the absolute luminosity (or stellar magnitude). The dashed line in Figure 1 shows this general relationship, as determined empirically. The stellar luminosity is shown on a logarithmic scale,

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in terms of its ratio to that of the Sun. The (effective) surface temperature is also shown by plotting its logarithm. The stars conforming to the dashed line are known as the main sequence. In general, the hotter a star, the more luminous it is, as one might expect. However, the relationship would have been difficult to work out in detail without the data gained from the study of binary stars.

The Evolution of Stars

I shall state here the conventional account, without arguing either for or against it.

The main sequence is considered to consist of stars, called "normal", deriving their energy by the fusion of hydrogen. Stars not on the main-sequence are usually thought to have exhausted their fuel, or to be in some stage of so doing. This stage is called "post-main-sequence"; the star is believed to expand, and the result is large, cool, highly luminous stars, known as red giants. These are above the main sequence.

In time, even the capability of remaining red giants would be exhausted. Then the stars are supposed rapidly to cross the main sequence (too rapidly to be observed?) and to come to a region below the main sequence. Stars of this sort are small, very hot, and of low luminosity. They are called white dwarfs.

There is supposed also to be, or to have been, a rapid stage of evolution, known as pre-main-sequence. Stars in this stage are supposed to derive their energy from gravitational contraction. Most evolutionists consider this stage to be too transient to be worth much study.

The Evolution of Binary Stars

If binary stars are considered to have evolved in a way similar to that just discussed, one would expect to find some consistent relation between the stages of the two stars. This is where the story breaks down. There is a class of binaries known as semi-detached systems, in which the stars almost touch each other. These systems have a large secondary, of lower mass, and a small primary star, of higher mass. According to the scenario mentioned above, the larger secondary would appear to be at a later stage of evolution than the primary. This presents a problem, for typical models, as solved e.g. with the help of a computer, predict that the more massive star should evolve more quickly than the less massive. So, to re-state the problem, why is the star of lower mass larger than the other?

Commonly, attempts to answer this question propose complex transfers of mass between the two stars. May there not, however, be another and much simpler explanation? Maybe both stars are very young, and are powered by gravitational contraction. Then nuclear fusion need not be involved, and the post-main-sequence models would not apply.

Pre-Main-Sequence Binary Stars

Conventional models of close binary systems (usually computer models, nowadays) commonly start with at least one of the component stars on the main sequence. Thus they assume that the system under study is cosmo-

Table 1. The ages (E + 6) at various points for the test model, compared with Iben's figures (Reference 5.)

Age Point	Primary 3 Solar Masses		Secondary 1.5 Solar Masses	
	Iben	Test	Iben	Test
1	0.034	—	0.23	0.205
2	0.208	0.06	2.36	1.391
3	0.763	0.747	5.80	3.483
4	1.135	1.202	7.58	4.949
5	1.250	1.351	8.62	5.949
6	1.465	1.432	10.43	—
7	1.741	—	13.39	—
8	2.514	—	18.21	—

logically old. According to the conventional evolutionary theory, one or both of the binary components will move above the main sequence as the star becomes exhausted of its hydrogen fuel. Then, as the more massive star expands, it transfers matter to the less massive companion. After a period of such transfer, the system will appear to have an older, less massive, secondary.

Models of pre-main-sequence binaries have been computed to study the transfer of mass;⁹ but no computations were published until 1980.⁸ These models undertake to follow the evolutionary tracks of a binary system as it contracts onto the main sequence. No other

CAPTIONS FOR THE ILLUSTRATIONS

On the following pages are shown the plots, according to the model, of some of the systems studied, according to the pre-main-sequence binary model. In every case, the filled circles indicate the track of the primary, the open, the secondary. When the model is compared with an actual system, the latter is indicated by the triangles, with the same convention as to filled or open.

The various parts concern the following systems:

1. The model for a test binary, primary $3M_{\odot}$, secondary $1.5M_{\odot}$.
2. TV Cassiopeia, Primary $3.1M_{\odot}$, secondary $1.39M_{\odot}$.
3. IM Aurigae, primary $2.97M_{\odot}$, secondary $0.89M_{\odot}$.
4. U Cephei, primary $3.19M_{\odot}$, secondary $1.53M_{\odot}$.
5. AI Draconis, primary $2.18M_{\odot}$, secondary $1.03M_{\odot}$.
6. U Sagittae, primary $4.27M_{\odot}$, secondary $1.60M_{\odot}$.
7. Delta Librae, primary $2.96M_{\odot}$, secondary $1.31M_{\odot}$.
8. Beta Persei, primary $3.15M_{\odot}$, secondary $0.74M_{\odot}$.
9. V505 Sagittarii, primary $2.22M_{\odot}$, secondary $1.18M_{\odot}$.
10. X Trianguli, primary $1.72M_{\odot}$, secondary $1.00M_{\odot}$.
11. TX Ursae Majoris, primary $3.13M_{\odot}$, secondary $0.90M_{\odot}$.
12. W Ursae Minoris, primary $2.68M_{\odot}$, secondary $1.19M_{\odot}$.

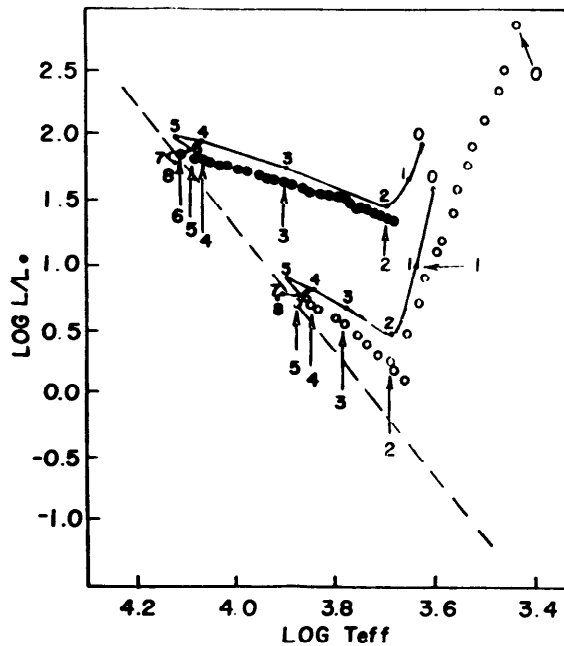
work seems to have been done, despite reports that some observed binary systems appears to be pre-main-sequence.²

The present investigation has set up pre-main-sequence models of eleven individual close binary systems.⁷ The observed positions on the Hertzsprung-Russell diagram are compared with the evolutionary tracks arising from the model. If both components appear to have the same age and fall near the tracks of the

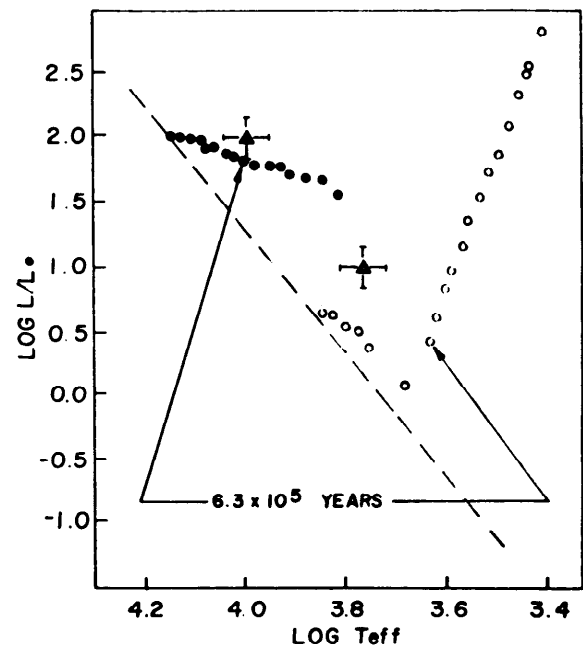
model, then the system may indeed be pre-main-sequence. Eleven semi-detached binaries were considered, each with a total mass between 2.5 and 6 solar masses. The periods ranged between 0.9 and 3.4 days.

Model and Results

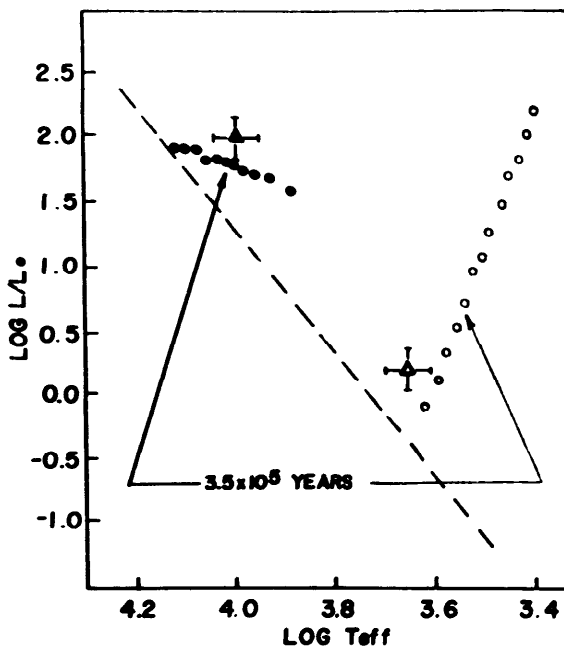
The stellar structure is represented by a polytrope of index $n=3$ for the radiative solution. A polytrope of in-



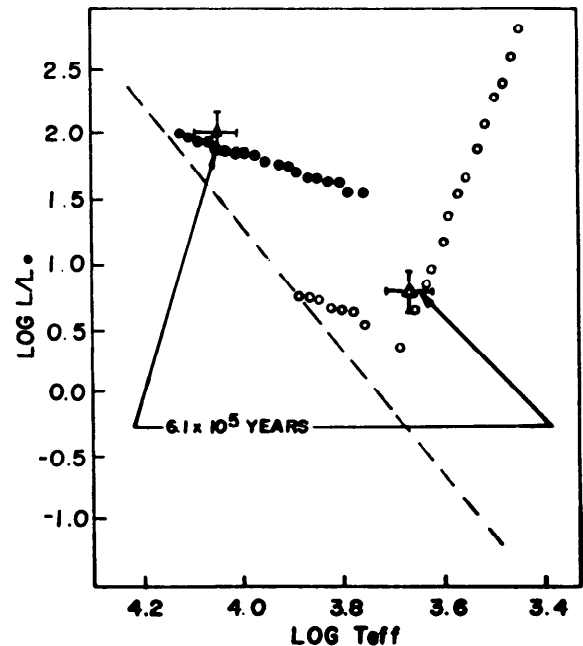
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4

dex $n = 1.5$ is used for the Hayashi solution.⁴ The initial configuration is constrained by the Roche lobe of each star. This limits the radius of each component of the system. The basic assumptions are as follows:

1. Mass and energy are conserved; both for the individual components and for the binary system as a whole.

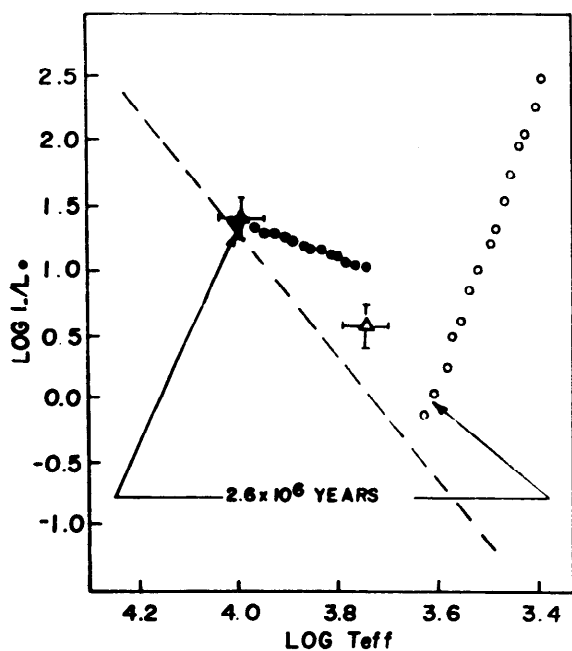
2. The binary system obeys conservation of angular momentum, with circular orbits.

3. The stars are spherically symmetrical.

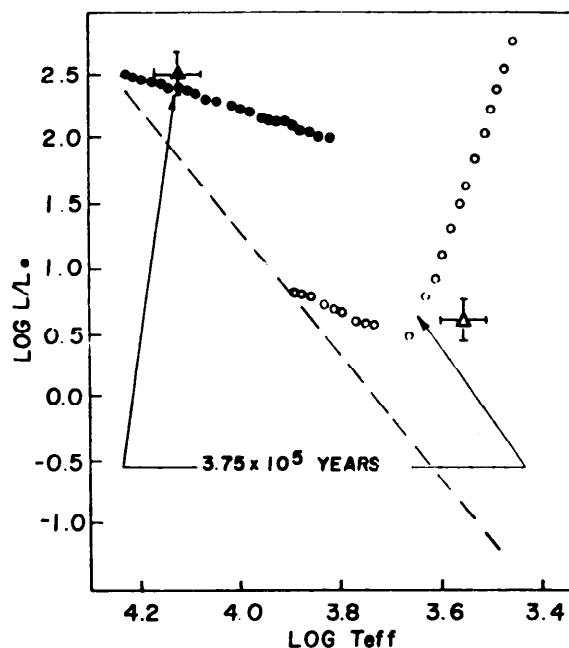
4. The stars are in quasi-hydrostatic equilibrium.

5. The chemical composition of population I type stars is chosen to be the same for each star: $x = 0.750$, $y = 0.224$, and $z = 0.025$.

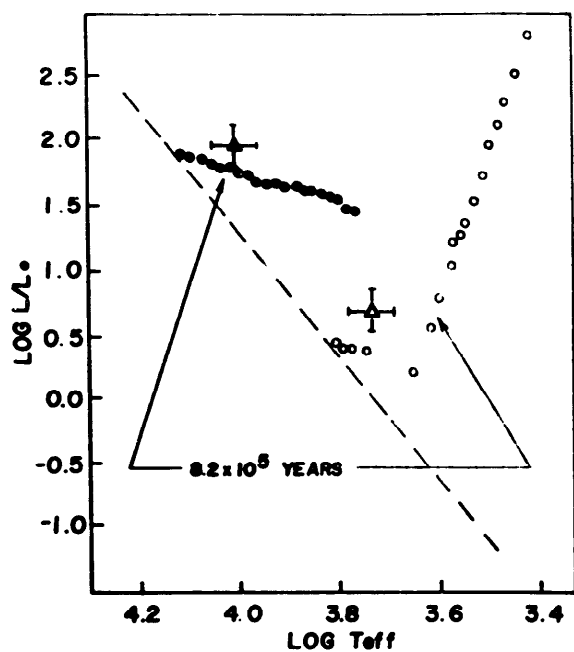
The masses of each star and their periods being free parameters, a computer program calculated the sequence of contraction models. Since both sequences were calculated together, the ages and structures of



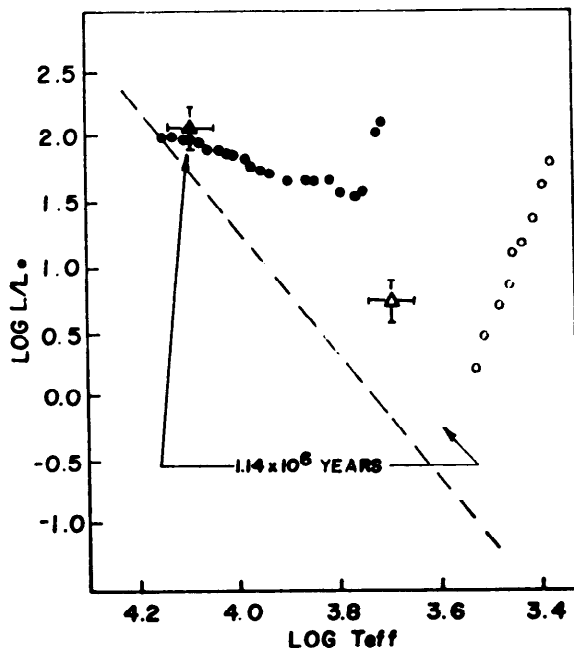
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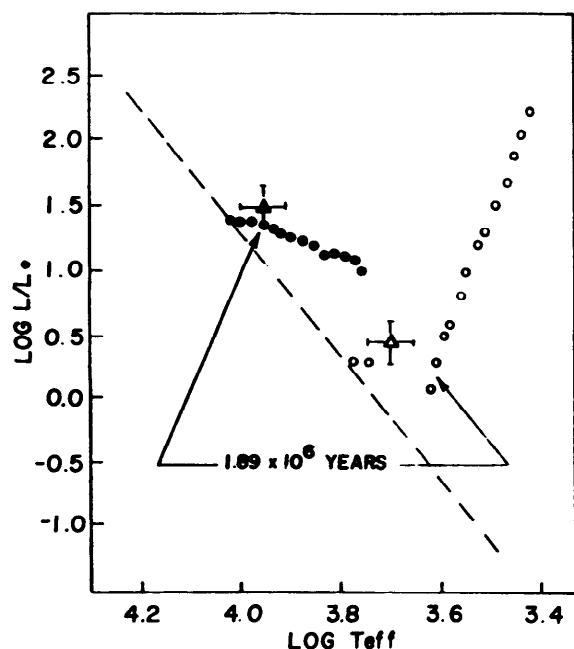
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each component could be compared. A test model was compared with the evolutionary tracks published by Iben.⁵ The primary for the test model was 3 solar masses, the secondary 1.5, and the period 3 days. Initially both test stars were on the Hayashi track.

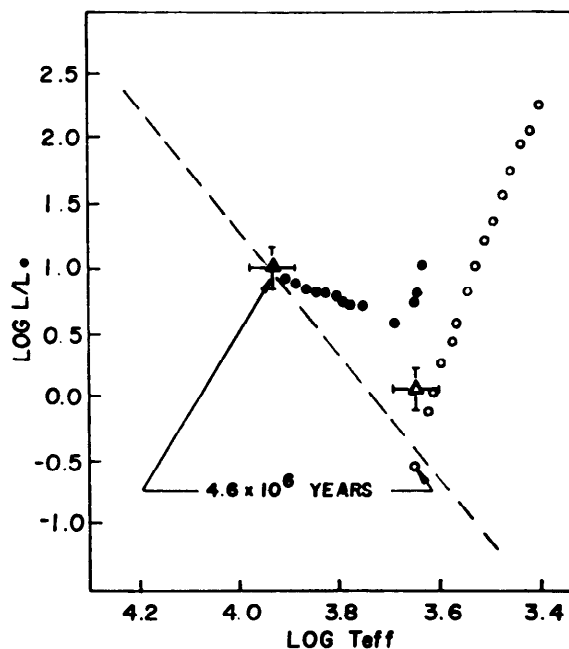
Figure 1 shows the plots of the test model and Iben's pre-main-sequence tracks for single stars on the Hertzsprung-Russell diagram. The initial point for

Iben's model is labelled "0". The points 1 through 5 can be used for age comparison with the test model. The same numbering was used for the test model. Table 1 shows the ages ($E+6$) at these points for each star.

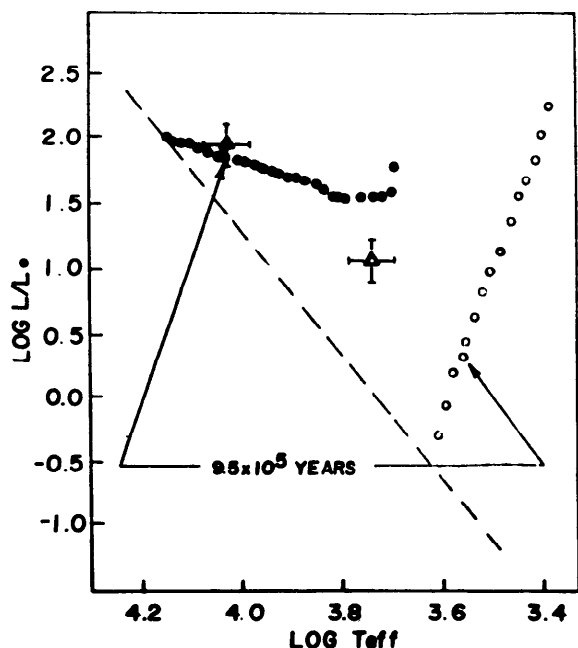
The absolute dimensions of the eleven systems were published by Giannone and Giannuzzi.³ Figures 4, 10, and 12 show the three systems found to fit the pre-main-sequence model best. They are: U Cephei at $6.1 E+5$



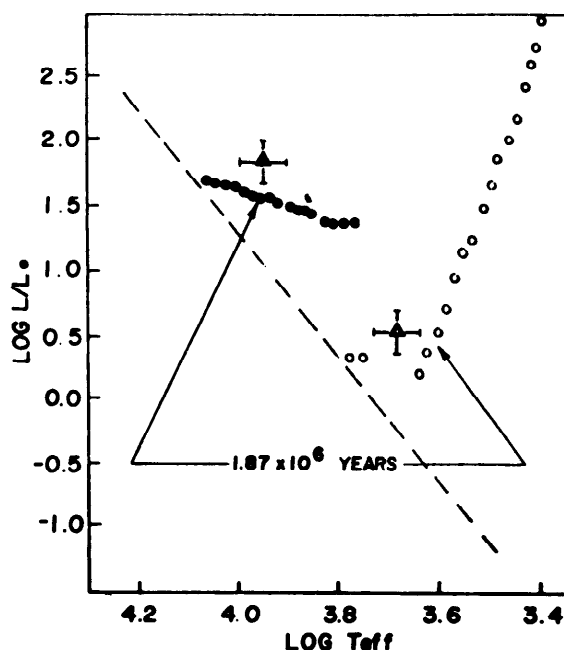
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years, X Trianguli at 4.5×10^6 years, and W Ursae Minoris at 1.87×10^6 years.

Four systems found not to fit the model are: TV Cassiopeia, AI Draconis, Beta Persei, and TX Ursae Majoris.

Finally, four systems could fit the pre-main-sequence model with modifications. These are: IM Aurigae, Delta Librae, U Sagittae and V505 Sagittarii. The modifications would require differing chemical compositions for each component of these binaries.

Conclusion

This investigation has shown that it is possible to represent some semi-detached close binaries by a pre-main-sequence model. More detailed study of individual systems is needed in order to adapt any model to the observed data and inferences therefrom.

Secondly, this survey of only eleven binary systems has yielded a significantly large number of systems fitting a pre-main-sequence model. Such a model sets an upper limit to the ages of those systems. Even though this limit is large compared with the Biblical age of Creation, it is three orders of magnitude smaller than the accepted evolutionary age attributed to typical semi-detached close binary systems.

Offer of a Program

The program used in these investigations is available to anyone wishing to do more work on the subject, on cassette tape or minidisc for the TRS80. It requires at least 16K level 2. I am willing to make a copy for anyone who will send me the disc or cassette.

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ALLEGED EVOLUTION OF THE ORDER PRIMATES, INCLUDING MONKEYS AND APES

W. MEHLERT*

Received 13 August, 1980

In previous studies, I have demonstrated that the evidence for the alleged evolution of *Homo* (Man) and of the ape-like creature *Australopithecus* (extinct since one million years B.P.) crumbles into dust when closely examined.¹ (I do not necessarily subscribe to such great ages as that just mentioned; but I shall not argue about them here.) The purpose of the present study is to show how weak and misleading is the evidence for the new world monkeys, the old world monkeys, and the great anthropoid apes such as orang utans, chimpanzees, and gorillas.

Not a single acceptable evolutionary ancestor has ever been found for the group *Australopithecus*, which lived, supposedly, from about 4 to 1 m. (short for million) years B.P.

Apes and monkeys belong, according to evolutionary theory, to the order Primates, which supposedly evolved from obscure or unknown ancestors some 60-70 m. years ago. It is alleged that some form of primitive early lemur or tarsier gave rise to all the modern members of the order Primates in the Tertiary Period. Just precisely what this claim is based on will be discussed first.

According to Professor E. C. Olson, Chicago University, fossils of ancient primates (lemurs and tarsiers only) are fairly abundant; but, as he admits, these creatures, although far separated from their modern counterparts in time, are fairly close to the modern, living forms in physical structure.² In his book he made no attempt to show precisely in which way any evolutionary development occurred. The great U.S. vertebrate paleontologist, Elwyn Simons, wrote: "In spite of recent finds, the time and place of origin of order primates remains shrouded in mystery".³ He cannot tell us where or how the lemurs or tarsiers arose.

Kelso admitted: "The transition to primates is not documented by fossils".⁴ Thus at the very beginning evolutionists cannot tell us how, or from what, the order primates arose. Romer⁵ and Kelso both concede that the evolutionary background of the New World (American) monkeys is unknown. Neither can anyone find ancestors for the Old World monkeys! "The record simply does not exist". The evolutionists are indeed off to a very bad start; Simons wrote in another place: "Not a single fossil primate . . . appears to be an acceptable ancestor for the great infraorder of the catarrhines, which include all of the living Old World primates".⁶ (Monkeys, apes, and Man.)

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Romer again wrote: "Our knowledge of the fossil history of the higher apes is tantalisingly poor".⁵ (Actually, it is non-existent.) For instance, there is a supposedly very early primate called *Plesiadapis*. To Carrington,⁷ and to Olson,² he doesn't even rate a mention. Wood referred to this fossil scrap as: "A primate ancestor—small and very primitive".⁸ Brace and Montagu say just the opposite: "It played no part in subsequent primate evolution."⁹ Such confusion!

Let us look more closely into the fossil record of the allegedly early monkeys and apes. The oldest fossil monkey is *Parapithecus*, dating from the Oligocene Period, supposedly around 30-40 m. years B.P. The total remains of *Parapithecus* consist of just two jaws. The whole reconstruction is built on just two jaws! And Brace, Carrington, Olson,¹⁰ and Colbert¹¹ all agree that he was an Old World monkey; although Carrington cautions us that the evidence is too scanty to give a definite picture. Wood doesn't even bother to mention him.⁸ Between the alleged beginning of the order Primates, 60-70 years B.P., and the first monkey fossil, 30-40 m. years B.P., the fossil record is a total blank for 30 m. years!!

Around the same time, we find the very first fossil gibbon: *Propliopithecus*. Another huge gap! Most experts accept him as an ape; but, once again, the fossils consist of nothing but jaws!

On such slender evidence rests the evolutionary beginning of monkeys and gibbons. And, even then, Brace said: "It fits fairly well into the model of a generalised *Dryopithecus*."⁹ Note the opposing viewpoints.

20 m. years ago the ape *Dryopithecus* appears—a gap of 10 to 15 m. years more. Most experts agree that this creature was a great ape; but Carrington says that it is: "Unlikely to be the father of apes and men".⁷ Wood writes that it was an ape, living in trees and going on all fours.⁸ *Proconsul*, 15 m. years B.P., is classed by Pilbeam, Brace, and Wood as a member of the *Dryopithecus* group.

The next specimen, *Pliopithecus*, is agreed by most experts to have been a gibbon, or gibbon-like; and is dated to about 12 m. years B.P. Wood says that he resembled modern gibbons;⁸ while Olson doesn't even give him a mention.² Total remains: part of a jaw and some teeth! Now we move to *Oreopithecus*, 12 m. years B.P. Most say that he was simply an extinct great ape; but Brace says that he left no evolutionary descendants; while Olson places him among the monkeys.

Finally we move to the last find: *Ramapithecus*, 10 m. years B.P. Believe it or not, his total remains are a handful of teeth and a few bits of jaw. On this slender evidence some scientists have built an evolutionary structure giving *Ramapithecus* the status of a hominid (ape-man). Others are more objective. Brace and Montagu wrote: "It is hard to distinguish him from well worn specimens of *Dryopithecus*. To say it was a hominid is simply reading too much into the evidence."⁹ Wood said: "No evidence—we can only speculate."⁸ Maynard Smith said the same; while Millar called *Ramapithecus* an early monkey with anthropoid affinities.¹² Carrington and Olson don't even give him a mention. More confusion!

Such is the slender nature of the entire evidence for primate evolution: a few teeth and bits of jawbones. The admissions quoted earlier in this article now seem to be understatements. If the evolution of apes had gone on for 60-70 m. years, there should be thousands of solid, well-documented fossils, showing the gradual changes from early primates to modern apes. The only conclusion that can be reasonably drawn is that, as admitted in the citations above, the case for primate evolution is virtually non-existent.

Wood has complained strongly about the practice of splitting. That is, every time a primate paleontologist finds a tooth or another piece of bone, he is inclined to exaggerate its importance by assigning it a new species name. It is extremely likely that this was the origin of most of the names mentioned above. For instance, as Brace and Montagu pointed out, the teeth and jaw fragments of *Ramapithecus* are difficult to distinguish from those of *Dryopithecus*. Indeed, the dental patterns of *Dryopithecus*, *Ramapithecus*, and *Australopithecus* are quite similar. Thus it is likely that all three belong to the same type of animal, and that no evolution at all has occurred. The same could be said about gibbons. Given the wide variability which occurs in populations of living apes, *Pliopithecus* and *Propliopithecus* would seem to have been just gibbons.

The whole picture, then, is disappointing to the evolutionist: for 95% of the 60-70 m. years of alleged primate evolution, the fossil record is blank. Much faith and speculation is required to make the evidence (which would easily fit into a one-gallon bucket) into an evolutionary sequence of events. It can be seen clearly that the evolution of monkeys and apes consists almost completely of splitting, confusion, lack of evidence, opposing opinions, and guesswork.

This article, then, completes my demonstration that the evolution of apes, *Australopithecus*, and Man, is a completely unproven theory. As the Harvard expert, Professor Stephen Jay Gould, admitted: "The fossil record with its abrupt transitions offers no support for the idea of gradual change . . . the evolutionary trees that adorn our textbooks are inferences, not the evidence of fossils".¹³

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"PUNCTUATED EQUILIBRIUM" AND THE MACRO-MICROMUTATION CONTROVERSY

A. JAMES MELNICK *

Received 20 November, 1980

Evolutionists seem to be coming more and more to admit that what was, until recently, the standard evolutionary dogma, gradual evolution through micromutations, is supported by neither the fossil record nor common sense. So the notion of saltational evolution, through macromutations and hopeful monsters, is being heard more and more. But that dogma has its own difficulties—nay, impossibilities.

It behooves Creationists to be aware of these developments. For from the controversy they can glean arguments against both kinds of evolution, and hence, by elimination, in favor of special Creation.

It is surprising what one may find in even the supposedly evolutionary and uniformitarian literature nowadays. For example, Stephen Jay Gould, professor of Geology at Harvard and associated with the Museum of Comparative Zoology there, in a recent article has stated that the modern synthetic theory of evolution is dead:

I well remember how the synthetic theory beguiled me with its unifying power when I was a graduate student in the mid-1960's. Since then I have been watching it slowly unravel as a universal description of evolution. The molecular assault came first, followed quickly by renewed attention to unorthodox theories of speciation and by challenges at the level of macroevolution itself. I have been reluctant to admit it—but if Mayr's¹ characterization of the synthetic theory is accurate, *then that theory as a general proposition, is effectively dead, despite its persistence as textbook orthodoxy.*²

Well, this is indeed news! It appears as if one of the major reasons for arriving at this conclusion is based on the lack of transitional forms in the fossil record:

The absence of fossil evidence for intermediary stages between major transitions in organic design, indeed our inability, even in our imagination, to construct functional intermediates in many cases, has been a persistent and nagging problem for gradualistic accounts of evolution.³

Or, again, in Kitts:

Despite the bright promise that paleontology provides a means of "seeing" evolution, it has presented some nasty difficulties for evolutionists, the most notorious of which is the presence of 'gaps' in the fossil record. Evolution requires intermediate forms between species and paleontology does not provide them.⁴

Many evolutionary scientists now admit that these "nasty difficulties" cannot be resolved by neo-Darwinism in its present form. Something new must take its place. "Saltation", "hopeful monsters", "Schindewolfian theory"⁵, "punctuated equilibrium", "macromutation"; all these are proposed. These are all code words for essentially the same doctrine in evolutionary thought. They all represent the same spectrum of theory which maintains that evolution did not or could not have occurred according to the standard gradualist scenario of micromutational changes but oc-

curred in a series of "jumps" along the phylogenetic tree.

In recent years, this explanation has become much more popular, because an honest evaluation of the fossil record on the part of some evolutionists has forced them to conclude that present synthetic evolutionary doctrine is outmoded and not substantiated by the evidence. We are now faced with a new round of theories and some new phraseology, most notably "punctuated equilibrium" and "macromutation", that seek to explain how we got here. The theory was most forcefully propounded by Niles Eldredge and Stephen Gould first in 1972.⁶ The ideas themselves are not new but have been brought out of the closet and dressed up for one simple reason—if the synthetic theory of evolution is *dead*, as Gould asserts, *something* must replace it, and, since *special creation* is not an admissible option⁷ (I wonder why!), "punctuated equilibrium" is born. Of course, there's always the "steady-state" option of interpreting the fossil data using the presupposition that

species do not originate. All they do is remain in existence or become extinct.⁸

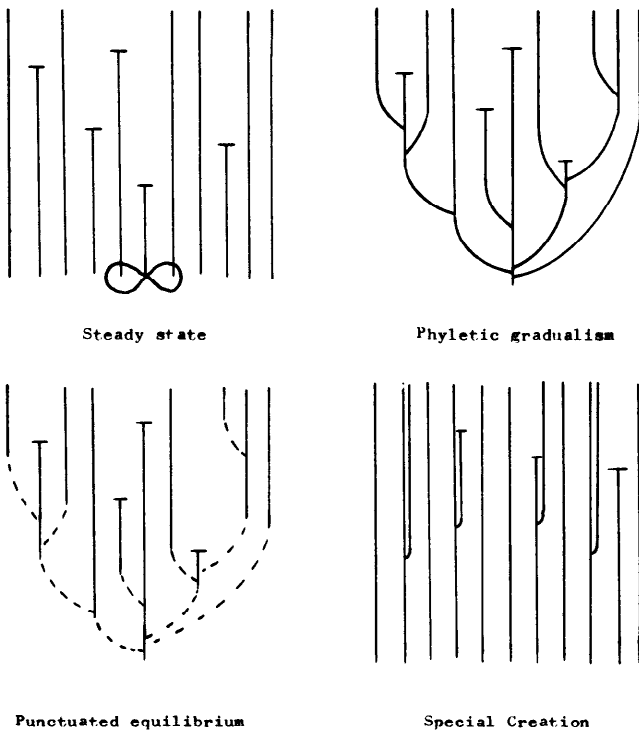
But such a position is excluded on its face even by virtue of the second law of thermodynamics. If species have *always* existed (i.e., from eternity), and new ones do not arise (old ones can only become extinct), how can any still remain? The biosphere of our planet (which supports all known life-systems) is significantly tenuous, so postulating existence *from eternity* is scientifically meaningless.

So we are actually left with very few options, (see Figure 1) and for the evolutionist who has grown up with gradualism (and all of the corollary aspects of uniformitarianism), "punctuated equilibrium" must sound somewhat frightening. But for those who have rejected the "modern synthesis", as it is so called, it is their hue and cry.⁹ The implications of what all this may mean are only now beginning to filter down to the popular press,¹⁰ and I suspect that we shall see a great deal more to follow. The whole problem is creating quite a stir. The "gradualists", the micromutational people, are upset:

...there are few (if any) genetically well-established cases of morphological macromutations which have been fixed in natural populations of animals. Mutations of large effect are almost always deleterious. . . .¹¹

Advocates of punctuated equilibrium and macromutation cite as evidence the frequent

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LEGEND FOR THE ILLUSTRATION

Figure 1. The various taxonomic models are contrasted graphically. A horizontal bar at the top of a line indicates extinction.

In the steady state model the lines, representing kinds or species, are considered to extend back to infinity, i.e., to have existed from eternity. In the diagram of punctuated equilibrium, the broken lines show lines of descent which are supposed to have happened, but which were so abrupt as to leave no fossils. In special Creation, kinds were created separately and remain separate. However, the branching lines close to the originals are intended to show the possibility of limited variation, which many Creationists grant. For instance, dogs and wolves may have had a common ancestor.

absence of transitional forms from the fossil record.¹² This negative information is not convincing.¹³

"Macromutation" throws out the entire structure upon which modern evolutionary biology is based, that is, that there is a successful accumulation of a series of *micromutations* within a species over a long period of time which enables that species, through the means of natural selection, to evolve. This is clearly "the whole ball game" in evolutionary theory and some of the big guns of classical neo-Darwinism, such as Ernst Mayr, are joining battle:

The absurdity of believing in the simultaneous appearance of numerous 'hopeful monsters' as Goldschmidt (1940) has called them, was far more clearly appreciated by Darwin than by some recent evolutionists. . . .¹⁴

Mayr, of course, has to turn to his highest authority (i.e., Darwin) for at least moral support and does not give macromutational theory any more than a few condescending sentences in his major work, *Evolution and the Diversity of Life*. He concludes:

The evidence, whether genetic, morphological, or

functional, is so uniformly opposed to a saltationist origin of new structures that no choice is left but to search for explanations in terms of a gradual origin.¹⁵

And how is saltation defined? For that answer we turn to the journal *Evolution*:

By "saltation" Darwin meant precisely what has been traditionally understood by that term: a macromutation. A saltation is a big change in a single generation.¹⁶

So we have an obvious and very severe contradiction.

As Lövtrop states:

I think we are here facing two alternative theories, mutually exclusive. It is, of course, possible to accept both the micromutation and macromutation theory, i.e., the comprehensive theory, but only the intellectually confused or dishonest can unite this standpoint with the claim of being a neo-Darwinian.¹⁷

In other words, Lövtrop throws out the classical label of "neo-Darwinian" for those who accept the macromutational thesis. And he also states that macromutation theory is based on a lot more than just the silence of the fossil record on this point:

The 'creative power' required to construct, say, a particular vertebrate, involves the origination of the epigenetic mechanism capable of creating the animal in question. And that mechanism, and hence the creative power, must be *exactly* the same, whether it originates in many small-step installments or in a few larger ones. Yet, there is a tremendous difference between these alternatives. Thus, the former implies a series of intermediate steps, which must have been grotesque in many cases. And still the theory requires that these forms have been so successful that they replaced the original ones.

In my opinion this logical deduction from the micromutation theory needs no empirical refutation, common sense suffices.¹⁸

This is precisely what Creationists have said all along.

The paradox is that the macromutational thesis, carried to its logical conclusions, is equally absurd. Thus, if a salamander hatched five eggs, and four of the five were salamanders, but the fifth (due to some postulated gross genetic mutation) was some "brown furry thing", the "brown furry thing" not only would have to survive (in a "strange" environment providing scarce resources) but also find another "brown furry thing" which had had exactly the same level of genetic mutation—but of the opposite sex! These are our "hopeful monsters"! And to "some geneticists all monsters are hopeless"¹⁹ is the gradualist reply. How does the saltationist answer this question?:

. . . the new mutation may involve 'major changes in genome size or organization', in which case sexual isolation is likely. [?]

. . . But I grant my critics that if the new mutation does not involve isolation, then it *may* be fixed through outbreeding.²⁰

He thus steps around it, but even the gradualist model

is hard put to answer this question of 'mating-by-mutation':

Eventually the isolated group might attain sufficient genetic distance from the parental stock as to be reproductively isolated: hence the establishment of a new species.²¹

Again, this is essentially theory, and this theory, when raised to the macroevolutionary level, requires, as Lövtrop states, a series of grotesque intermediate forms, each of which must be ideally suited to the surrounding environment. And this "creative power", as Lövtrop calls it, must be exactly the same in its incremental stages and consistent throughout all time. Otherwise, evolution cannot and will not occur. Thus, he believes he has a much higher probability with his "hopeful monsters". This would all be nothing but simply amusing except for the fact that our schoolchildren most likely will be taught this, as "punctuated equilibrium" becomes more and more the favored step-child of the Darwinian worldview.

What we find within both of these schools of evolutionary thought, however, is that each appeals to some locus of "ultimate evidence" which it believes abrogates the other's viewpoint. The micromutationists say that macromutation as a principle is genetically out of the question. The macromutationists say that if gradualism is true, there must be some evidence of it in the fossil record, and there is not. And are Creationists the only ones plagued by the suppression and distortion of evidence on the part of the opposition? No, the macromutationists, being the "new kids on the block" are facing similar problems, and they don't like it one bit:

Another way to avoid falsification (of neo-Darwinism) consists of underrating, ignoring or suppressing conflicting evidence... If the neo-Darwinians had been able to mobilise convincing evidence in favor of their theory, the present discussion would not be waged. But without facts, how is it possible to rejoin critics? Only one means is available: words. Two ways have been followed, the first of which is to appeal to the consensus of the majority... The other expedient is to answer with dogmatic postulates... And one may even go one step further and leave behind all rules of logical reasoning.²²

So we certainly are not alone in this respect. And the level at which this particular argument is being carried out is not always understood even among the scientists themselves.

What all of this points to is the fact that even within the evolutionary world, the possibilities for semantic misunderstandings are enormous. And this is especially true as far as the "macro-micromutational controversy" is concerned. Sören Lövtrop, of the Department of Zoophysiology, University of Umeå, Sweden, wrote his article entitled "Semantics, Logic and Vulgate Neo-Darwinism" in the journal *Evolutionary Theory* to clear up what he believes are gross misinterpretations of the theory of macromutation on the part of other, more orthodox neo-Darwinians.²³ Because of the outcry against them, Gould and

Eldredge in their 1977 article in *Paleobiology*²⁴ felt compelled to include the following heading: "What Eldredge and Gould Did Not (And Did) Say" (wouldn't it be wonderful if Creationists had the same opportunity to answer their critics in the pages of the major scientific journals?). So it is obvious that it is going to take some time for the smoke to clear in this whole area. In the meantime we can learn a great deal from watching this controversy unfold. Charges and counter-charges are flying back and forth among evolutionists. "Punctuated equilibrium" is a highly emotional issue, and some very unscientific attitudes are emerging:

Just imagine that scientific dispute has sunk to this level!²⁵

That is a macromutationist speaking. And then we have this comment from the micromutational side of the house:

What sort of trick should we be prepared for? Bogus history for one thing... Cracraft, supporting the "punctuated equilibrium" theory of Eldredge and Gould, tries to show that Darwin rejected 'saltation' for 'extrascientific' reasons. The argument is partly founded upon an egregious sophism.²⁶

So we sit back and observe the fray. We are not really invited to participate, and perhaps it's better that we just let the two sides hack away at each other for a while. I suspect that "punctuated equilibrium" (or "punctured" equilibrium, as I like to refer to it) will have its heyday, but in the meantime, it is performing quite a service, and in this respect I must agree with G. H. Harper most emphatically:

... punctuated equilibrists have kindly provided a non-evolutionist approach to the fossil record; steady state theorists [and Creationists—*my insertion*] can feel grateful and encourage them in their work.²⁷

Why? Because they are investigating and publicizing the very facts which Creationists have been demanding for decades. It is very refreshing to watch it all unfold, but also very disturbing to see that, regardless of the facts, most evolutionists still cling to the shreds of their theory. As Lövtrop himself asks:

What would the falsification of this prediction imply, if not Special Creation?²⁸

Indeed. But he himself does not accept it, choosing instead to believe in a world of macromutations. But for us as Biblical Creationists there is the certain knowledge that the only "positive macromutation" is a spiritual one, the one which changes a man from the creature he is into a child of God. Let us hope that more of *those* macromutations will puncture the collective consciousness of the scientific world.

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LET US REASON TOGETHER

WILLIAM J. TINKLE*

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As members of the Creation Research Society we all claim to be Christians; when we joined the organization we declared our belief in the Bible. We long for others to have this belief and recognize that those who oppose the Bible are helping, either wilfully or thoughtlessly, to aid the forces of atheism.

The Greek philosopher, Epicurus, said that the gods, nine of them, lived on Mount Olympus, dined on honey and ambrosia, and cared but little for people on the adjoining lowlands. There is a similar disregard among the leaders of the evolution model. We call this attitude a sterile religion and also poor science. Even reason teaches us something far better.

It is easy for a person to take for granted a certain guess about nature if it is what he desires to think; then he forgets that it simply is a wish and takes it as a basis for future thought. For instance Charles Darwin states "We have seen that man appears to have diverged from the Catarrhine or Old World division of the Simiadae, after these had diverged from the New World division"¹ Not content to say as some do that man and apes have descended from a common ancestor, Darwin has seen the division from which man came. But he gives no time, place, or pictures of this occurrence. In this manner a kind of philosophy is built up which he calls science. He forgets that science starts from a large body of facts; *observed* facts.

Is Change Easy?

In the *Descent of Man*, first chapter, Charles Darwin devotes page after page to show that man is physically

like the ape. There are at least two valid reasons for this likeness. (a) To control disease man can make tests and experiments on apes and other animals which he would have no right to impose upon a human being. They are enough alike that the findings on one are valid on the other. (b) If we are keeping animals for some kind of service we judge their needs from our own, for instance we'll not let them go hungry. Darwin shows that there are physical likenesses but does not show that this similarity enables one to change into the other. Persons have taken many young apes into their homes as pets, and although they have voice boxes (larynx) very much like ours, none has been able to speak or write a single sentence; which of course is easy for a child.

A popular college textbook claims that changes in nature are rare. "Many species have remained much the same for long geologic ages. The brachiopods among animals and the sea-weeds and others among plants are examples of groups of organisms in which almost no changes are observed in present-day species as compared with fossils."²

Heritable changes, called mutations may be seen in big collections in laboratories but if they escape into the wild they do not have the strength to become established. We sometimes read in scientific literature of favorable mutations but they are hypothetical examples rather than observed ones. Men with broad ideas rooted in their desires rather than their observation have been allowed to become spokesmen for science; but a better day is dawning. It is remarkable to note the organizations which are springing up and demanding change.

Planned Construction

The members of the Creation Research Society find

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that their observations in science give support for their belief in Christianity. It is reasonable to conclude that the Creator planned both the morphology of the organisms and the very diverse environments and fitted them into each other. He made a pleasing assemblage of plants and animals and so fashioned them that very few species, even though some prey upon others, have ever brought the others to extinction. We admit in shame that *Homo sapiens* is an exception. This mighty work was evidently done through intelligence, not through the sordid selfishness which natural selection says beat down all opposition.

In any large area where nature has been unopposed for many years we find no species overcoming another but a steady ratio of all species year after year. We do not find what we might expect, that animals which prey on others were increasing in number, toward the day when they would have to change their food or go hungry. Man is supposed to be God's lieutenant but we admit that he himself needs watching.

The Most Complex The Most Fit?

We still are told that natural selection rules the world. The species of plants and animals that succeed are the ones which become most complex. Indeed they say that is the reward for becoming more complex, to become more able to succeed in getting food, conquering enemies, and leaving descendants; or we might say, successful selfishness. Now let us, as good scientists, go back to observation.

You have been told that natural selection makes a fit species more complex, thus making it successful in the struggle for existence. Then, they say, the tendency is for the simple type to become more complex or to become extinct; it is in a very poor position to hold its own. Is this what we find? *Amoeba proteus* is about as simple as any species although not the smallest. Its equivalent of a stomach, the gastric vacuole, looks like a simple bubble in the cytoplasm but it digests flesh much as does the stomach of a dog. I have found them, *Amoebae*, in ponds in Wisconsin on dead leaves in two feet of water at the rate of one an hour; not fast but they are not becoming extinct. Mosses are simple, having no system of tubes to carry sap, but with proper shade and moisture, even on scant soil they flourish. The opossum is not a specialized mammal in teeth, legs, stomach or other organ but it increased its range from Virginia to New England. It is not native in California but when introduced there by man it succeeded quite as well as other animals. It is hard to demonstrate that complex organisms get along better than others. Persons who have this belief should demonstrate that some actually have increased in complexity. At this point some one will cite the location of fossils but this does not prove the point. The relative age of a fossil is determined by the relative degree of complexity rather than by its position.

Conclusion

In this country people happen to hear more persons speaking or writing for evolution than for creation. The speculations of these orators or writers may be founded

upon desire or preference more than upon careful observation. Some persons are not only Christians but also careful scientists as well; it is from this group that the spokesmen for science should come.

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CORRECTION

In the article, "Thornton Quarry Deposits: a Fossil Coral Reef or a Catastrophic Flood Deposit? A Preliminary Study", by David B. D'Armond, in the *Quarterly* for September, 1980, readers may have been misled by Figure 1, on page 89, into thinking that the core area and the top of the dome are separate. In fact, they are one and the same.

Incidentally, the mark and words: "Approx. top . . ." at the lower right of that Figure are not another feature. They are the key to the indication of the core area, farther up and to the left; and maybe might better have been given in an inset, or in a separate place.

THE SUN'S LUMINOSITY AND AGE

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Two recent papers in the June 1980 issue of this journal by Hinderliter and Steidl provided excellent documentation on solar shrinking and the lack of solar neutrinos; and their combined testimony is against evolutionary astronomy and for creationist astronomy. This paper adds some additional information on current research and on the history of investigation into the sun's luminosity and age. The Helmholtz contraction theory, the meteoric bombardment theory, and the solar incandescence as the source of sun's luminosity are revisited. It is found that all, except possibly meteors, may individually provide for the observed luminosity. Particularly, it is argued that if the sun was created 6000 years ago as an incandescent body at about 6000 degrees Kelvin there would have been imperceptible diminution in its temperature to the present.

Introduction

Hinderliter¹ and Steidl² have observed that the recently discovered solar shrinkage is amply sufficient to supply the solar luminosity and that this coupled with the apparent lack of solar neutrinos strongly suggests that the sun, and hence stars, do not burn nuclear fuel. Hence, they observe, that the enormous astrophysical ages given to stars can not be justified. These papers assume that the sun, indeed, is shrinking; however this question is being hotly debated, for nothing less than the foundations of evolutionary astronomy are at stake.

Eddy and Boornazian³ find the decrease to be 2.25 and 0.75 arc seconds per century for the east-west and north-south diameters, respectively. Their figure is based on meridian crossings at the Greenwich Observatory for the years 1836 to 1953. The east-west diameter was obtained from the time for the solar disk to cross the local meridian and then corrected for the sun's distance and increase in right ascension. The north-south diameter was obtained by setting micrometer wires on the north and south solar limbs. They conjecture that the north-south diameter may be comparatively erroneous since it is influenced by atmospheric refraction. They report a similar shrinkage from the U.S. Naval Observatory observations for the years 1894 to 1950. They also find the circumstances of the 9 April, 1567 eclipse at Rome to confirm their results.

Eddy's figures have been challenged by several. Shapiro⁴ used 23 transits of Mercury across the solar disk between the years 1736 to 1973. He found the shrinkage to be 0.05 ± 0.10 , and hence regarded the solar diameter as constant. Morrison⁵ independently examined Mercury transits from 1723 to 1973 and obtained similar results. Sofia⁶ puts any possible solar shrinkage at less than 0.5 based on changes in the solar constant (i.e., the energy per unit area per unit time received above the atmosphere for all wavelengths).

The objections raised against Eddy and Boornazian's figures are that the industrial atmosphere at Greenwich has become increasingly polluted in the years 1836 to 1953 and that increased extinction would increasingly diminish the apparent solar disk. It is also objected that the timing methods used during much of this period are questionable. Of course, the major objection, whether spoken or not, is that shrinkage of such magnitude may well negate all of evolutionary astronomy.

I favour actual shrinking for several reasons. 1) It is anti-evolutionary and compatible with the creationist view of a recently created, not evolved, sun. 2) The meridian observations are very numerous as compared to Mercury transits. 3) The reduction of meridian observations are much simpler than the reductions from Mercury transits or solar constant variations in that many more theoretical considerations enter into the experiment for the latter two cases.

An historical postscript to this controversy has been added by Prof. Wittmann of Gottingen, in the September 1980 issue of *Sky and Telescope*, in which Wittmann mentions that Gauss, in 1809, discounted solar shrinking in favor of observer errors even though meridian transit observations showed shrinking. He also cites Gething's 1955 study of transits showing a decided shrinking as opposed to Tobias Mayer's study in the mid 18th century showing no evidence for change.

Physical Quantities

Table 1 shows the values of physical quantities to be used subsequently. The sun radiates into space seeing an ambient temperature of space. The temperature, T_a , will be taken to be that of the famous 3 degree background radiation. The mean solar specific heat has been estimated from Eddington⁷ as follows. Eddington's Γ approximates the ratio of the molecular specific heat under constant pressure to that under constant volume. i.e., $\Gamma \cong C_p/C_v \cong 4/3$. Eddington derives $C_v = N/(\Gamma - 1)$ where $N = R/\mu$ and where R is the universal gas constant and μ the mean molecular weight. Taking $\mu = .6$ ⁸ gives $C = C_v \sim 4 \cdot 10^8$. The rate of change of the solar radius, $\dot{r}$, is taken from Eddy and Boornazian (3) as 2.25/2 arc seconds per century. The solar emissivity, ϵ , is the fractional amount by which the sun differs from a blackbody radiating at the solar temperature, i.e. $E = 4\pi r^2 \epsilon \sigma T^4$ gives $\epsilon = 100$. Figures in Table 1 not specifically mentioned may be found in references 11 and 12.

The Helmholtz Contraction Theory

In 1854, Helmholtz reported his contraction theory whereby the contractions of a homogeneous gas sphere will produce temperatures on the order of the solar surface temperature^{9,10}. Helmholtz assumed that all gas particles fall radially inward and their loss of gravitational potential energy is completely converted to ther-

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Table 1. This table contains physical quantities used in this paper.

Symbol	Value	Units	Definition
T	5785	deg k	The solar temperature
T _a	~ 3	deg k	The ambient temperature of space
r	6.91•10 ¹⁰	cm	Present radius of the sun
p	1.41	gm•cm ⁻³	Solar mean density
c	~ 4.10 ⁸	erg-gm ⁻¹ •k ⁻¹	Solar mean specific heat
ε	1.00		Solar emissivity
a	-1.73•10 ⁻¹⁵	rad-sec ⁻¹	Rate of change of solar radius(3)
σ	5.67•10 ⁻⁵	erg-cm ⁻² •sec ⁻¹ •k ⁻⁴	Stefan-Boltzman constant
M	2.0•10 ³³	gm	Solar mass
G	6.67•10 ⁻⁸	dyne-cm ² •gm ⁻²	Gravitational constant
R	8.31•10 ⁷	erg-k ⁻¹ •mol ⁻¹	Universal gas constant
μ	.6		Solar mean molecular weight
E	3.86•10 ³³	erg-sec ⁻¹	Solar luminosity
D	1.50•10 ¹³	cm	Sun-earth distance
r	-2.60•10 ⁻²	cm-sec ⁻¹	aD. = 8.18•10 ⁵ cm-yr ⁻¹ (3)
M _e	5.97•10 ²⁷	gm	Earth's mass

mal energy. Under these assumptions Helmholtz derived the following expressions for a stellar temperature rise ΔT , and increased internal energy, ΔQ ,

$$\Delta T = (2.47 \cdot 10^3) (1 + r/\Delta r)^{-1} [(GM)/(cr)] \quad (1)$$

$$\Delta Q = (3/5) (1 + r/\Delta r)^{-1} (M^2/r) \quad (2)$$

where the star shrinks from radius $r + \Delta r$ to r , G is the gravitational constant, M the stellar mass, and c the specific heat.

It now remains to associate a rate of shrinkage with the relative shrinkage $\Delta r/r$. Note that $r/\Delta r \gg 1$ and that $\Delta Q = -E\Delta t$, $\Delta r = r\Delta t$ where it is assumed that all the internal energy, ΔQ , contributes to the luminosity. In this case ΔT is the temperature rise if ΔQ is retained. Hence, ΔQ becomes, $\Delta Q \cong (3/5) GM^2 r^{-2} \Delta r$ and on dividing by Δt one gets $E = -\Delta Q/\Delta t = -(3/5) GM^2 r^{-2} (\Delta r/\Delta t)$; which on solving for r gives $r = -(5/3) E r^2 / (GM^2)$. Evaluating this expression gives $-1.15 \cdot 10^{-4}$ cm-sec⁻¹ = $-3.63 \cdot 10^3$ cm-yr⁻¹.

Steidl's formula³ on page 64 appears to estimate the loss in potential energy of a gaseous sphere as it uniformly collapses from fr to $fr + \Delta r$ for effective radius fr

$$\begin{aligned} \Delta Q = E\Delta t &= -M[GM(fr)^{-1} - GM(fr + \Delta r)^{-1}] \\ &\cong -(1/f) GM^2 r^{-2} \Delta r \end{aligned} \quad (3)$$

where, again, it is assumed that all the loss of gravitational potential energy somehow is converted into radiative energy. Hence, solving for $r = \Delta r/\Delta t$ gives $r = fEr^2/(GM^2)$ which for $f = 0.5$ is a factor of 12/5 larger than Helmholtz's value. Eddington (7, p. 289) quotes a coefficient of 3/2.

If Eddy and Boornazian *et al* are correct, then the observed solar contraction is about 200 to 20 times larger than necessary in order to provide the solar luminosity. Some caution must be exercised in using Helmholtz's figures since some part of the gravitational energy of contraction must be absorbed by ionization, electron excitation, convection, mass rotation, particle translation, etc. However, the observed contraction is in such excess that the very possible reality of stellar luminosity being a result of gravitational contraction can

not be denied. It is interesting to note Eddington's (7 pp. 289-291) summarial dismissal of the contraction mechanism based on the surety of evolutionary time based on the usual circular arguments from biological and geographical evolutionary time. One very interesting aspect of Helmholtz's theory is that it benignly assumes, though it does not require, the star to have nearly constant temperature throughout, or at least not the enormous temperature variation predicted by astrophysical theory. I find this to be compatible with the very simple incandescent explanation of the solar luminosity during its 6000 years of existence. Some of the more comprehensive early papers on the contraction theory were written by some of the most eminent theoretical astronomers of the 19th century.¹³

Meteoric Bombardment Theory

Moulton (10, pp. 59-63) notes that meteors travel at great speeds (about 40 km-sec⁻¹ near the earth) and that a sizable portion of their kinetic energy might be converted into caloric energy upon striking the sun. Moulton estimates that if the sun's luminosity is due to meteoric impact then "the earth should receive 1/236 as much heat from the impact of meteors as from the sun. This is certainly millions of times more heat than the earth receives from meteors." This is raw speculation on Moulton's part. We must also speculate but from the vantage point of much aero-space research into the meteoric flux distribution within the solar system. From even before the beginning of the space era, in 1957, primary interest was given to the meteoric flux. Before 1957, non-orbiting rockets were used.

The following numbers found in reference (18) permit an estimate of the total meteoric kinetic energy available to the sun,

$$\begin{aligned} \Sigma mv^2 &= (10^{-12}) (10^2) [4\pi(6.91 \cdot 10^{10})^2] (1.3 \cdot 10^{-6}) \\ &= (10^4) (3.3 \cdot 10^5) (10^2) (6.1 \cdot 10^7)^2 = 9.6 \cdot 10^{33} \text{ erg-sec}^{-1} \end{aligned} \quad (4)$$

These factors left to right are defined as follows. 1) The estimated near earth meteoric flux in particles-cm⁻²•sec⁻¹ $-2\pi \text{ster}^{-1}$ (18, p. 268); 2) The measured flux average frequently showed increases by a factor of 170 for extended periods of time. Hence, this factor is optimistically included (p. 269); 3) This factor is the area of the sun's surface in cm²; 4) This factor is the average meteoric particle mass in grams (p. 269); 5) The factor 10⁴ results from both observational and theoretically considerations for determining the earth enhancement as a gravitational particle sink (p. 222); 6) The ratio of the sun's mass to the earth's mass is used to convert the earth enhancement to the solar enhancement; 7) A factor of 10² is further included to account for the Poynting-Robertson enhancement (p. 222); 8) The velocity of a particle falling from infinity is taken as the representative velocity.

We note that this figure is about twice the solar luminosity thus indicating that, perhaps, meteoric bombardment cannot be dismissed as the source, or partial source, of the sun's luminosity.

Hinderliter¹, along with Thomson in 1854, objects that meteoric accretion would increase the solar mass

and thereby measurably change the length of the year. The year, P , may be defined by Kepler's law as $P = 2\pi r^{3/2} [G(M + M_s)]^{-1/2}$. If P and M are considered as being time varying, then differentiating gives,

$$\begin{aligned} \dot{P} &= -2\pi r^{3/2} G^{-1/2} (M + M_s)^{-3/2} \dot{M} \\ &= -.5PM (M + M_s)^{-1} \cong -.5PM / M \cong -2. \text{ sec-cent}^{-1} \end{aligned} \quad (5)$$

Hence, one may question whether a loss of 2 seconds in a century is measurable. I would say it is not. Furthermore, any increase in meteoric mass may well be offset or overwhelmed by a large ejection of mass.

The theory that meteors or other interplanetary material are responsible for the stellar luminosity well predated Moulton. For example Newton, in his 1713 edition of the *Principia*, added; "So fixed stars, that have been gradually wasted by the light and vapors emitted from them for a long time, may be recruited by comets that fall upon them . . .".

Incandescence

It is invariably and tacitly assumed that if the sun were simply a glowing body that it would perceptibly have cooled down in the recent centuries during which it has been astronomically observed. The contrary is suggested here; i.e., it is argued that if the sun, or a star, were created with the temperature they now have that due to their enormous thermal mass they would appear much the same and maintain their luminosity throughout the 6000 years since the creation.

Let it be assumed that the loss of internal energy of the sun is counterbalanced by an associated radiation. This energy balance is given by, $(4/3)\pi r^3 \rho c dT + 4\pi r^2 \sigma \epsilon (T^4 - T_a^4) dt = 0$ where a temperature decrease, dT , occurs in time interval, dt . Let $T(0) = T_0$ be the temperature at time $t = 0$. Separating the variables gives

$$(T^4 - T_a^4)^{-1} dT = -3\sigma \epsilon (\rho c)^{-1} (r/r_0)^{-1} dt \quad (6)$$

where the sun's radius is assumed to vary as $rt + r_0$. This equation can be integrated; however the resulting expression introduces mathematical complexity. If T_a is neglected then integrating from time T_0 to T gives

$$T = T_0 [1 + z \ln(1 + (t/r_0))^{-1}]^{-1/3} \quad (7)$$

where

$$z = 9\sigma \epsilon T_0^3 (\rho c r)^{-1}$$

Setting $r_0 = r$ and $T_0 = T$ and taking $t = 6000 \text{ yr} = 1.892 \cdot 10^{11} \text{ sec}$ gives $T = .8741 T_0$. For 100 years this becomes .9973 T_0 . Hence, by this model, it would seem that the solar temperature would have changed imperceptibly during the last century of solar astronomical observing; and that even over 6000 years the change would be small. This result is sensitive to the parameter z ; e.g. if $c = 1.8$ then for $t = 6000 \text{ yr}$, $T = .9561 T_0$. One might argue for increasing c , but this might be offset by a decreased value for r .

If this analysis is, in any way, correct then the mechanism for the light of the sun and stars is, indeed, simple and does not require the myriads of unproved assumptions and mathematical developments required by modern astrophysics which has as its underlying assumptions enormous periods of time.

The model used here is essentially identical to the procedure for measuring specific heats in the laboratory¹⁹ whereby the change in temperature, dT , is for each point of the body, or may be thought of as a mean value. Note that by this analysis we may infer that if the sun or a star were created isothermal it would stay nearly that way, which is, also, in direct contradiction to evolutionary astrophysics.

Thomson¹⁷, gave no calculations, but stated that the sun through conduction-convection would cool down about 1K-yr^{-1} . Thomson was writing in 1854, several years before the Stefan-Boltzmann radiation law was known; and so, it would seem, he had the wrong boundary conditions.

Concluding Remarks

Contrary to popular belief it is found that gravitational contraction, meteoric bombardment and incandescence may all three individually account for the sun's continuing luminosity for the 6000 years since creation. This, also, applies to stars in general. It would seem that the problem is that there is too much energy available, instead of the evolutionary problem of finding enough energy for sustaining luminosity for billions of years. The incandescence theory would probably have been the explanation in pre-Copernican times. This is another example of the frequent superiority of pre-Copernican astronomy over the present Copernican-evolutionary views.

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TIME AND ANCIENT RECORDS

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It is shown that not only Scripture, but also the works of the pagan writers of antiquity, points to a young world, which originated no more than a few thousand years B.C. Many quotations are adduced to show this point. Also, the ancients believed, not in random evolution by chance, but for the most part in fixity of the kinds, and in practically all cases that the world about us is to be seen as a result of intelligent design.

I remember a conversation I had with Sir Mortimer Wheeler, a distinguished archaeologist, on a Mediterranean cruise in 1965. I asked him, "What about 4004 B.C. as a date for the beginning of civilization?" We were leaning on the handrail and looking out to sea. His eye gleamed as he drew himself up to his full six-foot-three, pulled out his pipe, and snorted: "That idea we have long since chewed up . . . pulverised . . . scattered to the winds!"

Later I visited the tomb of Archbishop Ussher in Westminster Abbey. (You will, of course, recall that it was Ussher who popularised 4004 as the date for Creation.) He has a beautiful epitaph. It reads (in Latin):

"Among scholars he was the most saintly,

Among saints the most scholarly."

But the question today is: was he *right*?

(Charles Darwin, too, was buried in Westminster Abbey. What does that prove?)

We shall consider the question under two headings: I. Ancient records outside the Bible; and II. Ancient records in the Bible.

I. Ancient Records Outside the Bible

Robert Young's Concordance lists thirty-seven computations of the date of Creation. Of these, thirty are based on the Bible; seven are derived from other sources—Arab, Indian, Babylonian, Chinese, Egyptian, Persian, and Abyssinian. It is interesting to note that not one of these puts the date earlier than 7000 B.C. If man has been on this planet for two million years, as evolutionists allege, it seems very strange indeed that ancient civilizations, which included expert astronomers and engineers, should have left *no record whatever* of their own history before this arbitrary date. All the myths and legends, however bizarre, speak of instant creation a few thousand years ago. In a moment we shall look at a number of ancient writers who confirm us in this opinion; but first, it is interesting to see how evolutionists try to resolve the anomaly. For example Ridpath in his *Great Races of Mankind* (New York, 1877), writes: "No child notes its coming into the world by making a record of the event for posterity . . . we must not therefore expect to find any evidence in history at first hand, relative to the date of man's appearance." (page 132) Note the false analogy: newborn infants do not keep diaries, therefore *homo sapiens* could not have written his own history! But newborn infants do not do lots of things that Adam is said to have done, like eating fruit, naming animals, and undergoing major surgery in order to get a mate . . . If, on the other hand, he was

created fully grown, and given the stars to measure time, the difficulty disappears. Adam may well have had a perfect visual memory; in which case the recording of years would have been no problem.

Now let us see what the ancient world *outside* the Bible can teach us about the Origin of Man.

A. The "*Rig-Veda*" is one of the holy books of India, written in Sanskrit about 1000 B.C. In Book X, 90, we find this:

From that great general sacrifice . . . were horses born, from it all cattle with two rows of teeth; From it were generated kine, from it the sheep and goats were born. When they divided Purusha (= embodied spirit, or Man personified) how many portions did they make?

What do they call his mouth, his arms? What do they call his thighs and feet?

The *Brahmin** was his mouth, of both his arms was the *Rajanya*** made, His thighs became the *Vaisya*†, from his feet the *Sundra*‡ was produced.

Note: Although the Hindu scriptures do not regard all men as equal, they do sharply distinguish all humans from animals.

B. The Greek historian *Herodotus* (444 BC) has rightly been called the "Father of History." His quarter of a million words cover a vast canvas stretching from central Russia to South Africa and from the Caspian to the Atlantic. His own travels took him to Greece, Thrace (Bulgaria, Rumania), Scythia, Asia (Turkey), Italy, Libya, Egypt and Babylon; and he investigated the origins and culture of about one hundred tribes from the Atlas Mountains to India. Now, what has Herodotus to tell us about the *time* of the arrival of these tribes in their present locations? The general impression left upon the reader is that Europe was occupied by the Europeans *not very many centuries before the time of writing*. The Thracians had come from "Asia", the Greeks from Egypt, and the Thebans (Cadmus) from Tyre. Tyre is the oldest city mentioned: the local priests claimed for it an age of 2300 years, i.e. running back to 2750 B.C. Herodotus asserts that the Athenians originally did not speak Greek but "changed their language when they were absorbed into the Greek family of nations." Such an inquiry and such a conclusion would be possible only *in the early days* of a nation, when the subject of origins was still a matter of public interest. He is sceptical about the (comparatively) vast antiquity claimed by the Egyptians for their civiliza-

*Priests, the top caste.

**Kings, the second caste.

†Merchants, the third caste.

‡Labourers, the lowest caste.

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tion: he puts the demi-god Dionysus at 2050 B.C., whereas they allege 13,000 years beyond that.

Herodotus traces the causes of the Greco-Persian War back to the abduction of Io, princess of Argos (in Greece), by the Phoenicians who "originally came from the coasts of the Indian Ocean." This led to two reprisals: the abduction of a princess of Tyre, by Cretans, and of Medea, daughter of the king of Colchis (on the Black Sea), by Greeks. This, says Herodotus, encouraged Paris of Troy fifty years later to steal Helen from Menelaus . . . hence the Trojan War (1100 B.C.). Thus the abduction of Io, Herodotus's starting point, can scarcely have taken place earlier than 1500 B.C. Generally speaking it would be safe to say that his chronology fits comfortably into the Biblical picture of a dispersion from Babel in the third millennium B.C. Dating of the Great Pyramid has dropped in the last sixty years from 4800 to 2600 B.C. This may indicate that Herodotus was right to suspect that the Egyptians exaggerated.

The only support for Darwinism that can be found in the *Histories* is a report of "dog-headed men, and headless men with eyes in their breasts" (Herodotus does not vouch for this but merely repeats what the Libyans say); and another of a mare giving birth to a hare. Strange mutations indeed! He describes outlandish customs and legends of scores of tribes. There are the Cannibals (two varieties: those who eat their dead, and those who kill to eat), the headhunters and the scalp-hunters, the bug-biters and the skull-drinkers, the Amazons (who may not marry a man until they have killed a man), the Nameless tribe (who call each other 'you'), the Bald tribe, the troglodytes (world record-holders for running), sun-worshippers and sun-cursers, monkey-eaters and snake-eaters. Herodotus calls some of these 'uncivilized' but never drops a whisper of a hint that they are anything but truly human—even when they speak a language "like nothing on earth, it might be bats screeching."

"I acknowledge no master but Zeus (= top God) from whom I sprang", is the message sent to Darius by the king of Scythia. (The Scythians maintain that the country was uninhabited until their ancestor, a son of Zeus, arrived around 1500 B.C.). Darwin writes somewhere that he is humble enough to acknowledge his simian ancestry. All one can say is that, so far as we know, this humility was not shared by anyone known to Herodotus. Whenever pedigrees are mentioned, they are traced back to gods or demi-gods, *never* to the lower animals. The great chorus of antiquity, from East to West, from North and South, unite with the stars in declaring—"The Hand that made us is Divine."

Cicero

Towards the end of his life the Roman orator Cicero (106-43 B.C.) wrote a treatise on *The Nature of the Gods* ranging over all Greek and Roman philosophy. He refers to the Golden Age of vegetarianism when men "never did any harm to oxen," and insists that a) the stars and much of earth's produce have been created for man's sake alone, and b) many animals have been created for the service of man. When arguing against

the idea that the gods have human form, he quotes an older Latin poet as saying:

How like ourselves, in form and shape,
Is that ill-favoured beast, the ape!

But, says Cicero, outward physical similarity does *not* indicate a similar way of life (apes' habits are not ours); and conversely spiritual likeness does not betoken physical similarity. Thus "the gods must have wisdom and reason as we do, but that does not prove they look like us." Cicero has here intuitively hit on an important discovery of modern genetics: *similarity of physical structure does not necessarily indicate descent from a common ancestor.* It is "irrelevant." In the whole book there is not a syllable to suggest the idea of gradualism or transformation of one kind of creature into another. Epicurus (born 342 B.C.) is quoted as saying that ". . . the world was made by a natural process, without any need of a creator: and this process in fact comes about so *easily* that nature has created, is creating, and will create, worlds without end." In other words, no long aeons of *time* are required: "nature" can produce a rabbit out of a hat at any moment, and keep on doing it! So even the atheist lends no support to Charles Lyell's geological theories.

Although not strictly relevant to the question of time, a few more paragraphs from Cicero will show that arguments against evolution and for creation have been familiar to clear thinkers for at least two thousand years. William V. Mayer, writing in the *NABT Compendium on the Evolution-Creation Controversy* (page 96) tries to drag in the Greek philosopher Thales (640-546 B.C.) as a Darwinian before Darwin. But he does *not* tell us, as Cicero does, that Thales said: "from water the mind of God created all things!" Mayer calls Empedocles (495-435 B.C.) "the founder of the idea of evolution." Perhaps he was, but let us read Cicero's comment on his school of philosophy;

"Is it not a wonder that anyone can bring himself to believe that a number of solid and separate particles by their chance collisions and moved only by the force of their own weight could bring into being so marvellous and beautiful a world? If anybody thinks that this is possible, I do not see why he should not think that if an infinite number of examples of the twenty-one letters of the alphabet, made of gold or what you will, were shaken together and poured out on the ground it would be possible for them to fall so as to spell out, say, the whole text of the Annals of Ennius. In fact I doubt whether chance would permit them to spell out a single verse!

So how can these people bring themselves to assert that the universe has been created by the blind and accidental collisions of inanimate particles devoid of colour or any other quality? And even to assert that an infinite number of such worlds are coming into being and passing away all the time. If these chance collisions of atoms can make a world, why cannot they build a porch, or a temple, or a house or a city? A much easier and less laborious task."¹

Aristotle, too has often been (naively) invoked as a

champion of evolution, but his real sentiments have been preserved for us (from a lost book) by Cicero:

"Let us imagine a race of men who have always lived beneath the earth in fair and noble dwellings, beautified with paintings and statues and furnished with everything requisite to wealth and the blessings that wealth can bring. Let us imagine that these men have never come up to the surface of the earth but have heard by rumour and hearsay of the existence of the divine kingdom of the gods. Then let us imagine that at some point of time the jaws of the earth were opened and they were able to escape and come forth from those hidden abodes of theirs into the places where we live. When all at once they saw the land and sea and sky, beheld the majesty of the clouds and felt the power of the wind, and looked at the sun in its splendour, and came to understand its power, how it brought daylight to the world and shed its light across the sky: then, when night cast its shadow over the earth, they saw the whole heaven bright and glorious with stars, the varying brightness of the waxing and the waning moon, the rising and the setting of these heavenly bodies, and their sure and changeless course through all eternity. When they saw all these things, would they not be immediately convinced of the existence of the gods and that all these wonders were their handiwork?"²

Finally, I cannot resist including a paragraph which reminds some of us of our own humble origins 2000 years ago:

"If anyone tried to improve anything in the natural world, he would either make it worse or else attempt the impossible. All the parts of the world are so made that they could not be better adapted to their use or more beautiful to see.

Let us consider now whether all this is accidental, or whether the whole world is so constituted that it could not hold together without the guiding spirit of divine providence . . . When you look at a picture or a statue, you recognize that it is a work of art. When you follow from afar the course of a ship, upon the sea, you do not question that its movement is guided by a skilled intelligence. When you see a sundial or a water-clock, you see that it tells the time by design and not by chance. How then can you imagine that the universe as a whole is devoid of purpose and intelligence, when it embraces everything, including these artifacts themselves and their artificers? Our friend Posidonius, as you know, has recently made a globe which in its revolution shows the movements of the sun and stars and planets, by day and night, just as they appear in the sky. Now if someone were to take this globe and show it to the people of Britain or Scythia, would a single one of those barbarians fail to see that it was the product of a conscious intelligence?

Our opponents however profess to be in doubt whether the universe, the source and origin of all things, came into being by accident or by necessity or is the product of a divine intelligence. They im-

agine that Archimedes showed greater powers by imitating the motions of the heavenly bodies in a model than nature does in bringing them about. Yet the real motions are many times more subtle than his imitation of them."³

"So let us put aside all casuistry of argument and simply let our eyes confess the splendour of the world, this world which we affirm to be the creation of the providence of God."⁴

To sum up: Cicero was one of the most learned and prolific writers of the ancient world. His letters, speeches and treatises would fill two Bibles. But an evolutionist might search day and night for years without finding one crumb of comfort or support for Darwin in all those hundreds of thousands of words. As a trained lawyer Cicero preferred to believe the *evidence* of his senses, the *record* of history, and the *facts* of nature rather than the speculative hypotheses of head-in-air philosophers.

Ovid

One of the closest parallels to Genesis 1-11 is found in the *Metamorphoses* of Ovid (43 B.C.-17 A.D.), a famous Roman poet. The parallel is in fact so close that some scholars believe he may have had the Old Testament at his elbow while he wrote. But even if he did, it is certain he would not have written for a Roman readership ideas that were *peculiar* to the Jews. It seems more probable that, if Ovid had read Moses, he simply allowed the Hebrew narrative to give more definite shape and form to the vague legends which had been current for centuries among his own people. We give some quotations (mainly) from the Loeb translation:

Creation

Scarce had the creator thus parted off all things within their determined bounds, when the stars . . . began to gleam throughout the sky . . . The sea became home for shining fishes, earth received the beasts, and mobile air the birds.

Man

A living creature of finer stuff than these, more capable of lofty thought, one who could have dominion over all the rest, was lacking yet. Then man was born . . . the Craftsman of the universe, designing a more perfect world, made man of His own divine substance . . . So then the earth, which had but *late-ly* been a rough and formless thing, was changed, and clothed itself with forms of men before unknown.

Golden Age

Golden was that first age, which, with no one to compel, without a law, of its own will kept faith and did the right . . . Then spring was everlasting, and gentle zephyrs with warm breath played with the flowers that sprang unplanted . . . the earth untilled brought forth her stores of grain . . . streams of milk flowed and yellow honey was distilled from the verdant oak.

Giants

They say that the giants essayed the very throne of heaven, piling huge mountains one upon another, clear up to the stars . . .

Wickedness of the Human Race

Wherever the plains of earth extend, wild fury reigns supreme. You would deem it a conspiracy of crime. Let them all pay the penalty which they have deserved.

Flood

Jove . . . preferred a different punishment, to destroy the human race beneath the waves and to send down rain from every quarter of the sky . . . and now the sea and land have no distinction. All is sea, and sea without a shore. . . . The wolf swims among the sheep, lions and tigers are borne along by the waves. . .

Saved by Faith

When Deucalion and his wife, borne in a little skiff, had come to land (on Mount Parnassus), they first worshipped . . . there was no better man than he, none more scrupulous of right, nor was any woman more reverent of the gods than she.

Restoration of the Earth

When therefore the earth, covered with mud from the *recent* flood, became heated by the hot rays of the sun, it brought forth innumerable forms of life . . . also the huge Python, a snake unknown before, which was a terror to *new-created* men . . . This monster did Apollo destroy; and in order that the fame of his deed might not perish through lapse of time, he instituted sacred games called Pythian from the name of the serpent he had overthrown. At these games every youth who had been victorious . . . received the honour of an oaken garland. For as yet the laurel tree did not exist . . . (Ovid goes on to tell the Legend of the Laurel . . . how Daphne was turned into a tree to escape the attentions of Apollo)

Note: So far as we know, the Pythian Games were started not earlier than 1000 B.C. Therefore it seems probable that in Ovid's mind the Flood had occurred not more than two thousand years before his own time. Otherwise there seems to be no reason why he should have connected the Python with the Flood.

Juvenal

Juvenal lived in Rome in the first century A.D. and wrote twelve books of Satires on Roman society. He castigates all manner of folly, ignorance and vice, and has some wise words to say on the subject of parents setting an example for their children. Among "bad" examples he includes the Jewish father who "*gives up every seventh day to idleness*, keeping it apart from all the concerns of life."

Let us pause to think about this. Here we have God's chosen people living at the heart of the world's most powerful empire . . . and what are they noted for? Sabbath-keeping! (circumcision too, but several other races besides the Jews practiced this). For this unique custom they are ridiculed and vilified. This had been going on for six centuries, since the capture of Jerusalem, (i.e. by Nebuchadnezzar), so for 30,000 weeks. And it has continued for a further 100,000 weeks. To date, God's people have celebrated about 130,000 sabbaths world-wide among the Gentiles. Now, did God

mean this to be a witness to what He really did in space and time? Or, is sabbath-keeping a kind of Cosmic Practical Joke, designed to make the whole world laugh at the expense of the Jew? Can we believe that God is good and true if He allowed His people to be mocked week after week, year after year and century after century, for acting out a charade which was in fact a stupendous *lie*? To many it will seem more probable that God gave the Jews this unique Sabbath commandment, unparalleled anywhere in the heathen world, to be a permanent memorial—more impressive than the pyramids—of His unique and unparalleled act of Creation.

Of course this has relevance only to the question time—how long? not to the question time—when? of creation. But if we admit that Exodus 20:11 must be literally true, then there would seem to be good grounds for accepting Genesis 5 and 11, too, as literal chronology . . . as the ancient Jews certainly did.

Josephus

A contemporary of Juvenal was Flavius Josephus, the Jewish historian. Concerning Noah's flood he writes:

All the writers of barbarian histories make mention of this flood and of this ark; among whom is Berosus the Chaldean; for when he is describing the circumstances of the flood he goes on thus: 'It is said that there is still some part of this ship in Armenia, at the mountain of the Cordyaeans, and that some people carry off pieces of the bitumen' . . . Hieronymus the Egyptian also, and Mnaseas, and a great many more, make mention of the same. Nicolaus of Damascus in his ninety-sixth book speaks thus: 'There is a great mountain in Armenia . . . upon which it is reported that many who fled at the time of the Deluge were saved; and that one who was carried in an ark came ashore on the top of it; and that the remains of the timber were a great while preserved. This might be the man about whom Moses, the legislator of the Jews, wrote.'⁵

With regard to the long ages of the patriarchs in Genesis 5 and 11, Josephus evidently anticipates some incredulity in his readers, so he adds: ". . . the time is written down in our sacred books, those who then lived having noted down with great accuracy both the births and deaths of illustrious men."⁶ And later:

Now I have for witnesses to what I have said *all those that have written Antiquities, both among the Greeks and barbarians*; for even Manetho, who wrote the Egyptian History, and Berosus, who collected the Chaldean Monuments, and Mochus, and Hestiaeus, and beside these Hieronymus the Egyptian, and those who composed the Phoenician History, agree to what I say here; Hesiod also, and Hecataeus, Hellanicus and Acusilaus; and besides, Ephorus and Nicolaus, relate that the ancients lived a thousand years.⁷

Comment

1. Of course it is always possible to argue that a dozen historians widely scattered over the Near East might have copied the same gigantic lie from some solitary document, but many people will think it more probable

that the longevity of the patriarchs was a *fact* well known to the sons of Noah and passed on to their grandchildren as they dispersed to become progenitors of the different races of mankind.

2. The fact that "all the writers of barbarian histories" mention the Flood argues strongly for the view that it occurred in the third millennium rather than untold thousands of years before.

Tacitus (55-120 A.D.) was the most distinguished historian of the Roman Empire in his day. In his *Germania* he names sixty-three German tribes, records their legends and comments on their manners and morals. Three points are of particular interest:

1. *They trace their ancestry back to a god:*

"In the traditional songs which form their only record of the past the Germans celebrate an earth-born god called Tuisto. His son Mannus is supposed to be the fountain-head of their race . . ."

2. *Their history begins with the Trojan War or a few centuries earlier:*

"The Germans, like many other peoples, are said to have been visited by Hercules, and they sing of him as the foremost of all the heroes when they are about to engage in battle. Ulysses also is supposed by some to have visited German lands and to have founded and named Asciburgium, a town on the Rhine inhabited to this day."

3. *Some tribes were civilized while at the same time other tribes were barbarous and beastly:*

"The Chatti are the noblest people of Germany, and one that prefers to maintain its greatness by righteous dealings. Untouched by greed or lawless ambition, they dwell in quiet seclusion, never provoking a war, never robbing or plundering their neighbors . . ." "Their marriage code is strict, and no feature of their morality deserves higher praise."

"The Fenni are astonishingly savage and disgustingly poor. They have no proper weapons, no horses, no homes. They eat wild herbs, dress in skins, and sleep on the ground . . . the only way they have of protecting their infants against wild beasts is to hide them under a makeshift covering of interlaced branches . . ."

And again these facts fit very well into the Biblical post-Flood chronology and swift divergence of the races after Babel. These facts do *not* seem to agree with the hypothesis of man's slow emergence from an animal ancestry via cave-manhood over millions of years.

Lucretius

Our last but by no means least important witness shall be Lucretius (100-45 B. C.), a Roman poet and ardent disciple of Epicurus, founder of the Epicurean school of philosophy. A century ago when Darwinism was the Greatest Show on Earth, evolutionists began to ransack the Classics to find some support for the new-fangled theory of man's origin. Precious little *could* be found, but Lucretius seemed a promising candidate, with his denial of all interference by Deity, and of life after death. Andrew White refers to him a dozen times in *History of the Warfare of Science with Religion*

(1896) and even eight years ago Sir Gavin de Beer thought it worth while to quote Lucretius to lend weight to his own arguments against design in Nature: "Chance was exactly what Lucretius invoked to explain living organisms." (*Adaptation* 1972, page 2). But unfortunately the poet failed to invoke time also, limitless time along with chance; and it will be easy to show that Lucretius' view of the origin of the world agrees much better with the Bible account, God excepted, than with Darwin's. Here are some quotations (all from Book V):

1. Why have no poets sung of feats before the Theban War and the tragedy of Troy (1100 B.C.)? The answer, I believe, is that *the world is newly made*: its origin is a recent event, not one of remote antiquity. That is why even now some arts are being perfected . . .

2. Then it was that the earth brought forth the first mammals . . . it is not surprising that more and bigger ones developed in those days when Earth and atmosphere were young.

3. There was a great superfluity of heat and moisture in the soil . . . the childhood of the world provoked no hard frosts or excessive heat or boisterous winds.

4. . . there never were nor ever can be, creatures with a double nature, combining organs of different origin in a single body . . .

5. The animals cannot have fallen from the sky, and those that live on land *cannot have emerged* from the briny gulfs . . .

6. The name of 'mother' has rightly been bestowed upon the Earth, since it brought forth the human race and gave birth to every beast . . . and *at the same time* to the birds of the air . . .

If you had suggested to Lucretius that the human race evolved from monkey-like ancestors, he would have laughed. The only 'evolution' he postulated is from primitive *man* to civilized *man*, and all within a few thousand years.

7. The varieties of herbs and cereals and trees cannot be produced in this composite fashion: *each species develops according to its own kind*, and they all guard their own specific characters in obedience to the laws of Nature.

8. Another legend tells how water likewise once massed its forces and began to prevail, till many cities of men were drowned beneath its flood.

So, two thousand years ago Lucretius, an atheist philosopher whose driving purpose was to rid the world of 'superstition' by teaching 'science', believed in:

1. A young Earth
2. More and larger animals in (recent) prehistoric times.
3. Original ideal climate.
4. No half-and-half creatures.
5. No conquest of the land by sea creatures.
6. Simultaneous origin of all creatures and man.
7. Fixity of species.
8. A gigantic Flood.

And this is the *best* support that can be found among philosophers of the ancient world, for the modern theory of evolution!

Babylonian Legend

As a postscript we shall glance at the Babylonian version of the Flood—on clay tablets dated not earlier than 2000 B.C. If, as some scholars affirm, the Flood took place at least three thousand years before Abraham (2000 B.C.), how could the story have survived by *oral* tradition over a hundred generations? Note also the Chinese ideograph for ship is the figure eight + mouths, which strongly suggests Noah and his family in the Ark. This would fit in well with the fact that the earliest Chinese writing is dated around 2200 B.C., probably a century or two after the Flood. It does *not* fit at all well with the idea that writing was not invented until thousands of years after the Flood, by which time hundreds of other ship-stories would have become much more familiar than Noah's.

The Sirius Enigma

One of the most puzzling problems for a "molecules-to-man" evolutionist concerns the bright star Sirius. This is thoroughly discussed by Kenneth Brecher, Associate Professor of Physics at MIT, in *Astronomy of the Ancients*.⁸ Sirius is now classified as a 'white dwarf', but the ancient records—Babylonian (700 B.C.), Greek (270 B.C. and 150 A.D.), and Latin (50 B.C. and 10 B.C.), all describe it as copper-coloured or reddish. Now—the theory of stellar evolution supposed that it takes a million years for a 'red giant' to shrink to a 'white dwarf'. How come, then, that Sirius appears to have made the transformation in only two thousand years? The problem has not been solved, and perhaps never will be. But it illustrates a very important principle: *scientific theories* worked out on the drawing-board, and extrapolation into 'prehistory', *must yield to actual observations by ancient writers*. The present theory of stellar evolution cannot be correct, at least as regards *time*, if it fails to account for Sirius changing from red to white.

In much the same way, I suggest, the evolutionary theory of man's origin cannot be correct if it finds no support whatever from the observations, legends, and recorded histories of the ancient world. One has only to look at Rome, Egypt, the Incas, Aztecs and Mayas, to see that civilization can run downhill as well as up. But Victorian materialists, "drunk with power" and self-esteem arising from the remarkable technological progress of the nineteenth century, decided that man must always have been climbing upward, drew a graph, and extrapolated backwards until the line hit zero, i.e. the amoeba. Only later did they discover that this theory contradicts just about everything that the greatest minds of antiquity have written about man's origin. So, which shall we choose, to believe—modern theory, or ancient history? Kenneth Brecher's conclusion is challenging:

I would much prefer to learn stellar evolution (i.e. the *actual history* of stars) from the ancient myths of man than from the *modern myths of the computer*!⁹

Conclusion

In all ancient literature there is no suggestion that the

history of Man goes back hundreds of thousands or even tens of thousands of years. The evidence points to the emergence of 'homo sapiens' only a few thousand years ago, with memories of a golden age, and a disaster affecting the whole human race; the re-population of Europe and North Africa from some center in the Middle East; and the *co-existence* of 'cave man' and 'civil' man for hundreds of years B.C. and A.D. If Juvenal or Cicero had known that one day a Briton would concoct a theory of man's ascent from the monkey, they would have regarded it as the ultimate in decadence and folly, and proof of the essential inferiority of the British race.

Biblical Chronology

Now we shall consider the question: Does the Old Testament give a chronology from the Creation?

The answer given by many evangelical scholars today is decidedly no! Typical is the statement in one well-known Bible dictionary: "The compressed chronology of Archbishop Ussher, who assumes an unbroken succession of father-son relationships in Genesis 5 and 11, is untenable in the light of attested archaeological facts"

The *New Scofield Bible* (1967) agrees: "Scripture does not reveal the exact date of Adam's creation . . ." "Scripture does not provide data by which the date of the Flood can be discovered. . ."

Dare we challenge this consensus of opinion among so many learned and devout scholars? I think we may—nay, must—for the following reasons:

I. Every Bible commentator up to 1860 believed that the Old Testament gives a precise chronology running back to the date of creation.

II. Every Bible chronologer before 1860 put the date of creation between 3900 and 5500 B.C.

III. No commentators or chronologers before 1860 suggested there might be gaps in the genealogies in Genesis 5 and 11.

IV. Modern archaeology is based upon Darwinian presuppositions..

V. Darwinian presuppositions have been discredited.

Therefore

VI. We have no good reason for doubting that the old chronologers were right!

First, then, let us look at some old commentators:

a. Bishop Joseph Butler (1736) in his *Analogy of Religion*, writes (pp. 270 & 274):

"The Old Testament contains a chronological account of the beginning of the world, and from thence an *unbroken genealogy of mankind* for many ages before common history begins . . . a continued thread of history of the length of between three and four thousand years.

Its chronology is no way contradicted but is really confirmed by the natural and civil history of the world, collected from common historians, from the state of the earth, and from the late invention of arts and sciences . . . the Scripture contains an *unbroken thread of history* from the Creation to the Captivity."

b. The famous eighteenth century commentators,

Table 1. Some dates given by well-known chronologers for the Creation.

Chronologer	Date of writing	Date given for Creation, B.C.
Clinton	1840	4100
Hales	1809	5400
Ussher	1640	4004
Scaliger	1590	4700
Melanchthon	1520	3960
Theophilus of Antioch	250	5500
Josephus	70	5200
The Seventy*	250 B.C.	5200

*I.e., the traditional seventy translators of the Old Testament into Greek. Reasons will be given later for thinking that they were chronologers as well as translators.

Matthew Henry, Thomas Scott, and John Brown, accepted Ussher's dating without question; and many editions included a separate chronological summary. John Brown began his commentary with these words: "In this book (Genesis) we have the inspired history of the great events of 2369 years . . ."

c. Going back to the Reformers we find exactly the same interpretation. Martin Luther (1520) wrote: "We know from Moses that the world was not in existence before 6000 Years ago" John Calvin (1554) agreed. We can even quote William Shakespeare, not indeed as a theologian but as reflecting the common belief of educated people in the sixteenth century: "The poor world is almost six thousand years old . . ." says Rosalind in *As You Like It* (Act IV, sc. 1).

II. Secondly, *every Bible Chronologer before 1860 put the date of creation at 3900 to 5500 B.C.* Some of the best known are given in Table 1.

III. Thirdly, *no commentator or chronologer before 1860 ever suggested that there might be gaps in the genealogies.* One reason for this is obvious: if gaps existed, all their labour would have been in vain. Chronologers would be out of business if there were no chronology. But, in fact, many brilliant scholars and mathematicians (including Sir Isaac Newton) devoted years of their life to Bible chronology, in the firm conviction that *God invented dating*, and we miss something important if we neglect this part of His revelation.

Why were these scholars so sure they were *not* wasting their time?

A. Because it is obvious that the Old Testament is basically *history* with a superstructure of *prophecy*, and for both of these an accurate chronology is essential. Every child wants to know his/her own age, most children enjoy looking at their parents' wedding photographs, and some are even interested in the *date*. The Bible is the Family Album of the human race, and since the dawn of history most people have wanted to know how they began and when.

Now let us look at the number of times 'year' or 'years' is mentioned in the Old Testament, as given in Table 2.

Table 2. The number of times the words "year" or "years" occur in the Old Testament.

Books	Number of times
Genesis	112
Exodus—Deuteronomy	177
Joshua—II Samuel	53
Kings—Esther	234
Prophets, etc.	124
Whole Old Testament	700

Seven hundred is a lot of times, even in a book of one thousand pages. When we look more closely, we find a tight chronological system running right through, from the end back to the beginning.

1. There is the period of sixty-nine weeks in the prophecy given to Daniel. This is usually taken to mean 483 years from the rebuilding of Jerusalem to the time of Christ. Here we have no time to go into the details, but scholars agree that from Nehemiah's day to the Crucifixion was about four hundred eighty years.

2. Before that we have the seventy years of captivity prophesied by Jeremiah and fulfilled over the lifetime of Daniel. The seventy years was not an arbitrary figure but planned by God as a punishment fitting the crime . . . because for four hundred ninety years the Jews had failed to obey the command to let the land lie fallow every seventh year (Lev. 26:34).

3. From the Captivity back to Solomon, time was reckoned by Kings' reigns—about four hundred four-teen years.

4. Then in I Kings 6:1 we are given a total of four hundred eighty years from the Exodus to Solomon's Temple.

5. Back from the Exodus, time was measured in terms of the length of the Israelites' sojourn in Egypt—four hundred thirty years (Exodus 12:40).

6. Moses now had a 'problem'—how to link the personal chronology of Jacob's family with the national epoch of Israel's migration to Egypt. The problem is neatly solved by Jacob's interview with Pharaoh, at which he confesses that he is *only* one hundred thirty years old (Genesis 47:9).

That the method of computing time *changes* at this point is made abundantly clear by the fact that we are *not* told the age of Joseph at the age of the birth of his sons Manasseh and Ephraim, although Joseph was evidently Jacob's spiritual heir and the 'prophet' of Israel after his father's death. We do know Jacob's age at the birth of Joseph because Joseph was thirty-nine when his father was one hundred thirty (41:46 with 45:11 and 47:9), and *from Jacob back to Adam the precise age of each father at the birth of his spiritual-heir son is carefully noted.*

Here it may be objected that I am begging the question, that I am stating as a fact what I have yet to prove. So I shall re-phrase my last sentence:

We can say with certainty that from Joseph back to Abraham in Genesis 12 there is a precise chronology based on each father's age at the birth of his son; so the presumption is very strong that the same writer would

use the same method to continue his chronology right back to the beginning of the human race.

Professor S. R. Driver wrote, in 1902: "There is a systematic chronology running through the book almost to the end, so carefully and methodically constructed that every important birth, marriage, and death, has its assigned place in it."

So, if we accept that Genesis 5 and 11 are chronological, we can view the Old Testament as a self-consistent whole, a yard-stick by which to measure all human history. But, if we believe the gaps-between-the-godly-theory, we are saying that the first eleven chapters are totally different from the rest of God's Book in that they include no meaningful measurements of time but only a mass of *meaningless* figures.

B. Another argument against the gap theory stems from the fact that five of the connections in Genesis 5 and 11 *must* have been from literal father to literal son:

1. Adam and Eve named Seth
2. Seth named Enos
3. Lamech named Noah
4. Noah was clearly the literal father of Shem, Ham, and Japheth
5. Terah was clearly the literal father of Abraham.

C. A third argument against the gap theory is this: When Moses wished to denote an ancestor-descendant relationship, he used a different phrase altogether. We see this in 4:20 and 21, and 17:5. Here the word 'father' (Hebrew *ab*) is used, obviously in a non-literal sense. So if Moses had wished to say that the patriarchs were only the *ancestors* of their 'sons', he could have easily done it by the use of this word. The fact that he did *not* choose to use *ab* is, I believe, strong evidence that he wished to make it crystal clear that the succession of men of God was father-son throughout.

Here I regard it as my painful duty to comment on the footnotes in the *New International Version* on Genesis 5 and 11 . . . painful because I am sure the NIV is in most respects an excellent translation. But, footnotes state that the word 'father' in *these* chapters may mean 'ancestor'; whereas no footnote is given to explain the metaphorical use in 4:20-21 and 17:5! In fact, the word *yabad*, translated 'beget', 'bear' or 'be born' in the King James Version, is *always* used of a literal father-son or mother-son relationship, with four exceptions only out of the four hundred and fifty *other* places (i.e. not in these chapters) in the Old Testament. The four exceptions are: Genesis 46:18 and 22, Deuteronomy 4:25, and 23:8. In each of these the meaning is perfectly clear because *both* the children *and* the grandchildren are mentioned. There are no 'gaps'. So throughout the Old Testament not one example can be shown of '*yabad*' meaning 'became the ancestor of'. The NIV footnotes are, I suggest, unfortunate and unwarranted. Let us hope they will be removed in the next edition.

D. The fourth reason why older commentators accepted these chapters as chronology is found in Genesis 1:14, where God clearly states that He made the sun, moon, and stars as *timekeepers*. So far as we know, the earth's orbit round the sun serves no biological purpose. We would live just as long if the earth simply rotated on its axis in one spot and the stars looked exactly the same

every night. But that was not the way God wanted it. He invented dating!—and told Adam all about it. How else could Adam have measured his age? He must have looked up at the stars the first night after his creation and *memorized* what they looked like. The Hebrew word for 'year' means 'repetition', and when the stars were again in exactly the same position as on that first night, Adam knew that one year had passed and he *re-recorded* it. Why? . . . we can never fully answer any 'why?' about God, but we can say that this counting of years and keeping of birthdays answers to something deep down in man's nature. God created man with a time-keeping mind, and He appointed the stars, especially, to mark that time by their repetition. The fact that the *first* man was able to tell the years of his life is strong evidence, I suggest, that *God intended all mankind to know the age of the earth*. This is confirmed by the enormous interest in astronomy which we find in ancient civilizations.⁸

Of course from Abraham onwards the chronology serves another important purpose . . . to show how God's promises were precisely and literally fulfilled (e.g. the four hundred years in Egypt, forty years in the wilderness, seventy years captivity, etc.). But in Genesis 5 and 11 there are no prophecies, so the *only* purpose seems to be to show (a) how the patriarchs overlapped one another by many centuries and (b) how long was the span of years back to Creation.

E. The fifth argument against gaps brings us back to the seventy translators of the Old Testament into Greek. These Jews living in Egypt around 250 BC were no doubt well acquainted with the Egyptian chronology, which claimed an antiquity of five thousand years for their civilization. Thus the Jews were under pressure to conform their Hebrew figures to the Egyptian, because every race likes to think it is the 'original' or oldest. Now there are two ways to stretch a chronology: 1. to insert more names into the pedigree; and 2. to increase the age of each father before the birth of his son. Remember that the Seventy had access to hundreds of documents now lost, and to the whole oral tradition of the Hebrew race. Nevertheless they did not attempt to interpolate new names (except possibly Cainan in 10:24). They *did*, probably, increase the age of some fathers before their sons were born. This seems to be strong evidence that: 1. the Seventy regarded Genesis 5 and 11 as a chronology standing in competition with the Egyptian chronology; and 2. two thousand years ago Jews had never heard the slightest whisper of a suggestion that names had been omitted from the genealogies. If they had had any such suspicion, those names would almost certainly have been restored to the list in order to increase the aggregate of years.

F. Finally, the learned Jewish historian Flavius Josephus, writing about the same time as our Gospels were written, *adds up the total* number of years from Adam to the Flood. This proves that Josephus regarded the figures as a chronology. Of course he was not inspired or infallible, but few would question that his belief was typical of all Jews of his day and, in fact, of all Jews since the time of Moses.

These then are some of the reasons that led sixty

generations of Christians to believe that Genesis 5 and 11 are intended to be a literal strict chronology.

Let us now briefly consider three modern objections to the chronological interpretation:

Objection Number 1

There are ten names from Adam to Noah, and ten names from Shem to Abraham. It is alleged that this congruity cannot be natural but must be artificial. "One or other of the branches has been lopped to give an appearance of symmetry."

I would be more impressed by this argument had I not, as a boy, been an avid reader of Ripley's *Believe It or Not*. Coincidences happen every day, and it is possible to point to many both inside and outside the Bible. Jacob had twelve sons, but so did Ishmael (Genesis 17:20). In the last five hundred years there have been four Houses of Kings and Queens in England: five *Tudor* monarchs, six *Stuarts*, five *Hanoverians*, and six of the House of *Windsor*. 5 - 6 - 5 - 6 . . . what a coincidence!

Who would have predicted that three out of the first five Presidents of the United States would die on Independence Day, two of them on the Fiftieth Anniversary? Four thousand years from now a sceptical historian might well attribute these dates to a superstitious chronicler . . . yet it happened, just so. Truth is indeed stranger than fiction, and we have no reason to doubt that the ten names in each list represent one more minor coincidence in the vast kaleidoscope of history.

Objection Number 2

"Since there are gaps in the genealogy of Christ in Matthew 1, therefore we may assume that there are similar gaps in Genesis 5 and 11." In my book *The Great Brain Robbery*, Appendix D, I have answered this objection, so it need not detain us here.⁹ Suffice to say that Luke's genealogy is obviously the definitive one for the generations *before* Abraham, and there is no evidence that he has omitted *any* names from the list of seventy-five.

Objection Number 3

"If Noah was the only righteous man on earth before the Flood began, Methuselah could not have lived to the very year of the Flood, as the no-gap interpretation would require."

But, when we turn to the verses supposed to prove this, we find:

a. Genesis 6:9 does *not* state that Noah was the only righteous man on earth. It says he was "*perfect in his generations*". Genesis 7:1 repeats (almost) the same phrase, "*in his generation*". Noah's generation was not Methuselah's generation because Methuselah was Noah's grandfather. So there could have been two righteous men on the earth (three, if we include Lamech, who died five years before the Flood) at the same time, each unique *in his own generation*.

b. Even if Genesis 7:1 implies that Noah was literally the only righteous person alive on earth at that precise moment (but what about his family, weren't they

righteous too?), notice that these words were spoken just one week before the Deluge. Therefore Methuselah was probably dead already, having died the very *year* of the Flood but not necessarily in the last *week* before the Lord shut Noah in.

So, the no-gap interpretation still makes very good sense; whereas this objection seems to be clutching at a straw or the shadow of a straw.

Summary So Far

- A. Ancient Records outside the Bible indicate that man's history goes back *certainly* no farther than 7000 BC and *probably* no farther than 4000 - 5000 BC.
- B. The chronology of the Bible dates Creation about 6000 years ago.

Proposition IV. Modern Archaeology is Based Upon Darwinian Presuppositions

This is admitted by almost all archaeologists. Here are two quotations:

1. "It needed a revolution in men's conception of the nature and antiquity of Man, before the bare notion of primary prehistory could take birth. Such a revolution was wrought by the publication in 1859 of Charles Darwin's 'Origin of Species' . . . In Huxley's words, *acceptance of Darwin's views made it essential* to 'extend by long epochs the most liberal estimate that has yet been made of the Antiquity of Man.'"¹⁰

2. "Archbishop Ussher's date of 4004 BC for the Creation was still widely believed in the 1830's and in the absence of any convincing proof to the contrary it was difficult to get any general acceptance of the concept of the prehistoric archaeology . . . the final proof of the antiquity of man was not to come until 1859. . . ."¹¹

Proposition V. Darwinian Presuppositions Have Been Largely Discredited

Ample evidence in support of this statement has already been adduced by Creationists—and others. Here I shall content myself with one quotation . . . from Norman Macbeth's brilliant little book *Darwin Retried*.

"Classical Darwinism has slowly been abandoned piece by piece but the public has not been informed . . . it has become increasingly evident that there are serious difficulties even with neo-Darwinism, and many mysteries . . . remain intractable."¹²

One of the *most* intractable mysteries is the origin of Man. The frantic hunt for the "missing link" has left a trail of fraud and fallacies unprecedented, I think, in the history of Science. One need only mention Java Man, Pekin Man, Piltdown Man, Nebraska Man, and Neanderthal Man. The gross errors associated with these "discoveries" clearly stemmed from faith in Darwinism.

Conclusion: Proposition VI. We Have no Good Reason for Doubting that the Old Chronologers were Right!

To a candid and impartial observer there can be little doubt that the gaps-in-the-genealogies theory was a

desperate expedient invented by frightened men. Anxiously eyeing the dark clouds of Darwinism on the theological horizon, and hearing the roar of an approaching storm, they decided to jettison the Bible dates in hope of saving the ship of Christianity. Vain hope! The storm swept over them and swallowed up the dates, but that was just the beginning. Next the Pentateuch, then the whole Old Testament, then the Gospels, came under attack. What was left of Christianity after the self-styled "experts" had finished battering the Bible, bears no resemblance to the Faith of our Fathers.

Looking back over one hundred twenty years we can see, I think, that the strategy of men like B. B. Warfield and W. H. Green of Princeton was mistaken, though well-meaning. Their great reputation carried the day . . . but in this matter the reputation of One greater than Warfield or Green is at stake: that is, the reputation of God Himself. God is the greatest Communicator of all time. He had at His disposal all languages, all verbs and all shades of meaning, when He caused these genealogies to be written. Moreover He foreknew, we must believe, that these chapters would be translated into a thousand tongues and distributed by the million in every corner of the globe. Are we to suppose that He was so idle or so incompetent as to leave one hundred generations of His people groping in darkness, fondly imagining that the date of Creation could be computed by simple addition, when in fact the ages of the patriarchs have *nothing to do with dating*, as Warfield and Green affirm? Would any human father so carelessly allow his children to be misled? On the contrary, we agree with Dr. H. C. Leupold's comment:

"There is no reason for doubting the correctness of the chronology submitted by the Hebrew Massoretic text . . . No other nation has anything to com-

pare with it . . . The claim that the Scriptures do not give a complete and accurate chronology for the whole period of the Old Testament that they cover, is utterly wrong, dangerous, and mischievous."¹³

The ones who have been misled, I suggest, are the archaeologists who followed Darwin down the garden path and (like the biologists) have "engendered fragile towers of hypothesis based upon hypotheses, where fact and fiction mingle in an inextricable confusion"¹⁴

It was of such people that David wrote: "He who sitteth in the heavens shall laugh: the Lord shall have them in derision".

And among all the saints in glory, none, I think, will enjoy the merriment more . . . than Archbishop James Ussher!

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SATELLITE OBSERVATIONS CONFIRM THE DECLINE OF THE EARTH'S MAGNETIC FIELD

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Measurements by the NASA's Magsat satellite, between October 1979 and June 1980, corroborate the conclusion which had already been reached: that the Earth's magnetic field is decreasing—not oscillating, but decreasing monotonically and exponentially. In this article the evidence for a young Earth which such a decay provides is considered; also the question, what will happen if the present decay continues.

Decay Evidence

New evidence of the decline in the earth's magnetic field has been provided by NASA's Magsat satellite which orbited the earth from October 1979 to June 1980. Dr. Robert Langel, chief project scientist, stated that if the present rate of decline continues the earth's magnetic poles will reverse in about 1,200 years.¹ A decline in the earth's magnetic field had been noted in

other spacecraft observations for several years prior to this. However, Langel's news release is in reference to the findings from Magsat, which is the first American spacecraft expressly designed to study earth's magnetic properties.

There is nothing new about the fact that the earth's main magnetic field, its *dipole* field, is decreasing at a rapid rate. Sidney Chapman reported in 1951 that the earth's magnetic field is decreasing at a rate that is "unparalleled" by any other geophysical phenomenon. He described its rate of decay as *a few per cent per cen-*

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ture². Dr. Edward R. Benton, a University of Colorado geophysicist on the Magsat project, states that its rate of decline in magnetic intensity is *a fraction of 1 per cent per decade*, which is of the same order of magnitude as Chapman's observed rate of decline.

No actual data were given in the news release nor any of the other details which would be needed to make an assessment of the error factors involved, but the Magsat project is an important one. This first glimpse of its findings is sufficient to alert the scientific community to the fact that one can no longer ignore the rapid decay of the earth's magnetic field. It is definitely taking place.

The consequences of the rapid decay of the earth's magnetic field are astounding. This decay is inexorably heading the world toward a lethal environment of cosmic ray bombardment. Cosmic rays are very high speed positively charged nuclei coming in from outer space, from all directions and with high enough energies to transmute elements. The earth's magnetic field extends far out beyond the earth and provides a magnetic shield against most of those cosmic particles so that they miss the surface of the earth. However the weaker the magnetic field becomes the less it can accomplish this protective mission. If one takes the Langel projection, the earth's magnetic shield will vanish completely in the year 3180 A.D. If one takes the projection in a 1967 ESSA technical report³ the vanishing data for the earth's magnetic field is 3991 A.D.

A second consequence of the decaying magnetic field is the need to introduce a correction factor into carbon 14 dating, telescoping the dates down to younger ages. The stronger magnetic field in the past means that there was less penetration of cosmic rays then and a related smaller rate of production of carbon 14. Clearly that would yield a smaller residual amount of carbon 14 in a sample than would be expected by Libby's theory which assumes a constant rate of production of carbon 14. This means that a host of the previous carbon 14 dated samples have incorrectly been assigned long age dates. The prior stronger magnetic field must be taken into account. When it is corrected the ages will contract down to an age range that provides additional support for the creationist position.

Rejection of the Reversal Hypothesis

There is nothing in the Magsat findings to justify the claim that the earth's magnetic field will reverse its polarity. The evidence simply shows that the field strength is decaying. Langel's 1,200 year projected time at which the magnetic field will reverse polarity is actually the time for the magnetic field to *vanish*. At that time there will be no magnetic energy, and no magnetic poles. A reversal requires new magnetic energy and associated poles. If there are to be magnetic poles some new magnetic energy must be generated. But no valid mechanism for accomplishing this "reversal" in the earth's magnetic field has yet been developed, not even theoretically.

The decaying magnetic field presents a formidable problem to conventional geochronology. That frustrating problem has spawned the *reversal hypothesis* for sustaining the earth's magnetic field for

billions of years. According to the Magsat news release version of that hypothesis the earth's magnetic field has reversed many times and "at intervals of 50,000 to 1 million years" with the last "well-documented reversal" occurring 700,000 years ago. However it is acknowledged in the news release that "no one really understands the mechanism of a magnetic reversal."

With evolutionary geochronology in that precarious position it is not surprising that some "poetic license" might be taken with the data presumed to support the reversal hypothesis. That appears to have been done with the data on magnetic anomalies on the sea floor in the following Magsat news release: "Records of past polarities imbedded in the sea floor, which provide conclusive proof that the sea floor is spreading out from mid-ocean rifts, show that the 700,000 years is a long time between reversals. The average might be closer to 300,000 years." This so-called *conclusive proof* is based on the plate tectonics theory of continental drift espoused by Vine and supposedly supported by his interpretation of magnetic anomalies on the sea floor. Vine's claims are ripped to shreds by two lengthy articles in American Petroleum Geologist Bulletin V. 56 No. 2, 1972 by A. A. and Howard Meyerhoff pages 264-336. The following quotes are from those articles:

"It is not true that the linear magnetic anomalies can be correlated from the North Atlantic via the Indian Ocean to the northeastern Pacific. The magnetic signatures of supposedly correlative anomalies are very similar in limited areas, but are very different among different areas. Moreover, *magnetic stripes need not be caused solely by alternate bands of 'normal' and 'reversed' polarization, differences in magnetic susceptibility values of adjacent rock types can produce the same.* Page 271 (emphasis added).

"We have demonstrated that many of the beliefs held by continental drift advocates are misconceptions, most of them inherited from assumptions built on assumptions which are not clearly labeled as such — ". Page 271.

"The so-called magnetic anomalies are not what they are purported to be—a 'taped record' of magnetic events during the creation of the new ocean floor between continents." page 337.

"Vine's suggestion is interesting, but is simply another of those speculations, based on multiple assumptions, that gradually evolved into 'hypothesis', and later were transformed into 'established theory' and finally into 'fact'." page 338-339.

Additional Flaws in Reversal Hypothesis

One problem with the reversal hypothesis is that its only support is from anomalous evidence. The previously mentioned magnetic "record" on the sea floor has not only been exaggerated, it is not basic evidence in the first place. There is no assurance that there is any relation between the anomalous magnetic reversals observed on the floor of the ocean and the state (strength and direction) of the earth's main magnet, past or present. The documentation of that flaw in the presumed "reversal evidence" can be found in previous papers by the author in the Creation Research Society Quarterly and

Table 1.

Date	Field Strength	Date	Field Strength
1812	0.94 ± 0.05	1900	0.89
1848	1.016	1900	1.00
1850	0.96 ± 0.02	1900	0.94
1855 ± 3	0.95	1914	0.94
1858	0.87 ± 0.08	1930	0.988
1884	0.97	1955	1.00
1885	0.997	1955	1.00
1890 ± 10	0.67		

1812 to 1960 excerpt from "Change in Geomagnetic Intensity in the last 8500 years, According to Global Archeomagnetic Data" by S. P. Burlatskaya, Institute of Terrestrial Physics, USSR Academy of Science, 1969, page 547.

in the SIS Review.^{4, 5, 6, 7}

There are numerous problems involved. One is the matter of self-reversals in rock. It is unrelated to the ambient field. Another problem is in a flawed method of collecting and analyzing the data. The *only* dependable evidence on the history of the earth's magnetic dipole field is the realtime magnetic dipole *moment* evaluation developed from the whole earth. Those evaluations are achieved from extensive measurements of absolute field strength over a global distribution, in the same time frame, with the time accurately known, and so reduced as to eliminate the anomalous "noise". That has never been done for any of the presumed reversals.

Fortunately there is dependable real-time data on the earth's magnetic moment and its associated field that does meet the aforementioned criteria. It extends from the time of Karl Gauss' original evaluation in 1835 up to the present time. It shows the continuous decline in the earth's magnetic field as would be expected from the Magsat findings. So the decay has been documented since 1835. It is informative to compare that with the paleomagnetic data available in the literature, the type of data which has been classified as anomalous in this paper, the type employed to support the reversal theory. Table 1 gives all the listed paleomagnetic data in the overlapping time frame 1812 to 1960 which was available in the Russian paper which was supposed to have been a compilation of the available paleomagnetic data for the last 8,500 years. This test is to see if there is any check during this period of time in which it is known that the earth's magnetic field has been decaying rapidly. As can be seen from the table there is not the slightest indication in this paleomagnetic data of the actual decay which is known to have taken place. This is illustrative of the unreliability of data upon which the presumed reversal theory is said to have been "conclusively proved". It would never have been accepted in science had there not been such a motivation to hold on to the evolutionary chronology.

Earth's Magnetic History and Future

As noted there is no theoretical justification for reversals of the earth's dipole magnet. Nor is there any valid observational evidence for reversals of the earth's dipole magnet, only anomalous paleomagnetic observations. In the language of a communications engineer these anomalies are "noise" in so far as the dipole magnet is concerned. They are important and should be studied as evidence of nonuniformities in the earth's crust. These nonuniformities may have significance in mineral exploration, however they are only distractive effects that must be reduced out of the data before the basic "signal", the state of the dipole magnet and its symmetrical field, can be evaluated.

All of the worldwide real-time data indicate that the earth's dipole magnet is continuously decaying from a prior stronger state. In a previous paper the author has shown, from the available record of evaluations of the earth's magnetic dipole moment, that its half-life is about 1400 years.⁸ Extrapolating that backwards 10,000 years or so, yields implausibly large magnetic fields. If that is correct then by implication the age of the earth is also limited to that range.

There is excellent *theoretical* justification for the decay which has been observed. The theory was first developed by Horace Lamb in 1883. It is based on a solution to Maxwell's equations, meaning that it is completely dependable. *It predicts the decay and shows that no dynamo has been needed since its origin.*

This decaying magnetic phenomenon is somewhat analogous to the earth's spin. No motor has been needed to keep the earth spinning since its origin. The spin rate is declining but at a very slow rate.

The earth's magnetic field is indeed a remarkable geophysical phenomenon. It had a relatively recent origin. It is decaying and will vanish in the not too distant future, leaving the earth unprotected from cosmic ray bombardment.

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CREATIONISM AND CONTINENTAL DRIFT

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Calculations of the energy needed for continental drift as well as the energy dissipated by it show that classical continental drift will not fit into a creationist framework. If it is believed that the continents were at one time joined, then either God separated them in a manner in which the laws of nature were not involved or the earth expanded in such a way that the viscous forces were not involved.

Over the past few years, in response to the overwhelming geologic evidence, many creationists have embraced a modified form of the continental drift model. The main difference between secular and creationist drift models is the amount of time believed necessary for continental separation to occur. Stuart Nevins believes that,

"The cause for the ancient breaking up of continents can be explained easily by the enormous catastrophic forces of Noah's Flood which broke the lithosphere into moving plates which for a short time overcame the viscous drag of the earth's mantle."¹

Mark W. Tippetts in a recent article concerning continental separation stated,

"Since neither rates of geological processes nor the amount of time between events is known, it is mostly a matter of speculation as to the amount of time necessary to form the geological record as seen in the rocks of the earth's crust. Therefore, this author is free to use as little time as seems necessary to agree with the time indicated from a literal interpretation of Scripture."²

Scientifically, are we free to use any length of time we feel is necessary to separate the continents? This article is intended to demonstrate certain constraints on any continental separation and the place to start is to investigate what the effects would be of moving the continents around in a short time span as Nevins believes.

Philosophically, there are only four ways that the continents could be separated. First, God, himself, could have separated them outside of the natural laws of physics. If this is believed, the reader need not go further, for the matter is outside the realm of science. Secondly, an expansion of the earth would separate the continents effectively. Thirdly, forces acting at the surface of the earth could push the continents apart. Finally, motion in the mantle could drag the continents apart. These last two possibilities will be examined further.

Unfortunately, most creationists when discussing continental separation not only fail to specify which of these latter two forces are responsible for the separation but also fail to describe their nature precisely. Therefore, this article will examine the effects of separating the continents in a 5000 year time frame for convectional forces and surface forces.

Subsurface Forces

About the only conceivable mechanism for

separating the continents by subsurface forces is the convection cell.[†] It can be shown that the maximum velocity in the vertical direction for a steady-state convection cell is (see appendix) $V_0 = T_0 (g\rho\nu\alpha/3\mu\psi)^{1/2}$ where T_0 is the temperature difference between the upward flowing mantle stream and the surrounding mantle, g is the acceleration of gravity, ρ is the density, ν is the coefficient of expansion, α is the thermal diffusivity, μ is the viscosity of the mantle and ψ is the temperature gradient in the vertical.[‡]

Before evaluating this expression we need to determine T_0 and μ . The viscosity has been determined from the isostatic rebound of Fennoscandia to be of the order of 10^{22} poise.[§] However, since the calculations involve certain uniformitarian assumptions which would not be acceptable to creationists as a whole, it seems reasonable to re-evaluate the viscosity and see if it might be smaller.

The equation from which the viscosity is determined will not be derived here, but it is 'given by $\mu = \zeta \Delta t \rho' g / (2n\Delta\zeta)$ where ζ is the original displacement in the vertical, $\Delta\zeta$ is the uplift which has occurred in Δt time, ρ' is the density of the displaced asthenosphere approximately equal to 3.3, and n is a constant which depends upon the horizontal extent of the load. $n^2 = l^2 + m^2$ where $l = \pi/A$, $M = \pi/b$ and A and B are the orthogonal dimensions of the load.

Uniformitarian methods estimate that the central area of Fennoscandia has risen 130 m from 5000 B. C. to 1950 A. D. Gravity anomalies indicate that the area should rise 150 m more before equilibrium is established. The orthogonal dimensions of the ice cap is estimated to have been 1200 km. by 1800 km. Using these values the viscosity is estimated to be $\mu = 2.4 \times 10^{22}$ poise. Although this value is probably fairly close to the actual value, it is instructive to calculate the viscosity based upon the assumption that the time is off by a factor of 2. This would mean a change of 130 m in elevation since 1525 B. C. Thus $\mu = 1.2 \times 10^{22}$ poise. Therefore, it would appear that an estimate of 10^{22} poise for the viscosity of the mantle would be of the correct order of magnitude. For comparison, thick honey has a viscosity of around 100 poise while for water it is 0.01 poise.

The temperature inside of the convection cell is the

[†]A convection cell, is analogous to a vat of liquid, heated at one end. The warmed liquid, being lighter, rises and moves to the other end, where it cools and sinks. Thus convection currents are set up; and anything floating on the surface would be carried along with the current.

[‡]Viscosity is a measure of how difficult it is to get a liquid to flow. Thus the viscosity of molasses is greater than that of water. A unit of viscosity is the poise; the more poises the thicker, in the sense of not flowing readily, is the liquid.

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only other parameter which needs to be determined the temperature *in excess* of the thermostatic condition can be determined by the amount of uplift at an oceanic ridge.⁵ If the upwelling plume is T_0 hotter than the surrounding mantle, then the density in the plume is $\Delta\rho = \rho_m \nu T_0$ less than the surrounding mantle. ρ_m is the mean density of the mantle. If D is the depth of the plume, the net buoyancy force upwards per unit area is $F = \rho_m \nu T_0 Dg$. This force is balanced by the extra weight of the ridge.

If h is the height of the ridge, ρ_w is the density of water and ρ_r is the density of the ridge material, the excess weight per unit area is $F = (\rho_r - \rho_w)gh$. Equating the two forces yields $T_0 = h(\rho_r - \rho_w)/(\rho_m \nu D)$. Letting $\rho_r = 3.3$, $\rho_w = 1$, $\rho_m = 4.0$, $h = 1$ km, and $D = 200$ km, and $\nu = 2 \times 10^{-5}/^\circ\text{C}$, gives $T_0 = 143^\circ\text{C}$.

Substituting the expression for T_0 into that for V_0 gives $V_0 = h[(\rho_r - \rho_w)/(\rho_m \nu D)] [g\rho\nu\alpha/3\mu\psi]^{1/2}$.

When the relation found for T_0 is used $\rho = \rho_m(1 - \nu T_0)$, $\rho = 3.98$ if $\rho_m = 4.0$. Using all previously defined values and $\alpha = 0.01$ and $\psi = 1^\circ\text{C}/\text{km}$, we have, $V_0 = 7.3 \times 10^{-9}$ cm/sec = .23 cm/year.

As a point of comparison, the velocity needed for continental drift to have occurred in the past few thousand years is enormous next to the theoretical velocity. If a shelfedge is 1500 km from a ridge and the drift occurred over a period of 5000 years, the average velocity must be 300 meters per year. If this rate were continuing today it would be measurable. Since no movement of this magnitude is measurable, the next question which must be asked is could the velocity have varied exponentially; say $V = V_0 \exp(-\omega t)$? This would mean that some parameter determining V_0 would have to vary exponentially. It is difficult to see any of these except T_0 varying in time. If T_0 were the cause of the variation, T_0 would be equal to 18 million degrees centigrade hotter than the surrounding mantle in order for V_0 to be equal to 300 m/yr. Obviously this is too hot. The only other possibility is that the mantle's viscosity has been seriously overestimated. However, this seems unlikely.

Thus it is concluded, that convection cells cannot account for the separation of the continents in a creationist framework.

Surface Forces

As mentioned above most creationists when discussing continental separation fail to specify the precise nature of the forces involved. The examination of surface forces presented below will not specify what forces could be responsible either. This means that the result of pushing or pulling the continents apart by means of forces acting on the surface of the earth will be applicable regardless of the forces involved.*

If the continents are moving at a constant velocity U in the x -direction, hydrodynamics tells us that there will be some depth h such that the velocity of the mantle material will be zero.⁶ If F_0 is the tangential component of this force per unit area, then the total force will be

$F_0 b l$ where b is the width and l the length of the region under consideration. The frictional force can be shown to be $(\mu b l) (\partial u / \partial z)$, where u is the velocity of the fluid. Since the motion is steady these two forces must balance. Therefore,

$$\frac{du}{dz} = \frac{F_0}{\mu}$$

Integrating

$$u = C - \frac{F_0}{\mu} z$$

where C is the constant of integration.

Since at $z=0$, $u=0$ and at $z=h$, $u=U$ we have $F = -uU/h$ and $C=0$. Therefore, $u = Uz/h$. Motion like that described is called plane couette flow. The velocity varies linearly from 0 at $z=0$ to U at $z=h$.

The rate of temperature rise during such motion due to the frictional dissipation of heat is

$$\rho C_v \frac{\partial T}{\partial t} = \mu \left[\frac{\partial u}{\partial z} \right]^2$$

where ρ is the density of the mantle, C_v is the specific heat of the mantle, T is the temperature and t is the time.⁷

This, with the relation for u , gives:

$$T = \frac{\mu U^2 t}{\rho C_v h^2} \Big|_{t_0}^{t_1}$$

If $U = 300$ m/yr, $\mu = 10^{22}$ poise, $\rho = 4$, $C_v = 0.2$ (the value for basalt), $t_0 = 0$, and $t_1 = 5000$ years = 1.57×10^{11} sec, and giving h the ridiculous value of the radius of the earth, we find that the temperature of the earth after such movement would be $T = 4.3 \times 10^9$ °C. Thus it must be concluded that the temperature rise due to the movement of the continents through the mantle, regardless of the forces involved would vaporize the earth if it occurred within the time frame allotted to creationists.

These results show that neither convection cells nor any other forces could have separated the continents within a few thousand years, *if the viscous forces were involved in that movement*. This leaves only two possibilities to explain the fit of the continents. Either God separated the continents outside of natural agencies or that the earth expanded in such a way that the viscous forces were not involved. The expansion of the earth caused by an expansion of each individual atom due to a change in the permittivity of free space (the electric force) is a possibility which could avoid the viscosity problem.

Appendix A

Figure 1 shows the model of a convection cell with the origin taken as the base of the cell. We will assume a linear thermostatic temperature gradient (ψ) which on average is $1^\circ\text{C}/\text{km}$. The temperature which will be used in this derivation will be the temperature *in excess* of the thermostatic gradient. Similarly, the pressure (P) will be defined as that *in excess* of the hydrostatic pressure which is $\rho g z$.

*A situation of the sort might be set up in a deep pan of taffy, if one were to push horizontally on the top of the taffy, the bottom layer, in contact with the bottom of the pan, remaining stationary.

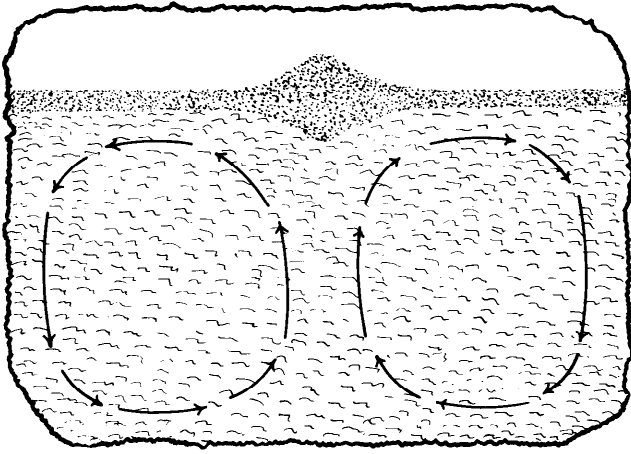


Figure 1. This shows a model of a convection cell. In the analogue of a heated vat of liquid, here the heat would have been applied under the middle of the vat.

The density of the mantle will be assumed to vary only with the temperature, according to $\rho = \rho_m(1 - \nu T)$ where ρ_m is the hydrostatic, thermostatic density, ν is the volumetric coefficient of expansion and T is the temperature in excess of the thermostatic condition.

The first three equations governing the motion of a steady-state convection cell are simply the equations of motion of a viscous fluid. These are:

$$-\frac{\partial P}{\partial x} + \mu \nabla^2 V_x = 0 \quad (1)$$

$$-\frac{\partial P}{\partial y} + \mu \nabla^2 V_y = 0 \quad (2)$$

$$-\frac{\partial P}{\partial z} + \mu \nabla^2 V_z - g \rho \nu T = 0 \quad (3)$$

where μ is the coefficient of viscosity and V_x , V_y , V_z are the components of velocity.

The fourth equation is the equation of continuity

$$\frac{\partial V_x}{\partial x} + \frac{\partial V_y}{\partial y} + \frac{\partial V_z}{\partial z} = 0 \quad (4)$$

The final equation is the heat flow equation

$$\alpha \nabla^2 T = \frac{\partial T}{\partial t} = \psi V_z \quad (5)$$

where α is the thermal diffusivity and t is the time.

We will assume that the velocities and excess temperature and pressure in the x - y plane can be represented by harmonics. Letting

$$V_x = V_x(z) e^{i l x + i m y}$$

$$V_y = V_y(z) e^{i l x + i m y}$$

$$V_z = V_z(z) e^{i l x + i m y}$$

$$P = P(z) e^{i l x + i m y}$$

$$T = T(z) e^{i l x + i m y}$$

and substituting these into Equations (1) through (5) we have

$$-i l P + \mu(-l^2 V_x - m^2 V_x + \frac{d^2 V_x}{dz^2}) = 0 \quad (6)$$

$$-i m P + \mu(-l^2 V_y - m^2 V_y + \frac{d^2 V_y}{dz^2}) = 0 \quad (7)$$

$$-\frac{dP}{dz} + \mu(-l^2 V_z - m^2 V_z + \frac{d^2 V_z}{dz^2}) - g \rho \nu T = 0 \quad (8)$$

$$i l V_x + i m V_y + \frac{dV_z}{dz} = 0 \quad (9)$$

$$\alpha(-l^2 T - m^2 T + \frac{d^2 T}{dz^2}) = \psi V_z \quad (10)$$

Taking the derivative with respect to z of Equations (6), (7), and (9) we have

$$-i l \frac{dP}{dz} + \mu(-l^2 \frac{dV_x}{dz} - m^2 \frac{dV_x}{dz} + \frac{d^3 V_x}{dz^3}) = 0 \quad (11)$$

$$-i m \frac{dP}{dz} + \mu(-l^2 \frac{dV_y}{dz} - m^2 \frac{dV_y}{dz} + \frac{d^3 V_y}{dz^3}) = 0 \quad (12)$$

$$i l \frac{dV_x}{dz} + i m \frac{dV_y}{dz} + \frac{d^2 V_z}{dz^2} = 0 \quad (13)$$

Multiplying Equation (11) by $i l$ and Equation (12) by $i m$, adding and substituting from Equation (13) we have

$$\frac{dP}{dz} = \frac{-\mu}{l^2 + m^2} (-l^2 - m^2 + \frac{d^2}{dz^2}) (-\frac{d^2 V_z}{dz^2}) \quad (14)$$

Substituting this into equation 8 we have,

$$-\frac{-\mu}{l^2 + m^2} (-l^2 - m^2 + \frac{d^2}{dz^2}) (\frac{d^2 V_z}{dz^2}) + (-l^2 - m^2 + \frac{d^2}{dz^2}) V_z - g \rho \nu T = 0 \quad (15)$$

We have now reduced our problem to two unknowns and two equations: (10) and (15). At the top and bottom of the cell all motion is horizontal so $V_z = 0$. Equally at the top and bottom of the cell the temperature is not in excess of the thermostatic condition. Therefore $T = 0$. If we assume that $V_z = V_0 \sin(kz)$ and $T = T_0 \sin(kz)$ where the depth of the convection cell is $D = \pi/k$ substituting that into Equations (10) and (15) gives

$$(l^2 + m^2 + k^2)^2 V_0 + g \rho \nu (l^2 + m^2) T_0 = 0 \quad (16)$$

and

$$\psi V_0 + \alpha(l^2 + m^2 + k^2) T_0 = 0 \quad (17)$$

The determinant of the coefficients has to be equal to zero if these equations are to have a solution. This means

$$(1^2 + m^2 + k^2)^3 - \frac{gQ\psi\nu}{\mu\alpha} (1^2 + m^2) = 0 \quad (18)$$

Rearranging

$$k^2 = \frac{[gQ\psi\nu (1^2 + m^2)]^{1/3} - (1^2 + m^2)}{\mu\alpha} \quad (19)$$

Letting $k^2 = y$, $1 + m^2 = x$, and $(gQ\psi\nu/\mu\alpha)^{1/3} = a$, puts Equation (19) into the form $y = ax^{1/3} - x$, or:

$$\frac{dy}{dx} = (1/3)ax^{-2/3} - 1 = C \quad (20)$$

where C is the value which this equation has, given x. Using equation 20, solving for a and substituting into the equation for y gives $y = [3(C+1)-1]x$. Therefore:

$$(1^2 + m^2) = \frac{k^2}{3(C-1) - 1} \quad (21)$$

Solving for V_0 in both Equations (16) and (17) and multiplying the results we have:

$$V_0 = T_0 \left[\frac{gQ\nu\alpha(1^2 + m^2)}{\mu\psi(1^2 + m^2 + k^2)} \right]^{1/2} \quad (22)$$

Substituting Equation (21) into Equation (22) gives:

$$V_0 = T_0 \left[\frac{gQ\nu\alpha}{3\mu\psi(C+1)} \right]^{1/2} \quad (23)$$

Obviously V_0 is a maximum when $C=0$. In this case Equation (23) reduces to:

$$V_0 = T_0 \left[\frac{gQ\nu\alpha}{3\mu\psi} \right]^{1/2} \quad (24)$$

References

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³Officer, Charles B., 1974. Introduction to Theoretical Geophysics. Springer-Verlag. Most of the derivations of this equation can be found on pp. 373-377 of this book.
⁴*Ibid.*, p. 370.
⁵Phillips, O. M., 1968. The heart of the earth. Freeman, Cooper, and Co., San Francisco. The derivation of the temperature equation can be found on pp. 221 and 222.
⁶Rogers, Ruth H., 1978. Fluid mechanics. Routledge and Kegan Paul, Pp. 94 and 97.
⁷Bird, R. B., W. E. Stewart, and E. N. Lightfoot, 1960. Transport phenomena. John Wiley and Sons, New York. Pp. 315 and 316.

More Thoughts on the Doppler Effect

(Continued from page 79)

plainly be when it was at its farthest from the Earth, behind the dim star. The eclipse, which is an interruption of the light, surely travels at the same speed as the light; so the Doppler effect must do likewise.

The question being discussed could be stated well in terms of ethers. I know that "ether" is not a popular word in physics nowadays. But if one is to have a wave theory, there has to be something; there can not be waves in, on, of, etc., nothing at all. And "ether" has a fairly definite meaning; whereas "space", "vacuum" etc., mean also many other things.^{5,6} I am not saying, of course, that one must accept one of the mechanical models of the ether, which were so popular in the last century.

Now there might be any of three situations: (i) a communal ether; (ii) each source has its own private ether, attached somehow to it and moving with it; or, (iii) likewise each receiver. (Let us say "receiver" rather than "observer", a terribly overused and mis-used word nowadays.) (i) is the situation as Maxwell, e.g., envisaged it. (ii) is a modification of Ritz's view, suggested for consideration by Dingle.⁷ (iii) is oddly like a view, mentioned by Aristotle as common (but which he did not share) that vision is something going out from the eye and reaching the thing seen.⁸

If (ii) were true, the Doppler effect, due to motion of the source, would be propagated instantaneously. So it seems to be ruled out. If (iii) were true, the Doppler effects, due to the Earth's motion, for stars at different distances, would take different times to reach the Earth; hence would be seen at different times. But stars in the same direction all show the same Doppler effect at the same time; so (iii) is ruled out. So (i) must be true; we are back to the situation much as Maxwell envisaged it.

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²Ritz, Walther, 1908. *Recherches critiques sur l'electrodynamique generale*. *Annals de Chimie et de Physique*, 8 serie, t. XIII, pp. 145 et seq.
³de Sitter, W., 1913. *Ein astronomischer Beweis fur die Konstanz der Lichtgeschwindigkeit*. *Physikalische Zeitschrift* XIV (10): 429.
⁴Payne-Gaposchkin, Cecilia, and Katherine Haramundanis, 1970. Introduction to astronomy. Second ed. Prentice-Hall. Pp. 351-358.
⁵Janossy, L., 1971. Theory of relativity based on physical reality. Akademiai Kiado, Budapest. See especially pp. 48 and 49, where it is pointed out that even Einstein was of two minds about the ether.
⁶Clube, S.V.M., 1980. The material vacuum. *Monthly Notices of the Royal Astronomical Society* 193 (2): 385-397. Arguments are given for what is in effect an ether much like that envisaged by Lorentz and others.
⁷Dingle, Herbert, 1960. The Doppler effect and the foundations of physics. *British Journal for the Philosophy of Science* XI, (41): 11-31; and (42): 113-129. See especially page 18.
⁸See, e.g., his On sense and sensibles, Chapter 2; and Topics, Book 1, Chapter 14.

THE ESSENTIAL NONEXISTENCE OF THE EVOLUTIONARY-UNIFORMITARIAN GEOLOGIC COLUMN: A QUANTITATIVE ASSESSMENT

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This article is a systematic and quantitative demonstration of global distributional tendencies of the evolutionary-uniformitarian geologic column.

Maps have been drawn to show the worldwide distributions of all ten geologic periods on all seven continents, and such maps have also been drafted to show complete segments of the geologic column in place.

Calculations have been performed to measure successional tendencies of geologic periods over the earth. For example, it has been found that two-thirds of the earth's land surface has 5 or fewer of the 10 geologic periods in place, and only 15-20% of the earth's land surface has even 3 geologic periods appearing in "correct" consecutive order.

These and similar findings have been briefly related to the Creationist-Diluvialist paradigm.

PLAN OF THIS ARTICLE

Introduction

I. Procedures Utilized in Measuring the Factuality of the Geologic Column.

II. Exposition and Discussion of Results.

III. Probable Diluvial Significance of Global Stratigraphic Trends.

Introduction

A major foundation of the evolutionary-uniformitarian paradigm is the geologic column. This column, presented as fact, purports to demonstrate that the earth and its life have been evolving and that the earth's sedimentary strata contain the resultant biochronologic "onion skins."

A bit of wisdom for geologists is given by Park and MacDiarmid¹, who said: "The final test of all theories and hypotheses in geology is their applicability in the field." Accordingly, Creationists-Diluvialists have long pointed out that the evolutionary-uniformitarian geologic column does not correspond to reality and that fossiliferous strata must be understood as non-evolutionary, mutually-contemporaneous, cataclysmically-formed Noachian Flood deposits.

The works of Price,² Nelson,³ Whitcomb and Morris,⁴ and Burdick⁵ have called attention to the fact that geologic periods rocks tend to be absent, inconsistent in their stratigraphic successional order from place to place, and all exhibiting some tendency to rest directly upon Precambrian "basement." Clark,⁶ on the other hand, noted that there are places where much of the geologic column can be seen in place and in "correct" order.

The purpose of this work is to examine the earth's land surface (although oceans and continental shelves are also considered) in order to determine the degree of correspondence of the geologic column with reality. This study of "the geologic column as it really is" involves the quantitative measure of: 1) the tendency of the earth's land surface to have rocks of many alleged geologic periods in place versus the opposite tendency, and 2) the actual modes of stratigraphic succession of rocks attributed to different geologic periods.

I. Procedures Utilized in Measuring the Factuality of the Geologic Column

Data were gathered in order to present maps showing the distribution on all seven continents of rocks attributed to all ten geologic periods; a separate map for each geologic period (Maps 1-10).

Fidelity to areas on the maps was guaranteed by using Lamberts Azimuthal Equal-Area Projection on the base map used throughout this work. Maps of separate continents were reduced and placed next to each other to eliminate oceanic areas so that the largest possible dimensions of continents capable of being fitted onto a *Quarterly* page could be utilized. The use of separate continents, obtained from several sources,^{7,10} reduces the perspective distortion that would result had the continents been bunched together from a single world map. (The bunching together of continents, a space-saving measure, is not at all intended to be an endorsement of the "new global tectonics.") The base map has a scale of one inch to 1530 miles, or one centimeter to 969 kilometers.

Much of the basic data for this work is derived from the works of a Soviet team of geologists headed by Alexander Ronov. They compiled data on all ten geologic periods, showing distribution, thicknesses, gross petrologic compositions, and inferred paleoenvironmental conditions of formation. Volcanic and volcano sedimentary formations were included, but evidently not postorogenic granites. Recently, Ronov *et. al.*¹¹ pointed out that some of their much earlier works are in need of revision. Accordingly, they have been updated partly by more recent works. Recent data for Antarctica has been added.

The geology of Antarctica is poorly known for east Antarctica because of the glacial cover. It is, however, probably mostly exposed Gondwana Shield. Whatever Phanerozoic rocks there are unaccounted for beneath the ice cap would not change the figures in this work by

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more than several per cent.

The errors in this work should favor the uniformitarian geologic column. Only a small part of the lower, medial, or upper portions of a geologic period need be present for the area to count as having that geologic period represented there. One thickness category used by the Ronov *et. al.* team, 0-100 meters, permitted areas to be exaggerated because scattered outliers would give entire areas having them credit for having those geologic periods.

It also appears that the Ronov *et. al.* team was generous in giving credit as to the representation of geologic periods to areas having rocks metamorphosed beyond biostratigraphic recognition. For instance, Ben-Avraham and Emery¹² wrote that Indonesian geology is poorly known and that the oldest fossiliferous formations are middle and late Paleozoic, resting upon crystalline schists. Yet from maps 1-3 it is evident that the Ronov *et. al.* team gave blanket credit for Indonesia having complete Lower Paleozoic despite the unknown biostratigraphic age of the schists.

The presumed geologic periods necessarily differ in their areal extent because there is no reason to believe that sedimentation and tectonic rates would be constant. Geologic periods also differed considerably in duration, ranging from only 40 million years for Silurian and Triassic to 100 million years for the Cambrian according to the scale of Braziliunas.¹³

Data for making the map for world Cambrian (Map 1) were taken from Ronov *et. al.*^{14,15} except that an addition was made for the Antarctic Cambrian.¹⁶ The work of Ronov *et. al.*^{17,18} on the Ordovician was used to draw that map (Map 2), while another work by Ronov *et. al.*^{19,20} was utilized to show the world's Silurian (Map 3). No Ordovician or Silurian rocks are known from Antarctica, but Maps 2 and 3 have been drawn to show areas where Ordovician and Silurian is suspected, according to Burrett,²¹ and Veevers,²² and Elliot.²³ Recent palynostratigraphic work by Kyle²⁴ has cast unfavorable light upon another area being Silurian, and so it has not been shown as Silurian.

The map for Devonian (Map 4) used partly an old work by Ronov *et. al.*²⁵ which was extensively updated using the works of House,²⁶ Spasskiy,²⁷ Brinkmann,²⁸ Kummel,²⁹ Brown *et. al.*,³⁰ Hermes,³¹ Cook and Bally,³² Miall,³³ and Churkin.³⁴ Sources for Antarctic Devonian are Boucot,³⁵ Elliot,³⁶ and Barrett *et. al.*³⁷

Carboniferous data for making the map (Map 5) were taken from Ronov *et. al.*³⁸ and from the more recent works of Churkin,³⁹ Brown *et. al.*,⁴⁰ Hill,⁴¹ Ross,⁴² Rocha-Campos,⁴³ Ross,⁴⁴ Meyerhoff,⁴⁵ Kummel,⁴⁶ Cook and Bally,⁴⁷ and Stocklin.⁴⁸ The map for Permian (Map 6) was drafted utilizing the work of Ronov *et. al.*⁴⁹ on Permian, as well as more recent works by Rocha-Campos,⁴³ Meyerhoff,⁴⁵ Stocklin,⁴⁸ Audley-Charles,^{50,51} Meyerhoff and Meyerhoff,⁵² Miall,⁵³ Brown *et. al.*,⁵⁴ Oftedahl,⁵⁵ Kummel,⁵⁶ Gobbett,⁵⁷ Cook and Bally,⁵⁸ and Churkin.⁶³ The PermoCarboniferous of Antarctica was drafted using data from Barrett,^{37,59,60} Elliot,⁶¹ and Kemp.⁶²

Ronov *et. al.*'s⁶⁴ work on the Triassic was used in drawing Map 7, with minor modifications from the

works of Audley-Charles,⁵¹ and Brown *et. al.*⁶⁵ Sources of Antarctic Triassic data used were from the works of Barrett *et. al.*,³⁷ Plumstead,⁶⁶ and Elliot.⁶⁷ Map 8 (Jurassic) was drawn utilizing the work on Jurassic by Ronov *et. al.*⁶⁸ with a minor updating based on Audley-Charles.⁵¹ Antarctic Jurassic data came from Elliot.^{69,70}

The map for Cretaceous (Map 9) was drawn from the maps in the work of Ronov *et. al.*,^{71,72} except that additions for Antarctica were made from the works of Elliot,^{23,69} Grikurov *et. al.*,⁷³ and Drewry.⁷⁴ (Drewry presented geophysical evidence for the presence of sedimentary basins under the east Antarctic ice cap, and both Drewry and Grikurov had conjectured the presence of Cretaceous-Tertiary formations there. These areas are shown in Maps 9 and 10 with question marks.)

Ronov *et. al.*'s^{75,8} works on the Tertiary were used to construct the map (Map 10). Sources of Antarctic Tertiary besides the previously-mentioned works of Grikurov *et. al.*,⁷³ and Drewry⁷⁴ (plus the estimates of Behrendt⁷⁹), were the works of Elliot⁶⁹ and Dort.⁸⁰

The intersections of Map 1 (Cambrian), Map 2 (Ordovician), and Map 3 (Silurian) were drafted as Map 11 (Complete Lower Paleozoic). The intersections of Map 4 (Devonian), Map 5 (Carboniferous), and Map 6 (Permian) were drawn as Map 12 (Complete Upper Paleozoic). Map 13 (Complete Paleozoic) is the intersection of Maps 11 and 12, while Map 14 (Complete Mesozoic) is the intersection of Map 7 (Triassic), Map 8 (Jurassic), and Map 9 (Cretaceous). Map 15 (Complete Geologic Column) is the draft of the intersection of Map 10 (Tertiary) with Maps 13 and 14.

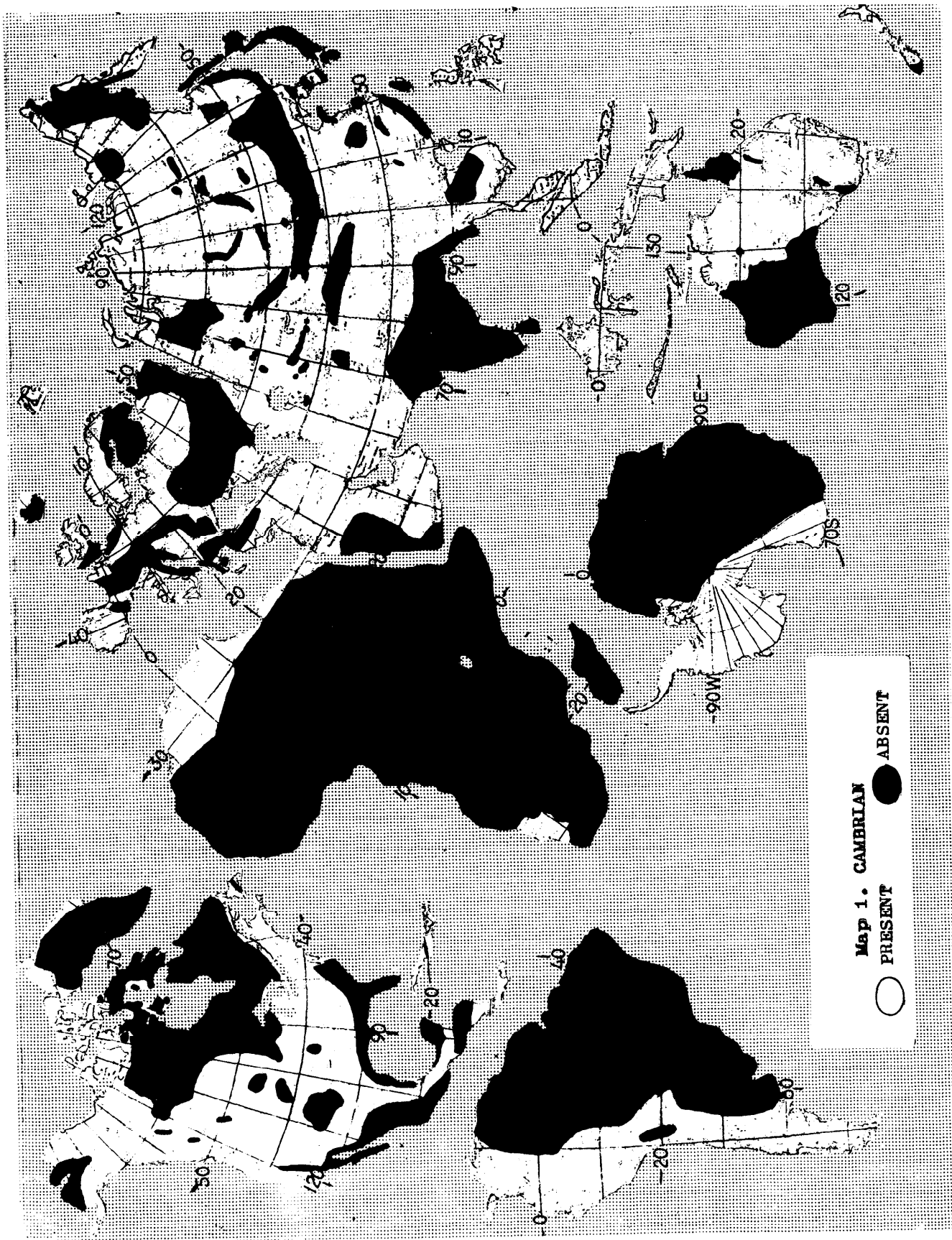
The earth's land surface was divided into 967 squares of equal area (each square being 252×252 miles or 406×406 kilometers) for the purpose of performing calculations on the areal tendencies of geologic periods. These square areas were given Cartesian coordinates (but letters instead of numbers) as is shown over a blank base map (Map 16).

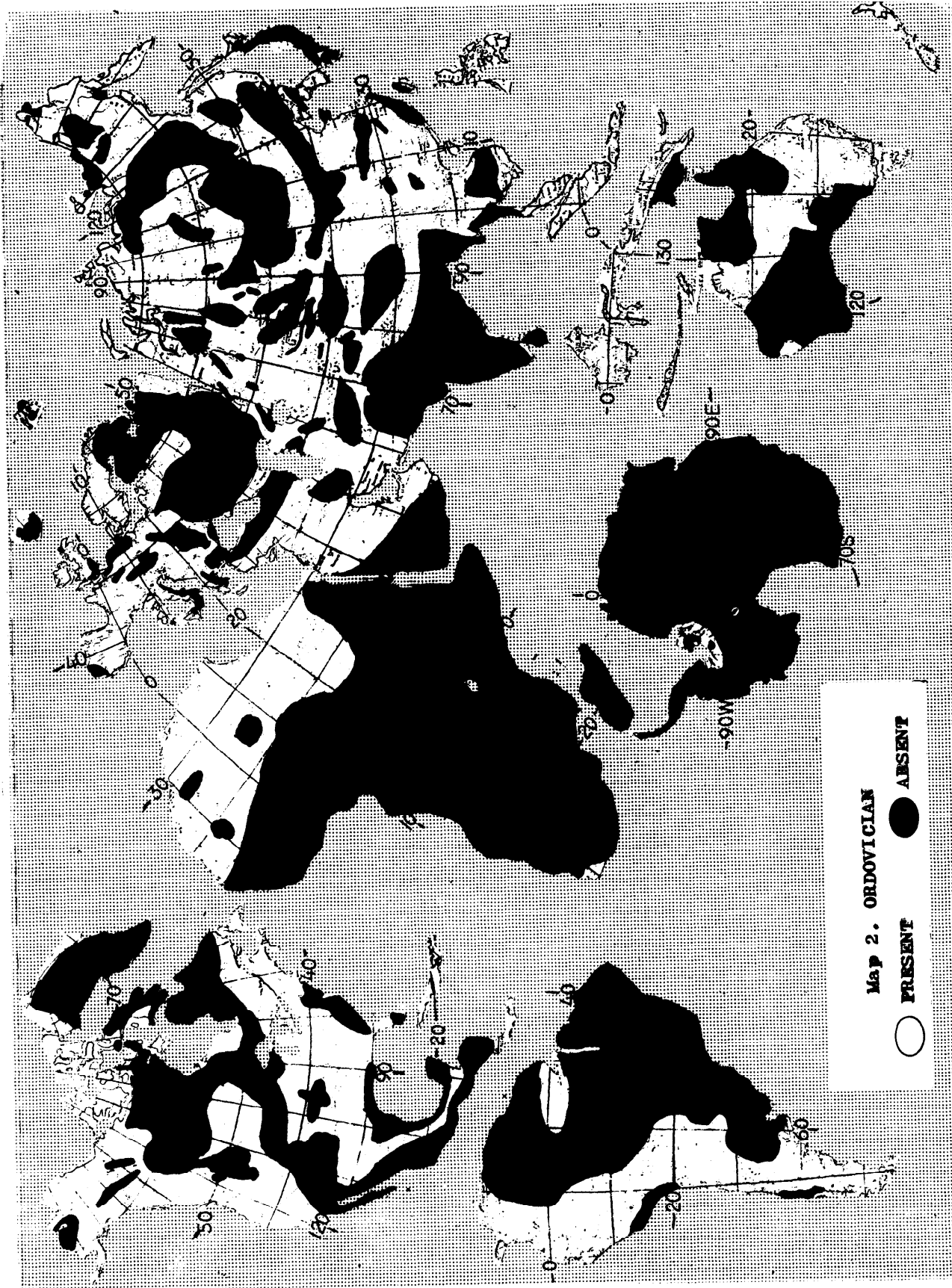
A transparency identical to the one superimposed over a blank base map (Map 16) was thus superimposed over Maps 1 through 10, and the preponderant presence or absence of rocks attributed to the ten geologic periods in these 967 square areas was entered into Table 1.

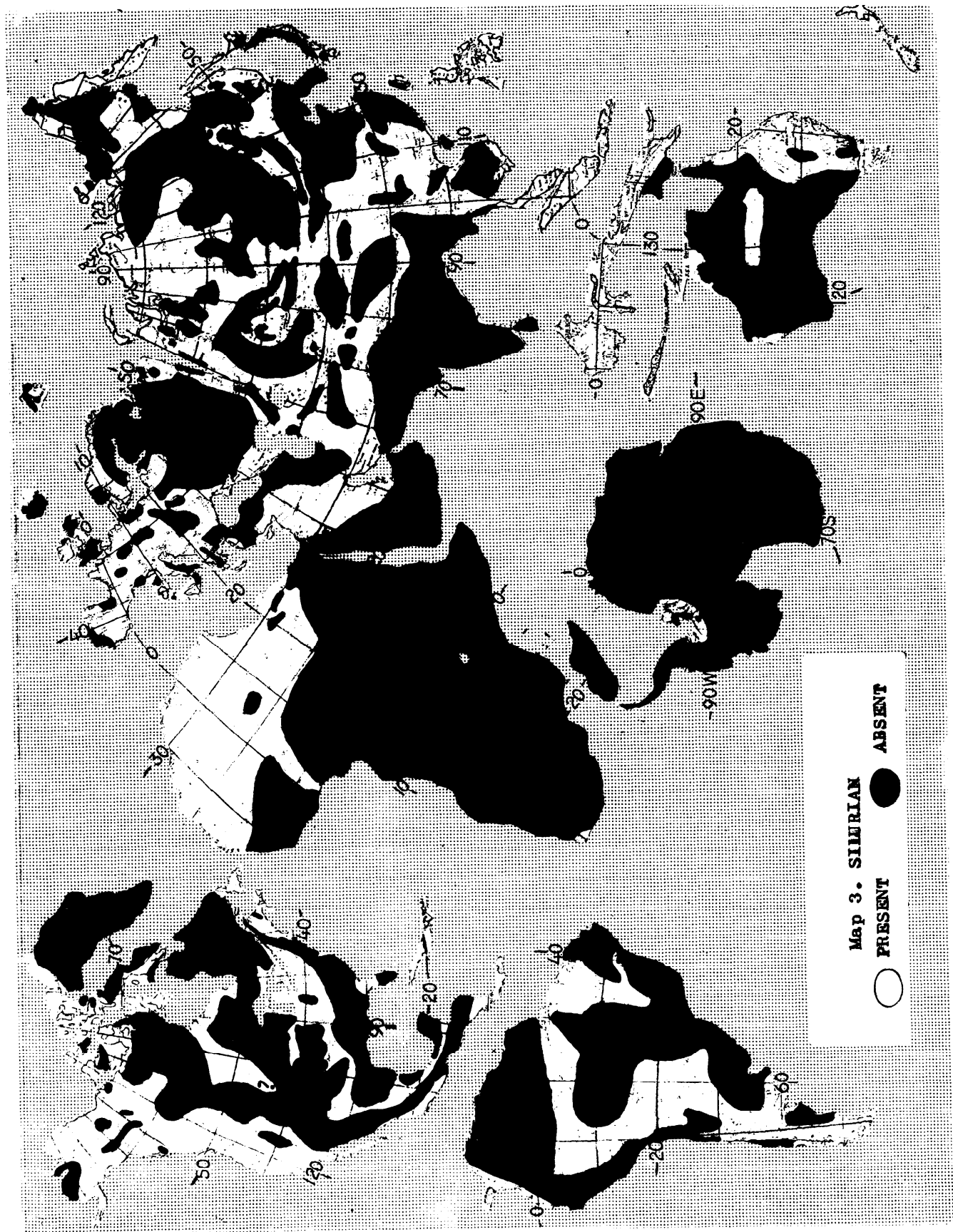
The numbers of geologic periods lithologically represented in each square were written after every row in Table 1. All the raw data in Table 1 was expressed as a percentage of all 967 squares (the entire earth's land surface). Figure 1 was drawn to show what percentage of the earth's land surface has how many geologic periods represented. Figure 2 shows what percentage of the earth's land surface has what particular sequence of consecutive geologic periods represented. Table 2 shows what percentage of a given geologic period (in terms of total subaerial terrestrial areal distribution) rests on what geologic period that is older than that given geologic period. This includes the percentages (of all ten geologic periods) resting directly upon Precambrian "basement."

II. Exposition and Discussion of Results

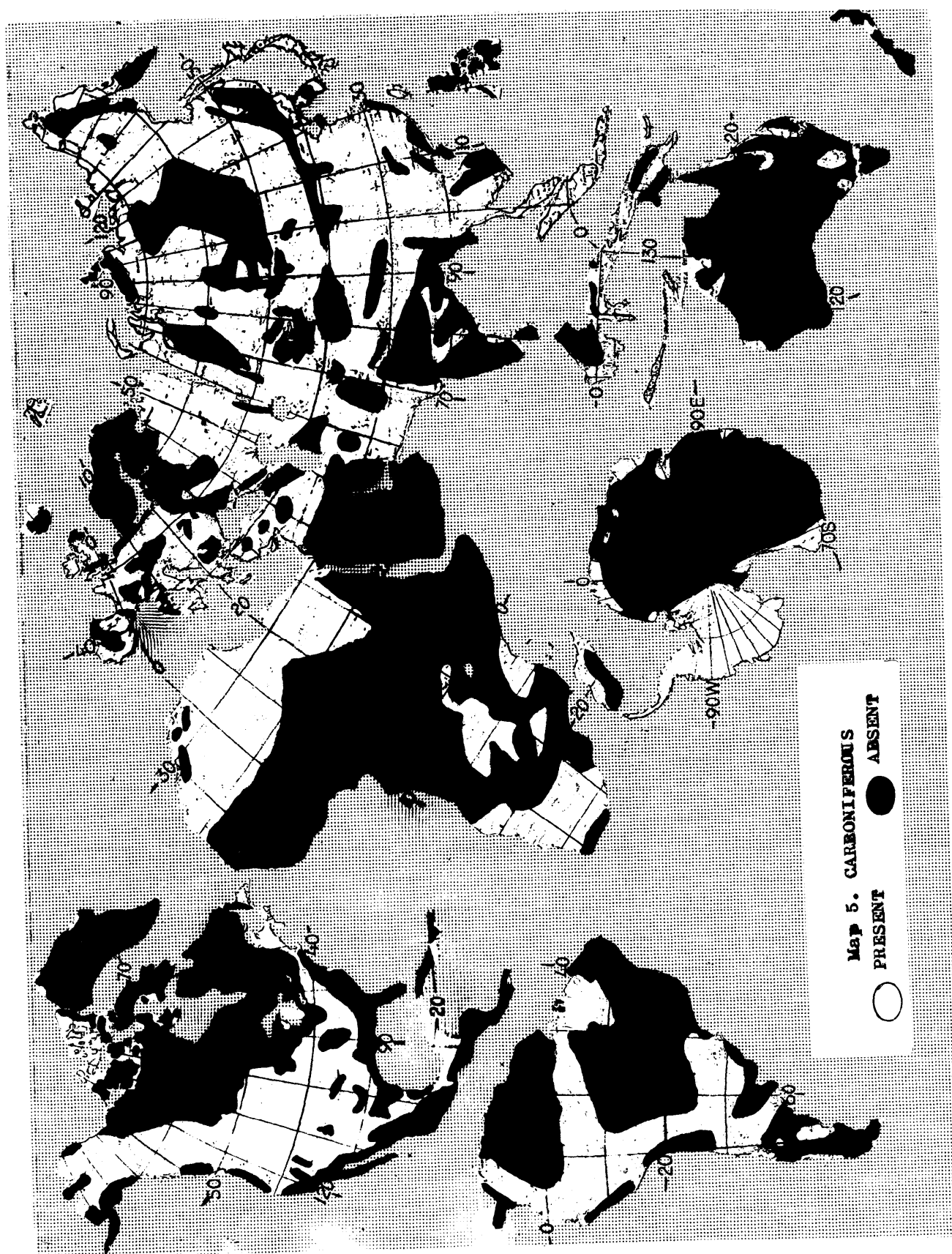
From maps 11, 12, and 14, it is obvious that the





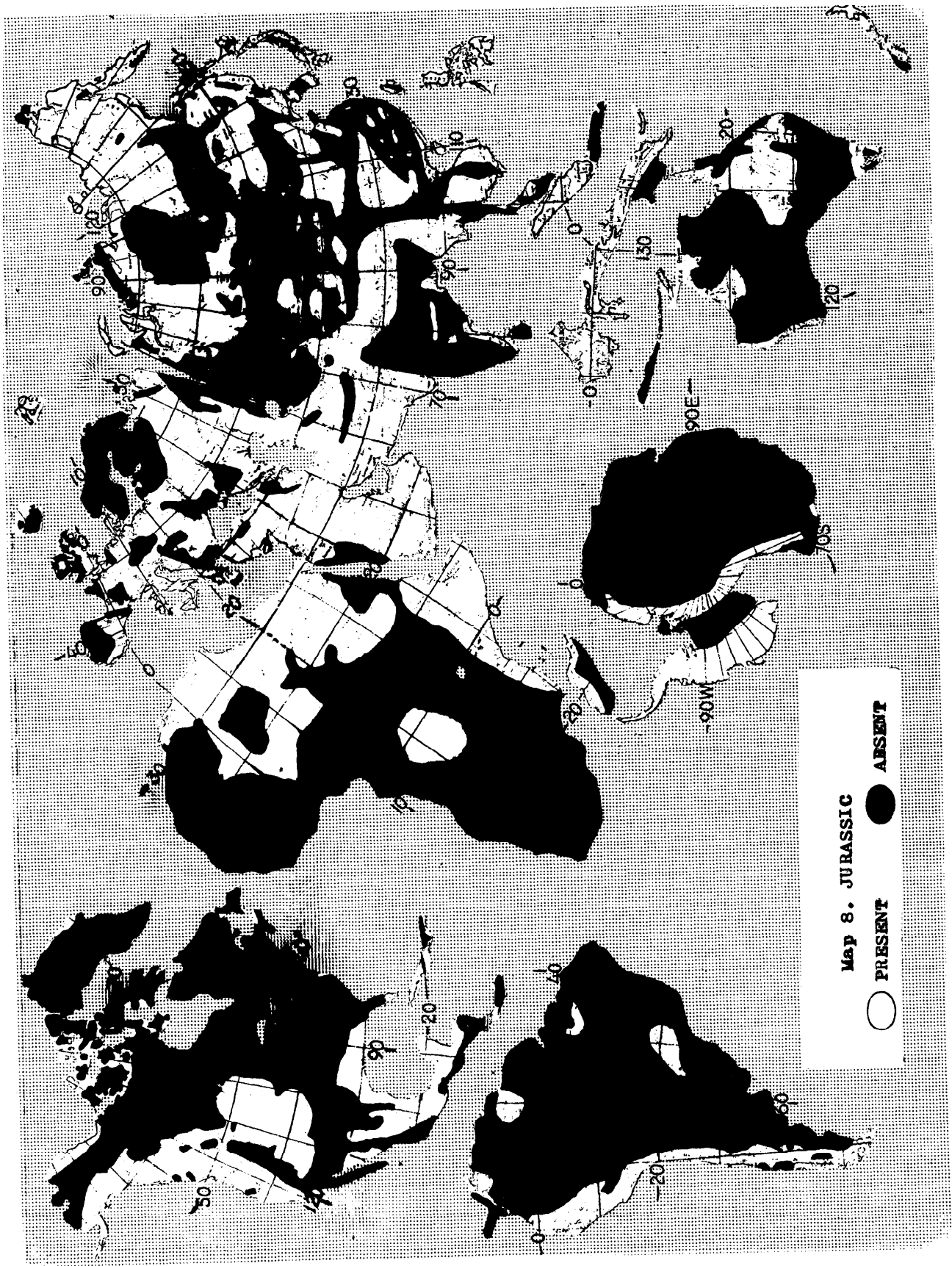


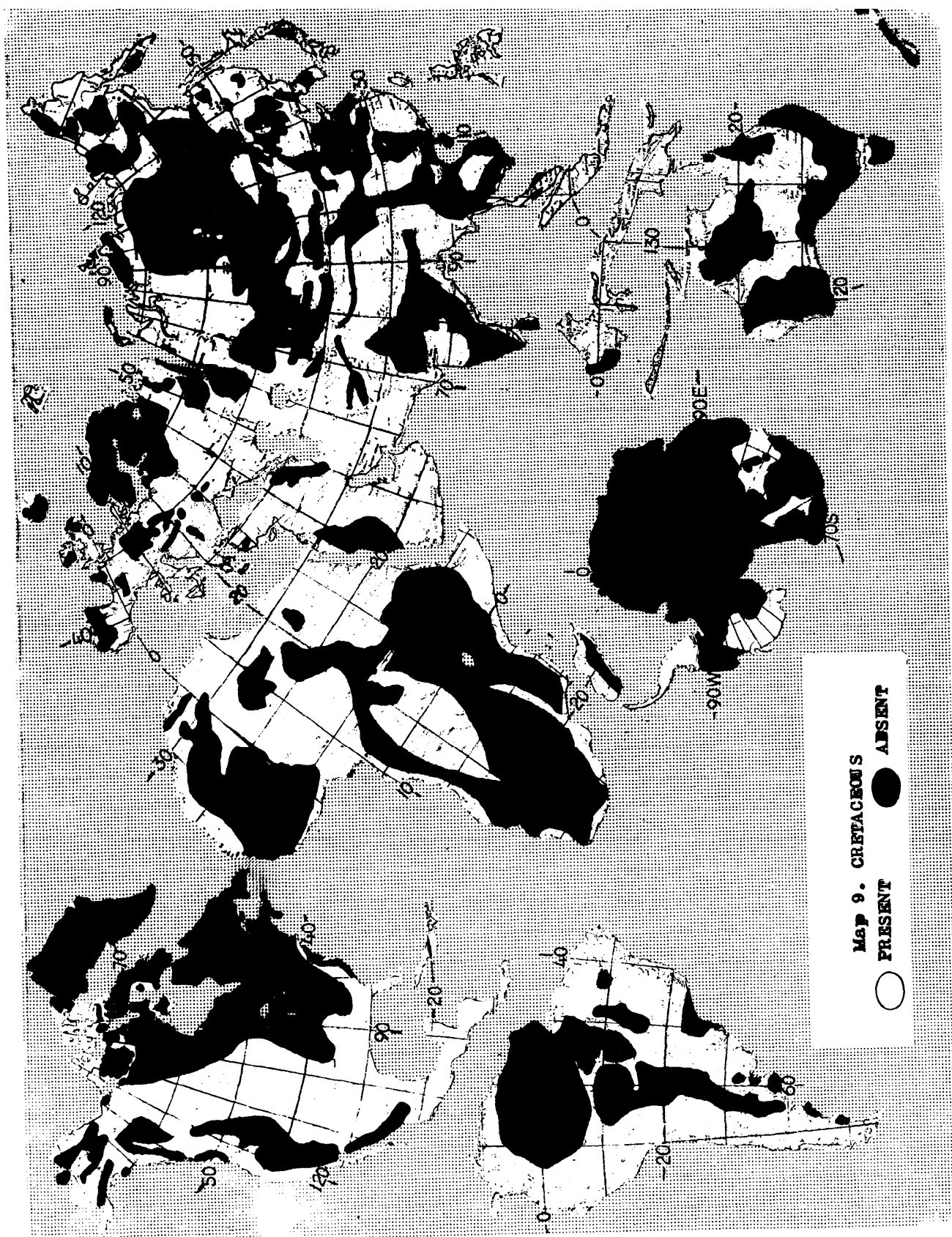


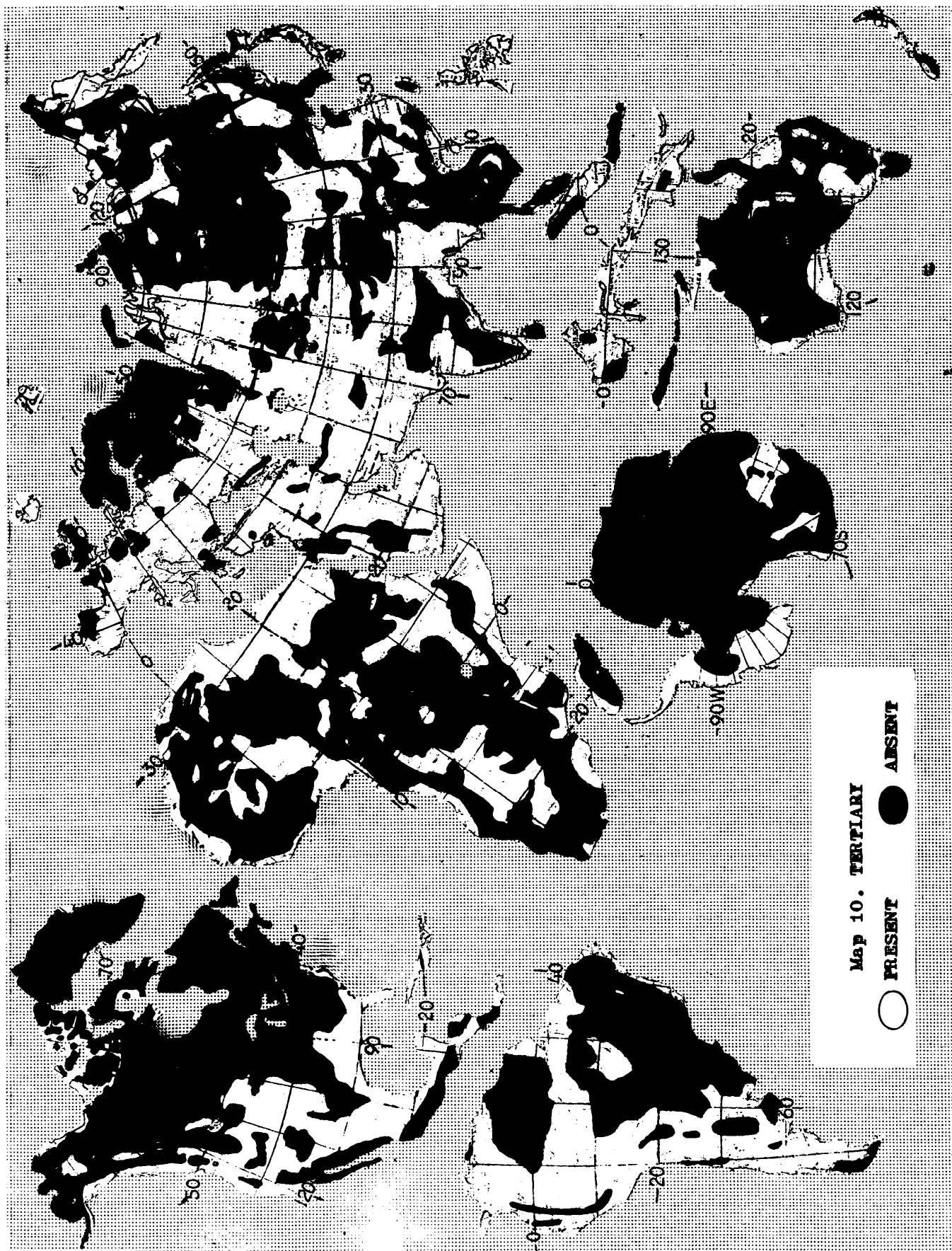


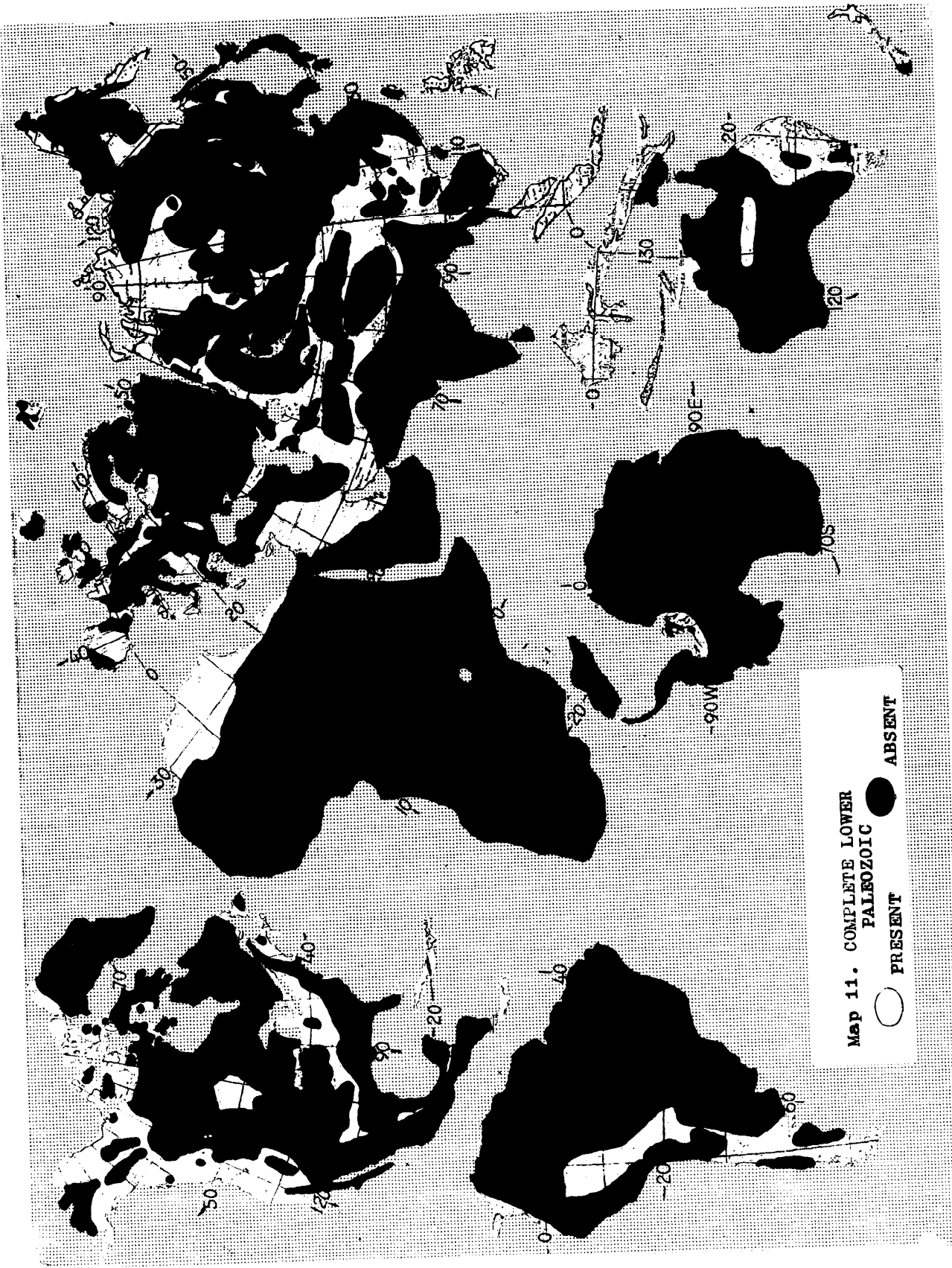


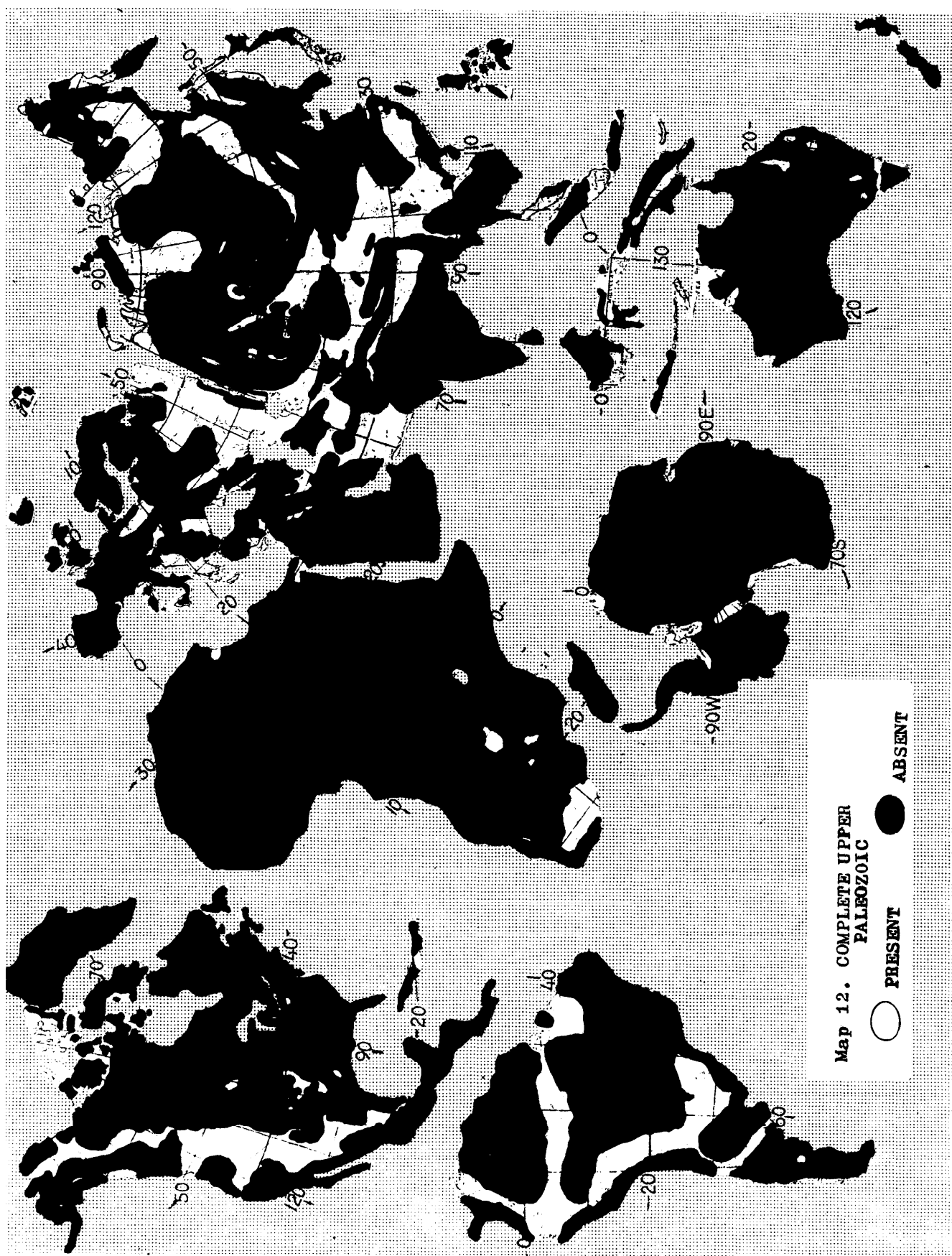


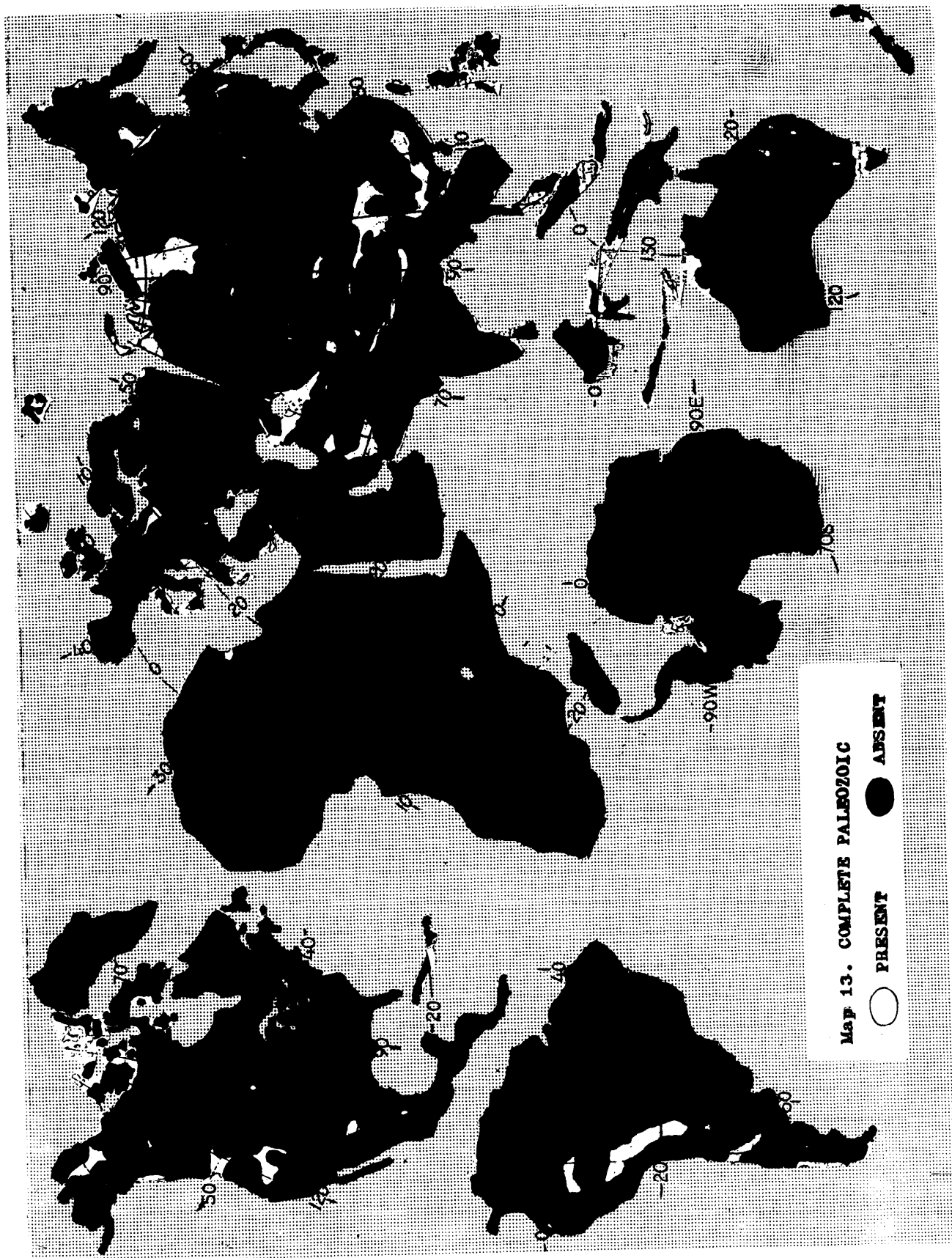


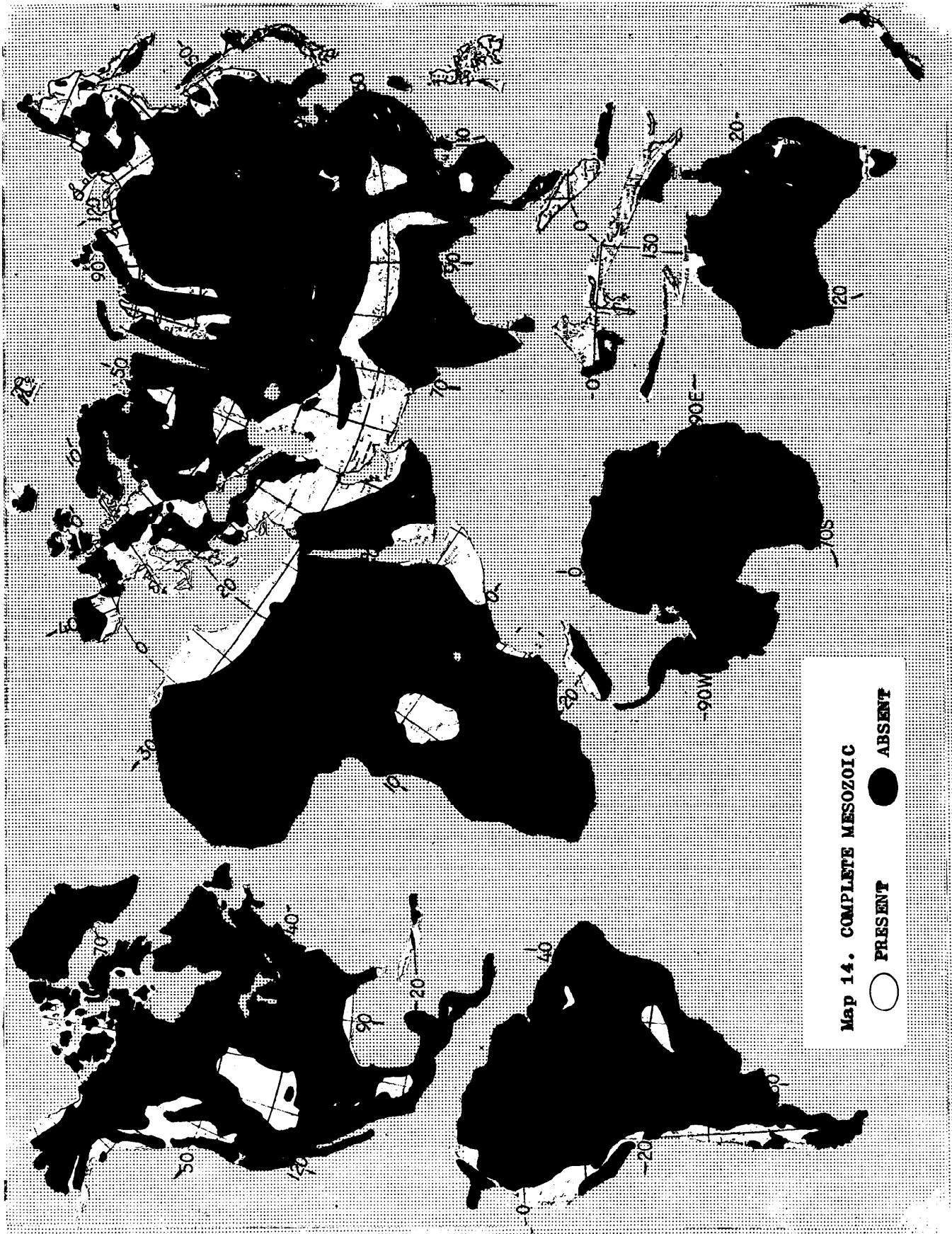




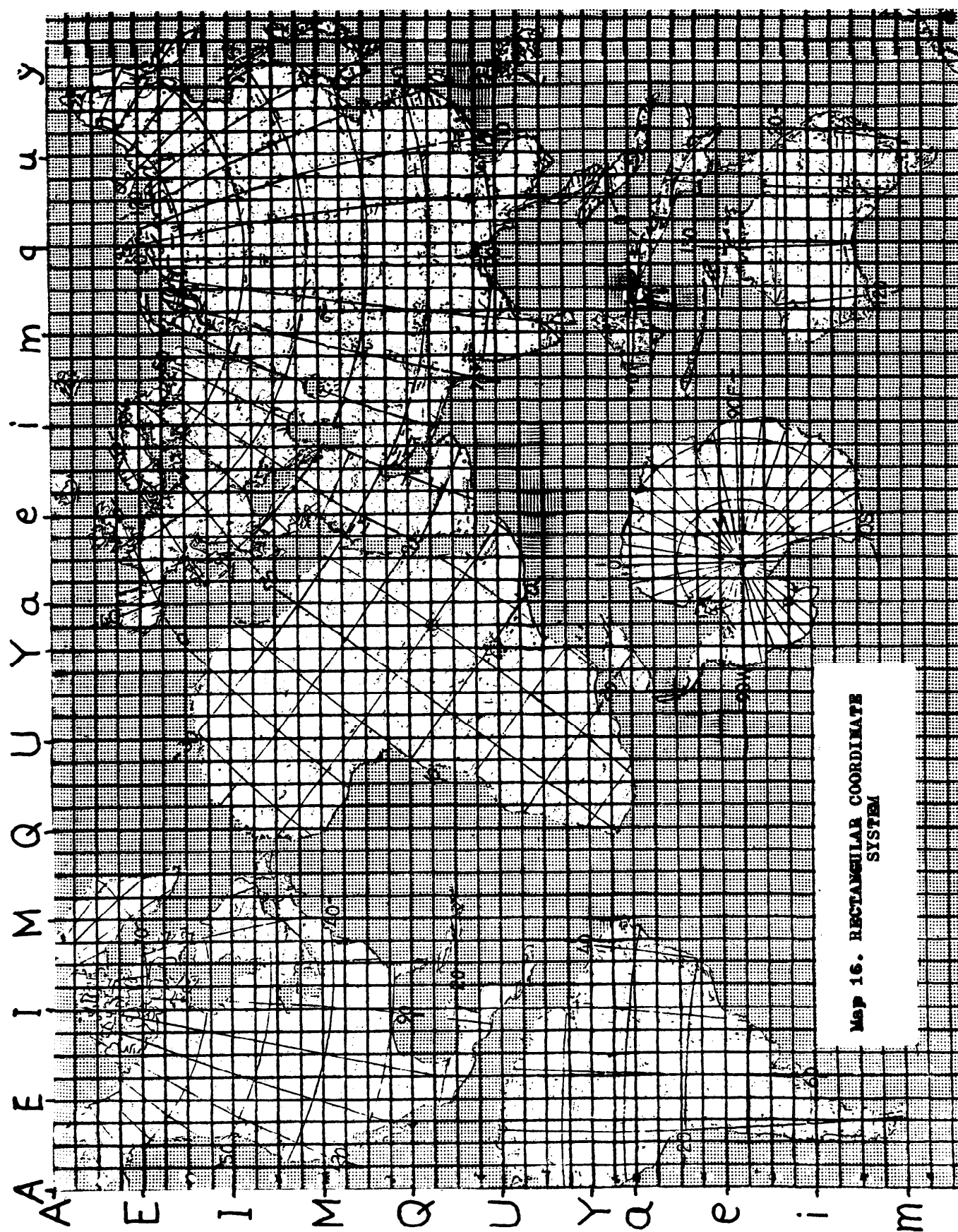












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(U,I) XXXXX000005	(X,N) OXXX0000X04	(T,T) 000000X0XX3	(T,Y) 000X0XX0003	(C,F) XXX0XXXXXX08
(V,I) XXXXX000005	(Y,N) OXX0000X003	(U,T) 000000XXXXX3	(U,Y) 00000XX0002	(D,F) X0XXXXX0005
(W,I) XXXXX00X07	(Z,N) OXX0X00XXXX6	(V,T) 000000XXXXX3	(V,Y) 000X0XX0003	(E,F) XXXX0000X05
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(Y,I) XXXXX0XXXXX9	(b,N) 0000X0XXXXX5	(X,T) 0000XX00002	(X,Y) 000000X0001	(G,F) 00000000000
(Z,I) XXXXX0XXXXX9	(c,N) XX0XX0XXXXX8	(Y,T) 00000000000	(Q,Z) 000XX000003	(H,F) 00000000000
(Q,J) OXX00000XX4	(S,O) 00000000XX2	(Z,T) 000000X00X2	(R,Z) 000XX000003	(I,F) 00000000000
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(S,J) OXXXX000004	(U,O) 00000000X01	(b,T) 000000XX0X3	(T,Z) 000XXXX0004	(M,F) 00000000000
(T,J) OXXXX000004	(V,O) 00000000XX2	(R,U) 00000000XX2	(U,Z) 000X00X0XX4	(N,F) 00000000000
(U,J) OXXXX000004	(W,O) 00000000X01	(S,U) 000000X0001	(Q,a) 00000XX0X03	(C,G) XXX0XXXXX007
(V,J) XXXXX00XX07	(X,O) 000X0000XX3	(T,U) 000000X0X02	(R,a) 000XXXX0004	(D,G) X0XXXXXX007
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(Q,K) 00XX0000002	(T,P) 00000000XX2	(Y,U) 000000000X1	(Y,a) 000XX000002	(I,G) 0X000000001
(R,K) 00XX0000003	(U,P) 00000000X01	(Z,U) 000000XX0X3	North America	
(S,K) 00XX0000004	(V,P) 00000000X01	(a,U) 000000XX002	(C,B) XXX0XXX0006	(K,G) 00000000000
(T,K) 00XX00000X5	(W,P) 00000000X01	(b,U) 000000XX002	(J,B) XXX00000004	(C,H) XXX00XXXX07
(U,K) 00XX0000X06	(X,P) 00000000X01	(c,U) 000000XXXX4	(K,B) X0X00000002	(D,H) X0XXXXXX008
(V,K) 00XX0000X04	(Y,P) 00000000X01	(d,U) 000000XXXX4	(L,B) 00000000000	(E,H) X00XX0X0X05
(W,K) 00XX0000004	(Z,P) 0000X00XX03	(Q,V) 0000X000001	(A,C) 00X0XX00X04	(F,H) X0000000X02
(X,K) 00XX0000XX8	(a,P) 0000X00XX03	(R,V) 000XX000002	(B,C) 000X00X0X03	(G,H) 00000000000
(Y,K) XXXXX0XXXXX9	(b,P) 00000000X01	(S,V) 000000X0X02	(C,C) XXXXX0X0007	(H,H) 00000000000
(P,L) 000000000X1	(T,Q) 00000000X01	(T,V) 0000X0X0XX4	(D,C) XXX0XXXXXX9	(K,H) 00000000000
(Q,L) 00000000000	(U,Q) 00000000000	(U,V) 0000X0X0X03	(H,C) XXXXXXXXX09	(L,H) 00000000000
(R,L) 00000000000	(V,Q) 00000000X01	(V,V) 0000XX00002	(I,C) XXXXX0X0X07	(C,I) XXXXXXXX0X9
(S,L) 00000000000	(W,Q) 00000000X01	(W,V) 00000000000	(J,C) XXX00000003	(D,I) XXX0XXXXX07
(T,L) 00X000000X2	(X,Q) 00000000000	(X,V) 000000XXXXX	(K,C) 00000000000	(E,I) X0X0000X04
(U,L) 00X0X00XX06	(Y,Q) 00000000X01	(Y,V) 000000X0X02	(L,C) 00000000000	(F,I) X000000X03
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(Z,L) 00X0X0XXXXX7	(T,R) 00000000000	(Q,W) 0000X000001	(C,D) XXXXX000X7	(M,I) 00000000000
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(S,M) 00000000000	(W,R) 00000000000	(T,W) 000X00000X2	(F,J) XXX00000X05	(E,J) XX0XX000X05
(T,M) 00X00000XX4	(X,R) 00000000X01	(U,W) 000XX000003	(G,J) XXX00000X05	(F,J) XXX00000X05
(U,M) 00X00000XX4	(Y,R) 00000000000	(V,W) 0000X000001	(H,J) XXXXX000X07	(H,J) 00000000000
(V,M) 000X0000X03	(Z,R) 00000000X01	(W,W) 00000000X01	(I,D) XXX00000X04	(I,J) 0X000000001
(W,M) 00XX0000X04	(a,R) 00000000X01	(X,W) 0000X000001	(L,D) 00000000000	(J,J) 0X000000002
(X,M) 00XX0000X05	(b,R) 000000X0XX3	(Y,W) 0000XX00X05	(M,D) 00000000000	(K,J) 00000000000
(Y,M) 00XX0000X06	(S,S) 00000000XX2	(Q,X) X000X000001	(N,D) 00000000000	(L,J) 00000000000
(Z,M) 00X0X00XX06	(T,S) 00000000X01	(R,X) 000XX000002	(C,E) X0X0XX0X06	(M,J) 00000000000
	(U,S) 000000XX0X3	(S,X) 000X00000X2	(D,E) XX0XX0X0X06	(N,J) X0XX0000003

Table 1. This table is a compilation of raw data used for all of the calculations in this article. As shown in Map 16, the earth's land surface was divided into 967 equal areas; each such square having a coordinate which can be found in Map 16 and in this table. (Here in the columns under "Coor.") Maps 1 through 10 were scanned for the same 967 coordinated areas to provide the data which comprise this table. The letters "C, O, S, D, . . . , etc.," indicate the geological periods: Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian, Triassic, Jurassic, Cretaceous, and Tertiary. "X"s indicate the preponderant presence of the represented geological periods in a given square; "O"s their absence. Under "#" is listed the number of periods present.

Coor.	COSDCPTJCT#	Coor.	COSDCPTJCT#	Coor.	COSDCPTJCT#	Coor.	COSDCPTJCT#	Coor.	COSDCPTJCT#	
(B,K)	XXXX000XXX7	(D,R)	00000000XX2	(F,a)	000X0000001	(C,l)	XXXX000XX06	(a,h)	X000XX00003	
(C,K)	XXX0X0XXXX8	(E,R)	X0XX0XXXXX8	(G,a)	000000000X1	(C,m)	XXX0000XX05	(b,h)	X00X0XX0X06	
(D,K)	X0XXXX00005	(E,S)	00X000X0X03	(H,a)	000000000X1			(c,h)	X00XXX0X005	
(E,K)	XX0XX00XX06	(F,S)	XX00XX0XX7	(I,a)	00X0XX0X05			(d,h)	00000000000	
(F,K)	XXXXX0XXXX9	(H,S)	0000XX0XXX5	(J,a)	00X00XX0003			(e,h)	00000000000	
(G,K)	XX0XX0XXX07	(L,S)	XXXX0XXXXX9	(K,a)	00000000X01	Antarctica			(f,h)	00000000XX2
(H,K)	00000000000	(E,T)	00X0000XX03	(L,a)	00000000XX2			(g,h)	00000000XX2	
(I,K)	00000000000	(F,T)	00000000XX02	(B,b)	XX0XXXXXXX9	(b,a)	0000XX00002	(h,h)	00000000000	
(J,K)	00000000000	(G,T)	X000XX0XXX6	(C,b)	XXXXXX00XX8	(c,a)	0000XX00002	(Y,i)	X000XX0X0X5	
(K,K)	0X000000001	(H,T)	XX00XX0XXX7	(D,b)	XXXXX000XX7	(a,b)	0000XX00002	(Z,i)	X000XX0X0X5	
(L,K)	0X0XX000003	(H,U)	00000000XX2	(E,b)	00000000000	(b,b)	00000000000	(a,i)	X000XX0X0X5	
(M,K)	XXXXX000005	(I,U)	000000X0X02	(F,b)	000X00X0002	(c,b)	00000000000	(d,i)	X00XX000XX6	
(B,L)	XXX0XX0XXX8	(I,V)	XXX0000XX05	(G,b)	000000000X1	(d,b)	0000XX00002	(e,i)	00000000000	
(C,L)	XXXXXX00007			(H,b)	000000000X1	(e,b)	0000XX00002	(f,i)	00000000XX2	
(D,L)	XX0XXXXX007			(I,b)	00X00000X02	(f,b)	0000XX00002	(g,i)	00000000XX2	
(E,L)	XX00XXXXXXX8	South America		(J,b)	00000000X01	(a,c)	0000000X001	(h,i)	00000000XX2	
(F,L)	0000XXXXXXX6	(A,V)	XXX000X0XX6	(K,b)	000000X0X02	(b,c)	00000000000	(d,j)	X000X00X003	
(G,L)	X0000000X02	(B,V)	XX0XXX00XX7	(A,c)	X00000000X2	(c,c)	00000000000	(e,j)	00000000XX2	
(H,L)	00000000000	(C,V)	00000000XX2	(B,c)	X0000X000X3	(d,c)	00000000000	(f,j)	00000000000	
(I,L)	00000000000			(C,c)	0XX0X0XXX7	(e,c)	00000000000	(g,j)	00000000000	
(J,L)	0XX00000002	(D,V)	00000000XX2	(D,c)	0XXXXX00XX7	(f,c)	00000000000	(d,k)	X000X0XX004	
(K,L)	0XX00000002	(E,V)	00000000XX2	(E,c)	0XX00000002	(g,c)	0000XX00002	(e,k)	X00X0XX0XX6	
(L,L)	XX0X0000003	(F,V)	000000X0X02	(F,c)	00XX0000002	(w,d)	0000X000XX3	(f,k)	00000000000	
(M,L)	XXXXX000005	(A,W)	X000XX0XX6	(G,c)	000X0X00X03	(x,d)	0000X000XX3	(g,k)	00000000000	
(B,M)	0XX0000XXX5	(B,W)	X00XXX0XX7	(H,c)	000000X0X02	(a,d)	X00XX0X005			
(C,M)	0XXXXXX00X7	(C,W)	000000X00X2	(I,c)	00XX00X0X04	(b,d)	00000000000	Australia		
(D,M)	000XXXXXXX7	(D,W)	000000X0001	(J,c)	00000000X01	(c,d)	00000000000	(q,f)	X0000000X02	
(E,M)	0000XXXXXX6	(E,W)	000000XX002	(K,c)	00000000XX2	(d,d)	00000000000	(o,g)	XX0XXX00005	
(F,M)	0X00XXXXXX7	(F,W)	000000XX002	(C,d)	XX00000XXX5	(e,d)	00000000000	(p,g)	XXX00000003	
(G,M)	0XX0X000X04	(G,W)	00000000000	(D,d)	XXXXXX0X08	(f,d)	00000000000	(q,g)	X0X00000X03	
(H,M)	0X0XX000003	(H,W)	000000000X1	(E,d)	XXXXX0X00X6	(g,d)	000XX000002	(r,g)	X0000000X02	
(I,M)	0XXX0000003	(A,X)	XX0XXXXX X8	(F,d)	00XX0000002	(x,e)	X000X00XXX5	(l,i)	0X00X000XX5	
(J,M)	0XXX0000003	(B,X)	XX0000X0XX5	(G,d)	000X0XX0X04	(y,e)	X000X00XXX5	(m,i)	00000000000	
(K,M)	0XXX0000003	(C,X)	000000X0001	(H,d)	000X0XXX005	(z,e)	XXXXX00X006	(n,i)	00000000000	
(L,M)	0X0X0000002	(D,X)	000000X0001	(I,d)	00000XX0X03	(a,e)	0000X00X002	(o,i)	00000X00X02	
(B,N)	X0X000X0X04	(E,X)	00000000000	(J,d)	00000000X01	(b,e)	00000000000	(p,i)	X0000X00002	
(C,N)	X00XXXXX0X6	(F,X)	000X0000001	(C,e)	XX00000XXX5	(c,e)	00000000000	(q,i)	XX000000002	
(D,N)	000XXXXX0X5	(G,X)	0X0X0000002	(D,e)	XX0XXXXX0X8	(d,e)	00000000000	(r,i)	XX0X0000X04	
(E,N)	0000X0X0XX4	(H,X)	000000000X1	(E,e)	0XXXXXX00X7	(e,e)	00000000000	(s,i)	X00X000XX04	
(F,N)	XX00XX00XX6	(A,Y)	XX0XXXXXXX9	(F,e)	00XX0X00003	(f,e)	00000000000	(t,i)	X00X00XXX05	
(G,N)	X00XX000004	(B,Y)	XXXXX0X0XX8	(G,e)	000XXXXX0X5	(g,e)	00000000000	(u,i)	XXXXXXX0X09	
(H,N)	XX0X0000003	(C,Y)	0XXXXX000X5	(H,e)	000XXXX00003	(x,f)	X000X00X0X4	(m,j)	00000X00X02	
(I,N)	XXXXX000005	(D,Y)	00XX00000X4	(I,e)	00000000000	(y,f)	XXXXXX0X007	(n,j)	00000000000	
(J,N)	XXXXXX00005	(E,Y)	00XX0000003	(C,f)	XX00XX0XXX7	(z,f)	XX0XX000005	(o,j)	00000000X01	
(K,N)	X00X00X0003	(F,Y)	00XXXX000X5	(D,f)	XXX0X000XX7	(a,f)	X000XX0X004	(p,j)	X0000X00X03	
(C,O)	X00X0X00003	(G,Y)	0XXXXX000X6	(E,f)	0XXXXX000X6	(b,f)	00000000000	(q,j)	XX000000X03	
(D,O)	XX0XXXX00XX7	(H,Y)	000XXXX00X5	(F,f)	000XXXX00X5	(c,f)	00000000000	(r,j)	XX000000X04	
(E,O)	0XX0XX00XX7	(I,Y)	00XXXXX0XX7	(G,f)	000XXXX0X04	(d,f)	00000000000	(s,j)	XX000000X03	
(F,O)	XX00XX00X05	(J,Y)	00XXXXX0XX7	(H,f)	0000XX0X04	(e,f)	00000000000	(t,j)	XXX0000XX05	
(G,O)	XXX0X000X05	(A,Z)	XX0XXXXXXX9	(C,g)	XXXXXXXXXX10	(f,f)	00000000000	(u,j)	XXX000XX006	
(H,O)	XX000000XX4	(B,Z)	XXXXXX00XX8	(D,g)	XXX0XX00XX7	(g,f)	00000000000	(v,j)	XXXXX00X006	
(I,O)	XX0XX000X05	(C,Z)	XX0XX000XX7	(E,g)	00000X000X3	(h,f)	00000000000	(m,k)	00000000000	
(J,O)	XX0X0000003	(D,Z)	000XX000X4	(F,g)	000XXXX0X05	(X,g)	X000XX0X0X5	(n,k)	00000000000	
(K,O)	00000000XX2	(E,Z)	000XX000X4	(G,g)	00000X00X02	(Y,g)	X000XX0X005	(o,k)	00000000X1	
(C,P)	00XX0000002	(F,Z)	000XX000XX5	(C,h)	XXX0X0XXX8	(a,g)	X00XX000004	(p,k)	00000000XX2	
(D,P)	XX0XX000XX7	(G,Z)	00000000000	(D,h)	XXXXXX00XX8	(b,g)	X000XX0X004	(q,k)	00000X00001	
(E,P)	XX0XXXX0XX8	(H,Z)	00000000000	(E,h)	00000X00XX3	(c,g)	00000000000	(r,k)	X0000000001	
(F,P)	XX0XX000X05	(I,Z)	0XXXXXX0X08	(F,h)	00000000XX2	(d,g)	00000000000	(s,k)	XX000000X04	
(G,P)	XX0XX000XX7	(J,Z)	00XXXXX0XX7	(C,i)	XX0000XXX7	(e,g)	00000000000	(t,k)	XX0X0000X04	
(H,P)	XX0X00XXXX7	(K,Z)	00000000X01	(D,i)	XXX00000XX5	(f,g)	00000000000	(u,k)	XXX000X0X05	
(I,P)	0X0X000XXX5	(A,a)	XX0000XX005	(E,i)	XXXX0000XX6	(g,g)	00000000000	(v,k)	XXXXX000005	
(J,P)	00X00000XX3	(B,a)	XX0XX000XX7	(C,j)	XXX00XXXXX8	(h,g)	000X0000001	(n,l)	000000000X1	
(D,Q)	000X0000002	(C,a)	XXX0XX00XX7	(D,j)	XX0X0000XX6	(Y,h)	X000XX0XXX6	(r,l)	X0000000001	
(E,Q)	XXXXXX00XX9	(D,a)	0000X000XX3	(C,k)	XXXX0000XX6	(Z,h)	X000XX0XXX6	(s,l)	X00000000X2	
(F,Q)	00000000XX3	(E,a)	000X0000001	(D,k)	XX00X000XX6					

Coord. COSDCPTJCT#	Coord. COSDCPTJCT#	Coord. COSDCPTJCT#	Coord. COSDCPTJCT#	Coord. COSDCPTJCT#
(t,l) XXX0XX000X6	(n,G) XXXXXXXXXX10	(q,J) XXX00X000X5	(t,M) X00XX00XXX6	(u,P) XX00XX000X5
(u,l) XXX00000003	(o,G) XXXXX00XXX9	(r,J) XX000X00003	(u,M) 0X00XX00003	(v,P) XX00XX00X06
(s,m) 0000XX000X3	(p,G) XXXXXXXXXX09	(s,J) XX00X000003	(v,M) 00X0XX000X4	(d,Q) 0X00000X0X3
(t,m) XXXX0X00005	(q,G) X0XXXXX00005	(t,J) X000X000002	(w,M) 00X00X000X3	(e,Q) 0X000X0XX05
(u,m) XXXX0000005	(r,G) X0000000001	(u,J) X00XX000003	(x,M) 00X00XX0X04	(f,Q) XXXX0XXXXX9
(t,n) XXXX0X00005	(s,G) X00X000X0X4	(v,J) XX0X0XX0005	(z,M) 000XX0XXX6	(g,Q) XXXX0XXXXX9
	(t,G) X00XXXXXX07	(w,J) X0000XXXX05	(d,N) XXX000XXXX7	(h,Q) XXXXXXXXXX10
	(u,G) X00XXXXXX006	(x,J) 0XXXX0XXXX8	(e,N) XXXXX0XXXX9	(i,Q) XXXXXXXXXX10
	(v,G) 0X0XXXXX006	(d,K) 0000XXXXXX6	(f,N) XXX0XXXXXX9	(j,Q) X0X00XXXXX7
	(w,G) 0X0XX0XXXX7	(e,K) XX0XX0XXXX8	(g,N) XX0XXXXXX08	(k,Q) X0X00XXXXX7
	(y,G) XX0X00XX0X6	(f,K) X0XXXX0XXXX8	(i,N) X0000XXXXX6	(l,Q) XXX0XXXXXX9
	(c,H) 0XXXXXX0X9	(g,K) 000XX00XX5	(j,N) XXXXX0XXXX9	(m,Q) XXX0XXXXXX9
	(d,H) XXXXX0X0XX8	(h,K) 000XXXXXX7	(k,N) XXXXX00XX8	(n,Q) X00X000XX05
	(e,H) 000XX0XX0X5	(i,K) 000XXXXXX7	(l,N) 0X0XX0000X4	(o,Q) X00XXXXXX06
	(f,H) XXXX000XX7	(j,K) 000XX0XXX6	(m,N) XXXX0000004	(p,Q) XXXXX00X06
	(g,H) X0XX000X004	(k,K) XXXXX0000X6	(n,N) X0XX0X000X5	(q,Q) XXXXX00X07
	(h,H) XX0XX00XX06	(l,K) XXXX0000XX6	(o,N) 000XXXXXX6	(r,Q) XXXXXXXXX07
	(i,H) XX0XX0XX07	(m,K) XX0XX00XX7	(p,N) 0X)XXX)XX6	(s,Q) XXXXXXX0007
	(j,H) X000XXXXX06	(n,K) X0XX000XX7	(q,N) XX0XX0000X5	(t,Q) XX0XX00005
	(k,H) 0X0XX0XX06	(o,K) XXXXX0XX08	(r,N) 0X0XX000XX5	(u,Q) X000XX000X4
	(l,H) XXXXX000XX7	(p,K) X0XX000X004	(s,N) XX0XX000XX6	(v,Q) 0000XX00002
	(m,H) XXXXX0XXXX9	(q,K) XX0X0X0X005	(t,N) 0XXXX0XX0X6	(w,Q) 0XXXXXX00X6
	(n,H) XXXX000XX7	(r,K) XXX00X00004	(u,N) 0000XX00X03	(d,R) 0000000X001
	(o,H) XXXXX00XX8	(s,K) 00000000000	(v,N) 00X00X0XX04	(e,R) X0000X0XXX5
	(p,H) XXXXXXX0007	(t,K) X00X00X0003	(w,N) XX00X00XX05	(f,R) XXX00XXXXX8
	(q,H) XXXXXXX0006	(u,K) X00XX0X005	(x,N) XX00X00XX05	(h,R) XX0XXXXXXX9
	(r,H) XX00X000004	(v,K) XXX000XXXX8	(z,N) 0X00XX0X0X5	(i,R) X00XXXXXXX8
	(s,H) XX00000X0X4	(w,K) 000XXXXXX7	(d,O) XX00000X003	(j,R) X000XXXXXX7
	(t,H) X00000XX0X4	(x,K) XXX000XXXX6	(e,O) XXXX0XXXXX9	(k,R) X000XXXXXX7
	(u,H) X00X0XX0X6	(y,K) 0XXXXXX0X07	(f,O) XXX00XXXXX8	(l,R) X00000000X2
	(v,H) X0X00X00003	(d,L) XX0XX0XXXX8	(g,O) X00000XX0X4	(m,R) XXX00XX00X6
	(c,I) 0XXXXXX0X8	(e,L) 00000XXXXX5	(h,O) XX0XX0XXXX8	(n,R) XXXXXXXXXX9
	(d,I) XXXXX00XX8	(f,L) X000XXXXXX7	(i,O) XXXX0XXXXX9	(o,R) X00XXXXXXX8
	(e,I) 000XXXXXX7	(g,L) X0XX0X0XX7	(j,O) XXX0XXXXXX9	(p,R) X00X0XXXXX6
	(f,I) 00X00000XX3	(h,L) X0XXXX0XXXX8	(k,O) XXXXX0XXXX9	(q,R) XXX00XXXXX8
	(g,I) 000X000XX4	(i,L) X00XX0XXX7	(l,O) XX0XX0XX0X8	(r,R) XXXXX0X0X8
	(h,I) X00XX00XX05	(j,L) XX0XX00XX8	(m,O) XXXXX0X0X8	(s,R) XXXXXXXX0X9
	(i,I) X00XX0XX06	(k,L) XXXXX000XX7	(n,O) X0X00X000X4	(t,R) XXX0XXXXXX08
	(j,I) 000XX0X004	(l,L) XX0XX0000X5	(o,O) X0X0000X0X4	(u,R) XXX0X0XX0X7
	(k,I) 0X0XX00004	(m,L) XX0XX0000X5	(p,O) XXXXX00006	(v,R) 0X0XX0X0X06
	(l,I) XX0XX000XX6	(n,L) 0X0XX0000X4	(q,O) XXXXX00005	(w,R) X00XX000XX6
	(m,I) 00X000XXXX5	(o,L) XXXXX0000X6	(r,O) 00XX0X000X4	(d,S) 000000XXXX4
	(n,I) 0000X00XX4	(p,L) X00X0000002	(s,O) 00000000X01	(e,S) X00000X0XXX5
	(o,I) XXXX000XX8	(q,L) X0000000001	(t,O) X000X0XX0X5	(f,S) X0000X0XXX5
	(p,I) XXXXXXX0007	(r,L) X0000000001	(u,O) XX00X0XXX7	(g,S) XX000XXXXX7
	(q,I) XXXXXXX0007	(s,L) 00000000X01	(v,O) XX00X0XX0X6	(h,S) XX00XXXXXX8
	(r,I) X0X0XX00005	(t,L) 000XXXXXX06	(x,O) XX000000002	(j,S) X000XXXXXX7
	(s,I) XXX0000X004	(u,L) XX0XX00X005	(z,O) 000XXXXXX7	(k,S) 0000XX0XXX5
	(t,I) XXX00000003	(v,L) 0X0X000X0X5	(d,P) 0X0000000X2	(l,S) 00000000000
	(u,I) 00000000000	(w,L) X0000X0XXX5	(e,P) XXXX0XXXXX9	(m,S) 00000000000
	(v,I) X0XX0X00004	(x,L) XXXX0XXXX08	(f,P) XXXX0XXXXX9	(n,S) X00000X00X3
	(c,J) 0XXXXXX0X8	(z,L) 0000XX0XXX5	(g,P) XX0X0XXXXX8	(o,S) XXXXXXXX00X8
	(d,J) 000X0000XX3	(e,M) XXX0X0XXXX8	(h,P) XXXXXXXXXX10	(p,S) XXXXXXXX0X9
	(e,J) X0XXXXXX0X9	(f,M) X0X00XXXXX7	(i,P) X000XXXXXX7	(q,S) XXXXXXXX0X8
	(f,J) 00X00000XX3	(g,M) X00X000X0X5	(j,P) X00XXXXXX8	(r,S) XX0XXXXXX08
	(g,J) 000XXXXXX7	(i,M) XXXXX0XXXX9	(k,P) X0000X0XX5	(s,S) XX0XXXXX007
	(h,J) 000X00XXXX5	(k,M) XXXX000XX7	(l,P) 00XXXXXXX8	(t,S) X0XXXXXX0X8
	(i,J) 000XX0XX0X6	(l,M) XX0XX0000X5	(m,P) X0XXXX0XXXX8	(u,S) XX0XXXXX006
	(j,J) 000XX0XX05	(m,M) X0XX0000003	(n,P) 000X0X00XX4	(v,S) XXXXXXXX0X8
	(k,J) 000XX000002	(n,M) X0XX00000X4	(o,P) 0X0XX0XX0X7	(w,S) XXXX0000X03
	(l,J) XXXXX000XX7	(o,M) 000XX0000X3	(q,P) 0X0XX0X0X05	(x,S) 0000X000X02
	(m,J) XXX000XXXX7	(p,M) XXXX0000004	(r,P) 0XXXX0XX07	(d,T) 000000XXXX4
	(n,J) 000X000XX4	(q,M) X0XX0000004	(s,P) XXXX0X0006	(e,T) X000000XXX4
	(o,J) XX0XX00XX7	(r,M) X00XX000003	(t,P) XXXX0XXXXX8	(f,T) X0000X0XXX5
	(p,J) XXX00X00004	(s,M) X00XX000003		(g,T) XX000X0XXX6

Eurasia

Coor. COSDCPTJCT#	Coor. COSDCPTJCT#	Coor. COSDCPTJCT#	Coor. COSDCPTJCT#	Coor. COSDCPTJCT#	Coor. COSDCPTJCT#
(k,T) 0000000XXX3	(o,U) 00000000XX2	(m,W) 0000X00XXX4	(k,b) XXXXXXXX008		
(l,T) 00000000XX2	(q,U) 0000000XXX3	(s,W) X000XXX005	(n,b) XXXX0XXXXX9		
(m,T) 00000XX0002	(r,U) XX00XXX006	(t,W) XX0XX0X0005	(u,b) XXXX0X0X07		
(n,T) 0000XX00002	(s,U) 0XXXX0X0005	(u,W) XX0000X003	(r,c) XXX0XXXXXX9	(m,h) 00000000000	
(o,T) 000000000X1	(t,U) XX0XX0X0005	(y,W) XXXX00XXXX8	(s,d) XXX0000XXX6	(n,h) 00000X00X02	
(p,T) 000X0000XX3	(u,U) XXX0000X0X5	(l,X) 00000000XX2	(t,d) XXX0XXXXX08	(o,h) XX000X0XX05	
(q,T) X000000XXX4	(x,U) XXXX00X0XX7	(m,Y) 0000X000001	(s,e) X00X0000XX4	(p,h) XX0X0X00004	
(r,T) XX00XXXXX07	(l,V) 00000000000	(s,Y) XXXXXXXX0X8	(t,e) X000000XXX4	(q,h) X0000000001	
(s,T) XXXXXX00007	(m,V) 0000000X001	(m,Z) XXXX00XXXX8		(r,h) XXXX0000004	
(t,T) XXXXXXXX008	(n,V) 00000000XX2	(r,Z) XXXX0XXXX08		(s,h) XX0X000X0X5	
(u,T) XXXX00X00X6	(r,V) X000XXX0004	(s,Z) XXXXX0XXXX8	New Zealand	(t,h) 000X0X0XX04	
(v,T) 0X0X00XXXX6	(s,V) 0XX0XXXXX07	(l,a) XXX000XXXX7		(u,h) X0XXXX000X6	
(l,U) 00000000XX2	(t,V) 000X00X0X03	(m,a) XXXX00XXXX07	(y,p) XXX00XXXXX7		
(m,U) 0000XX00002	(y,V) XXX00X0XX07	(s,a) XXXXXXXXXX10	(z,o) XXX00X0X005		
(n,U) 00000000000	(l,W) 00000000000	(t,a) XXXXXXXXXX10			

earth's land surface is hard-pressed to produce even 3 of the 10 geologic periods in "correct" consecutive order.

The quantitative data is particularly revealing. From Figure 1, it is evident that nearly 13% of the earth's land surface has 5 geologic periods represented (irrespective of their order or identity) while slightly less than 1% has all 10 periods simultaneously in place. From the cumulative frequency curve in Figure 1, it can be seen that 42% of earth's land surface has 3 or less geologic periods present at all; 66% has 5 or less of the 10 present; and only 14% has 8 or more geologic periods represented at all.

Individual geologic periods' coverage of the earth's land surface range from a high of just over 51% for Cretaceous (Fig. 2) to a low of only 33% for Triassic. Sequences of consecutive geologic periods cover far less area. Sequences of 3 consecutive geologic periods and their per cent terrestrial areal coverage are: complete Lower Paleozoic 21%, complete Upper Paleozoic 17%, complete Mesozoic 16%. For 6 consecutive geologic periods, one finds only 5.7% of the earth's land surface covered by complete Paleozoic, and only 4.0% covered by complete Upper Paleozoic/complete Mesozoic.

The overall failure of geologic periods to be numerically abundant in most places on earth and their even greater failure to occur in consecutive sequences is significant enough, but it can be seen from Table 2 that where geologic periods' rocks *do* exist they often fail to rest "properly." A significant percentage of every geologic period's rocks does not overlies rocks of the next older geologic period. In fact, only a *bare majority* of Cretaceous, Jurassic, and Devonian "properly" overlies the next older geologic period's rocks (Jurassic, Triassic, and Silurian, respectively). Some percentage of *every* geologic period rests directly upon Precambrian "basement," especially high percentages of Ordovician (23.2%) and Devonian (18.6%) doing so.

There apparently are regions on earth where all ten geologic periods can be found superposed (Map 15). Frank and Fuchs⁸¹ presented stratigraphic correlation charts for Himalayan Geology in West Nepal. A complete geologic column was shown, but Cambrian and Ordovician were shown as uncertain. In the lower Himalayas, the Triassic was shown as unknown, and some slates were questionably placed in a range from Precambrian to Ordovician. In the lower Himalayas/

Kashmir region, a complete column is shown except for the Triassic, but there are major gaps in the Ordovician and the Silurian.

Another example of a major region apparently possessing the entire geologic column in place is a part of the Bolivian Andes, described by Lohmann.⁸² The area is called the Northern Antiplano; a region approximately 68°-70°W and 16°-18°S. But even here, the Cambrian and Ordovician are uncertain for lack of nearby outcrops. The Cordilleran area nearby (66°-68°W and 16°-20°S) also has an apparently complete column, but Jurassic strata are said to be scarce throughout the area.

It has already been demonstrated that the apparent completeness of the geologic column in Indonesia stems from ascribing metamorphosed "basement" to the entire Lower Paleozoic. Similarly, it has been pointed out by Ray and Achayya⁹¹ that in eastern Burma, western Thailand, and Malaya the Permian and Mesozoic rest upon a folded and metamorphosed "basement" of inferred early Paleozoic. The alleged completeness of the geologic column shown for Cuba (Map 15) based upon data of the Ronov *et al.* team can be questioned for the same reason. The work of Hatten⁹² demonstrates how poorly known the pre-Mesozoic geology of Cuba is: Mesozoic rocks overlying metamorphosed equivalents of presumed Paleozoic strata.

All ten geologic periods are undoubtedly represented in the Swiety Krzys (Holy Cross) Mountains of south-central Poland (20-22E and 50-52N) as is evident from the local map of the mountain region enclosed in the work of Ksiazkiewicz, Samsonowich, and Ruhle.⁹³ In fact, the presence of all or almost all of the geologic column (in terms of sedimentary lithologies that are unambiguously biostratigraphically dated) can be shown to occur over much of Poland.^{94,95} But only a very small percentage of the earth's land surface has most or all of the geologic column in place (Map 15, Figure 1 and 2).

Continental shelf data were not included in this article, but Ronov *et al.*¹¹ noted that submerged shelves cover only 14% of the total continental area. Examples are now cited which show that they tend to have few and non-consecutive geologic periods represented. The report on the North Sea by Kent and Walmsley⁸³ reported only post-Devonian sedimentary strata, with usually only 4 or 5 of the 6 geologic periods represented per borehole.

significance of the geologic column to evolution is therefore obvious. Yet not only does this column basically not exist, but even where geologic periods' rocks *do* occur, their biostratigraphic basis *itself* is arbitrary. One need only consult the volume edited by Harland⁹⁷ to note that most fossil taxons overlap from a few to several of the ten geologic periods.

Of course, the absence of geologic periods is claimed to be a result of non-deposition during those periods in the regions of their absence, or to subsequent erosion. This is self-serving because there is no deterministic reason why the earth's land surface should (or should not) become *everywhere* depositional sometime within any span of several tens of millions of years comprising each geologic period. The claim of non-deposition and erosion during geologic periods begs the question, because it does not face the question whether or not these geologic periods ever existed in the first place.

Since only a small percentage of the earth's surface obeys even a significant portion of the geologic column, it becomes an overall exercise of gargantuan special pleading and imagination for the evolutionary-uniformitarian paradigm to maintain that there ever *were* geologic periods. The claim of their having taken place to form a continuum of rock/life/time of ten biochronologic "onion skins" over the earth is therefore a fantastic and imaginative contrivance.

III. Probable Diluvial Significance of Global Stratigraphic Trends

This section briefly considers how the findings of this work and related findings affect the Creationist-Diluvialist paradigm. Since it has already been demonstrated that the geologic column is not supported by what actually is found on earth, the principle of Occam's Razor favors the Creationist-Diluvialist paradigm because of its intrinsic abrogation of all concepts of evolution, geologic periods, and geologic time.

The fact that most of the earth's land surface has few of the ten geologic periods represented (Fig. 1) means that Diluviology needs to explain the stratigraphic separation of only a few fossil groupings over most terrestrial areas. Furthermore, the fact that most represented geologic periods tend not to be consecutive further implies that only a few groupings of fossil types exist over most areas. This says nothing of the long range of most fossil taxons.

The fact that Devonian, Jurassic, and Cretaceous appear to have special liberties not to rest on the next older geologic periods (Table 2) may have Diluvial significance. The Devonian has the first large-scale diversity of land fossils (although all geologic periods consist overwhelmingly of marine fossils), and its liberty may be due to the ecological independence of its terrestrial fossils from the almost wholly marine Lower Paleozoic as well as the poverty of the Lower Paleozoic in the Gondwana continents (Maps 1, 2, and 3).

The successional liberties of Jurassic and Cretaceous (Table 2) may support the position that they are post Flood and that their fossil populations are therefore truly successional and not part of the mutually-contemporaneous Flood-buried continuum of the older geologic periods.

The works of Ronov *et. al.*^{11,88} and Schwab⁸⁹ consider volumes, compositions, etc., of rocks from the viewpoint of geologic periods. No geologic period has a monopoly on any type of lithology. However, submarine volcanogenic rocks decrease going from global Paleozoic to global Mesozoic. Terrestrial volcanogenic deposits increase drastically going from Paleozoic to Mesozoic and Cenozoic.

This may reflect the global tendency for Paleozoic rocks to have been formed during the Flood so that Volcanism was primarily submarine, while Mesozoic and Cenozoic have been formed during late Flood and post Flood conditions so that volcanism was subaerial rather than subaqueous in nature.

Those strata which are at or near the earth's surface at any given localities are the likeliest candidates for having formed under late and post Flood conditions. For instance, where Jurassic has a thick mantle of Cretaceous-Tertiary rock overlying it, the Jurassic in that case probably was a mid-Flood deposit. Jurassic with nothing overlying it, on the other hand, probably was late-Flood to post-Flood in origin. The fact that world outcrop areas of geologic periods decline exponentially going stratigraphically downward⁹⁰ probably reflects the ever-decreasing probability of older geologic periods' rocks to be primarily late-Flood and post-Flood in origin.

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- GN-Proceedings of the International Gondwana Symposium
- IG-International Geology Review
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- SE-Sedimentary Geology
- SO-Sovietskaia Geologiya
- TE-Tectonophysics
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POPGEN I: COMPUTER SIMULATION OF POPULATION GENETICS

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The availability of relatively inexpensive computers has given many people access to the devices in schools, businesses, and even homes. Creationists will be able increasingly to test aspects of both the evolution and Creation models through the use of these "smart machines". This paper describes the use of a program to simulate a population of organisms in which the processes of reproduction, mutation, and natural selection are operating.

Population Genetics

A simplified discussion of the genetic principles involved may aid in the use of POPGEN I. Population genetics is concerned with the behavior of genes in populations rather than individuals. Interest centers on the *gene pool*, all of the genes possessed by all of the creatures in a population. Usually attention is focused on a single gene, which we can symbolize as A, and studies are made of the change through time in the relative frequencies of A₁ and A₂, the alleles of A. These frequencies are symbolized as p and q, respectively.

Three factors are most important in changing allele frequencies from generation to generation. Mutation can change A₁ to A₂, and the relative frequency with which that occurs is expressed as a fraction, u. Typical mutation rates are in the range 0.00001 to 0.000001. The mutation rate for achondroplastic dwarfism in humans has been estimated at 0.000042, which means that 42 out of one million times that the A₁ (normal) allele is copied, it changes to A₂ (the allele that produces dwarfism). Mutation can also change A₂ to A₁, but this is much less frequent and is ignored in POPGEN I.

A second factor that affects allele frequencies is natural selection. Unlike mutation, which acts on single genes, natural selection acts on the phenotype, the expression of the genotype. The amount of selection (s), is a number between 0 and 1. A phenotype with s = 1 is lethal, while s = 0 indicates that there is no selection against that phenotype. One may also speak of the fitness (w) of a particular phenotype, which is equal to

1-s. POPGEN I uses fitness values for the three possible genotypes A₁A₁, A₁A₂, and A₂A₂, to simulate the effects of natural selection.

The third factor affecting allele frequencies is drift, which refers to random changes in frequencies not caused by mutation or natural selection. Drift is particularly important in small populations where, for example, the death of a few individuals may change significantly the allele frequencies.

Description of the Program

Figure 1 is the program POPGEN I, which is written in BASIC for the IBM 5100 portable computer¹. With modification to be described later, it can be run on the Radio Shack TRS-80, Level II. Other computers with BASIC and a random number generator can also use the program.

Statements 20-80 allow the user to specify all parameters of the program: population size, number of generations, initial frequencies of the alleles, mutation rate, and fitness of the three genotypes. Statements 110-180 print the parameters supplied by the user and the headings for the results of the simulation.

The rest of the program consists of two loops. Statements 190-520 loop for the number of generations specified, while statements 220-470 loop for the number of individuals in the population. Statement 200 calculates the probability (M) that an allele selected at random from the gene pool will be an A₁, that is, the relative frequency of A₁ (p) minus the probability that A₁ mutates to A₂ (u). Statements 240-260 generate a random number between 0 and 1 and compare it to M. If M is greater, an A₁ allele is selected; if less, an A₂.

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0010 PRINT FLP,'          ***POPGEN I***'
0020 PRINT 'ENTER THE FOLLOWING PARAMETERS:'
0030 PRINT '  DESIRED POPULATION SIZE,'
0040 PRINT '  NO. OF GENERATIONS TO BE COMPUTED,'
0050 PRINT '  INITIAL FREQUENCY OF ALLELE A1,'
0060 PRINT '  MUTATION RATE OF A1 TO A2,'
0070 PRINT '  FITNESS OF A1A1,A1A2,A2A2.'
0080 INPUT N1,J1,P,U,W2,W1,W0
0090 Q=1-P
0100 F=1/N1
0110 PRINT FLP,'          THE POPULATION SIZE = ',N1
0120 PRINT FLP,'  THE INITIAL FREQUENCY OF A1 = ',P
0130 PRINT FLP,'  THE INITIAL FREQUENCY OF A2 = ',Q
0140 PRINT FLP,'  THE MUTATION RATE OF A1 TO A2 = ',U
0150 PRINT FLP,'          THE FITNESS OF A1A1 = ',W2
0160 PRINT FLP,'          THE FITNESS OF A1A2 = ',W1
0170 PRINT FLP,'          THE FITNESS OF A2A2 = ',W0
0180 PRINT FLP,'GEN      A1A1      A1A2      A2A2      A1      A2'
0190 FOR J=1 TO J1
0200 M=P-U
0210 G1,G2,G3,Z=0
0220 FOR I=1 TO N1
0230 N=0
0240 X=RND
0250 IF X>M GOTO 0270
0260 N=1
0270 X=RND
0280 IF X>M GOTO 0300
0290 N=N+1
0300 GOTO 0310,0330,0350 ON N+1
0310 W=W0
0320 GOTO 0360
0330 W=W1
0340 GOTO 0360
0350 W=W2
0360 X=RND
0370 IF X<W GOTO 0400
0380 I=I+1
0390 GOTO 0470
0400 Z=Z+N
0410 GOTO 0420,0440,0460 ON N+1
0420 G3=G3+F
0430 GOTO 0470
0440 G2=G2+F
0450 GOTO 0470
0460 G1=G1+F
0470 NEXT I
0480 P=Z/(2*N1)
0490 Q=1-P
0500 PRINT USING FLP,0510,J,G1,G2,G3,P,Q
0510 :###      #.###      #.###      #.###      #.###      #.###
0520 NEXT J

```

Figure 1. POPGEN I computer program.

Statements 270-290 repeat the process for the second allele of the individual.

Statements 300-390 simulate the effects of natural selection. A random number is generated and compared to the fitness of the particular genotype. If the random number is greater than the fitness, the genotype is eliminated. If it is not, then statements 400-460 add the genotype to the growing population.

After each generation is complete, statements 480-510 calculate the relative allele frequencies and print them along with the genotype frequencies.

It should be noted that POPGEN I simulates a population in which generations do not overlap, and in which the population size remains constant.

Random Number Generator

A feature of the computer which makes possible POPGEN I and other simulations of biological systems is the random number generator (RND). In this program it provides the element of chance in the selection of alleles for the next generation (statements 240 and 270) and for the operation of natural selection (statement 360).

One property of RND is that it always generates the same list of random numbers in the same order. This may or may not be desirable, depending on the objectives of the user. To avoid this feature, the statements in

```

0101 PRINT 'ENTER MINUTES AFTER THE HOUR.'
0102 INPUT T
0103 FOR I=1 TO T
0104 X=RND
0105 NEXT I

```

Figure 2. Program statements to be added for RND initialization.

Figure 2 can be added to POPGEN I and will cause RND to start with different numbers later in the program.

Description of the Printout

Figure 3 illustrates the printout from one run of POPGEN I. A description of its features may aid in the use of the program. The first few lines report the parameters supplied by the user. The initial frequency of allele $A_1 = 0.6$, which means that sixty percent of the A genes in the gene pool are A_1 and forty percent are A_2 .

The mutation rate equals $1E-7$, which is the computer's way of writing 1×10^{-7} or 0.0000001. This means that A_1 mutates to A_2 about once for every ten million times that it is copied.

The fitness values illustrate a situation in which A_1 is dominant, that is, both A_1A_1 and A_1A_2 have the same phenotype. In this example A_2A_2 has a fitness of 0.8 compared to the other two genotypes. This could mean that only 80% of the A_2A_2 individuals survive to

```

          ***POPGEN I***
          THE POPULATION SIZE = 200
          THE INITIAL FREQUENCY OF A1 = .6
          THE INITIAL FREQUENCY OF A2 = .4
          THE MUTATION RATE OF A1 TO A2 = 1E-7
          THE FITNESS OF A1A1 = 1
          THE FITNESS OF A1A2 = 1
          THE FITNESS OF A2A2 = .8

```

GEN	A1A1	A1A2	A2A2	A1	A2
1	.305	.565	.130	.588	.413
2	.325	.525	.150	.588	.413
3	.320	.515	.165	.578	.423
4	.320	.560	.120	.600	.400
5	.365	.525	.110	.628	.373
6	.440	.485	.075	.683	.318
7	.465	.465	.070	.698	.303
8	.375	.550	.075	.650	.350
9	.440	.455	.105	.668	.333
10	.440	.450	.110	.665	.335
11	.465	.470	.065	.700	.300
12	.475	.445	.080	.698	.303
13	.515	.395	.090	.713	.288
14	.510	.440	.050	.730	.270
15	.565	.365	.070	.748	.253
16	.580	.385	.035	.773	.228
17	.615	.335	.050	.783	.218
18	.570	.395	.035	.768	.233
19	.600	.345	.055	.773	.228
20	.610	.335	.055	.778	.223
21	.605	.355	.040	.783	.218
22	.655	.315	.030	.813	.188
23	.645	.305	.050	.798	.203
24	.645	.300	.055	.795	.205
25	.585	.375	.040	.773	.228
26	.635	.325	.040	.798	.203
27	.655	.310	.035	.810	.190
28	.685	.300	.015	.835	.165
29	.675	.300	.025	.825	.175
30	.715	.265	.020	.848	.153
31	.710	.280	.010	.850	.150
32	.710	.270	.020	.845	.155
33	.710	.270	.020	.845	.155
34	.630	.350	.020	.805	.195
35	.680	.305	.015	.833	.168
36	.735	.250	.015	.860	.140
37	.730	.250	.020	.855	.145
38	.775	.205	.020	.878	.123
39	.770	.210	.020	.875	.125
40	.745	.240	.015	.865	.135
41	.775	.210	.015	.880	.120
42	.780	.215	.005	.888	.113
43	.825	.170	.005	.910	.090

Figure 3. Printout from execution of POPGEN I.

reproduce, or that they produce only 80% as many offspring as do A_1A_1 and A_1A_2 individuals.

Following the fitness values are the results of the simulation. For each generation the relative frequencies of the three genotypes are given and then the allele frequencies. The parameter having the largest effect is the selection against A_2A_2 . This causes the frequency of A_2 to decrease rather steadily, although the effect of drift can be seen in generation 3 where the frequency of A_2 increases from 0.413 to 0.423. Drift also causes temporary increases in other generations.

Suggested Investigations

The effects of different population sizes, mutation rates, and patterns of natural selection can be evaluated with POPGEN I. A few possibilities follow.

1. A study of different population sizes as they relate to random genetic drift. Mutation rates should be set at 0 and fitness values should all equal 1. Increasing population size greatly increases computer time, so after determining the minimum population size that does not drift significantly, that parameter should be used to investigate other variables.
2. Simulate the case of sickle cell anemia in malaria-infested countries. This human mutation is recessive and usually lethal for those who carry two alleles for it (A_2A_2). Heterozygous individuals (A_1A_2) do not suffer anemia and are resistant to malaria. To simulate this, try $w(A_1A_1) = 0.8$ (might die from malaria), $w(A_1A_2) = 1$ (no anemia and resistant to malaria), and $w(A_2A_2) =$

0.01 (probably dies from anemia). Give A_1 an initial frequency of 0.99.

3. After determining equilibrium frequencies for A_1 and A_2 in the preceding investigation, simulate the situation for slaves brought from Africa to America. Give A_1 the equilibrium frequency for an initial frequency and, because malaria is absent in the U.S., make $w(A_1A_1) = 1$. See what happens when the advantage of this mutation is no longer present.

Use with Radio Shack TRS-80

POPGEN I can be easily converted to use with the Radio Shack TRS-80, Level II². Although not necessary, prompting messages, such as statement 20, can be included in the INPUT statements. LPRINT is equivalent to PRINT FLP, and if the user lacks a printer, PRINT will produce the results on the video screen. LPRINT USING is equivalent to PRINT USING FLP, except that the format specification of statement 510 is included in LPRINT USING. Instead of statement 210, each variable requires a separate statement. The $\geq$ should be written $>=$, and GOTO _____ ON _____ should be rendered ON _____ GOTO _____.

References

- ¹IBM 1977. IBM 5100 BASIC Reference Manual. International Business Machines Corporation, Rochester, MN
²Radio Shack 1978. Level II BASIC Reference Manual. Tandy Corporation, Ft. Worth, TX

PANORAMA OF SCIENCE

The Rose of Jericho

In the September-October 1980 issue of the *Biblical Archeology Review* the remarkable adaptation of the Rose of Jericho to desert conditions is described.¹ This plant is actually not a rose at all but a member of the mustard family. Its scientific name *Anastatica* means "not static" or maybe, from Greek, "resurrection plant". It is so named because the dried up skeleton of the plant, a ball of dried out twigs, when immersed in water gradually opens up and extends its branches like a miniature tree!

The Rose of Jericho begins to bloom in March and April, and has small spikes of white flowers set in a cluster of green oval leaves which grow close to the ground. By May or June the seeds are ripe but dormant and enclosed in tightly sealed fruits. The leaves have fallen off, and the dry, hard, twiggy skeleton has become a ball resembling a closed fist.

Now this plant has developed a special system for measuring rainfall and intermittently releasing its seeds so as to make its survival more certain. Fruits at the periphery of the skeleton have two loosely connected covers or valves. The first part of a rain causes the ball to open and if further rain falls some of the peripheral

seeds will drop. Others further on down on the branches wait for a more opportune time in case the first seeds are not successful in establishing plants. Seeds at the center will wait for decades or possibly even centuries until the most propitious moment after a particularly heavy series of rains.

Laboratory tests have shown that a skeleton will open more rapidly if the soil is wet. The drier the soil the more rain it takes to open the skeleton. No seeds will be dropped unless a second shower falls before the skeleton is redried and closed. So when it rains on the *opened skeleton* drops of water hit the fruit valves and separate them. The seeds thus drop on soil sufficiently wet to insure germination. Also they drop near the parent plant thus assuring a suitable location.

When the soil is dry four millimeters of rain are needed to open the skeleton, thus exposing the fruit valves. The gradual opening of the skeleton, is a two hour process. The seeds germinate in about eight hours. This insures that the released seed will be able to root in the soil before its upper crust dries out.

Though usually found in large dense concentrations, individual plants are found along a wadi belt or runnel. By following flow channels it was found that the size and density of the plants increased downstream. But a

limit is soon reached and when perennial plants become fairly abundant the Rose of Jericho disappears. This strange behavior is explained by the existence of the gerbil-like rodent known as the fat jird. These animals live in little burrows and occur in great profusion in the ground supporting perennial green-leafed plants, thus indicating that there is enough water for them even in the summer time, since the leaves of the perennials remain green. Further upstream where less water accumulates in the winter the perennials thin out and at the densest concentration of the Rose of Jericho there is only one burrow per 500 meters. Now these rodents relish the seeds of the Rose of Jericho as was found out by placing dried plants in a cage with them. They broke open the skeletons and the fruits and ate the seeds with obvious pleasure. So then this was the reason for the disappearance of the plant downstream. As the rodent burrows decreased upstream the plants increased in a remarkably exact inverse proportion!

Birds distribute the seeds to other desert areas. Thus the desert partridge eats scores of seeds from opened skeletons after a rain. The sticky mucilage around the seeds insures that some seeds will stick to the birds' feathers and finally fall off where the partridge settles down in the sandy ground. If the soil is still moist it germinates and forms its own skeleton. There in a little impression in the sand it patiently waits until the next rain, perhaps as long as ten years later, is sufficient to open it and shed some seeds thus establishing a new colony of plants.

As mentioned above the scientific name of this plant is *Anastatica hierochuntica*. As indicated by the authors, the regenerative characteristic of the Rose of Jericho figures in the folk traditions of Jews, Moslems and Christians. It is often used as a charm in a pregnant Arab woman's room. When labor begins, a dried skeleton of the plant is dipped in water. The plant's reaction is supposed to induce the same reaction in the woman's womb, thus facilitating birth. Legend relates that in Syria, women in labor drink the water in which the plant skeleton has been immersed.

In Israel the plant is found only in the driest part of the Negev, a triangular desert region, about 4,700 square miles in area, the Judean wilderness, and the Sinai. It also grows in certain areas of the Sahara desert. The average annual rainfall is between three quarters of an inch and two inches. Roses of Jericho are completely absent where the annual rainfall exceeds four inches. Quite evidently it is completely adapted to desert conditions.

As discussed in my article "On the Recent Origin of the Pacific Southwest Deserts"² there is considerable Biblical and archeological evidence that such deserts as the Negev, and the Sinai deserts, as well as those in North America are relatively recent. It would seem then that the many changes involved in transforming the Rose of Jericho from a typical member of the mustard family to a plant with its unusual desert adaptations could hardly have occurred by natural selection in such a short time geologically speaking. Thus most species of the mustard family or Cruciferae at least in California are annuals i.e. about 107 annuals to 36 perennials.³ Though some of the desert annuals are adapted to desert

conditions by having stout fleshy water-retaining stems as in *Streptanthus inflatus*, none has anything like the series of highly integrated adaptations shown by the Rose of Jericho. Likewise the perennials, though often having rather woody basal stems or strongly developed root-crowns, do not show any very complex adaptations to the desert conditions in which some of them live. The Rose of Jericho is then truly a unique member of the mustard family.

Contributed by Walter E. Lammerts.

Birth Pain Repressor in Rats

A recent *Science* report⁴ indicates the pain threshold of rats increases during pregnancy. There is a gradual increase from 16 to 4 days prior to parturition and an abrupt rise 1 to 2 days before birth. The increased pain threshold is abolished by the narcotic antagonist nal-trexone, suggesting endogenous endorphin mediates the response. Endogenous opiates are thought to minimize certain kinds of pain in humans and may even contribute to a jogger's "second wind". The role of endorphins in reducing pain associated with birth should be of particular interest to creationists. We know one of the consequences of the original sin was increased pain in childbirth (Gen. 3:16) and yet birth (without complications) among animals seems free of pain. A comparative study of endorphin mediated alteration of pain threshold of other animals and man would be a worthwhile research project for creationists. Could this be the mechanism by which mountain goats "get rid of their labor pains"? (Job 39:1-3)

Contributed by E. Norbert Smith

Asa Gray Vindicated

According to an article in *Newsweek* (Nov. 3, 1980), at a conference in mid-October at Chicago's Field Museum of Natural History, the majority of 160 of the world's top paleontologists, anatomists, evolutionary geneticists and developmental biologists agreed to abandon Darwinian evolution in favor of punctuated equilibria, otherwise known as the hopeful monster theory.

Apparently, Darwin's theory had become indefensible to them, citing particularly the absence of intermediate fossils as the conflicting fact. The hopeful monster theory is a retreat to what appears to be reliable geological evidence, namely, the general stringing-out of fossils from "simple" to "complex" in the rock strata. It was the absence of intermediate fossils as well as evidence for intelligent design that caused Asa Gray to break with Darwin. Gray's theistic evolution and the hopeful monster theory are essentially the same except that the hopeful monster theory rests on chance rather than theism.

Perhaps proponents of the hopeful monster theory should have considered the following advice:

There are, however, some who still think that species have suddenly given birth, through quite unexplained means, to new and totally different forms: but, as I have attempted to show, weighty

evidence can be opposed to the admission of great and abrupt modifications. Under a scientific point of view, and as leading to further investigation, but little advantage is gained by believing that new forms are suddenly developed in an inexplicable manner from old and widely different forms, over the old belief in the creation of species from the dust of the earth.⁵

The genetics of the hopeful monster theory is more in the realm of wishful thinking than science. Once the public learns that special creation best explains the geological evidence, they will also realize that the hopeful monster theory has only atheism to offer.

Contributed by Randall Hedtke

Once Upon a Time—Man! a Bit of Whimsy

It is interesting to observe a recent version of how man shook off his animal nature and became what he is today.

Anthropologists like to say that getting up from all fours to stand on two legs was undoubtedly the earliest and most important event in hominid development. Since the front legs no longer needed to be concerned about walking, they became free to do more important things like tool making, grasping, handling, and carrying things, especially activities concerned with hunting. With all these stimulating new activities going on, pre-man's brain began to develop.

Somehow, dim-brained pre-man got up off all fours, and amazing things began to happen as noted above. To their credit, birds got the same brilliant idea, but alas their forelimbs turned unwillingly into wings, and they remain as bird-brained today as ever.

There is an urgent need, however, to explain the many species of dinosaur which not only duplicated

pre-man's great idea of walking on hind legs, but they had very functional forelimbs. In addition they had many more millions of years to manipulate, to carry, to make and use tools, and to hunt than man ever did. Apparently they did not have as many new opportunities as pre-man did, and hence to our great relief we do not need to be concerned about those potential rivals.⁶

There are living species today which may be well advanced toward duplicating and perhaps surpassing man's amazing evolution. The kangaroo has seen the wisdom of freeing up the front limbs. If now this beast begins such activities as manipulating and all the rest, man may soon (in geological terms) be hopelessly outclassed with the ultimate threat of extinction. There is an urgent need for evolutionists to organize kangaroo watches to see if these recent converts to bipedalism are moving into the next stage. Once they begin to chip rocks and if some new opportunities cross their path, we can be sure that their brains will begin to develop, perhaps even explosively so, and then man is in deep, deep trouble.

Contributed by Erich A. von Fange

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- ¹Friedman, Jacob, Zippora Stein, and Amotz Dafni, 1980. *Biblical Archaeology Review* VI (5): 38-43.
- ²Lammerts, Walter E., 1971. On the recent origin of the Pacific Southwest deserts. *Creation Research Society Quarterly* 8 (1): 50-54.
- ³Jepson, Willis Linn. 1925 edition. Manual of the flowering plants of California.
- ⁴Gintzler, A. R., 1980. Endorphin-mediated increases in pain threshold during pregnancy. *Science* 210 (4466): 193-195.
- ⁵Darwin, C. P.F. Collier and Sons Corp. edition. 1965. The origin of species. P. 500.
- ⁶It may be readily noticed also that squirrels, too, use their fore-paws as hands quite skillfully, for instance in eating; but they have not thereby evolved into anything else. (Editor's note.)

BOOK REVIEWS

The Nature of the Stratigraphical Record, by Derek V. Ager, 1973.† Wiley, New York. 114 pages. \$11.95.

Reviewed by Erich A. von Fange*

Ager's slender volume of 100 pages is a juicy morsel for the creationist—so juicy, in fact, that the author invokes in effect a curse upon any creationist who uses the information. One might ask how a confirmed evolutionist can shred up some of the most sacred assumptions and beliefs in conventional geology and still remain in the good graces of the profession. The answer is very simple. Ager lulls the profession with a stirring credo of his loyalty to evolution and tops this off with a scathing denunciation of the creationist view:

(Books are still being published by the lunatic fringe about Noah's Flood as the explanation for major geological changes in the earth.) In case this book should be read by some fundamentalist searching for straws to prop up his prejudices, let me state categorically that all my experience (such as it is) has led me to an unqualified acceptance of evolution by natural selection as a sufficient explanation for what I have seen in the fossil record. I find divine creation, or several such creations, a completely unnecessary hypothesis. Nevertheless this is not to deny that there are some very curious features about the fossil record.

Among the points and theses Ager develops in his book are the following:

The break between Palaeozoic life and Mesozoic life is in the mind of the specialists rather than in the matter. Specialists do not agree on how many major faunal breaks occurred in the past. Extraterrestrial causes and

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†This book is not new; but it seems to the reviewer not to be as well known as it should be.

magnetic reversals of the earth are becoming respectable explanations for great extinctions in the past. The most serious error of palaeontologists is to measure the past by the present. (That sentence ought to be repeated ten times for its full impact!) Continuous sedimentation is a ridiculous illusion, full of contradictions. Remains as recent as Roman times are found at 'startling' depths. Sedimentation in the past has often been very rapid indeed and very spasmodic. Changes do not take place gradually. "We are now all catastrophists!" Most sedimentation in the continental areas is lateral rather than vertical. Dating rock by its fossils and dating the fossils by the rock is an impossible circular argument, yet we are always on dangerous ground if we accept other lines of evidence. Plate tectonics is not really all that important. The history of the earth consists of long periods of boredom and short periods of terror.

Ager goes quite far in taking an honest look at geology, but he is unable to pursue some of his points to their logical conclusion. For example, Ager in effect would say that a period like the Permian could have happened in a week or a month, but then the earth goes into some kind of suspended animation for 50 million years (minus one week) until the conventional time allotted to that period is up. This is reassuring to the geologist who accepts the geological column as an article of faith, but it makes no logical sense at all. Above all, the geologist needs time for evolutionary changes to

take place. Ager clings to a naive faith in the merits of radiometric dating: "Radiometric dating has nearly reached the stage when we can make reasonable estimates at the stage, if not the zone level."

All in all, Ager's is a curious book, illustrating the dilemma of a man faithful to his profession who is attempting to face up to some devastating contradictions in the stratigraphical record.

Charles Darwin and the Problem of Creation, by N.C. Gillespie, 1979. The University of Chicago Press.

The item: "The Episteme is the Theory", by Mr. Randall Hedtke, elsewhere in this issue of the *Quarterly*, began, as is explained there, as a review of this book, and turned into an article. However, the article can still serve, to a considerable extent, as a review; and it may be seen for that purpose.

FORTHCOMING BOOKS

Thermodynamics and the Development of Order, and the third edition of *Biology: a Search for Order in Complexity*, both by the Creation Research Society, are expected to be out in the fall of 1981. Watch subsequent *Quarterlies* for further information.

LETTERS TO THE EDITOR

Too Thick a Canopy Might be Bad for Plants

I read with interest the items concerning a pre-flood canopy of ice.¹

I must take issue with Mr. Westberg's statement that, "there could have been a 10,000 to 1 absorption [of sunlight, by the canopy] before the Flood, and the illumination would still have been adequate."² While a light intensity of 5 ft-c. may be adequate for the survival of animal life, it is certainly not adequate for the survival of green plants, if we assume that the plant species currently existing on the earth were created in their present forms, during Creation Week, then light intensities before the Flood must have been adequate to support these species. Loomis³ states "... a few species of flowering plants survive on the forest floor where the light intensity is less than 2 per cent of full sunlight, about 200 fc. maximum ... Technically, some photosynthesis will be carried on at any light intensity above zero, but practically, light of 500 to 1000 fc. is required for fair rates of photosynthesis in typical leaves."

It should be noted, however, that even 1000 ft-c. is inadequate for proper growth in many plant species, particularly those species which utilize the C-4 pathway of carbon metabolism (e.g., corn, sorghum, sugar cane, *Amaranthus* spp.), which require full-sun light intensities for good production, and which cannot survive under even moderate shading. A great majority of the

crop plant species used as food for man and animals require nearly full-sun light levels.

It therefore seems to me that, unless plant life underwent some extreme biochemical changes after the Flood, the light intensities striking the earth's surface before the Flood must have been comparable to modern incident intensities.

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- ³Loomis, W. E., 1949. (In) Photosynthesis of plants, J. Franck and W. E. Loomis, eds., Iowa State College Press, Ames, Iowa. Pp. 10 & 11.

Sincerely,
Malcolm M. Manners
(Plant physiologist and
horticulturalist)
P.O. Box 760,
Homestead, Florida 33030
Received 26 November, 1980

Reply to Manners

About the botanical limits which should have been added to the visual limits on pre-Flood lighting of the

Earth, under an ice canopy, I must confess that my botanical training is limited to raising plants in a plastic hothouse. However, I had little success there until I installed an automatic heater fan under the seedling trays during the winter.

My original paper was concerned only with effects of the canopy on heating and lighting. However, it is generally agreed that pre-Flood vegetation must have been very heavy, in order to satisfy the huge animal appetites which must have existed, and to form the huge beds of coal. In such a jungle, the lighting at ground level, one would think, must have been rather little; but the ground itself was warm, at all places and all times. The canopy kept the heat from being radiated away.

I remember reading recently, maybe in the National Geographic, about the luxuriant vegetation in the stygian darkness of the deep sea-floor where volcanic seams keep the surrounding water warm. It appears that warm temperatures can be a major factor in the existence and growth of plants—and, indeed, of animals. So it might be that, other things having been favorable, rather less lighting than today would not rule out much growth of plants.

Sincerely,
Luther Westberg
3400 Westach Way
Sonoma, California 95476
Received 19 December 1980

Creation an Important Christian Doctrine

May I share a thought with other readers of the *Quarterly*?

It is not uncommon to meet Christians who are sound in their belief on almost all points, and who are moreover active in their Christianity; but who are willing to espouse, or at least to refrain from criticizing, the theory of evolution. In that respect, I believe, they diminish the effect of their witness; and to those people I should say something like this:

God's word says in Romans chapter one, verse eighteen and following, that every individual knows within himself the eternal truths of God and His creation, yet most try to deny it. I believe this also to be true in connection with the evolution and special creation controversy. Being confronted with these opposing theories, I believe a person is in like vein suppressing the truth for whatever reason, when denying special creation.

I realize this is strong language but I passionately believe that compromise of any sort by Christians becomes increasingly detrimental to the furtherance of God's kingdom as the Parousia draws near. (See II Timothy 4:3, 4)

Insisting on the belief in the theory of evolution with its numerous shortcomings and inconsistencies rather than aligning oneself with his or her innate understanding that it is God's hand which has accomplished it all just as He said, is suppressing and compromising the truth. If one prefers to believe in a theory marked with gross assumptions contradicting the written word of God rather than believe what God has revealed, that one reduces God in size. God is definitely big enough to

do it the way He said, and as would be expected, the facts don't contradict His word.

As Christians, we need to communicate to the world the most accurate picture of the nature of God both in His creation and sustenance of the universe and in His redemptive work in our lives, thus ringing the apriori bell in those who don't have it smothered. The God of the Bible is a God of immediacy in both His love and His wrath. Evolutionary theory, however, tends to diminish God's pungency, or more commonly, to reduce Him to nothing.

As unfinished and controversial as the theory of evolution appears, I entreat you to be truthful to your God-given understanding and His written word and thus better witness to the world of the impending universal destruction and judgement.

Sincerely in Christ,
GORDON L. WILLIAMS
3751 S. W. 20th Ave., #129,
Gainesville, Florida 32601.
Received 22 December, 1980.

How Will the Sun and Moon be Darkened?

May I pose a question to other readers of the *Quarterly*? What is one to expect as to the physical nature of the darkening of the Sun and Moon, referred to in several places in prophetic Scripture? Examples include: Isaiah 13:10, Amos 8:9, Zechariah 14:6, Isaiah 58:10 and 60:2, Joel 2:2, and Amos 5:18 and 20. It is possible to consider these things from a theological viewpoint, but I should like to hear of some scientific hypotheses.

Sincerely, in Jesus Christ
Rev. Lawrence H. Glaser
(Licensed Baptist minister)
404 W. Nellie, Monett, Missouri.

Triplets' Paradox no Paradox

Jeffrey Lee asked a question of Relativity.¹ Although I am not an ardent supporter of Relativity, I believe it has a degree of internal consistency. The following numbered comments assume Relativity to be valid.

(1) To be consistent with some of the things the other observers do, Ernie should first predict that both clocks will read 1.0 second, and then relativistically revise his prediction to 0.8 second. Relativity says that all three observers will see this reading on both clocks at the time and place of meeting.

(2) The two clock triggerings will be simultaneous events to Ernie only. If he sees them both, he can make a set of simple time-speed-distance calculations showing how Alvin and Bill observe each other's progress along the rod. In other words, when Alvin is at a certain position, he is receiving the light showing Bill at some easily calculable position, and so on. Also, if Alvin and Bill can see each other's clocks, each will see the other's clock advancing exactly 4 times as fast as his own. For example, when Alvin has moved 75% of the distance along his half of the rod, and his clock shows 75% of the reading it will have at meeting time, he is seeing Bill's

clock being triggered. At meeting time, both clocks will show 100% of their final reading. These statements would be equally true if the final reading is to be 1.0 second, or if it is to be 0.8 second as predicted by Relativity.

(3) Alvin makes a mistake if he trusts his memory for the length of the rod or takes Ernie's word for it. He must measure his half of the rod as it approaches him, and he will find it contracted by a factor of 0.8, to a length of 144,000 km, or 0.48 light-second. At Ernie's speed of 0.6c, Ernie will reach Alvin in 0.48/0.6, or 0.8 second of Alvin's time.

(4) Alvin goes through a series of steps in coming up with his incorrect prediction of 0.4706 second for Bill's clock reading. First, he sees Bill's clock advancing 4 times as fast as his own. Correctly applying this observed Doppler shift, he determines Bill's velocity to be:

$$(4^2-1) c/(4^2+1) = 0.88235c$$

Second, he incorrectly assumes that the two clocks were triggered simultaneously. (To him they were not!) Third, he incorrectly assumes that 1.0 second of his time will elapse while both he and Bill make the transition from triggering to meeting. He then relativistically transforms the correctly measured velocity and the two incorrect assumptions into an incorrect prediction of 0.4706 second for Bill's clock reading.

(5) If Alvin wants relativistically correct answers, he must reason as this paragraph suggests. His clock is well advanced (to 75% of its final reading) when he first sees Bill's clock at zero. He then sees Bill's clock advancing 4 times as fast as his own. Extrapolating linearly, he will conclude that the final reading of both clocks will be the same, 0.8 second. At meeting time he reasons this way: "My clock was at 0.60, or 75% of its final value, when I saw Bill's clock at zero. Then I saw both clocks side-by-side and reading 0.80. Because Bill was approaching me, he should have come closer to me by 0.88235×0.8 , or 0.70588 light-second while his clock was making that 0.8-second advance. My clock should have advanced by 0.8 (his reading)—0.70588 (his approach in light-seconds), or 0.09412 second. It actually advanced by 0.8 (its reading)—0.6 (its reading when I saw Bill's clock start), or 0.2 second. Therefore Bill's clock is running slower than mine by a factor of $0.09412/0.2$, or 0.4706!"

(6) Alvin can look back to his own past and say, "Bill's slow-running clock started 0.8/0.4706, or 1.7 second ago. He was 0.88235×1.7 , or 1.5 light-second (450,000 km) away at that time." If asked about the rod, Alvin can reply, "Bill's end of the rod was 1.5 - 0.48, or 1.02 light-second away, 1.7 seconds ago. Ernie's, and the rod's, velocity towards me was therefore $1.02/1.7$, or 0.6c." When told that Ernie sees Alvin and Bill as mirror images of each other, Alvin replies, "Bill's conclusions about me are the same as mine about him, and are equally valid to him."

These comments may correctly describe how space, time, and light interact. Or they may be nothing more than a mental exercise in applying certain prescribed rules of thought. They may only illustrate the fact that if you are in the center of a rigid rod, relativity grants

you a certain omniscience, or certain calculation privileges denied to other observers.

I am wondering whether some creationists put relativity in the same category as evolution, regarding it as a faith-threatening heresy to be refuted scientifically. I may be overlooking something, but I do not have any theological or Biblical reasons for rejecting it. He who made space and time and said "Let there be light," *may* have related space, light, and time in the manner visualized by the relativists. On the other hand, scientists have jumped onto the relativistic bandwagon as they did with evolution in the past century. Perhaps its postulates have been accepted too readily as the final word on the mysteries of the universe, and its paradoxes (such as clock slowing and non-simultaneity) dismissed too casually. Therefore I am pleased to see the work of Dr. Thomas Barnes and others who seek to counteract this effect by providing non-relativistic models of the creation.

Reference

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More Thoughts on the Doppler Effect†

I agree with Slusher that the Doppler effect, observed in starlight, raises some questions to which the theory of relativity does not seem to give clear answers.¹ Moreover, I suggest that there are other points which may be added.

Consider Slusher's Figure 2. When the Earth is in positions (2) and (4) the Doppler effect is greatest; at positions (1) and (3) it vanishes. Now there is another effect, aberration, which does just the opposite. When the Earth is at position (1) the star appears shifted slightly to the right in the drawing; at (3) slightly to the left. At (2) and (4) it does not appear shifted at all. The textbooks commonly offer for this some analogy, such as one walking in a rainstorm. Although the drops are falling vertically, because of his own motion he has to tilt the umbrella a little. However, in my opinion such ballistic analogies must be suspect in dealing with light considered as a wave phenomenon.

As well as the aberration, there is another effect: parallax. As seen from position (1), the star would appear at an angle slightly to left, from (3), slightly to the right. However, this parallax is apparent only for a few quite near stars, whereas aberration seems to be the same for all. The parallax is not in question here.

Now the Earth has its orbital motion; some stars, too, may move in orbits; viz., binary stars. Suppose that there should be a binary star, moving in an orbit in the same plane as the Earth's, of the same size, going around in the same time, and moving in step with the Earth. There is nothing impossible about such a thing.

† Memorandum from the editor to himself.

CREATION RESEARCH SOCIETY

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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.

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The Earth and such a star would have no relative motion with respect to each other at all.

Would the Doppler effect be observed in the light of the star? One would expect so, since it is observed for all others, and one would not expect a sharp difference. Would aberration be observed? It would seem so, since it is for all others. But there is no relative motion; whence, according to the conventional theory, came these effects?

There is more: arguments from double stars have been used before. Early in this century Ritz proposed a ballistic theory of light.² In it, light from a moving source has the velocity of the source added to that of the light, as would happen to a bullet fired from a moving vehicle. De Sitter suggested, however, that were that so, light emitted when the star was moving away from the Earth, for instance, would take longer to reach the Earth than that emitted when it was approaching.³ The

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 man, 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 an historic event worldwide in its extent and effect.

4. We are an organization of Christian men 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 Saviour for all mankind. Therefore, salvation can come only through accepting Jesus Christ as our Saviour.

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result would be that the Doppler effect observed would be a complete jumble, which is not true.

A somewhat similar argument could be used on a question which Slusher posed: whether the Doppler effect propagates instantaneously, or whether it propagates along with the light, so to speak, at the same speed as the light. An answer is suggested by a special class of binary stars: the eclipsing binaries.

In this special class, a bright star (for instance) revolves in its orbit around a large, but relatively dark one. When the bright star is behind the other, it is, of course, eclipsed: the light is cut off. Now the eclipsing always comes just when there is no Doppler shift: when there was formerly a red shift, i.e. the star moving away from the Earth, and will in a little while be a blue shift, i.e. the star moving toward the Earth.⁴ But this would

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Why Not Creation?

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