

1972 ANNUAL ISSUE

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

VOLUME 9

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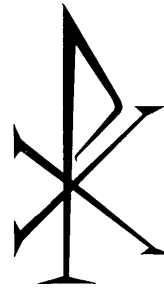
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Notices of change of address, and failure to receive this publication should be sent to Wilbert H. Rusch, Sr., 2717 Cranbrook Road, Ann Arbor, Michigan 48104.

COVER ILLUSTRATION

The *Kalima inachus* butterfly is a prime example of camouflage. As it perches on the branch, it seems to imitate the adjoining foliage, even to apparent veins and wormholes through the leaf. It is difficult to assign this precision to mere chance; or, if due to the "psychic pressure" of adaptive development for survival, by what means did it survive until this perfection was attained?

The problems of heredity, environment, instinct, adaptation and survival would be compounded to infinity to account for this superlative accomplishment any other way than creative design. This beautiful photograph sets the stage for this entire issue of C.R.S. *Quarterly* focused on the clear evidence for design in nature. We are indebted to Mr. Willis E. Keithley for this fine photographic study. He is an experienced nature and wildlife photographer as well as a Bible-science lecturer and evangelist. He resides at Rt. 2, Box 1417, Madras, Oregon 97741. Another of his photographic essays appears elsewhere in this issue.





THOMAS G. BARNES

I was very pleased when Dr. George Howe asked me to write this dedication of the ninth Annual Issue of the *Creation Research Society Quarterly* to Professor Thomas G. Barnes, a man who is a giant in the creationist cause. His work in the Creation Research Society since its beginning has been invaluable in strengthening and furthering the work of the Society.

Prof. Barnes was the driving force in the writing of the Society's biology textbook, *Biology: A Search for Order in Complexity* (Zondervan Publishing House, 1970). This book has already made a great impact and promises to be a lasting influence in the establishing of the truth regarding life and the organic world. Prof. Barnes has contributed many effective writings to Christian apologetics. Students and associates of Prof. Barnes can attest to his powerful Christian influence.

I have known Dr. Barnes as a friend and associate at the University of Texas at El Paso since I arrived in El Paso 15 years ago. He is a man of strong and forceful personality. He has what seems to be an inexhaustible source of energy. I have seen him tackle the most difficult scientific problems and solve them. As one colleague of his remarked, "Tom has the ability to inspire even the dullest student to make good." Dr. Barnes exemplifies the teachings of Christ in his dealings with people—generous and fair with all, including those with whom he differs strongly.

Dr. Barnes is a physicist by training but his scientific work has embraced many fields, ranging from medicine to geophysics. He earned his A.B. degree at Hardin-Simmons University in

1933, and the MS. degree at Brown University in 1936 while studying there under R. B. Lindsay, the famous physicist. In 1950 Hardin-Simmons University awarded him the D.Sc. degree.

He has been a professor of physics at the University of Texas at El Paso since 1936. He was director of the Schellenger Research Laboratories on the University of Texas at El Paso Campus from its establishment in 1953 to 1965. It was during this time that the laboratory enjoyed its greatest activity and prestige. The work of this group under Dr. Barnes established a high reputation in atmospheric physics, rocketry, and acoustics.

During World War II and afterwards Dr. Barnes did much research as a physicist with Duke University (1942-45) where he was co-inventor and engineer of "Dodar," an electronic sound ranging device. He worked as a consulting physicist in San Diego, California, the summers of 1951-2, U. S. Army Research Office in 1963, and he has been a consulting physicist for Globe Exploration Co., Inc. (now known as Globe Universal Sciences) from 1965 to the present. For Globe Universal Sciences, Prof. Barnes has done much original research regarding seismic energy sources. His research has varied from the developing of apparatus to study medical patients with heart trouble to developing instruments for the detection of enemy locations in Viet Nam.

Prof. Barnes is the author of many scientific papers on varied subjects such as "Filtration of Elastic Waves in Solid Rods with Membranes as Side Branches" or "Electra-Chemical Toot De-

sensitization." He is the author of a textbook used very widely in college and universities entitled *Foundations of Electricity and Magnetism* (D. C. Heath and Co., 1965). In this book Dr. Barnes developed electromagnetic principles starting with Maxwell's equation. He was the chairman of the committee responsible for the development of the Creation Research Society's biology textbook published by Zondervan Publishing House. Readers of the *Quarterly* are familiar with his papers investigating the decay of the earth's main magnetic field. This work seems to establish the young age of the earth.

The scientific prestige of Prof. Barnes is noted in his appointment to the Governor's Atomic Energy Advisory Committee in 1964 by Governor Connally of Texas, and to the Governor's Scientific Committee in 1963 by Governor Jack Campbell of New Mexico.

In 1938 he married Elizabeth Evans. She has been a constant source of encouragement and help to him. Mrs. Barnes contributed a tremendous amount of work in the preparation of the biology textbook manuscript. They have four children and four grandchildren.

Dr. Tom Barnes' stature as a scientist is great. His stature as a Christian and defender of the Faith is even greater. His influence is tremendous. He is always concerned about those around him and goes to great lengths to help others. He is fearless in his defense of the teachings of the Scriptures. However, he is not content to just defend the Faith but always "counter-attacks" the forces opposing Christ. His example is one that shows what following Christ is really about. It is an honor to write about Tom Barnes, a great scientist and a great Christian.

HAROLD S. SLUSHER

SPECIAL ANNOUNCEMENT

The finest group of speakers in the history of modern creationism will appear at the Creation Convention scheduled for Milwaukee, Wis., October 10 through 13, 1972. Seventeen speakers are tentatively planned for convention sessions:

Tuesday evening, October 10: Dr. Henry Morris, "The Two Laws of Thermodynamics" and Dr. John C. Whitcomb, "The Genesis Flood."

Wednesday morning, October 11: Dr. Clifford Burdick, "Geologic Evidences for a Recent Creation" and Rev. Walter Lang, "The Scientific Accuracy of the Bible."

Wednesday afternoon, October 11: Dr. A. G. Tilney, "Cell Structure" and Dr. John Moore, "Chromosome Tests."

Wednesday evening, October 11 (School Night): Dr. Douglas Dean's topic for the banquet will be "The Need for Creationism in the School System." Various groups will report on attempts to introduce creationism into the schools.

Thursday morning, October 12: Dr. Bolton Davidheiser, "The History of Evolution" and Dr. John Klotz, "The Scientific Method."

Thursday afternoon, October 12: Dr. George Mulfinger, "Degeneration in the Universe" and

Dr. Donald Chittick, "Radioactive Dating Systems."

Thursday evening, October 12 (Youth Night): Mr. Kelly Segraves, "Challenge for Youth" and Dr. Bernard Northrup, "Dinosaurs."

Friday morning, October 13: Dr. William Tinkle (Topic to be announced) and Dr. Frank Marsh, "The Genesis Kinds."

Friday afternoon, October 13: Dr. Walter Lammerts will discuss "Mutations" and Prof. Wilbert Rusch, Sr., will talk on "Evidences from Fossils."

Various creationist groups, also book publishers, etc., will display their materials. Competition for science projects promoting creationism will be sponsored.

Registration will be \$25 which will entitle the registrant to a booklet containing printed copies of essays presented during the convention. Communication media and professional scientists cannot ignore the impact of such a mass gathering for serious study of creationism. Therefore, C. R. S. *Quarterly* readers are encouraged to support this convention. Since at least 500 registrants will be required, all who can are urged to register even though participation through attendance may not be possible.

DARWINISM IS PHYSICAL AND MATHEMATICAL NONSENSE

HOWARD BYINGTON HOLROYD*

In this article, new and vastly important evidence is presented concerning the mechanical theory of organic evolution which was popularized by Charles Darwin and developed by his followers; and it is shown, far beyond any reasonable doubt, that this theory is nothing more than physical and mathematical nonsense.

The great error of the Darwinians suggests that a suitable place in history for Darwin should be a word added to our vocabulary for a scale of errors which goes as follows: little boo-boo, boo-boo, small error, error, big error, colossal error, and now far larger, Darwinian error, which is the Mount Everest of errors. To say, "Some one made a Darwinian error," means that the person was as wrong as possible in a matter of great importance.

During the past two thousand years, the mechanical theory of organic evolution was the **darwinian error** of the human race, the highest peak in a whole mountain chain of great and related errors, which includes the philosophy of materialism, making H-bombs, parts of the theories of both Capitalism and Communism, and some other things.

It is a fact of history that Darwin's **The Origin of Species**, published in 1859, started a vast revolution of thought in Western culture. At that time, critics were not well prepared to refute Darwin's arguments on which he had spent years of time. His attack came as a complete surprise. Some say he exploded a bomb-shell, and the result was that he and his followers won the first battle. But then they made the serious but common error of thinking that they had won the war; they nearly abandoned research on weapons, and even allowed the old ones to rust.

Now it is time to start the counter-revolution. During uneasy years of peace, due to efforts of quite a few people, a new and greatly improved weapon has been invented; indeed a multi-megaton "intellectual H-bomb" has been designed. This time it will be the Darwinians who are surprised, and this time they will lose the war.

Machines and Organisms

In the mechanistic theory of organic evolution, it is postulated as obviously true that complex designs may be produced by random changes and selection. The purpose in the following discussion is to examine this postulate from the point of view of an experimenter and designer who knows a little mathematics. The conclusion is that the postulate is false, and therefore that the whole mechanistic theory of evolution is false.

That organisms and machines are similar in some aspects is generally accepted, and most people have heard or read the metaphor, "Man is a machine." We understand machines far more completely than organisms, and therefore we can be far more certain in thinking about our own designs than about those in nature. Is it theoretically possible to obtain the designs of complex machines by making random changes, testing them, and selecting the better? We shall see that this is not possible for the reason that improvements are far too improbable.

Need for Mathematics

Since designs must be produced in limited time and space, and with a large but limited number of atoms, the investigations must be

somewhat quantitative. It is not possible to think correctly in matters involving chance without using, at least to some extent, the mathematical theory of probability. Can any person imagine that 10 people can pass in single file through a door in exactly 3,628,800 different ways, and that 15 people can similarly pass in more than 1.3 million million ways? These cannot be imagined, but they are both true. Since the necessary mathematics may be found in many books, it is not required to develop it here, or even to give references. The Darwinian error was caused by the failure to use necessary mathematics.

Generalized Concept of Operations

Engineers are familiar with the idea of operations in making things: for example, drilling a hole, reaming it, and making threads are considered three operations. The idea of operations as small, elementary actions may be extended to acts of nature: the collision of two grains of sand in surf, the making of a simple chemical bond, the breaking of such a bond, the emission of a quantum of radiation, the beat of a gnat's wing, the bumping of two gas molecules, the fracture of a rock by frost, and so on may all be considered operations.

*Howard Byington Holroyd, Ph.D., is retired head of the department of physics, Augustana College, Rock Island, Illinois.

Googol of Operations

So far as we know, there are no instantaneous operations, and it is evident that a finite number of entities in finite time can perform only a finite number of operations regardless of how they are counted. It is important to find a number which is known to be greater than the total number of operations which have been performed on earth during its entire past. The mass of the sun is greater than the mass of the earth, so let us start with the mass of the sun which is approximately 2.0×10^{30} kilograms. The atomic mass unit is 1.66×10^{-27} kilograms. Therefore the mass of the sun is

$$2.0 \times 10^{30} / 1.66 \times 10^{-27} = 1.2 \times 10^{57}$$

atomic mass units.

Let us now imagine that each one of these mass units is an entity which can perform operations, that these are performed at the high rate of 10^{21} per second for 10^{11} years, and that a year is 10^8 seconds. With these extreme assumptions, the total number of operations is

$$1.2 \times 10^{57} \times 10^{24} \times 10^{11} \times 10^8 = 1.2 \times 10^{100}$$

In their book, *Mathematics and the Imagination*, Kasner and Newman have named the large number, 10^{100} , a "googol," and it is convenient to use this term in discussing what may be done with a vast number of operations.

Total Number of Mutations

A googol is much larger than the total number of mutations which might have taken place in the past. We do not have much information to use in estimating this total: we know the size of the earth and its approximate age, and something about the size of living cells. The area of the earth is 197×10^6 square miles. Let us imagine that there is a layer of living cells one foot deep over the entire earth, and that there are 10^{13} cells per cubic foot. Assume also that at any one time there is one mutation per 1,000 cells. With these assumptions, at any one time there are

$$197 \times 10^6 \times 5280^2 \times 10^{13} \times 10^{-3} = 54.8 \times 10^{24}$$

mutations. We may assume that this condition lasts for one billion years, and at the end of each hour the 54.8×10^{24} mutations are replaced by the same number of different mutations. These assumptions give a total of

$$54.8 \times 10^{24} \times 10^9 \times 365 \times 24 = 4.8 \times 10^{38}$$

mutations. These assumptions, of course, may be greatly in error, but in making them judgment has been weighted in favor of obtaining many mutations, and it is evident that we can not find a basis for a much larger number.

These numbers of operations and mutations are important because we can obtain from them a fair estimate of what can be done in a long time by chance. Many people have jumped to the conclusion that almost everything can hap-

pen by chance in the vast ages of the earth's existence, and these include the eminent physicist, Werner Heisenberg, who stated, "The enormous time interval of roughly 4,000,000,000 years that has elapsed since the formation of the earth has given nature the possibility of trying an almost unlimited variety of structures of groups of molecules." Heisenberg apparently lapsed into irrationality when he was writing this statement, for if he had given the matter even a few minutes of concentrated thought he should have known that it is false. Similar lapses into irrationality are common, and we all must be on guard against them.

Practical Meaning of Googol

From the point of view of counting, a googol is a very large number, but from another point of view it is small: a table of factorials shows that 70-factorial equals 1.198×10^{100} . In mathematics, it is shown that the number of permutations of N distinct objects, taken N at a time, is N-factorial. It follows that if a design problem involves placing more than 70 objects into a definite order by random methods, it cannot be solved in a googol of trials.

Some mechanical devices make use of the principle of permutations: any competent mechanic can construct a lock with 100 different tumblers which may be arranged in 100-factorial different ways. A table of factorials shows that in a googol of trials there is only one chance in approximately 10^{58} of finding the one key which will open the lock.

Let us observe that 10^{58} is about ten times larger than the number of atomic mass units in the sun. Sir Arthur Eddington introduced a famous number into mathematical physics for the total number of electrons and protons in the entire physical universe: it is approximately 3.145×10^{79} . Since 100-factorial is about 9.3×10^{157} , it is obvious that there is far from enough matter in the entire universe to make the complete set of keys for trying in the lock.

And if a key is made and tried, and then the material is used to make a new key, there would not be enough matter in the entire universe to use in keeping records. From this it is obvious that Heisenberg's statement quoted above is completely false; he too lapsed into irrationality, and made a truly "Darwinian error," in the sense previously coined.

It is so easy to make mechanisms involving the principle of permutations that it seems useless to use more space in describing them. One more is enough. Consider the little wheels in the odometer of the ordinary automobile for showing the miles which the machine has traveled. We may place 100 of these wheels, without indexing mechanisms, on a single shaft not more

than 50 centimeters long. Let each wheel be two centimeters in diameter, and let us consider that each wheel is a solid disk except for the hole in the middle for the shaft, and another hole, two millimeters in diameter drilled five millimeters from the center axially in line with some numeral.

If these disks are placed in the proper position, a beam of light can be made to pass through all of them at once. The probability of finding this position by chance is one in exactly 10^{100} . If every electron and proton in the entire universe had its own number, this number could be shown on this device. More wheels can be used similarly to have vastly greater numbers of permutations.

Heisenberg's statement may be corrected to read as follows: So vast is the number of the varieties of structures of molecules, that in the enormous time interval of roughly 4,000,000,000 years that has elapsed since the formation of the earth, nature has been given the possibility of trying only an infinitesimally small fraction of them.

Further evidence that this is a true statement comes from recognizing that a designer often makes his selections from infinitely many possibilities. Geometrical forms are infinite in number, and this infinity is greater than that of the integers; infinitely many ellipsoids are possible, and these are only one class of infinitely many classes. Sizes also are infinite in number, and the result is that the designer, having selected a form for a part of a machine or instrument, has free choice in regard to size. Simple geometrical forms, and forms of different sizes may be joined to make complex forms, and the joining may be done in many ways. The important conclusion is that selecting by chance a particular form and a particular size from the infinities of forms and sizes has only infinitesimal probability.

Probability is defined in the mathematical theory of probability as a fraction, and when we have a finite numerator and an infinite denominator, the probability is infinitesimal.

Compound Microscope by Chance

Let us consider the compound microscope, an instrument much used by biologists, and let us consider that it has eight lenses in the objective assembly and two in the ocular piece. A single lens, like the ones used in optical instruments, is only one of infinitely many geometrical forms.

After the designer has made his selection of the lens from the infinity of forms, he has free choices of the two radii of curvature. He must also choose the thickness of the lens, and its diameter, and both of these choices are made from infinitely many possibilities.

The materials from which the lenses are made must be transparent and free from optical flaws.

The materials must have proper optical constants; and there are very many known materials which are not at all suitable for lenses, with the result that selecting materials by chance to give good lenses certainly has a probability of less than one in many thousands.

In the compound microscope, several lenses must be designed to be placed properly in relation to each other. When the instrument has ten lenses, one lens can be placed arbitrarily, and then for each of the other nine, selections must be made of x-, y-, and z-dimensions to determine the positions of the lens centers, and of an angular dimension, for the axes of the lenses must lie along one line.

This makes a total of 36 spatial dimensions, and there is not one chance in a thousand for obtaining any one of them by random choices, that is, less than one chance in a googol for the combination. The various mechanical parts of the instrument are selections from the infinity of geometrical forms.

This analysis shows that if the selections of forms, materials, and dimensions are made at random, the probability that one set of selections will result in a microscope is infinitesimal, and this means that it is infinitesimal for any finite number of selections. This is an awkward way for saying that it is impossible to produce a microscope by chance.

A simple illustration shows that the method of random change and selection is an exceedingly inefficient way for obtaining a result. Let us assume that we have a poem in which a typographical error has caused one word to be written where another should be used, that the poem has 2,000 words and that a dictionary has 500,000 words.

To correct the error, a word is selected from the poem, and the probability that the right word is selected is one in 2,000; then a word is selected from the dictionary, and the probability that the right word is selected is one in 500,000. Therefore the probability for correcting the error in one exchange of words is $1 \text{ in } 2,000 \times 1 \text{ in } 500,000$ or only one in a billion.

Infinitesimal Probability of Machines

Our general conclusion is that the works of man, buildings, bridges, ships, machine tools, airplanes, computers, and many other things have only infinitesimal probability when considered as productions by chance. In some cases we recognize this clearly enough: without violating any physical laws, it is possible for nicely formed arrowheads to be produced naturally. There is plenty of flint, chert, and obsidian, and there are adequate forces for breaking off flakes,

Nevertheless when we find an unmistakable arrowhead, we draw the conclusion that it was

made by human hands. We recognize that while it is not impossible for the arrowhead to have been formed naturally, it is only *infinitesimally probable* that this is ever the case.

To make the arrowhead, a large number of forces must be applied with excellent control of magnitudes, directions, and positions, and not at random. Therefore, we refuse to believe that in the entire time during which the earth has existed even one well-shaped arrowhead has been formed naturally. The belief that complex designs can be produced by random changes and selections is absolutely false; it is a modern superstition.

Designs of Organisms

Let us now consider the theory of organic evolution as developed by Darwin and his followers. In his recapitulation and conclusion to *The Origin of Species*, Darwin stated his theory as follows:

That many and serious objections may be advanced against the theory of descent with modification through variation and natural selection, I do not deny. I have endeavored to give them their full force. Nothing at first can appear more difficult to believe than that the more complex organs and instincts have been perfected, not by means superior to, though analagous with, human reason, but by the accumulation of innumerable slight variations, each good for the individual possessor. Nevertheless, this difficulty, though appearing to our imagination insuperably great, cannot be considered real if we admit the following propositions, namely, that all parts of the organization and instincts offer, at least, individual differences—that there is a struggle for existence leading to the preservation of profitable deviations of structure or instinct, and lastly, that gradations in the state of perfection of each organ may have existed, each good of its kind. The truth of the propositions cannot, I think, be disputed.

But they can be disputed and shown false in an important way.

Darwin's theory is completely qualitative, and therefore nothing quantitative can be deduced from it: it can give no explanation of the size or form of any organism, or of any part of any organism, and therefore it must be judged, whether true or false, as incomplete. Since his theory contains no geometrical postulates, no geometrical descriptions of any part of any organism can be deduced from it.

Although Darwin intended his theory to be mechanical, and excluded Mind as the cause of organisms, he made almost no use of the physical science of his time, and almost no use of mathe-

matics. He postulated nothing about time, and therefore time rates of change cannot be deduced from his writings. The ideas of variations and selection must have been in the minds of plant and animal breeders for many thousands of years. So Darwin's book might just as well have been written at the time of Aristotle or earlier.

In this article, I am making no attempt to evaluate the evidence from paleontology to determine whether or not there has been slow progressive change in organisms. Darwin had his theory in mind years before he wrote his book, and it is a practical certainty that he used it in making his selection of things to observe. He did not first have a lot of data, and then start to search for a theory which would give a unified explanation.

He had the theory very early in his work. He thought that he had proved that there must be progressive upward change, and very many people have accepted his theory, as modified into neo-Darwinism, as valid. Thus, there must have been considerable bias among researchers ever since Darwin, and the new evidence of this article makes it necessary to reconsider the whole matter. It is now known that nature uses, at least in some cases, means other than the struggle for existence to control the number of individuals in a species. We should search for other explanations.

A very serious objection to the theory that the designs of organisms have been produced by random mutations and natural selection is that this theory is so vague and flexible that almost any conceivable change in organisms can be explained by it. A scientific theory should state something so clearly and definitely that it can be tested by observations and experiments in a way which show without doubt whether it is true or false.

The people who think that their first ancestor was a chemical accident ask us to believe that mutations and natural selection can explain the long neck of the giraffe and the short neck of the pig; the hard shells of some turtles and the soft shells of others; the great size of the whale and the small size of the shrew; the warm blood of mammals and the cold blood of reptiles; the graceful flight of the eagle and the awkward flight of the great blue heron; the gliding of the snake and the jumping of the frog; the bright colors of some birds, and the drab colors of others; why some birds eat carrion and why others will not touch it; the great speed of the jackrabbit and the slow speed of the woodchuck; and so on. It should be recognized that such a general explanation, intended to cover all such things, actually explains nothing at all.

Infinitesimal Probability of Organic Designs

We have seen that the design of a fairly simple instrument, the compound microscope, has only infinitesimal probability when considered as a product of chance. No long study is needed to show that the designs of organisms also have infinitesimal probability.

The skeleton of a mammal has a plane of symmetry; each bone is a complex geometrical form, and if organisms were formed by chance, the symmetry would have only infinitesimal probability. It is not possible in a googol of operations to select at random, from the possible infinity of forms, the shapes and arrangements of the dextral and the sinistral bones of even one mammal.

The various parts of organisms, as well as those of machines must have proper dimensions, and it is evident that in a complex organism many thousands of compatible dimensions must somehow be determined. Let us recognize that if a result depends upon a hundred factors, and if the probability of getting each one right is one in ten, then the probability of getting the whole hundred right is only one in a googol.

Auditory powers involve the complex mechanism of the ear and some kind of harmonic analysis: man-made devices for recording and analyzing sounds for their harmonic content are certainly infinitesimally probable, and it is not plausible that animal structures for doing the same thing are finitely probable. The auditory nerve in man has about 5,000 fibers which may be connected to the brain in 5,000-factorial ways, of which it is plausible that only one is correct.

The situation is still more difficult with the optic nerve which has about 1,000,000 fibers, which may be connected to the brain in 1,000,000-factorial different ways. All of these things, and very many more, show that a higher organism must be considered an infinitesimally probable state of matter which could not have been produced in a googol of operations of random mutations and selections. And we have seen that there must have been far less than a googol of operations for all of the living things.

Additional Evidence Against Darwinism

Let us consider additional evidence which reveals the vast complexity of organisms, for the established facts about this aspect of organisms are hopelessly contradictory to the mechanical theories of evolution. The great complexity of the human body with hundreds of muscles shows the necessity for extremely complex quantitative controls.

Consider the case of a man running over rough ground (or better that of a mountain sheep), where each step must be properly placed within a tolerance of a few inches at most. Perhaps he

is dodging among trees, jumping from one irregularly spaced stone to another, and perhaps balancing a load.

Such motions require accurate and rapid observations and extremely fast data processing. Moreover, the data are extremely numerous since they include many measurements of the positions of joints and the tensions of muscles, and they are necessarily quantitative, as every engineer will recognize.

On the basis of the data processing, extremely complex quantitative controls must be arranged to give accurately controlled forces in hundreds of muscles. We know from what we do that setting up the quantitative controls requires only a small fraction of a second. I myself, when younger, did not hesitate to run across small streams at full speed on irregularly spaced boulders when I knew that they would not roll under my feet.

The ability of our hearing to distinguish the sound of a single instrument in an orchestra requires fast harmonic analysis of some kind, and comparisons with remembered sounds. Our visual ability to distinguish patterns also requires fast data processing. When I was young, I could walk across a field of clover, and in an hour or so have a handful of four-leaved clovers. Developing this ability required practice.

Data collecting by our senses, data processing, and then the harmonized regulation of thousands of elements takes place unconsciously at a speed which is very great in comparison with that of our conscious minds. We know next to nothing about the way it is done. The only possible analogy we have at present is the electronic computer, but we know that the analogy is not close.

It is not good thinking to compare the mind with a computer for which it is the cause. We realize that it would require an extremely complex computer with many elements to accomplish any one of the things which we do with ease, and such a computer could not be designed by random methods and selection.

According to biologists, there are something like 10,000,000,000 cells in the cerebral cortex. If an engineer were to attempt to reproduce such a thing, he would need spatial information for the location of each cell, for he must not dump in the cells helter-skelter. Having this information would be the first step in stating how the cells should be connected, since the cells would be designated by their positions.

To state the position of the center of gravity of each cell would require 30,000,000,000 numbers. Since cells are small, and since the locations would have to be stated quite accurately, each number would have to be about as long as an average English word, and if we assume that

a fairly large book contains 250,000 words, we should need a library of 120,000 volumes merely to state positions.

But this is only a beginning; according to biologists, there are several trillion nerve connections between cells in the brain. If we guess that there are twelve trillion—they certainly have not been counted—we should certainly need more than 48,000,000 volumes of 250,000 words each. The conscious mind of man is incapable of dealing with this amount of factual information, and it is preposterous beyond words to believe that a computer requiring 12,000,000,000,000 connections could have been designed by random changes and selections in a googol of operations.

The human body (and organisms generally) involves extremely complex organic chemistry. It has been estimated by organic chemists that the straight chain $C_{40}H_{82}$ has about 6.25×10^{13} isomers. Many organic molecules are known to be far larger than this, and therefore to have vastly more isomers than stated above. It is evident that a molecule with a googol of isomers will be much smaller than many organic molecules. To produce these large molecules many chemical operations must be performed, presumably, in ordered sequences. The principle of permutations applies to these operations, and if the order of the operations is changed the resulting molecules will be changed also. Heisenberg should have recognized that it would be impossible for the whole human race working full time for 4,000,000,000 years to study all of the isomers of a single organic molecule of no great size.*

Charles Darwin

Charles Darwin was a rich man's son who was a weak student generally and especially in mathematics. Under parental pressure, he studied to become a clergyman, but he was not ordained, and he eventually became the world's greater leader in agnosticism.

Extremely unlike Aristotle, the world's first great biologist whose interests were universal, Darwin was an unusually narrow man. He had little education in science, and his formal education was finished at about the age when most students now receive their first degree. As he himself realized, he had little capacity for philosophical and abstract reasoning, and this is proved definitely by the lack of depth in his books.

A person cannot have more than a superficial understanding of physics and chemistry without understanding mathematics at least through the level of differential equations, the level that is

commonly required for engineering students. Many engineers know considerably more than this, while physicists usually know still more.

Leaders always have followers, and physicists since the time of Sir Isaac Newton, one of the world's very greatest mathematicians, have followed his leadership into learning much higher mathematics, with excellent results in the progress of physics. On the other hand, those who follow the leadership of Darwin are satisfied with studying physics without calculus at a level which engineers do not consider sufficiently rigorous for their profession. This deficiency in quantitative areas has persisted among biologists at large down to our present day.

Darwin's Philosophical Error

Sir Isaac Newton's "Rules for Reasoning in Philosophy" were violated by Darwin who probably did not know of their existence, for he did not discuss this important matter. Following are the first two rules:

Rule 1: We are to admit no more causes of natural things than such are both true and sufficient to explain their appearances.

Rule 2: Therefore to the same natural effects we must, so far as possible, assign the same causes.

As shown from the previous quotation from Darwin, he started out to find two causes for similar things: for the infinitesimally probable things made by man, human reason he considered the cause; for the infinitesimally probable designs of organisms, variations and natural selection he considered the cause. Thus, according to Darwin, we have two very different causes for similar appearances, a violation of Rule 1 (which is often called Occam's Razor) and of Rule 2.

A very great amount of human experience has been concentrated in these two rules, and they should never have been discarded lightly. The ancient and famous argument in Theology called the Argument From Design is based upon these rules. To account for the designs of organisms, we assign a cause far greater than but analogous with human reason.

Darwin's great fame comes from appearing to many people to have destroyed the argument from design. We need to examine his reasoning in detail to find out what went wrong, for we have seen far beyond dispute, that the infinitesimally probable designs of organisms could not have been produced in a googol of operations of random change and selection.

In order to discuss what Darwin had in mind, we should start with his own statements in the first paragraph of the fourth chapter of his *The Origin of Species*:

*Editor's Note: Some of the complexities of organic chemical molecules were vividly portrayed by Dr. Oscar Brauer in his recent article, "Organic chemistry reflects God's infinite knowledge," *C.R.S. Quarterly*, 8(1):9-12.

Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life, should occur in the course of many and successive generations. If such do occur, can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the *best chance* of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least injurious would be *rigidly destroyed*. This preservation of favorable individual differences and variations, and the destruction of those which are injurious, I have called Natural Selection or the Survival of the Fittest. Variations neither useful nor injurious would not be affected by natural selection. . . .” (Emphases added)

It is reasonable to believe that Darwin after working for many years on his theory would be as careful and accurate as possible in stating it. He recognized that variations may be divided into three classes: 1) beneficial, 2) detrimental, and 3) neutral, that is entirely harmless and without benefits. But this idea needs more analysis than he gave it, and this is evidence that he was indeed a weak abstract thinker.

His statements which show what he considered the differences between beneficial and detrimental variations are surely false. With the beneficial variations, he used the term, “best chance,” but with the detrimental he used the term “rigidly destroyed.”

Surely there is not this great difference between the effects of a small beneficial variation and a small detrimental variation. Life, as we know it so well, is hazardous, with the result that we must often use statistical reasoning. It is not at all in accord with experience that organisms with obvious detrimental variations are “rigidly destroyed,” for we know that they often live long enough to procreate.

So we must correct Darwin on this important point as follows: A small beneficial variation gives the organism which has it a slightly greater probability of leaving offspring, while a small detrimental variation would give it, not “rigid destruction” but a slightly smaller probability of leaving offspring.

It is certainly not true that there is a sharp discontinuity in effects between small beneficial and small detrimental variations. In every case, survival and death are matters of probability and never of certainty; the probability of survival is greater for some variations than for others.

After Darwin’s time, biologists observed that there are sometimes large changes in organisms which they called mutations, and so they abandoned long ago the idea of slight variations. Their studies of mutations led to their important theory of the gene. For the present analysis, the important point is that mutations are inherited, whether beneficial, detrimental, or neutral. This inheritance of mutations greatly changes the situation from that imagined by Darwin: as we shall see, it destroys the whole theory.

In order to make our reasoning clear, let us consider a mechanical problem: a large number of pumps of various capacities pump water into an elevated reservoir for supplying a city. In order to know whether the level of water in the reservoir will go up or down, we must know how many cubic feet per second are pumped by each pump and add them to determine the rate at which water is added to the reservoir. Then we must know the rate at which water leaves the reservoir.

If it leaves through a single pipe, it is sufficient to measure the rate of flow in it, and give no attention to what happens to the water beyond this point. If the rate of flow from the reservoir exceeds the rate at which water is pumped in, the level will go down; if the opposite is the case, the level will go up. This is a quantitative matter which cannot be decided by qualitative observations and thinking.

The matter of conceivable or hypothetical change in organisms is also quantitative, but the state of our knowledge is such that quantitative descriptions cannot be made. We recognize roughly that mutations are small and large with many gradations, but we are far from being able to give quantitative measures. A single extremely beneficial mutation in a species may overcome the effects of many detrimental mutations, and oppositely.

Now that we know there are mutations we cannot decide from any broad principle what will take place in a species, for we must know the details, and these we cannot know. In a species there may be greater complexity of organs or greater simplicity; greater or less size, better or worse vision; greater or less speed in an animal, and so on, all depending upon the kind and magnitude of mutations.*

A truly mechanical theory of evolution must start from the facts, conceptions, and principles of physical science. Then a physically possible model must be formed, and it must be shown by rigorous deduction that there are mutations in a

*Editor’s Note: C. R. S. readers realize that certain quantitative aspects of mutation and natural selection have been analyzed by Howe and Davis, C. R. S. *Quarterly*, 8(1):30-43.

species, and that the beneficial mutations in their total effects are greater than the combined effects of all detrimental mutations. The present state of knowledge is so limited that such a theory cannot even be started.

Darwin did not claim to know the causes of variations, but he made the assumption, which he did not justify either by facts or theory, that among variations there are those which are beneficial. This is a very important point in his theory, for if there are no beneficial variations, there certainly cannot be upward change. It is conceivable that all variations are detrimental.

Many people are now familiar with the little rock tumblers used by amateur lapidaries for producing small polished stones. The action of the tumbler produces variations in the stones: every stone becomes less massive and angular, and also smoother. We recognize that the variations are all in one direction, and from this it is evident that the mere fact that there are variations does not show that there are any beneficial variations. Charles Darwin and Alfred Russel Wallace merely assumed that there are beneficial variations.

Darwin's Logical Error

Then, later, after mutations were discovered, it was merely assumed that the beneficial mutations in a species outweigh detrimental mutations. But this is something which must be demonstrated from a sound theory of evolution, and from this we see that the Darwinians and Darwin himself fell into the logical error of *petitio principii*.

We cannot take it for granted that there are little jumps upward in organic trends. From many experiences, engineers have learned that there is a great difference between making designs worse and making them better. Making things worse requires no imagination, no research, no careful weighing of alternatives, no insight, and no mathematics; all that is required to obtain worse designs is to change things in a random manner. To reach perfection is indeed difficult, but imperfection can be reached without effort.

Biologists have found that they can produce mutations in the laboratory by using x-rays, but they have given no clear evidence that mutations beneficial to the organism can be produced in this way. Nor have they shown that beneficial mutations produced in a species by hard radiations will outweigh in their total effect the numerous and obviously detrimental variations.

The second law of thermodynamics has been firmly established in physics and chemistry. According to this law, physical and chemical systems spontaneously go from less probable to more probable states. Buildings, roads, bridges, dams, and machines are all destroyed by acts of

nature, consistently with this law. As a result, it is not possible for a physical scientist to accept without convincing evidence the idea that natural events, considered blind and mindless, ever make beneficial mutations. Only the detrimental effects of mutations are consistent with the second law. This matter is complex and it needs more thought than it has ever been given.

For the sake of emphasis upon the extremely low probability of organisms considered as products of chance, let us consider the case of placing the bones of the human skeleton into place. Surely the probability of the whole body is far less than that of any of the internal organs: that of two eyes to send two images over two cables of 1,000,000 conductors each to form one image is less than that of one eye; and surely that of one eye is much less than merely taking the bones of the skeleton and placing them into their proper positions. We can calculate this last probability.

There are, at minimum count, 206 bones in the human skeleton, and we may assume that they are in a random pile. Number these bones from one to 206, and give the same numbers to the proper positions for the bones. Now try placing the bones into position by random procedures. The principle of permutations applies to the situation: the probability of placing the bones into their correct positions (merely the center of gravity) in one trial is one in 206-factorial, or one in approximately 5.6×10^{388} .

From this it is evident that a googol of trials fails to give a significant probability of success. Even the enormously greater number of trials of a googol times a googol times a googol, that is, 10^{300} gives only one chance in 10^{88} , and this most certainly is not significant.

Some biologists believe that the only problem is to explain the origin of the first cell, and that everything from this point on is explained by mutations and natural selection. This is not the case: each beneficial mutation in the direction of greater complexity goes from low probability to much lower probability; in other words, each beneficial mutation requires a miracle of chance. We can no more believe that such miracles take place by chance in great numbers than we can believe that natural events, without the help of human hands, turn vast quantities of flint arrowheads.

Conclusion

I believe that I have given sufficient evidence to justify the title of this article: Darwinism is physical and mathematical nonsense, and it is logical nonsense as well, for a sound thinker does not assume anything which must be deduced from his theory. Darwinism is, indeed, far more a blunder than a theory, and physical scientists

should have shown this clearly and effectively decades ago.

It is not surprising that Darwin, with his weak scientific education should fall into error; but it is surprising that the great physicists and chemists of his time and following should not have taken time enough to point out the errors effectively. But this sort of thing happens, as in the case of Archimedes who came so near to discovering the calculus and failed to do so.

Physical scientists, who know higher mathematics and are capable of analytical thinking, should never have allowed the thoroughly mis-

taken mechanical theory of evolution to reach such a degree of apparent certainty in the thoughts of nearly every one.

Let us recognize that although the human mind is capable of discovering highly reliable scientific truth, it is also capable of generating dangerous superstitions through ignorance, careless and incomplete observations, numerous biases, and generalizations not justified by evidence. It is ironical that the Darwinians, who have made great efforts to destroy superstitions, should themselves be responsible for one of the worst superstitions of all time, the mechanical theory of evolution.

A QUAIL: COTURNIX COTURNIX

WILLIS E. KEITHLEY*



Figure 1. Illustration of natural camouflage of *Coturnix* quail.



Figure 2. Young *Coturnix* quail.

God's grace and also His judgment was demonstrated in sending quail to feed His people on their way from Egypt to Canaan. In Exodus 16, quails were provided in connection with the manna. But in Numbers 11, they appeared in such a teeming multitude that the people foundered in their voracious gluttony.

Flying at about three feet above the earth (they were not piled that deep!) they could be easily captured, and it is recorded in Numbers 11:32 that the least any man gathered was 860 gallons. It is not known how many persons

gathered such a tubful, but even that was a lot of quail!

We might wonder at such statistics until we examine the fertility and potential of the *Coturnix* quail. It has been said that in their migration across the Red Sea, their numbers blacken the sky. This incredulous anomaly of propagation becomes understandable when we discover that they are capable of laying an egg per day all through a year, and begin laying at the age of six weeks.

This fact, coupled with their secretive nature and the natural camouflage as evidenced in the illustration, makes it possible for them to feed a multitude even yet today. This actual descendent of "Pharaoh's quail" gives ample evidence of the veracity of God's Word.

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FLORA AND FAUNA OF THE GALAPAGOS ISLANDS

JOHN W. KLOTZ*

The author discusses the flora and fauna of the Galapagos Islands. Particular attention is given to finches, tortoises, cacti, and iguanas. It is concluded that Darwin was probably right regarding the origin of the unusual plants and animals he found on the Galapagos Islands, but wrong in his conclusions that his observations (and observations since) proved evolution.

Introduction

The Galapagos Islands lie on the equator in the eastern Pacific (when I visited the islands we crossed the equator three times in twenty-four hours). They are 600 miles from Ecuador, the country that exercises sovereignty over them, and a thousand miles from Panama. The closest islands are the forested Cocos, 600 miles north-east. West of the Galapagos there is no land for 3000 miles.

The largest of the islands is Albemarle, about 80 miles long. It has been suggested that originally this island consisted of five islands represented by its five mountains and that a subsequent lowering of the sea level united the five islands into a single large land mass.¹ The highest point is over 4000 feet above the sea.

Several of the other islands are between 10 and 20 miles across and rise to heights of between 2000 and 3000 feet. The larger islands include James, Chatham, Narborough, Indefatigable, and Charles. Fresh water is limited to Albemarle, Chatham (See Figure 1), Charles and James. There is brackish water available on Indefatigable; otherwise no water is available.

The rainy season lasts from mid-December to early March. During the rest of the year a south-east trade wind blows and normally no rain falls; yet a thick mist, the garua, covers the higher ground and makes agriculture possible at higher altitudes. Daytime temperatures are relatively cool for an equatorial region because the cold Humboldt current is nearby.

Island Habitats

In general the islands are arid and the landscape harsh—a great contrast from the tropical paradise some of the European settlers were persuaded they would find. Shorelines consist chiefly of low cliffs, black lava boulders, and a few dense mangrove swamps (Figure 2).

The most prominent plants of the lowlands are the tall tree cacti, the dildo trees, and the torch thistles. Ordinary bushes and trees including the thorny *Acacia* and the poisonous manzanilla are also present. In places, where the lava has flowed recently, much of the ground is bare; in some places the lava is so jagged that walking a hundred feet will cut a pair of shoes to shreds.



Figure 1. Charles Darwin statue, Chatham Island, at Wreck Bay. Author, Dr. Klotz, in foreground.

Inland and higher up there is humid forest with rich black soil, and tall trees covered with ferns, orchids, lichens, and mosses. In the very highest areas there is open country with grass, ferns, mosses, and occasional thickets.

Origin of Islands

One question that has been studied is that of the origin of the islands: whether they were formed from volcanoes pushed up from the sea, or whether they were once connected by land to South America. In support of the idea of a land connection is the existence of raised beaches: on Albemarle, for instance, there are ancient sea cliffs and beach terraces several hundred feet above present sea level.² Some have suggested that there may have been a submergence of the

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intervening land or an elevation of the sea of as much as 2000 fathoms.

Yet it seems more likely that the islands were formed as a result of volcanic activity and that they were never connected to the South American mainland. On the American mainland opposite the Galapagos there are several hundred species of passerine and near-passerine birds. Habitats in the islands are similar to those which these birds occupy on the mainland, yet the descendants of only six passerine forms and one species of cuckoo live on the islands.

Similarly despite the rich variety of American mammals, reptiles, and amphibia, there are only two types of land mammals, five types of land reptiles and no amphibia on the islands. There are also great gaps in the flora.³ If the islands had been connected to the mainland, it is hard to believe the flora and fauna would be so sparse.

Unusual Forms

These islands show a variety of unusual forms. These include 53 species of the land mollusc *Nesiotus*; two genera of iguanas, *Conolophus* and *Amblyrhynchus*, both represented by a single species; a giant tortoise, *Geochelone*, which exists in several forms which Darwin regarded as separate species; a lizard, *Tropidurus*, which exists in seven or eight different island forms; a gecko, *Phyllodactylus*; and a snake, *Dromicus*.⁴ There is also a rice rat, *Nesoryxomys*, and a bat, *Lasius brachyotis*.

Domestic animals have been introduced by settlers: many of these are now feral. There are two species of ants, *Camponotus macilentus* and *C. planus*; these occur in a number of forms. There are four species of grasshopper: *Halmenus*, *Liparoscelis*, *Schistocerca*, and *Sphingonotus*. None of the insects seems to have developed into separate species.

One of the Galapagos plants, *Scalesia*, is supposed to have developed into separate species, six in number.⁵ Other plants that are said to have developed particular Galapagos species are *Telanthra*, *Acalypha*, and *Euphorbia*. *Euphorbia viminea* is said to have produced eight different geographical forms. Especially interesting are the two cacti, *Cereus* and *Opuntia*. Both have developed tree-like forms with trunks and bark. There are a number of other plants such as the thorny *Acacias*, the poisonous *Hippomane mancinella*, *Bursera*, *Croton*, and *Maytenus*.⁶

The Finches

Probably the most famous of the Galapagos forms are the birds, and of these the finches have received most attention. It is believed that there are 14 different species belonging to four different genera.



Figure 2. Lava cliffs and rugged terrain of the Galapagos.

There are six species of ground finches belonging to the genus *Geospiza*: the large ground finch (*G. magnirostris*), the medium ground finch (*G. fortis*), the small ground finch (*G. fuliginosa*), the sharp beaked ground finch (*G. difficilis*), the cactus ground finch (*G. scandens*), and the large cactus ground finch (*G. conirostris*).

There are also six species of tree finches: the vegetarian tree finch (*Camarhynchus crassirostris*), the large insectivorous tree finch (*C. psittacula*), the Charles Island large insectivorous tree finch (*C. pauper*), the small insectivorous tree finch, (*C. parvulus*), the woodpecker finch (*C. pallidus*), and the mangrove finch (*C. heliobates*).

The warbler finch (*Certhidea olivacea*) is the sole representative of its genus as is also the Cocos finch (*Pinaroloxias inornata*), which does not occur on the Galapagos proper.

Most of these species occur on a number of islands. The large ground finch, *G. magnirostris*, for instance, is reported from nine different islands; the woodpecker finch, *C. pallidus*, from five islands. The large insectivorous tree finch, *C. pauper*, however is known only from Charles island, and the cocos finch only from Cocos island which is really not part of the Galapagos.⁷

The chief way in which these species differ is in their beaks. The large, medium, small and sharp-beaked ground finches eat seeds: also a variety of fruits, flowers, buds, young leaves, and caterpillars. Their beaks are heavy and finch-like.

The beak of the cactus ground finch is long and decurved, suggesting flower probing and nectar feeding: its staple food is the flowers of the prickly pear, *Opuntia*. It also feeds on the soft pulp of the *Opuntia* and on other types of food including the seeds that form the bulk of the food of the other ground finches. Thus it has not completely departed from the typical ground finch diet.

The vegetarian tree finch, *C. crassirostris*, has a short, thick somewhat decurved and slightly parrot-like beak, similar to that of other birds that feed primarily on leaves, buds, blossoms, and fruits. It rarely takes insects and has not been observed to take grain, but does eat some types of seeds.

The three insectivorous tree finches have beaks very similar in shape to that of the vegetarian tree finch, yet their diet consists of beetles and similar insects which they dig out of twigs, bark, and leaf clusters and also from the soft wood. Lack believes that this resemblance is due not to diet but because they are closely related by descent.

The woodpecker finch, *C. pallidus*, has a stout, straight beak similar to those of the insectivorous tree finches but more elongated and modified in the direction of that of a woodpecker or nut-hatch. It is more exclusively insectivorous than the insectivorous tree finches. Moreover it climbs up and down vertical trunks and branches.

The mangrove finch, *C. heliobates*, has a similar beak and feeds almost exclusively on insects, and the warbler finch, *Certhidea olivacea*, has a warbler-like beak. It searches leaves, twigs, and ground vegetation for insects and sometimes catches insects in the air.

The Cocos finch, *Pinaroloxias inornata*, has a slender beak similar to that of the warbler finch. It feeds predominantly on insects.⁹

How did these finch species originate? Darwin thought that they had come from a common stock and that because they were now separate species he had "proved" evolution.

The Origin of the Finches

There seems no reason to question their origin from a common ancestor. They show marked similarities to each other, but oddly enough they do not show close resemblance to any particular species of finch on the South or Central American mainland.¹⁰ It is believed that the ancestral finch first became differentiated into various forms because of geographical isolation on different islands.

After a period of isolation, some had become so different that when they met on the same island they were already intersterile. Such new species must have tended to compete with each other when they met: both could survive

only if they were better adapted to one part of the food supply or habitat which was then divided between them. The restricted habitat led to further specialization and greater divergence.¹¹

Evolutionists have generally assumed the origin of all the finch species from a single gravid female, a single pair or at most a very small number reaching the islands together. Lammerts, however, suggests that many pairs of finches from Ecuador or even Central America happened to fly to the Galapagos and settle there? This would provide a substantial amount of original variation.

Lack points out that birds are capable of active dispersal from one island to another and that the finches could often reach an island inhabited by a different form in an hour's continuous flight. He raises the question of how bird populations could remain isolated from each other.¹³

We know that birds are capable of long sustained flights in migration. The Galapagos are situated in the Sea of Calms, an area in which storms are infrequent, and it seems quite plausible to assume more than one invasion of the islands by finches. There is of course the problem of why so few South American bird species are represented, but there is no reason to insist on a single finch invasion. On the other hand, there is no serious problem if a single invasion is assumed.

Are they separate species? A number of questions arise when we study these finches. The first of these is whether these species are really intersterile and consequently "good" species. The evidence seems to point in this direction. Studies on captive finches indicate the several species have bred successfully with others of their own group but not with members of different species.¹⁴

More significant are the field observations which have been made. These have necessarily been somewhat limited, but they have failed to indicate any instances of hybridization even though this has been suggested by some writers. At first it may seem that some of the intermediate forms reported from the various islands are of hybrid origin, but Lack believes they represent special adaptive modifications.¹⁵ He recognizes that there may be a few hybrids¹⁶ but believes these are the exception rather than the rule. There is no reason to doubt that new species arise¹⁷ and there is no reason to question the conclusions of Darwin and those who followed him that new species of finches have arisen on the Galapagos Islands.

Lammerts in a study of the most complete collection of skins, that of the California Academy of Science, suggests that these are all one species broken up into various island forms as a result of chance rearrangement of the original vari-



Figure 3. Cactus ground finch with dark plumage, *Geospiza conirostris conirostris*.

ability potential. He does however believe that *Certhidea*, the warbler finch, is distinctive.¹⁸ It is interesting that he expresses the opinion that the four species of *Certhidea* of the California collection are actually one species, an opinion with which Lack apparently concurs. Lammerts' careful measurements and his comparison of the Galapagos finch situation with that of the song sparrow, *Melospiza melodia*, deserve serious consideration and raise some interesting questions.

However, assuming there are 14 "good" species, we must recognize that the problem of evolution is much wider than the origin of species. These birds are all still finches, and there is no evidence of change of the magnitude which macroevolution would require.

Problems of Evolutionary Theory

Moreover there are some interesting observations made on the Galapagos finches which do not fit with some of the more generally accepted principles of evolutionary theory. According to Gloger's rule, birds of more humid environments should have darker plumage than those of drier climates. Most of the tree finches, *Camarhynchus*, breed in the humid forest and the ground finches of the genus *Geospiza* breed in the arid lowlands, but the tree finches have paler plumage than the ground finches. The ground finch with the darkest female plumage is *G. conirostris conirostris* (Figure 3) which is confined to the particularly arid lowlands of Hood.¹⁹

It is also interesting that the Galapagos finches have extremely few natural enemies.²⁰ Under

these circumstances we might expect them to develop conspicuous coloration: there should be no limit on the development of bright colors in keeping with sexual selection theories. It might be argued that the original drabness prevented the development of conspicuous coloration; yet what is happening is that the distinctive male plumage, which is present, is being lost. Lack reports that many males breed in the plumage of the juvenile pattern.²¹

While it is believed that marked beak differences between island forms of the same species are adaptive, many of the smaller differences in beak or wing length are extremely difficult to correlate with adaptation to the environment. Lack has a long list of what he calls "pointless variations."²² He believes it is difficult to demonstrate that these are non-adaptive, but he expresses the opinion that many of these are genuinely unrelated to environmental differences.

It is also interesting to note that there is a great deal of individual variation in the beaks of Galapagos finches. This is significant because the significant species differences are in the structure of the beaks. In several cases one island form was earlier thought to consist of two separate species because of this variation. In some cases the beak is so unusual that the species cannot be determined.²³

Mockingbirds

Darwin was more impressed by the different forms of mockingbirds and tortoises. In his private diary of the first voyage the finches are not even mentioned and in the first published edition of the *JOURNAL* they received only brief notice without comment.²⁴

The mockingbirds have obvious affinities with the mainland genus, *Mimus*, but it is different enough to be placed in a separate genus, or subgenus, *Nesomimus*. No island has more than one form, but it is believed there are at least three and possibly four species involved.

The Galapagos mockingbird (Figure 4) has a much broader feeding niche than the mainland species, perhaps even wider than all the mainland species combined.²⁵ Mockingbirds are famous for the beauty and complexity of their singing, but the Galapagos mockingbird has a simple, dull, and quiet song.²⁶ The loss of this mockingbird characteristic is as much a problem for evolution theory as is the loss of male plumage on the finches.

The Tortoises

The other form which impressed Darwin was the tortoise (Figure 5). It is generally agreed that there is only one species, *Geochelone elephantopus*, with fifteen subspecies. Ten of these occur on 10 different islands, and five are found



Figure 4. Mockingbird from Champion Island.



Figure 5. Galapagos tortoise, *Geochelone elephantopus*.

on Albemarle. These are believed to have developed on separate islands which became united into a single mass by the lowering of the sea level or by the elevation of the land mass.

The giant tortoises were discovered in the early 16th century. Later they were collected by buccaneers who used them as food. Still later whaling ships used them in the same way. One author reports a total of over 15,000 tortoises recorded in the logs of some 105 whaling ships between 1811 and 1844. During this period there were over 700 ships in the American whaling fleet alone without counting the whaling fleets of other nations, seal hunters, and merchantmen.²⁷

The tortoises provided an ideal source of meat on board ship because they could live for months without food and water. There are records of their storage in the hold of a ship for seven months and reports of their having remained alive for as much as 18 months. It is believed that over 100,000 tortoises were taken.²⁸

In addition to the large number of reptiles taken, the sex ratio was upset. Normally the tortoises live at higher altitudes; only the females come down to the coast to lay their eggs. Most of the tortoises taken were females on their way to or from the beaches.

Still later the settlers hunted the tortoises for their fat. Feral goats, cattle, and burros competed for available food; and feral cats, dogs, pigs, and rats were a major threat to the young tortoises. Very possibly some of the tortoise varieties have not bred successfully in the 20th

century. It is believed that today only on Indefatigable and Albemarle are there sufficient numbers of tortoises to constitute a viable population.

It seems reasonable to believe that the tortoise came from South America, since fossil tortoises are found there. It is reported that the tortoise can float and survive for long periods in sea water. Some investigators have suggested that the ancestor that made the trip was smaller than the Galapagos tortoise at present: it is easier to imagine a small tortoise making the trip than a large one. Possibly the present large size developed after they reached the islands; however, there are fossils of large tortoises in South America.²⁹

It is believed that when the first tortoises arrived they found an environment that was both favorable and unfavorable. There were no representatives of either the dog or cat family, animals which regularly eat a great many young tortoises. However, the food supply was limited, at least in variety. It is suggested that they first turned to the tomatoes they found growing there. Supposedly because they had a monopoly of this food source, they developed their large size.

The Cacti

Two cacti genera are quite common: *Opuntia* (Figure 6) and *Cereus*. In addition a single species of *Brachycereus* is known as well as three species of *Jasminocereus*.³⁰ *Opuntia* and *Cereus* seem to have reached the islands many years ago: no doubt they came on natural rafts together with other plants and animals.

Such natural rafts have been observed over 100 miles off the mouths of large tropical rivers,³¹ and one was observed a distance of 1000 miles at sea. In particular enormous rafts of sudd have been observed moving seaward from the mouth of the Guayas River. The Humboldt current flows past the Salinas peninsula where the Guayas empties into the Pacific to the Galapagos. Cacti are known to be resistant to sea water.

It is believed that the seven *Opuntia* species listed are derived from at least two ancestors. *Brachycereus* is believed to have arrived in relatively recent years. It is quite similar to *Armato-cereus* of Ecuador. It occupies the five northern islands.

Jasminocereus is less like its nearest Ecuadorian relative, *Monvillea*. It is believed to consist of three species and occupies at least five major islands. There are a number of islands from which it is absent, yet it seems to have ready access to these islands, and its absence from these islands is puzzling.

There are two principle forms of *Opuntia*: one group shows the prostrate or sprawling habit, and the other, *O. galapageia*, the erect aborescent habit (Figure 7). This second group has attracted special attention because of the extraordinary size of the erect plants and definite trunk development. Many plants reach a height of 15 feet, and tree cacti of 30 or more feet in height are not unknown.

In only a few other places have the opuntias developed this aborescent habit, and it has been suggested that this is due to the feeding of the giant tortoises. Moreover where there are no tortoises the opuntias have the prostrate or sprawling habit.

On lava shores the cacti provide the only food and drink for an herbivorous reptile. It is suggested that the ancestral tortoises consumed many of the succulent, decumbent ancestral opuntias. The rough lava landscape did provide some places that were inaccessible to the tortoises, and here the opuntias survived. Subsequently the opuntias are believed to have adapted to the grazing of large numbers of tortoises while providing these tortoises with large quantities of food and drink.

The opuntias have large seeds which provide for large and rapidly growing seedlings. These develop heavy spinations very quickly, and the branching consists of a succession of pads, each from the apex of the preceeding one: this provides for rapid growth in height during a few growing seasons.

Tortoises do not graze on the young, weak-spined, growing stems, for during this growing season food is relatively abundant. Grazing occurs during the dry season; by this time heavy spinescence has developed. The erect growth



Figure 6. Cacti in bloom on Tower Island.

and spiny armament discourages herbivores. Later when growth in diameter leaves gaps between the spines a thick papery bark develops which discourages feeding.

While the cacti are protected, they nevertheless provide food for the tortoises. Spination is progressively reduced as height increases and the upper branches usually have only soft, bristle-like spines. At the beginning of the rainy season the shriveled pads of the preceding year fill with water and this additional weight frequently breaks the pads or even whole branches off, causing them to fall to the ground. Here they serve as food for the tortoises during the dry season. The fruits, too, supply food for the tortoises: they fall to the ground and are quite attractive to the tortoises who apparently relish them.³²

Evolutionary Implications

Now what has all this to do with evolution? Darwin and his successors felt that the variations in the island forms of the tortoises was evidence that evolution had occurred and was occurring, and they felt that the aborescent habit of the cacti was an evolutionary adaptation to tortoise feeding.

It is interesting to note though that the tortoises (which certainly show marked and interesting morphological differences from island to island) are nevertheless classified as a single spe-



Figure 7. Cactus forest on Indefatigable showing tree forms, *Opuntia galapageia*.

ties. While a great deal of variation has occurred there is no evidence that a new species has arisen (and even this would not be evidence for macroevolution). There is certainly no reason why tortoise varieties should not have arisen on the different islands.

It is also interesting to note that while some believe large size has developed in the tortoises since they came to the Galapagos, there is fossil evidence of large tortoises on the South American mainland from which it is generally agreed the Galapagos tortoise population is derived.

How carefully the cacti studies have been conducted is not clear from the literature. It is not clear whether *Opuntia*, *Cereus* and *Jasminocereus* are divided into species on the basis of a variety of studies, or whether the division is made merely on the basis of morphology. The unusual aspect about the Galapagos cacti is their arborescent form; and it is quite plausible that this is an adaptation to tortoise feeding.

What is especially interesting in this connection is the report of Dawson that on Jarvis where the tortoises are extinct or close to extinction the arborescent habit is not being strictly maintained. This is one of the islands that has not seen the introduction of goats which also feed

on the cacti, and Dawson reports there is a great deal of regrowth from the fallen pads. These, however, produce a low, shrubby form, though growth from seeds produces a distinctly erect form.³³

This same author reports a similar situation from the Daphne Major Islet where one of the opuntias shows degeneration from the arborescent form in the absence of tortoise grazing. Again plants developing from seeds tend to be erect while those developing from pads grow into a low form. On this islet low shrubby habit seems to dominate which would indicate that in the absence of tortoise grazing it is better able to survive. Thus the arborescent habit may actually be an undesirable form which is able to survive only when the shrubby form is at a marked disadvantage from tortoise or goat grazing.

Iguanas

Another unusual Galapagos form is the iguana. There are two species known, *Conolophus*, the land iguana (Figure 8), and *Amblyrhynchus cristatus*, the marine iguana (Figure 9). Both show some differentiation from island to island. It is believed that the two species developed from a single original colonist.³¹ Some Crea-

tionists believe it is more likely that both species arrived as colonists on the island. The land iguana feeds primarily on cacti, and the marine iguana feeds primarily on green algae.

It is the marine iguana that has attracted special attention. This lizard dives into the water and grazes on the green algae which grow on the rocks. It is the only known iguana with this sort of diet. The sea is cool; yet it suns itself on hot rocks exposed to the intense equatorial sun. After a trip into the water to feed, these iguana apparently must spend a given period of time on the rocks to dry out and to warm up before returning to the sea. (Another unusual characteristic is a salt gland in the head in which it apparently concentrates salt which it expels in a small pellet through the nares.)

It has been suggested that the feeding habits of the marine iguanas together with their willingness to enter the sea is the consequence of evolutionary development, that they came to the islands and found the only available food the cacti and other land plants. These were insufficient to support the growing iguana populations; therefore, some of them then turned to the sea which they have exploited so effectively that, whereas the land iguana is threatened with extinction, the marine iguana is not.

Are Darwin's Conclusions Supported?

In the case of these iguanas, as with all the other Galapagos forms (and there are a number of other unusual forms which cannot be mentioned in this brief review), the question is the amount of change possible and whether changes of a considerable magnitude are indeed evidence for macroevolution.

There is no reason to doubt that the forms God created were created with considerable potential for variability, that they could adapt to a variety of habitats, that these adaptations may be expected to bring about marked morphological, physiological, and behavioral changes.

There seems little reason to question the accepted explanation for the origin of these unusual plant and animal forms: most of them seem to have come from the South American mainland.

Nor does there seem reason to question the suggestion that they have undergone marked change in the generally harsh, inhospitable environment of the Galapagos: that there are any plants and animals on the islands is a testimony to God's wisdom in providing adaptive potential in the forms He created.

A large part of Darwin's problem came from his acceptance of the fixity of species concept. He believed that Scripture taught the creation of forms with very limited potential for change and that certainly the species barrier was insur-



Figure 8. Land iguana, *Conolophus*.

mountable, for he identified the "kinds" of Genesis with the species he knew.

Thus Darwin was both right and wrong: generally right in his explanation of the origin of the unusual plant and animal forms he observed on the Galapagos, but wrong in his conclusion that when he demonstrated change and even the origin of new species he had proven macroevolution.

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Figure 9. Marine iguanas, *Amblyrhynchus cristatus*.

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BACTERIUM *E. COLI* VS. EVOLUTION†

JOHN NICHOLLS*

Escherichia coli is the name of a bacterium found in large numbers in the intestinal tract of man and animals. It is usual to obtain counts of several millions of *E. coli* per gram of feces from normal healthy people.

As it does not survive very long outside the intestine (unless presented with suitable food), *E. coli* is widely used as an indicator of recent fecal pollution of our rivers and reservoirs. All water boards in this country routinely analyse drinking water for its content of *E. coli*, detecting it at the low level of one cell per 100ml water.¹

Besides its practical uses in testing the wholesomeness of our water, food and milk, *E. coli* has been used as a research organism by geneticists and biochemists. The main reasons for this are that it has the very short "generation time" of less than an hour (this is the time taken for cells to divide once and thus double in number); it is readily available and easy to isolate; and it has very simple nutritional requirements—it only needs a sugar and a few mineral salts in solution to grow satisfactorily. As a result, the organism has come to be regarded as the "workhorse of bacteriology."

We probably know more detail about its biochemistry and genetics than about any other kind of cell. This, therefore, makes *E. coli* a most significant organism from the point-of-view of evolution. The next step backwards from bacteria like *E. coli* would be to the "rich, primitive pool" of organic matter composed of amino acids, proteins, lipids, vitamins and nucleic acids.

So the question that the evolutionist must ask himself, in the light of the information available about this bacterium, is: Could a cell as complex as *E. coli* have conceivably arisen, step by step, from a "rich pool of organic matter"—or is it more reasonable to believe that the bacterium was produced by an act of creation?

Below are presented some facts about this organism: to make the evolutionist think again, and to provide evidence that the believer in Creation has the support of scientific facts. Structural and genetic aspects of this organism will be considered in turn.

Size and Structure

E. coli is 2 microns in length and 1 micron in diameter. It is coated in three layers, each having recognizable functions. The *capsule* is composed principally of polysaccharide associated with lipoprotein.² In the strains of *E. coli* capable of causing disease (such as gastro-enteritis), the capsule resists the enzymic action of the macrophages.

The *cell wall* is composed of a unique substance called mucopeptide. This substance has amino acids and amino sugars arranged in the form of a cross-linked meshwork structure, having considerable tensile strength. It enables the bacterium to withstand fluctuating conditions of salt concentration in the intestine and in the primary protecting barrier enveloping the cell. If it is removed by treating with the enzyme lysozyme (a mucopeptidase) the cell will die. Its presence is essential for the life of the cell, so before bacteria could survive the rigors of the "primitive organic pool," an intact mucopeptide *cell wall* must have evolved.

The other barrier, the *cell membrane*, is 7.5 microns wide and has regulatory and synthetic roles. It is composed of lipid and protein, and some of the proteins are enzymes, involved in the synthesis of new cell wall and capsule materials. Other enzymes are concerned with the regulation of the water content of the cell and the carriage of various ions, sugars and amino acids across the membrane. For example,

E. coli concentrates potassium to give an intracellular concentration of 1000 times greater than that outside the bacterium in the intestine;³ the entry of potassium is linked with an efflux of sodium ions. If this ion balance is lost the cell dies.

Like the *cell wall*, the *cell membrane* must be intact for the cell to have a continued existence. If it is subjected to freezing, or heating much above 50°C its integrity is broken. So, once again, doubts must be raised about the feasibility of such a structure evolving in and enduring primitive earth conditions.

The interior of the *E. coli* contains among other substances, ribosomes and nucleic acids. Ribosomes are 10-20nm in diameter,⁴ composed of protein and ribonucleic acid, and are only observable by electron microscopy. Their function, as in other cells, is to manufacture proteins. All cells make their proteins with the use of ribosomes, and there does not appear to be any other method available. Each *E. coli* cell will contain many thousands of ribosomes.

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Function and Genetics

The details of protein synthesis have been worked out, and it is a highly sophisticated process. A good account is given by Rose.⁵ Again we must ask the question: How was it possible for the first primitive cell to evolve elaborate ribosomes and the associated materials to carry out protein synthesis? No cells are known which thrive without producing protein.

Evolutionists can only assume that there was a profusion of mutations occurring within minutes of each other. There can be no other explanation on the basis of evolutionary theory.

When we consider the genetics of *E. coli*, evolutionary theory is faced with even more difficult problems. The hereditary material in *E. coli* has been shown to be in the form of a circular paired strand of DNA⁶. It has been estimated⁷ that this strand contains 3×10^6 pairs of nucleic acid "bases."

On the assumption that the average protein contains 100 amino acids, and that three nucleic acid "bases" form a code for one amino acid, this means that it is possible for *E. coli* to make 10,000 different proteins. Even if one assumes that the first primitive cell contained only 10% of this number, this still means that it had a code for 1000 different proteins. It would seem difficult to believe that random mutation, chance collisions and aggregations of precursors could produce an intact cell of this complexity.

Furthermore, it has been shown⁸ that the total time taken for the replication of DNA in *E. coli* is 40-50 minutes at 37°C; and this therefore means that DNA synthesis is done at the rate of 1000 base pairs per second. This is an extremely rapid process which must be done by only one enzyme molecule and so shows a high degree of organization and control.

E. coli and DNA Code

As DNA appears to be the universal hereditary material, and DNA polymerase the enzyme responsible for its replication, are we to assume that the first primitive cell evolved all of this from the "primitive pool" of nucleic acids and amino acids? The "Genetic Code" was largely worked out using *E. coli* and recently Marshall *et al.*⁹ showed that the code was the same in the South African clawed toad, the guinea pig and in *E. coli*.

It is remarkable that the code is the same in three organisms differing so greatly: showing that the code is almost certainly universal. It also implies that the code was established very early in evolutionary history, and has remained substantially unchanged.

Therefore we would ask the questions: Why has it remained unchanged; why has it not been improved or extended down the ages? A more

credible explanation of the universal code would be that living things were created by a single Being who has produced variety on a basic theme.

A similar degree of organization and complexity was shown by Dr. Kepes¹⁰ in his experiments on the breakdown of lactose (milk sugar) by *E. coli*. The principal enzyme involved in this process is called galactosidase and Kepes showed that it took 25 seconds to synthesize this enzyme.

Galactosidase contains about 1,200 amino acids, and he therefore calculated that the messenger RNA used in the process of enzyme synthesis must have been made at the rate of about 22 nucleic acid bases per second. This showed how rapidly an enzyme can be made and how quickly the gene which codes for it can be switched on.

In the fluctuating primitive conditions such a rapid system for producing enzymes would be essential for survival. Can evolutionists offer a plausible explanation as to how this system developed?

Finally, in an interesting chapter of his book, *The Life Processes*, Prof. J. A. V. Butler, F.R.S. says:

Even the simplest complete organisms we know of today are almost unbelievably complex. It is difficult to visualise the steps by which they may have originated, because the various processes which occur in them are interdependent, none can function without the others. . . . It is not easy to see how these different parts of the life process could have been elaborated separately.

And after reviewing the evidence for primitive life and the hypotheses built upon it, he concludes that this is "highly speculative and the gap between a rich organic environment with all the necessary precursors, including even polypeptides and nucleic acids, and the simplest organized life remains immense." We would suggest that this "gap" will become even more immense as knowledge accumulates about single-celled organisms like *E. coli*.

Modern scientific facts do not refute Creation: they support it.

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PROGRESS REPORT ON GRAND CANYON PALYNOLOGY†

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During 1964 and 1965, while I was doing work in the Department of Geochronology at the University of Arizona (with special application to paleobotany and palynology), we did a research project in the Petrified Forest of Arizona. We had especially good results with fine microphotographs of many species of Chinle formation conifers. Thus encouraged, Dr. Kremp next initiated some research in the Grand Canyon in palynology.

Considering the wide sections of Paleozoic Era Periods visible of the geologic column, there are all too scanty arrays of macrofossils to demonstrate the evolutionary succession of life. Since microfossils, that is pollen and spores are many times more numerous, it was a well conceived enterprise to check the fossil plant life by means of the spores.

Samples were taken by the instructor and turned over to this author to process in the laboratory. The schistose formations from the Permian, the Mississippian, the Cambrian, and the younger Precambrian produced a variety of spores, but the predominant type of spore from all the ages tested was the vesiculate conifer. Such results were deemed by some as out of order, according to current paleontological thought.

Accordingly the Creation Research Society sponsored a repeat research project in the Grand Canyon, and also encouraged a corollary project sponsored by Loma Linda University of California. Samples processed by the University of Arizona produced negative results, due to defective technique. On a tour of the canyon sponsored by the Bible-Science Association, Drs. Bullis, and Arthur Chadwick of Loma Linda took rock samples and processed them in their Loma Linda laboratories.

At this writing their results practically duplicate the work formerly done by Burdick.¹

Introduction

The study of fossil spores and pollen; i.e., palynology, is comparatively recent as compared with the study of macrofossils, but is developing into a very valuable tool in the study of ancient plant life. Darwin complained about the scarcity of fossils; but for every tree in the forest we find many spores or pollen grains. Therefore if we can learn to identify the tree or plant by its spore we have a thousand times as rich a fossil picture. This is a great aid in ascertaining the distribution of plant life in the geologic record.

Since some formations were named in the past on the basis of scanty fossil evidence, it would not be at all surprising if upon securing fuller evidence from fossil spores, we might find it necessary to rearrange some of the former hypotheses, and even to modify the geologic column.

Spores make ideal fossils for study, inasmuch as they are covered with a very tough coat called exine, which does not weather easily and which is not affected by most acids.

Most of the laboratory work with spores in the past involved treating macerated rock samples with strong acids such as hydrofluoric acid which dissolves the quartz, and hydrochloric acid which dissolves the carbonates. However such acids can be a health hazard. We were able to develop a method without acids that worked very well. This method was outlined in the paper by Burdick² in the 1966 Annual of the Creation Research society.

In the past where results appear anomalous, researchers tend to condemn the findings as "contaminations." It is often suggested that spores or pollen floated in from contemporary plants at the time the samples were being taken and got mixed up with the rock. Such fears might be understandable from someone who is not too familiar with palynology, for they perhaps confuse pollen contamination with bacterial contamination.

Naturally great care must be taken to avoid contamination. But when we get extremely large numbers of a single type of spore in a sample, the mathematical odds are against it being due to contaminations. Not only at the Grand Canyon, but also from the Arizona Petrified Forest, I have processed multitudes of samples with no spores that showed up, not even contaminations.

Great care must be exercised when taking rock samples. No weathered rock should be included in the sample. Fresh unweathered rock

†The author is grateful to the Creation Research Society for providing funds to extend former work in the Grand Canyon. Thanks are also due to Pastor Walter Lang and the Bible-Science Association for conducting a tour in the Grand Canyon by means of which a geologist from the University of Arizona, Dean Delavan, accompanied the tour and collected samples of rock to be tested at the University of Arizona Palynology Laboratories.

I am also grateful for the time and work expended by Drs. Bullis and Chadwick, biologists from Loma Linda University, California, for taking separate samples, and for the laboratory work of Dr. Arthur Chadwick in obtaining clear photographs of both Gymnosperm and Angiosperm pollen from the Precambrian and Cambrian samples thus far tested.

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must be dug out and sealed immediately in new sterile plastic bags.

Another diagnostic clue is quite reliable, especially when the spores are dug out of red shales, like Hakati. The red iron stains the spore so that it appears redder under the microscope than modern spores that have not been buried in the rocks.

In most cases the fossil spores obtained from the macerations were extinct species or genera; they did not compare with slides of extant types on file in the palynology laboratory.

Previous Work

The discovery of pollen analysis came at a time when important problems in the history of vegetation and climate as well as in archeology were without solution. To Swedish scientists belongs the credit for early pioneering in the branch of paleobotany known as palynology. To another Swedish scientist of another age also belongs the credit for modern nomenclature, Linneaus perhaps the most famous in that line since Adam named the animals.

Pre-Quaternary fossil pollen grains were first observed by Goppert (1836) and Ehrenberg (1838). The first to utilize the occurrence of pollen grains in Post-Glacial deposits were Geinitz (1887) and C. A. Weber (1893).

The real potentialities of the new science of palynology were not realized until Lennart von Post,³ a state geologist, took it up with Langerheim as his micromorphological instructor. Von Post presented the first modern percentage pollen analysis in a lecture at Oslo and also at Stockholm.

From the middle twenties pollen analysis has been the dominant method for investigation of late Quaternary development of vegetation and climate and has been perfected into a very refined instrument of research, giving intimate glimpses into the conditions of life during earlier periods. Erdtman⁴ gave a general survey of the taxonomic systems.

The science of palynology finally "spilled" over into the new world, and such pioneers as Dr. S. A. Cain and Dr. P. B. Sears⁵ and Dr. Waksman did much to expand the work in this country; but perhaps Dr. R. P. Wodehouse⁶ has done more than anyone to promote interest in pollen research in the New World.

Most recently Dr. Gerhart Kremp⁷ has published an up-to-date library in several volumes on pollen analysis.

In 1966 the Creation Research Society published the first palynology study in the Grand Canyon by Burdick⁸ (1966). This study indicated that gymnosperms (conifers) were a dominant type of plant or tree in the Permian, Mississippian, Cambrian, and younger Precambrian.

This work has been challenged because it was somewhat anomalous by standards of procedure; therefore, encouragement was given to further work in the Grand Canyon by scientists not connected with the former project.

Current Research Project

This repeat project was sponsored in part by the Creation Research Society of Ann Arbor, Michigan, and the Bible-Science Association of Caldwell, Idaho. A geologist, Dean Delavan from the geology department of the University of Arizona, accompanied a field trip in the Grand Canyon which was organized by the Bible-Science Association, in June of 1970.

Mr. Delavan took rock samples from the schistose strata of the Permian period, namely the Hermit Shale and the Supai formations. These were from fresh unweathered exposures and immediately sealed in sterile plastic bags. Samples were also taken from the shaly layers in the Mississippian Redwall formation. Further samples were cut from Cambrian formations, chiefly the Bright Angel shale. Getting down into the Precambrian, the Proterozoic, samples were taken from the Hakati Shale and the Bass limestone.

Mr. Delavan then turned the samples over to Mr. Morgan, a palynologist from the geochronology department of the University of Arizona for processing. Mr. Morgan used the acid technique, which has been the vogue in the past. When the spore residue was placed on slides and examined through the university microscopes, they were so clouded with undissolved rock silt that if spores were present they were completely obscured. Therefore I would conclude that the University of Arizona phase of the investigation was inconclusive. However sufficient samples were available for a repeat performance but Mr. Morgan has been too busy to repeat the analyses.

The announced tour of Grand Canyon had been rather widely advertised by the Bible-Science Association, and two scientists, Drs. Bullas and Arthur Chadwick, were sent along to also take samples, which they did from the same rocks where Mr. Delavan sampled. They too followed specific procedures to avoid contamination.

Loma Linda University has recently outfitted a laboratory especially designed for spore and pollen analysis, and Dr. Chadwick and graduate students have taken special instruction in palynology. They have studied the technique of processing and the maceration of rock samples for the extraction of the spores.

This present paper is based primarily upon the first results of their investigation, that is, results from the aforementioned Cambrian and Precambrian samples. Work is presently continuing on

the samples from the higher strata stratigraphically, up through the Permian.

The Loma Linda biologists report that great care has been exercised to avoid contamination, and they are convinced that the results obtained represent a true picture of plant life corresponding to the age of the strata or periods sampled.

As the readers will observe, the Loma Linda results largely follow the same pattern of the palynology investigation as performed by Burdick in 1964 and 1965, while doing research for the University of Arizona. If there is any divergence in results it would appear that Loma Linda secured a slightly greater proportion of Angiosperms.

In a recent personal communication, Lanny Fisk, a graduate student, reports that they are now finding about the same type of Gymnosperm and Angiosperm fossil spores in the Redwall and the Hermit Shale, the latter being one of the higher formations of the Permian Period. These results also correspond with Burdick's results.

Parallel Research Report

Every spring the Arizona Academy of Science has a science seminar at one of the three state universities in Arizona. Students and members of the Academy are invited to submit abstracts for presentations at the meetings. Those selected are printed in an advance booklet and sent to members and universities with invitations to attend the convention.

Abstract No. 93 was titled: "A river level pollen transect in the Grand Canyon of the Colorado River"; by James E. King⁹, who is taking work in the geochronology department of the University of Arizona. This was a speech, and presumably not otherwise published except for the abstract.

Mr. King's work had nothing to do with fossil spores except the very recent ones coming into the canyon as "pollen rain." The plants that produced the pollen are growing near the place where the pollen was deposited, or at least the same species are. This branch of palynology at the University is under the direction of Dr. Paul Martin, while the fossil spore department of palynology is managed by Dr. Gerhard Kremp.

The meeting of the Arizona Academy of Science is also held in conjunction with sessions of the local branch of the American Association for the Advancement of Science. Since Mr. King's work involved work in palynology in the Grand Canyon, it may be well to quote the entire King abstract:

A transect of 22 surface samples collected through the Grand Canyon at river level between Lee's Ferry and Diamond Creek has been analyzed for the modern pollen rain. The results show the pollen spectra varying with both changing vegetation and geomorph-

ology of the Grand Canyon. *Pinus* pollen averages 20% through the transect, all of it drifting in from the canyon rims; *Quercus* pollen also drifting in, is generally less than 10%. *Juniperus*, which does occur occasionally at river level, accounts for 10% to 20% of the total pollen rain. Other arboreal pollen types which occur occasionally throughout the transect include *Rhamnus*, *Betula*, *Picea*, and *Abies*.

The pollen of *Torreyana* - type *Ephedra*, is common in the upper half of the Canyon, while that of *Ephedra Nevadensis-viridis* type is dominant in the lower portion. This shift approximates the distributions of *Ephedra* species within the inner gorge. Of the non arboreal pollen, *Franseria-Ambrosia* type Compositae are very abundant in the Lower canyon, while *Chenopodiaceae-Amaranthaceae* pollen varies with the degree of disturbance and the amount of suitable habitat available.

Means of Identification

As a rule no one publication was sufficient for complete identification, but the following four texts were used:

1. Textbook of Pollen Analysis, 1950. Knut Faegri,¹⁰ Johs Iversen, and H. T. Waterbolk, Hafner Publishing Co., New York.
2. An Introduction to Pollen Analysis; G. Erdtman, 1943, The Ronald Press Company, New York. (Reference 4).
3. Synopsis of Spores, Four volumes, 1958-1962,¹¹ Robert Potonie, Hanover Germany.
4. Catalog of Fossil Spores and Pollen, Gerhart Kremp, and Spakman and H. T. Ames. 1956- to present. Penn State University, Department of Geology, University Park, Penn. (Reference 7).

Spore Morphology

Pollen is formed in the male portion of the flower, the anther. The interior of the anther consists of a sporogeneous tissue from which originate the pollen mother cells. With few exceptions each of these give rise to four pollen grains. The sporogeneous tissue is surrounded by a wall, the structure of which is rather complicated. When the pollen is ripe, this wall breaks down in some way, and the pollen grains are liberated for transfer to the pistil, usually of another flower, where fertilization takes place.

The angiosperm pollen grain is built up of three main concentric layers. The central part is the living cell, which germinates on the stigma and forms the pollen tube which then penetrates the style and brings the fertilizing nuclei down to the ovum.

The middle layer is the *intine*. It is present in all pollen grains and envelops the whole of the grain. Part of the intine consists of cellulose and is not as enduring as the outer *exine*.

The *exine* is one of the most extraordinarily resistant materials known in the organic world. Recent pollen grains can be heated to almost 300 degrees Centigrade, or be treated with concentrated acids or bases with very little effect on the the *exine*. Thus spores remain as unaltered fossils while the wood that produced them has long since disintegrated. From such criteria one can easily perceive the value of spores as index fossils to illuminate the past.

The following are a few of the more common types of pollen grains according to morphological classification:

1. Vesiculate—that is having bladders such as conifers which have two wings.
2. Polyplicate—Have meridional ridges separated by deep grooves.
3. Inaperaturate—with no distinct apertures.
4. Monocolpate—aperture elongate.
5. Monoporate—with one circular aperture or pore.
6. Dicolpate—with two furrows.
7. Tricolpate—with three furrows.
8. Dicolporate—with two furrows and also pores.
9. Tricolporate—with three furrows and pores.
10. Diporate—with two pores.
11. Triporate—with three pores.
12. Periporate—pores distributed over the surface.

The first type is typical of gymnosperms, while many of the others are typical of angiosperms. In former work Burdick¹², (1966) about one-half of the spores or pollen recovered from the Hakati shale were Gymnosperms and one-third angiosperm: tricolpate.

Pollen from Precambrian Hakati Shale—Grand Canyon

Exhibit A (Figure 1). The following identifications are not dogmatic, even as to genus, but Exhibit A probably belongs to the monocotyledons, of the Angiosperms. The pollen photographed compares to either *Alismo plantago* or *Sagittaria sagittifolia*. They are small pollen grains with a diameter of about 25 microns. The construction of the pollen from the two genera is similar, having pores and sharp conical spines. The grains are spheroidal, cribellate, and subechinate. They have a faint reticulate texture.

Potonie describes another monocotyledon that also compares to Exhibit A: *Peltandripites woodhouse*, 1933. *Locus typicus* Colorado-Green River formation. Eocene; pores and spines round or elliptical.

Exhibit B (Figure 2). Dicolporate, belongs to the angiosperm, dicotyledons. Morphology unmistakable, although in this case, if the spore could be rotated, it might turn out to be a tricolporate, of which there are numerous genera. We could not presume to make a positive identification, which is unnecessary, since we are carrying the identification just far enough to demonstrate that angiosperm dicotyledons apparently lived in the Precambrian. This specimen may represent an extinct genus, but compares somewhat to *Ulmus scabra*. It has many pores, about 30 microns in diameter. The grains are round to suboblate with the *exine* quite thick.

Exhibit C (Figure 3). This grain is typically gymnosperm, vesiculate or disaccate, meaning having two bladders or air sacs. The body is spheroidal or slightly flattened. The *exine* is especially thick. The germ is between the two bladders. This is some type of conifer. Although this specimen is probably an extinct genus, it might be compared to *Picea excelsa* (spruce) which is biconvex with well-rounded corners. The contours of bladders run smoothly into the contours of body. There is a thick *exine* with granular texture to body and reticular texture of bladders.

Exhibit D (Figure 4). Gymnosperm, vesiculate, two bladders or wings similar to Exhibit C. Different view; body partly hidden by bladders. These are comparatively large spores, measuring from 80 to 140 microns in diameter. If this compares with *Alisporites opii* (Daugherty) the bladders are slightly pendant and crescent shaped. The diameter is 110 microns. These are disaccate grains, similar to the Petrified Forest type.

Exhibit E (Figure 5). Gymnosperm, but not vesiculate conifer type. Probably belongs to genus *Ephedra*, possibly species *antisphilitica*. The grains are prolate to subprolate, provided with approximately 13 longitudinal ridges which are separated by well defined grooves. When the pollen grains germinate, the *exine* dehisces, splitting into two or more parts through the grooves. These grains measure 32 X 52 microns. The type location is Eocene Green River formation.

Exhibit F (Figure 6). This is also a gymnosperm but of doubtful identification. The bladders are not well developed, but may compare with *Parcisporites annectus* Leschik. There is monad, disaccate, non-aperturate, reticulate ornamentation. Air bladders not well developed; most have two small wings. The bodies are circular with a rough, reticulated *exine* covering. The diameter is 30 microns. The bladders are rudimentary, protruding from the sides. There is a rough, heavily reticulated surface of both bladders and body. The spore is dark red from absorption of iron in the rock.

(Summary on Page 30)



Figure 1. Exhibit A. Pollen comparable to either *Alismo* or *Sagittaria*.

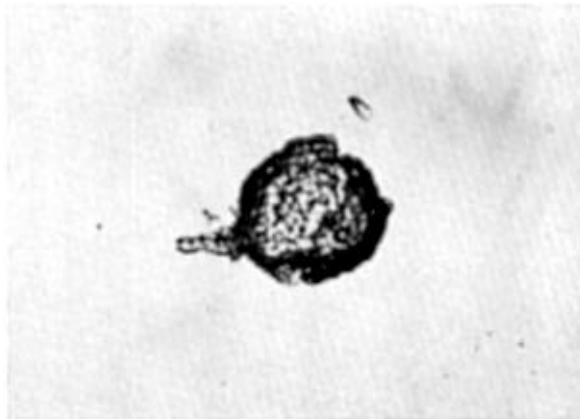


Figure 2. Exhibit B. A dicolporate angiosperm.



Figure 3. Exhibit C. Typically gymnosperm, vesiculate or disaccate, having two bladders or air sacs.

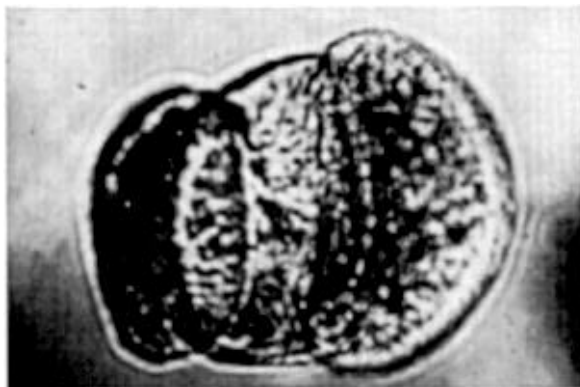


Figure 4. Exhibit D. Gymnosperm, vesiculate. Comparable to *Alisporites opii* (Daugherty).



Figure 5. Exhibit E. Gymnosperm, *Ephedra*.

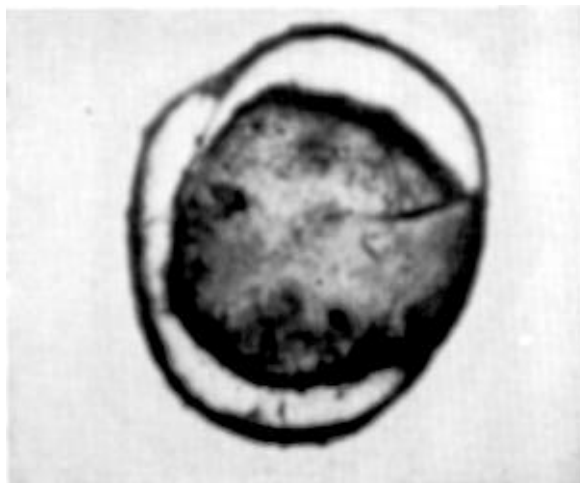


Figure 6. Exhibit F. Gymnosperm.

Summary

The Loma Linda project largely followed the pattern of the previous work in palynology in the Grand Canyon by Burdick¹³, except that the Loma Linda work seemed to produce a slightly larger percentage of angiosperms than the former work. Burdick's work covered the whole series of formations that produced spores from the Permian Supai down to the Precambrian Hakati shale.

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A CHRISTIAN BIOLOGIST'S REFLECTIONS ON THE SCIENTIFIC METHOD

AALDERT MENNEGA*

Science is an activity in which we engage in order to gain a more clearly articulated explanation of the phenomena which we experience all around us in life. The Christian does this in obedience to the cultural mandate which God gave to man, and in which He charged man to subdue the earth and to have dominion over all living creatures on the earth. Our purpose in science, then, is to subdue the earth, to help our fellow man, to enrich our life, but above all to glorify God.

In scientific pursuits the analytic function of man is intensified for the purpose of abstracting a part of the total situation under study so that a clearer understanding of this particular part may then enable us better to understand the total situation. As one of the tools of science the scientific method is *consciously* applied so that by systematization of our work we may sooner get to a clearer understanding of a problem or situation.

The scientific method is a pattern or approach which helps to clarify and explain the phenomena and events which we experience in our everyday lives. This approach is most rigorously applied when we are engaged in specific and detailed abstractions in the laboratory. In the scientific method different stages or steps are often distinguished as follows:

a) recognition of a number of data or observations which seem to be related in some way;

b) formulation of a hypothesis whereby this relationship might be explained;

c) collection of data which may have bearing on this relationship, including designed experiments;

d) evaluation of all the amassed data which may result in 1) clear proof that the hypothesis is contradicted by the total evidence gathered, or 2) corroboration of the initial hypothesis which tends to lend more credibility to the hypothesis and which might now be called a theory, until evidence is adduced which clearly contradicts it.

Initial recognition of a possible relationship between certain data or observations is an activity of the whole person and not necessarily the immediate result of his analytic activity. From his entire rich background of many diverse experiences in life the relationship is discerned by the individual, who has some recognition of the structural order of things and events around him.

The hypothesis by means of which the phenomena and their relationships might be explained is, again, rooted in the total experience of the individual, and is definitely correlated with his basic commitments. Because of such commitments, a person will accept or reject certain possible explanations for eligibility under the circumstances of the situation. For example, when enrolled in my master's degree program I

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was encouraged to determine the relationship of groups of muscles as found in certain different classes of backboneed animals, and my major professor suggested that my work be done within the framework of thinking of genetic descent currently held by evolutionists.

But my basic commitments prevented me from accepting this possibility as a legitimate hypothesis. At the same time, however, my suggestion to study these groups of muscles from a creationist viewpoint was immediately and forcefully rejected by the professor as a possible alternative. For both of us our basic commitments limited the type of hypotheses which we could legitimately entertain as possible explanations for the observed and suspected similarities.

Selection of further data, and decisions regarding the design of experiments, too, are determined by the whole person in his rich background of experiences and his commitments. The same is probably still more obvious when we arrive at the point of evaluating the phenomena and the accumulated data, and extrapolating from these to more inclusive concepts. We must decide on which basis we accept or reject the plausibility of a particular hypothesis, and therefore our entire system of values has a bearing on this activity.

These several different activities in which we attempt to arrive at an acceptable explanation of phenomena in our scientific endeavors are, however, not at all unique activities, which would be restricted to use in science. They are refinements, or intensifications, of activities in which we engage during the normal everyday activities usually not included in science.

The housewife, who finds that one of the lids of her newly canned jars of applesauce is not sealed, will quickly seek for an explanation of this undesirable situation. She will contemplate different possible explanations and will test them, if possible. One hypothesis, for example, that the little bit of applesauce left on the rim of the jar might have prevented a perfect seal is confirmed when she repeats the sealing procedure after carefully cleaning both the rim and the lid.

Repeated demonstration that careful removal of all particles of applesauce from rim and lid results in well-sealed jars will soon give the housewife the assurance that her explanation of the situation is correct, and she will show this conviction by carefully wiping all subsequent rims and lids.

Life is an entity, a unity, the many different aspects of which are all necessary to make a

coherent whole. On the one hand, we have our naive experience in which we encounter life as citizens and neighbors, for example, in a general non-analytic way. On the other hand, as scientists we have our theoretic and highly analytic experience of those things which we have abstracted from the full context of life. These two kinds of experience, the naive and the theoretic, must not be thought of as being unrelated, or as clearly distinguishable, separate parts of life. Because life is a whole, the theoretic experience is based on, and rooted in, the naive experiences of the individual, while the naive experience is conditioned by his heart commitment. The naive and theoretic experiences are intricately interwoven, so that no sharp distinction line can be drawn between the two; neither, however, do they completely overlap.

The scientific method is a method or tool which we use in our everyday life, as e.g., in the canning of applesauce, but on which we rely much more heavily in scientific endeavors in order to obtain deeper insights and more valid experiences. In scientific work the scientific method naturally takes on a more distinct character because we consciously try to apply this method consistently in all our theoretical abstractions of that part of reality with which we are, at that time, so deeply concerned.

New insights, gained through the scientific method in our scientific endeavor, can indeed enrich the daily experiences of life and can, in turn, be integrated into the total naive experience. Scientific endeavor is part of the scientist's total everyday activity, and in the laboratory he is not merely an analytic machine, but he remains a person with preferences, dislikes, weaknesses, ambitions and values.

When the Christian scientist enters his laboratory he cannot cease to be the whole man who committed his entire life to Christ. The whole man enters, with Christ, but his activities take on a concentration on the theoretical, and he consciously tries to abstract only a part of his subject of study in order to be able to see more clearly a certain aspect. After this he consciously tries to relate his newly abstracted knowledge to his total life experience, in order to determine the true meaning of the newly found data.

This clearly indicates the necessity of his continually feeding on the Word of God so that the latter may be a guide to help him, as a scientist, to determine the right relationship of the scientific data to his full-orbed Christian life, and so that the new data may become truly meaningful in his Christian world-and-life view.

UNIFORMITARIANISM, PROBABILITY AND EVOLUTION

A. J. ("MONTY") WHITE*

The author has endeavored to show that Lyell's Uniformitarianism Hypothesis is not only the philosophy governing the study of Geology, but also that which governs Cosmology and Chemical Evolution. He then considers the formation by chance of a small protein 100 amino acids long, containing 20 different amino acids in a definite sequence from a "primeval soup" where all the Earth's hydrospheric water molecules have been replaced by these 20 different amino acids. The author uses the laws of probability to show that the odds of forming such a small protein by chance in the last 10^{10} years are 10^{67} to 1 against. In light of this conclusion, the complex nature of DNA is then briefly discussed with reference to the genetic code. Finally the author concludes that in order to avoid confusion, science must only be studied in the light of God's revelation to man.

Research students are awarded a Doctor of Philosophy (Ph.D.) degree for writing a thesis on an original piece of research work in a particular academic discipline. Often the thesis produced contains no philosophical discourses, but is a mere record of the student's research program with an attempt to show how the findings of that piece of research fit into the overall picture of the student's particular academic subject.

Indeed, I found that as an undergraduate student in chemistry, philosophical discourses were discouraged and often banned in lectures and seminars. To illustrate this point, I remember a lecturer of thermodynamics being asked by a student how he and the other students would answer the question, "Is not the Evolutionary Theory a contradiction of the Second Law of Thermodynamics?" The lecturer refused to answer the question and would not allow anyone else to discuss this vital question.

Furthermore, it has been my experience both as a post-graduate research student and a post-doctoral research fellow in the field of Physical Chemistry, that philosophical discussions in lectures, seminars and research colloquia have not been encouraged, and the philosophy of science and scientific method are totally neglected in most scientific teaching. The result of teaching Chemistry in this way, i.e. as a strict discipline, is a plethora of Chemistry Ph.D. degree holders, who are often incapable of philosophical thought, and who do not give any consideration to the implications of the various hypotheses and theories with which they have been indoctrinated.

Uniformitarianism

The physical laws of nature, such as the laws of gravity, motion and thermodynamics are taught with the inference that they have always been and always will be in operation. Similarly with physical quantities (such as the velocity of light, the strength of chemical bonds, the physical and

chemical properties of chemical compounds), there is again this inference that the values and properties, determined today, are the same as those which would have been determined at any time during the past or which would be determined at any time in the future.

This inference is, however, only true for the period of time from the time of the creation by Almighty God until the day "in the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also and the works that are therein shall be burned up."¹ Furthermore, the word of God records² that God "Himself existed before all things and in Him all things consist—cohere, are held together."

Now because God is unchanging³, it is not unreasonable to deduce that the majority of the laws governing science, and the physical and chemical properties of matter have not changed since the creation, and will not change until the "destruction." It must, however, be noted that certain measured properties are not constant and their values vary from year to year, e.g. the position in the sky to which the north pole points⁴ and the value of the earth's magnetic moment.⁵

Very little thought is given by science students to the truth and/or the implications of the above inference because, generally speaking, the Uniformitarian Hypothesis is integrated into the whole of science, and is accepted consciously or unconsciously without question as being true. This hypothesis, which was propogated by Charles Lyell (1797-1875) in his famous text book, *Principles of Geology*, may be expressed briefly as "the present is the key to the past."

This hypothesis is usually thought of applying only to the field of Geology, where it is taught that all the geological processes now operating on the earth have been acting in the same way in the past over extremely long periods of time, and that such gradual processes account for the world as we see it today, with its continents of mountains, valleys and fossiliferous strata. We can see, however, that Lyell's hypothesis of Uni-

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formitarianism is not only in operation in the Geological field but also in *all* areas of science.

Cosmology

In the field of Cosmology, this type of reasoning has led to two different evolutionary hypotheses dealing with the nature of the universe—Hoyle's "Steady State" hypothesis (also called the "continuous Creation" hypothesis, although it involves a continuous *evolution* [not creation] of matter out of nothing), and Gamow's "Eternal Oscillation" hypothesis (also called the "Big Bang" hypothesis).

Hoyle's hypothesis can be expressed in one of his own sentences: "This idea requires atoms to appear in the Universe continually instead of being created explosively at some definite time in the past."⁶ Gamow's theory, on the other hand, is expressed in the conclusion,

that our universe has existed for an eternity of time, that until about five billion years ago it was collapsing uniformly from a state of infinite rarefaction; that five billion years ago it arrived at a state of maximum compression in which the density of all its matter may have been as great as that of the particles packed in the nucleus of an atom (i.e., 100 million million times the density of water), and that the universe is now on the rebound, dispersing irreversibly toward a state of infinite rarefaction.⁷

Both these theories are evolutionary and uniformitarian in thought, and both involve the assumption that the universe did not have a beginning, and will not have an end. The difference between these two theories has been summed up in the following manner:

The steady state theory suggests that the universe looks more or less the same, from any position and at any time in the past, present or future, whereas according to the big bang cosmology the universe (that we see today) started in a highly compressed state as a "primeval atom," which exploded and developed into the system of galaxies observed today.⁸

As proponents of both of these theories assume that the laws governing science and the physical and chemical properties of matter remain the same throughout time, it is concluded that studying the processes occurring in the universe today, and making observations of remote stars and galaxies is the key to understanding how the universe evolved, i.e. *the present is the key to the past*. This is the definition of the Uniformitarianism Hypothesis!

Chemical Evolution

This hypothesis, naturally enough, is the philosophy governing the study of Chemical Evolu-

tion—a term which "has come to mean the chemical events that took place on the primitive, prebiotic Earth (about 4.5-3.5 billion years ago), leading to the appearance of the 1st living cell."⁹

Again using as their tenet of faith "the present is the key to the past," scientists have (i) reconstructed in their laboratories similar atmospheric conditions which they *think* existed on the primitive, prebiotic Earth, and (ii) passed electrical discharges and electro-magnetic radiation through this inorganic atmosphere to try to produce organic compounds.

For example, in 1953, Miller¹⁰ produced glycine, *a* — and *b* — alanine, aspartic acid and (*a* — amino butyric acid from a mixture of methane, ammonia, water vapor and hydrogen using high energy radiation. (Figure 1). Lemmon summarizes the results of all the chemical evolution experiments that had been done up to March 1969 in the following manner:

The most important organic molecules (biomonomers) in living systems have been enumerated as the 20 amino acids of the natural proteins, the 5 nucleic acid bases, glucose, ribose, and deoxyribose. Of these, laboratory experiments under conditions clearly relevant to probable conditions on the primitive Earth have resulted in the appearance of at least 15 of the 20 amino acids, 4 of the 5 nucleic acid bases, and 2 of the 3 sugars. In addition, representatives of the biologically important nucleosides, nucleotides, fatty acids, and porphyrins have been observed. This research has made it clear that these compounds would have accumulated on the primitive (prebiotic) Earth—that their formation is the inevitable result of the action of available high energies on the Earth's early atmosphere. (Reference 9).

With the results of such experiments in mind, scientists demand that in the course of time such lifeless organic molecules became assembled *by chance* into a living organism.¹¹

Probability

Let us examine this hypothesis of life originating *by chance* from lifeless organic molecules. Let us suppose that we have 20 amino acids, and that we wish to construct *by chance* a small protein 100 amino acids long in a particular sequence. There are in all 20^{100} or 10^{136} possible configurations of this protein. The earth's hydrosphere is 1.37×10^9 cubic kilometres in size¹² containing about 10^{47} molecules.¹³

Now we will assume that the primitive, prebiotic earth's ocean was the same size as the present hydrosphere, but instead of being composed of 10^{47} water molecules, we will put 10^{47} of our amino acids instead—a very concentrated primeval broth considering that, according to

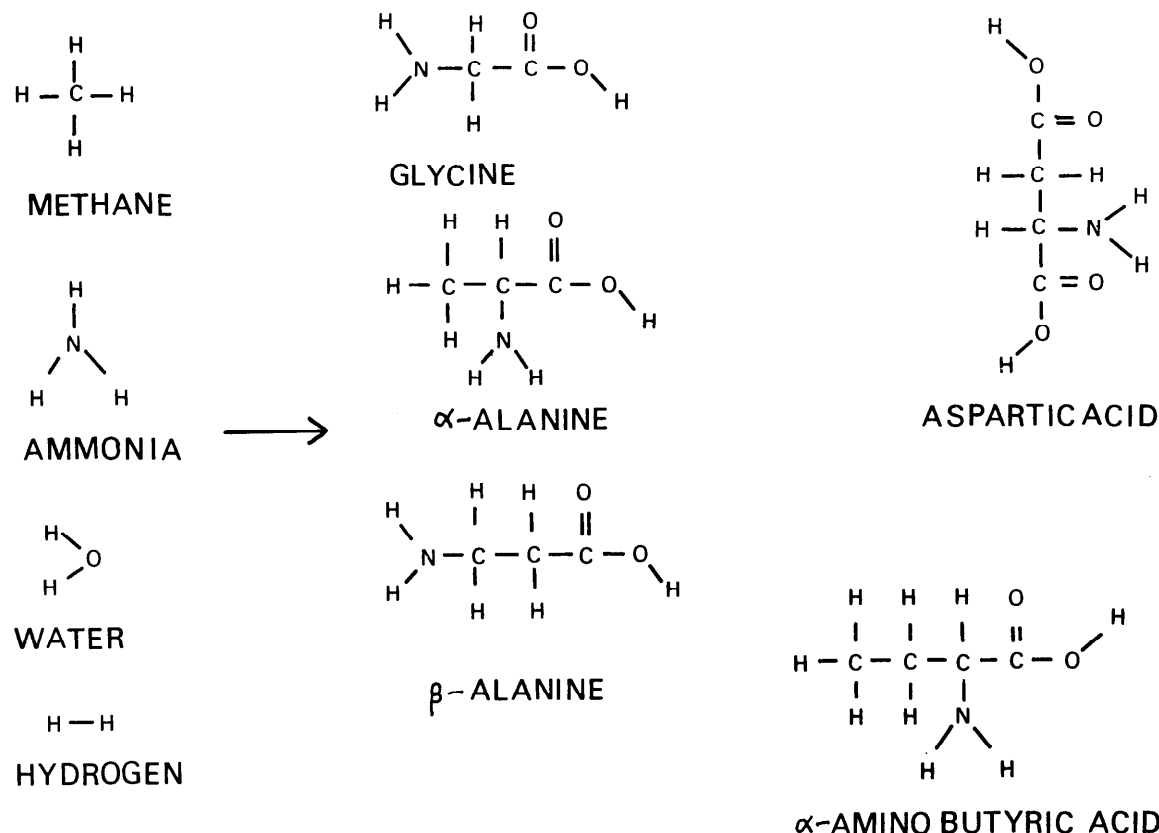


FIGURE 1

chemical evolutionists, it would have taken 3×10^8 years for the abiogenic earth's oceans to have developed a 1% solution of organic matter.¹⁴

Now suppose that all of these amino acids linked up to form protein molecules 100 amino acids long, *every second*. This would produce 10^{45} proteins per second. Now a year is about 3×10^7 seconds long—say 10^8 seconds to “round it off.” Hence every year, 10^{53} proteins—each 100 amino acids long—would form.

Although cosmologies vary, many evolutionists hold that the earth condensed from a dust cloud 4.5-4.8 $\times 10^9$ years ago.¹⁵ Even if we assume it was 10^{10} years ago, this would mean that, during this whole period of time, 10^{63} proteins—each 100 amino acids long—would be formed.

This, however, is still 10^{67} short of the 10^{130} possible configurations. This means that the chances of a simple protein containing 20 different amino acids and 100 amino acids long being formed *by chance* from the earth's oceans containing nothing else but these 20 different amino acids during 10^{10} years is 1 to 10^{67} against!

Chemical evolutionists, such as Lemmon mentioned already, however, insist that lifeless organic molecules assembled *by chance* to form living organisms in about 10^9 years. Now in order for the 100 amino acid long protein in the above example to be produced in 10^9 years, the amino acids would have had to link up 10^{68} times every second!

DNA Considered

How long would it therefore require to form *by chance*, in the above examples, one molecule of DNA? These initials stand for deoxyribonucleic acid. This is composed of the four bases: Adenine, Cytosine, Guanine and Thymine (often abbreviated by A, C, G and T, respectively), which are linked together like a spiral staircase by sugar and phosphate bonds to make a chain. (Figures 2 and 3).

Now it is the structure of this long thread-like molecule which determines that mice beget only mice, dandelions only dandelions and man only man. The DNA in ϕ X 174, a small virus that infects the colon bacillus *Escherichia coli*, is a

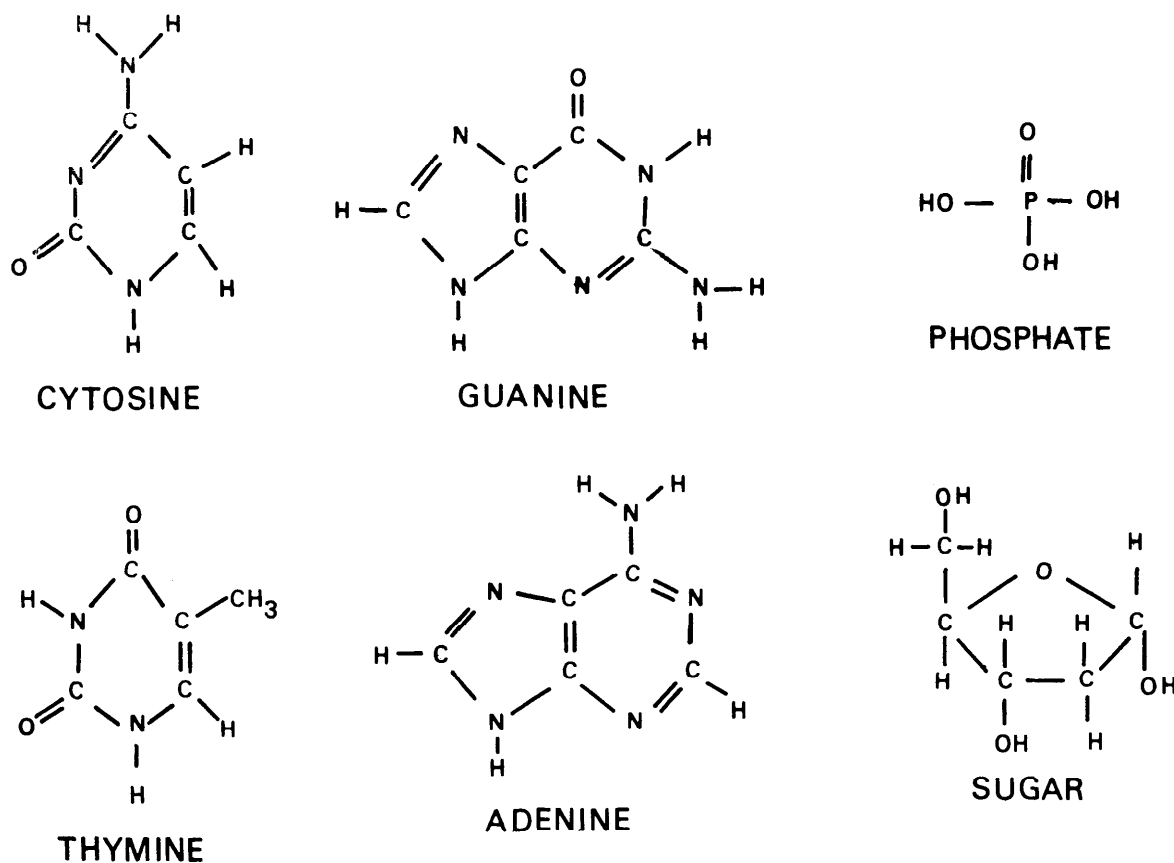


FIGURE 2 BUILDING BLOCKS OF DNA

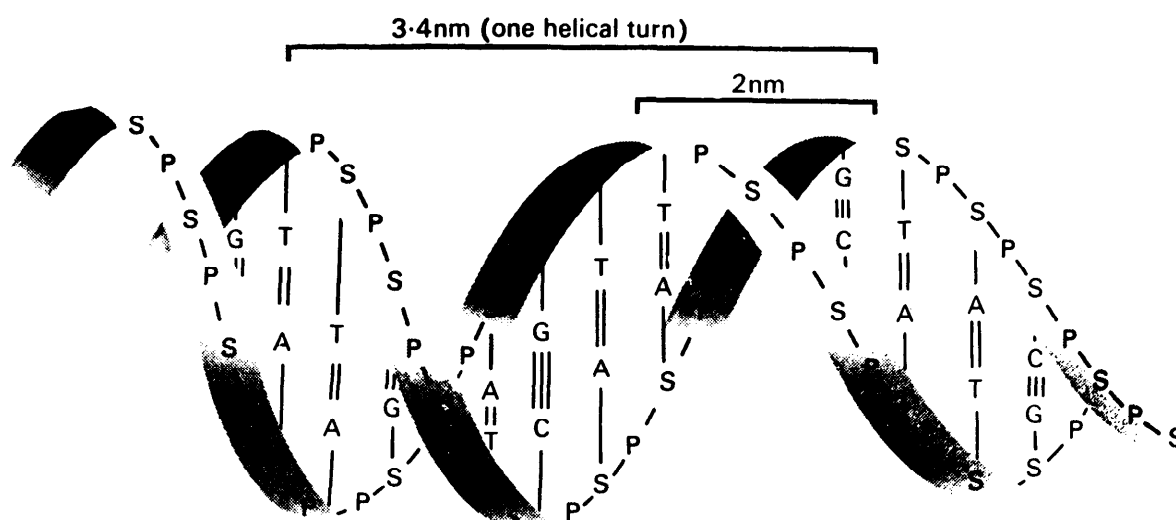


FIGURE 3 STRUCTURE OF DNA

S = sugar

T = thymine

G = guanine

P = phosphate

A = adenine

C = cytosine

single-stranded circular molecule composed of, not 100 amino acids as in the above simple hypothetical protein, but 5500 deoxy-nucleotides,¹⁶ and the amount of DNA in bacteria is 1000 times as large, and in human cells, 1,000,000 times as large as this.

DNA is a most complex molecule and is really a genetic code, similar to a master computer or file. Its genetic recipe is so complex that F. H. C. Crick, a Nobel Prizewinner, says that if this language of life were translated into English, it would occupy 1,000 books of 500 pages each. There is, however, no known single writing of man as long as this. The code is about 300 times as long as the *Works of William Shakespeare* and nearly 20 times as long as *Encyclopaedia Britannica*. Even in the face of all this complexity, evolutionists want us to believe that the genetic code arose by chance.

Illogical Approach

In order to show the thinking and philosophy behind Chemical evolutionists, Victor Pearce¹⁷ uses the following amusing illustration:

A native stands before the airliner—a native who has only recently been introduced to metals and smelting. The white man, impatient at the native's refusal to believe in the white man's aeroplane factories, ironically dismisses the native's curiosity by saying This is how the airliner originated. One day there was a terrific thunderstorm. Lightning played upon ore-bearing rocks, and fused the various ores into lumps of molten iron, copper and bauxite. Again the lightning struck before the metals had cooled, so that the metals formed themselves into patterns inherent in their atomic particles. This resulted in simple components being formed—nuts, bolts, aluminium plates, etc. Again the lightning struck and formed more complex components—cylinder heads, pistons, rings, wires (ready insulated), turbines, blades, propeller parts, wheels, and melted some rubber trees into tyres and left all these in a heap.

Again the lightning struck and flung the heap high into the air. Some of the nuts were near enough to the bolts to respond to an inherent attraction and screw themselves together capturing another component in the process and so were selected for the developing plane. Other pieces fell uselessly as unwanted debris and so were not selected. After repeated lightning the major units were formed: engines, panel instruments, struts, fuselage, tanks, seats and lavatory pans.

Coincidentally an earthquake ruptured the strata and released oil from an anticline. The oil spouted and poured itself into the tanks,

refining and separating into grades on the way.

A final burst of lightning flung everything up into the air. There were far more parts than those required by any one aeroplane, but those which were lucky enough to fall into a viable position made up a complete airliner which throbbed into life and made a safe landing.

Isn't this just the type of fable that the evolutionists would have us believe?

Concerning Confusion

Finally, to go back to the initial question which was asked the Thermodynamics lecturer: "Is not the Evolutionary Theory a contradiction of the Second Law of Thermodynamics?" the answer is "Yes!"

According to Evolutionary Theory, in time chaos and confusion will go to order; whereas, according to the Second Law of Thermodynamics, in time order will give rise to chaos and confusion. It appears that the Second Law of Thermodynamics seems to apply to Evolutionists, for in time as they have disregarded the ordered thinking that the Bible teaches, and their thinking has become chaotic and confused.

The Bible tells us that "God is not the author of confusion,"¹⁸ and that He made plants and animals, with their own particular DNA, such that they would reproduce only "after their kind."¹⁹

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THE TWIG GIRDLER'S INSTINCTIVE BEHAVIOR

WILLARD L. HENNING*

Among the insects that work hard to make special provision for food in a favorable state for their developing young, the twig girdler beetles should be rated highly.¹ Most remarkable is the habit of this type of long-horned beetle which simply girdles a twig instead of gathering food, storing it in a safe place and depositing an egg on it as many insects do.

The jaws or "mandibles" of both the larvae (round-headed borers) and adult long-horned beetles are among the most powerful of any insect, since the larvae feed on the hardest wood. However the adult female long-horned beetle (*Oncideres cingulata* Say)² of the twig girdler habit gnaws the bark and outer wood of certain hardwood twigs or branches (about one-half inch in diameter) for forty or fifty hours³ so as to encircle the twig (one-eighth inch deep) and cut off the passage of sap and nutrients to and from the outer branchlets. She then lays about twelve to twenty eggs on the smaller branchlets. She repeats this on several other twigs.

Why is the girdling process essential? Really for two reasons. The larval wood borers must have the wood both dead and moistened to feed upon. In the autumn after the twigs are girdled, they easily break off in a stiff breeze or wind. Once they fall to the ground the entire branch absorbs at least some soil moisture, and partial

decay may result. The larvae feed on the wood during the following spring and summer and become pupae and adults by September or October. After mating the females repeat their laborious process of twig girdling.

Those who believe in evolution might account for such an instinctive habit by claiming such an act of behavior developed by some supposed evolution during the past several millenia. Yet the development of entirely new and complex patterns of instinctive behavior on the part of insects, under natural conditions, has not been demonstrated.

We know from God's Word that "without Him was not anything made that was made" (John 1:3b). This includes not only the living creatures, but their instinctive behavior patterns and acts necessary for their own survival and for their offspring. Instinctive behavior for survival is referred to by ants in Proverbs 30:25 and by migratory birds in Jeremiah 8:7. No doubt the habit of killing the outer twigs of trees came about after man first sinned and the curse fell on the entire creation (Genesis 3: 17-19, Romans 8:22).

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TELEOLOGY: PURPOSE EVERYWHERE†

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The word "Teleology" is derived from the Greek "telos" meaning "end" or "teleios" meaning "complete" and "logos" or "word," "body of thought." The study is one of final causes, of purpose in nature. C. Wolf used the term in his book, *Logic*, 1728.

While Aristotle taught purpose in nature, it was during the seventeenth century in this country that this subject developed. Together with the revival of interest in the Holy Scriptures at the Reformation went the expansion of the study of the natural world. So there occurred an increase in knowledge of both the spiritual and the physical.

The great Sir Francis Bacon saw the pursuit of natural science as being "to the glory of God and the relief of man's estate." The work of the leading Puritans was important here.

John Wilkins, 1614-1672, Bishop of Chester, wrote *A Discourse concerning the Beauty of Providence in all the Rugged Passages of it*, 1649, and then his noted work *On the Principles and Duties of Natural Religion*, published posthumously in 1678.

John Ray, an ejected minister at the Restoration of Charles II, devoted himself to natural science and produced a monumental and influential book in 1691, *The Wisdom of God manifested in the Works of Creation*. Three times enlarged by him, it passed through some eight further editions up to 1827.

George Berkeley, 1685-1753, Bishop of Cloyne, the eighteenth century philosopher, following this view, saw God's attributes in "the works of nature, which discover so much harmony and contrivance in their make" as he wrote in his *Treatise concerning the Principles of Human Knowledge*, 1710.

Later William Paley's *Natural Theology or evidence of the Existence and Attributes of the Deity, Collected from the appearance of Nature*, similarly exerted great influence, being required reading in the universities. It was in its twentieth edition by 1820.

To-day Dr. R. E. D. Clark's *The Universe and God*, 1939; and *The Universe: Plan or Accident*, 1949, cite plenty of evidence from modern discovery for the existence of the great Planner.

There seems to be purpose everywhere and in everything. Formerly this was recognized by many, but in modern times the subject has been disregarded and relegated to a mere half-column in the most recent edition of the *Encyclopedia Britannica*.

E. H. Haeckel, 1834-1919, the German Zoologist, notorious for his faked diagrams to foster the theory of evolution, picked out exceptions to purpose, mocking the idea by using the term "Dysteleology." However, the advances of science have told against him. For example the idea of the uselessness of vestigial organs has been exploded as their purposes have come to light.

Further, the intricate structure and interworking of organs, cells and secretions all make the idea of chance less and less acceptable. The increased interest during recent years in the study of Ecology, or the relationship of plants to one another and to their environment, shows a greater recognition of purpose in the natural world.

It would be foolish to think that the purpose for everything is known. Much needs to be discovered about the value of disease, pests and weeds on the physical plane. But on the moral, an explanation is available in the doctrine of man's fall and punishment, following the intrusion of Satan, the Destroyer. Because all is not known, we do not reject the whole study, any more than the physician ceases his treatment or the researcher his pursuit of knowledge owing to lack of complete success.

John Ray stated that the works of God in creation shows His wisdom in: I. Their Formation. II. Their Order or Harmony. III. Their End or Use. So we may think of how the complexities and varieties of structures and of the methods of functioning show the extent of the Creator's skill.

For a brief review of a sample of these wonders, the following five groups may be considered:

I—THE EARTH AS A PLANET. This sphere is unique within the limitations of our knowledge. Its range of temperatures and pressures, the composition of its atmosphere, the existence and amount of water and of numerous other compounds, make it just suited for the continuance of life as it was in the beginning.

This is in complete contrast to the conditions obtaining on other planets and recently confirmed by the space probes. The now familiar lunar exploration has shown how inhospitable is that sphere to terrestrial life. Neither can scientists

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conceive of any form of life that would be possible in the conditions found elsewhere than on the Earth,

II—THE PROPERTIES OF MATTER. The law of gravity makes for stability and order, enabling work to be done and goods to be stored. The weightlessness of the lunarnauts produced amusing results, but made many normal activities high impossible.

The phenomena of magnetism and electricity have proved valuable in former times for giving direction and assisting detection by means of the ancient lodestone. While to-day much of the activity of modern man with his machines is due to the use of the forces and principles involved in these phenomena.

How much might be said of the general properties of the gases, liquids and solids found in the Earth. The melting points, boiling points, densities, solubilities, conductivities and the like suggest a Guiding Hand has adjusted them so that the materials are of use to man. Here for example, the higher specific gravities of many ores is of assistance in their separation.

Water, almost a universal solvent with its suitable temperature range from melting to boiling point, is a remarkable case of purpose. Its peculiar properties of having its maximum density at four degrees Centigrade, and its crystals floating, thus preventing complete freezing up and assisting unfreezing, adds to its unique value in the Earth.

III—CHEMISTRY. In this sphere there are the remarkable cycles involving the elements oxygen, hydrogen, carbon and nitrogen. The simplest of these, for example, may be that in which oxygen is removed from the air and used by animals, and restored by plants, which will have absorbed it in the form of carbon dioxide produced from it by the animals. Thus a balance is effected to enable life to continue.

The element calcium, by means of a soluble chloride in milk and in the blood stream, supplies what is necessary to form the insoluble phosphate needed for the formation of bones and teeth. Yet this absorption is dependent on the presence of vitamin D in the food. The elements of the group, namely strontium and barium, have many similar properties, but cannot be so used, and are moreover lethal, as we think of the strontium fallout from nuclear fission and the use of barium in poisons.

Carbon is another element with markedly unique properties. Its high valency and ability to combine both with the electro-positive element hydrogen and with the electro-negative oxygen make it the constituent of very many compounds in the natural world, so that Organic Chemistry is defined as that of the carbon compounds.

Here again the most similar element to carbon, i.e., silicon, is very different, and could not conceivably be used as a substitute. In fact silicon itself, is an element of first importance, being the next most abundant to oxygen in the Earth's crust, and forming the silicates, which are the basic substances of most rocks.

Single atoms of certain elements are vital parts of biologically important compounds. The familiar green color of plants is due to chlorophyll. This is a very large molecule composed of many atoms, but within it is a single atom of magnesium. This compound is essential to life, being the catalyst enabling photosynthesis to build up compounds in plants.

Iron also occurs as four single atoms in the complex twin molecule of thousands of atoms and a molecular weight of about 68,000, known as hemoglobin. Here, owing to its special properties, it is able to combine ("rust") with oxygen to transport it to tissues where it is released and carbon dioxide removed. One author stated that iron rusting is an "unfortunate" property, but here it is essential to life. Incidentally the rusting or oxidation of a number of metals helps to remove the remains of man's discarded and disfiguring machines!

Thyroxine, an essential hormone, is a complex compound secreted by the thyroid gland. It has been synthesized, and as such has proved a blessing in treating diseases of that organ. The presence of four atoms of the comparatively rare element iodine in the molecule produces its peculiar and important properties.

A certain sickness in some Australian sheep was shown to be due to the absence of cobalt from the soil. Subsequently it was found that a single atom of this element was an integral part of the complex compound known as Vitamin B 12. This is essential for the manufacture of red corpuscles in the bone marrow.

The assertion is therefore made that these elements situated in these vital components show the wise work of the Designer, rather than the blind chance processes of supposed evolution.

IV—THE BIOLOGICAL FIELD. The fluids of the animal bodies all carry the signs of design. Blood, the carrier of the body, containing all the substances needed for its upbuilding and activities, as well as those to be eliminated, is wonderfully contrived. So too is the four-valve pump which controls its flow.

The miracle of the egg, with its peculiarly strong shell, is the story of two liquids and two cells which, without more than a steady application of gentle heat, can produce the new life of the creature which lays it. In all species the reproductive process is a miracle, beyond the conception of man's mind or remote chance.

Milk too is a marvel, eminently suitable for its purpose of feeding the young. Wonderfully secreted and containing all the substances necessary for the proper development of the offspring, it also provides a valuable food in many cases, for other creatures including man.

The alimentary canal with its attached glands and blood vessels is much more complicated, intricate and remarkable than the most sophisticated industrial plant. Essentially just one main tube, it is more than a factory producing a variety of products. Through a wise Designer, it, without apparent conscious direction, absorbs food, sorts, processes and allocates it, eliminating waste and keeping itself in constant repair. It uses and produces most complex chemicals in its digestive action, which may be described in part, but which are neither understood nor reproduced in the laboratories of the most advanced scientists.

Even the air with its precise worldwide balance of suitable gases, small variations from which prove lethal, shows evidence of design to suit the various forms of life dependent on it. This view is rather to be preferred to that of its being accidental, or the result of some fantastic processes of evolution of these numerous varieties of creatures combining to adapt the composition of the atmosphere or themselves to its use.

Numerous well-known structures of familiar creatures all point to design, rather than chance or some gradual development. The intricate organization of the ant hill is one example. Similar are the wasp's nest and the beehive with the regular hexagonal cells. The queens, drones, workers and their particular functions suggest a Super Organizer in the beginning.

The spiders with webs produced perfectly from the first, indicate something built-in, and that needs a Builder. Birds' nests of the many species are similar structures. Who too gave the birds their light strong feathers for flight and bones of minimal weight? Man's most intelligent efforts

in this form of transport are extremely clumsy in comparison.

The fine formation and beauty of diatoms; of insects, especially butterflies and moths; of plants, particularly in their flowers and seeds, are indicative of the quality of the Designing Hand behind all. The Lord reminded men that Solomon in all his glory was not arrayed like one of these. (Matthew 6:28-29).

V—THE INANIMATE FEATURES OF THE EARTH'S CRUST. These appear as designed for specific purposes. Thus in the rocks are to be found building materials, minerals, metals, fuel and the basis of soil. The mountains serve as watersheds, stores, shelters, boundaries and objects of beauty and recreation. The lakes are reservoirs, the rivers means of transport, communication and purification, while the seas are great food factories. Man is the center of all this purpose.

Sir Julian Huxley, as reckless and illogical as his ancestor T. H. Huxley, stated his "glorious paradox," that blind chance gave rise to purposeful man. The truth is that the Almighty Designer put purpose in creation which was provided for man and to be controlled by man (Genesis 2:8-9. Psalm 8:6). This control is seen increasingly through modern technology, although it often works blindly without a goal or Divine direction.

Evolutionists may declare, "What was needed, came!" or "What was present, was adapted by life!" But how did it come, how would the need be known, or how can adaptation occur without an Agent? Man for all his intelligence does not know where he is going, or what to adapt, neither can he, as the Lord said, add a cubit to his stature. (Matthew 6:27).

The creationist states, "God foresaw and provided all." Just as man is advised by a textbook or maker's handbook how to deal with a mechanism, so he needs to heed the Creator's Book, the Bible, in order to learn the right use of the Creation.

BIOLOGICAL ODDITIES THAT ARE UNACCOUNTABLE BY EVOLUTION

OSCAR L. BRAUER*

Evolution theorists strain at a gnat and swallow a camel. After noting some similarity of structure between two different families of animals, they immediately assume some ancestral relationship. They jump at some little factor such as "survival of the fittest" and neglect a thousand factors that are not explainable by this assumed process. To account for the hundreds and hundreds of unique things in the human body by anything like evolution is absurd in the extreme.¹ It is impossible to provide a plan, a driving force, or a direction to the evolution theory. Accordingly, this view is unable to account for certain highly designed systems in the animal world. Four well-designed adaptations in the animal world are examined. Creation evidence is seen in oilbird sonar, hare tracking, vulture tool use, and chuckwalla escape behaviors.

The Oilbird of Caripe²

There is a strange bird that lives in the deep dark caves of northern South America. Its scientific name is *Steatornis caripensis*. The natives call it Guáchart, Spanish for "One who cries and laments." This bird is commonly called the "Oilbird" because the natives rob the bird's nests and boil the squabs for their high oil content. The Indians use this oil for flavoring food.

The oilbird spends most of its life in total darkness. The young are hatched in total darkness and live there until they are grown. After they are grown and learn to fly in darkness without colliding with other birds and the walls of the cave, they emerge from the cave during night darkness to search for food, fruit of the tropical trees.

One mysterious thing about the oilbird is that it can travel around the dark cave with perfect ease and safety. It has very large wings for a hawk-sized bird. This enables it to fly slowly or stay placed in mid air like a helicopter. It keeps from colliding with the walls and with other oilbirds by a built in sonar-like device. It emits distinct evenly spaced clicks. Apparently the bird can judge distances by the return time of the echoes of the clicks.

How can the oilbird tell distance by the echoes of the clicks? He could not judge distance by any training. These echoes are measured in infinitesimally short times. Training could not possibly give it that ability. It can only be a gift from God. This ability certainly could not develop by evolutionary chance.

How do we know that this is the way the bird guides himself? Donald R. Griffin of Cornell University and William H. Phillips, Jr. of Caracas, Venezuela captured several oilbirds. These men allowed the birds to fly about in a dark enclosure and noted that they never collided with the walls. Then the men plugged the ears of the birds after which they collided with the walls every time. This fact gave rise to the title of the article in *The National Geographic Magazine*: "Birds that

'See' in the dark with their ears." It was further observed that when the oilbirds leave the cave in regular flight they terminate the clicking.

Dr. Ross and his two companions entered the large cave near Caripe, Venezuela. First they came into a large room which had very little light. They heard great noise but could not see any birds. They found that the first room opened into a larger room from which the noise originated. In this large circular room was total darkness. The men shouted and bedlam broke loose. One thing characterized these birds. That was noise.

How would an evolutionist explain this bird's adaptation to dark cave life? How could oilbirds evolve the sonar-like device? How could they develop their life pattern in total darkness?

Evolutionists think that any animal which develops a new or unusual characteristic does so by a very small step at a time over very long periods. The oilbirds are limited to a very few dark caves in northern South America. An evolutionist would expect them to have acquired an adaptation for dark caves by first going into a cave with dark shade, and then into a darker and darker caves until they adjusted to total darkness. An objection to this arrangement is that caves are not arranged in a series of darker and darker caves. In the places where birds are found there is usually only one or possibly only two connected caves.

Furthermore, there is no possibility of the oilbirds developing his sonar-like clicks by a succession of very small steps. The clicks had to be ready-made and of sufficient loudness and exactly evenly spaced. Then when we come to consider measurement of distance by the echoes of these clicks from near objects, we see the impossibility of the bird learning this ability by any possible training. Each young bird has to have the clicking mechanism when it is born as well as the ability to judge distance by timing the echoes. This ability to judge distance by timing the echoes is marvelous. Nothing short of God could possibly bring it about.

Young birds born in total darkness and never having seen anything must live their youthful

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lives; learn the voices of their parents; learn to fly and maneuver. Finally they must emerge from the cave into outer darkness; turn off the clicks and search for food. Having found it and recognized it, they must then find their way back to the cave, turn on the clicks, and find their homes. It is quite logical and simple to assume that God created this bird as he wanted it and gave it the ability to live successfully in its strange environment.

Dr. Rose makes this statement in his article, "There is only one species, and it occupies a genus and family all its own in the order Caprimulgiformes." This seems to violate several points in the evolutionary classification. It would appear that the oilbird is a species with many missing links back of it. This involves a missing link at the genus, family, and then order level.

The Arctic Hare

The arctic hare has a truly amazing strategy of escape. Lindell Page³ was following the hare (*Lepus arcticus*) up a hill on snow shoes when he came to what looked like the end of the animal's tracks. He turned around and found the tracks of the hare doubling back on his trail.

When the hunter got back about one fourth mile the extra back tracks stopped. Then looking around, Page, the hunter, found that the hare had jumped 12 feet to one side and continued up the hill. This procedure Mr. Page said is common to the Arctic Hare.

We wonder how the animal learned this strategy. A creationist would say that God gave this animal such power and knowledge. How would an evolutionist account for it? According to the usual way, an evolutionist would account for any unusual characteristic in an animal, he would expect that the animal had gradually made small advances over a long time.

In the case of the Arctic Hare, the evolutionist would suggest that after the first thousand years the animal would double back 100 feet and then jump two feet to one side. Then after the next thousand years he would double back 200 feet and jump four feet to one side. Then after the third thousand years he would double back 300 feet and jump six feet to one side. This would continue at the same rate until he had doubled back 1320 feet and jumped 12 feet to one side as at present.

Explaining the strategy of the Arctic Hare by such a development is ridiculous. Evolutionists rarely apply their methods to the development in a living animal such as the hare. They are concerned rather with how the hare supposedly evolved from some less complex ancestor. In this respect the time-element is in millions of years instead of thousands.

Since we cannot visualize the situation in this case we cannot see the humor in it. Perhaps if we could see the whole number of factors involved and the lack of logic in the supposed steps it would seem far more humorous than in the case of the behavior of Arctic Hare alone.

The Tool-using Bird, the Egyptian Vulture⁴

A gibbon is a long armed ape. His bone structure is more like that of a man than any other animal. When fossils of the gibbon occur in the strata it is hard for anthropologists to be sure that it is not the fossil of a man. Immediately the men digging for fossils begin to look around for tools. If they find arrow points, stone axes, or flint skinning knives they are quite sure they have found a fossil man. Let us see if it is correct to assume that animals do not use tools.

The thrush has been observed to throw snails on a rock to crack them. In this case the bird is not said to be using a tool. The object is not classed by scientists as tools unless it has been picked up or otherwise manipulated by the animal. It must be used as an extension of the hand, trunk, paw, or mouth.

Today, however, there is a case where a bird uses a rock as a tool. In the Serehgeti National Park in northern Tanzania the Egyptian Vulture, *Neophron percnopterus*, has been photographed throwing rocks to break ostrich eggs so the bird could eat them. The eggs were so large and so strong that the bird could not break the shell by pecking at it, even though the Egyptian Vulture is about the size of a raven.

Observers had a favorable chance to see and photograph the vultures eating eggs. A grass fire had scared the ostriches away and left about 20 eggs on the ground. The vultures "took over" and broke open all the eggs. Other scavenger birds could not learn how to open eggs from the Egyptian Vultures but fought for the eggs these birds had opened.

The Egyptian Vulture picked up a stone in its beak, raised its head as high as possible and threw the stone at the ostrich egg on the ground before him. Two birds took turns throwing stones at the egg.

Sometimes they missed, but in time one of them made a direct hit hard enough to crack the shell of the egg. Then they were able to break into the egg and eat it. These vultures sometimes had to search for suitable rocks to throw at the egg. They ranged as far as 50 yards to hunt for suitable rocks and flew back with them to throw at an egg.

The authors had gone into Africa for *The National Geographic Magazine* to study chimpanzees. They observed that these animals used sticks as tools to dig termites and ants out of their

nest. Another chimpanzee in Liberia had been observed using a rock to pound open a palm kernel.

There have been many other instances of animals using tools. Thus we conclude that using tools is not exclusively an accomplishment of man.

It is highly improbable that these Egyptian Vultures learned using tools by evolution. According to the family trees of the evolutionists these birds had common ancestors with many other birds which do not use tools. No doubt God in his wisdom saw the necessity of these birds having this ability to help preserve the balance of nature.

Birds in general cannot learn the rock throwing ability from the Egyptian Vultures but had to wait for the vultures to break open the eggs and then they would fight for some of the booty.

The Chuckwalla⁵

The chuckwalla lizard has some peculiarities that make it more suitable for surviving the rigors of desert life than most desert animals. We would assume that God gave him all these characteristics, taught him to use them, and put him directly on the desert.

The evolutionist would say that he existed first in a non-desert environment, then moved into the desert, and finally evolved all of his adaptations to desert conditions. This doesn't seem logical since the chuckwalla would have perished while these new adaptations were forming.

Let us note some of the chuckwalla's unique characteristics and abilities. We would wonder why other desert animals did not evolve some of its peculiarities while they were evolving (if they evolved at all).

A casual glance at a chuckwalla reveals a potbellied lizard up to 16 inches in length with a creased, wrinkled, baggy hide which looks as if it were several sizes too large. All these odd features have meaning when we study the life patterns.

The oversize baggy skin is important for defense. At the approach of an enemy the lizard hurriedly crawls into a crack in the bedrock. Once in the crack in the rock the animal turns its scales outward, grips the rock with its toenails, and pumps up lung cavities to 300% of normal size, or half the size of the animal's body. This jams him so tightly in his crack that his enemies cannot get him out.

Once the author, his son, and another boy vacationed in the Mojave Desert. The boys chased a chuckwalla into a rock crevice. Then they tried in every way to get the lizard out, but all their methods were failures. Although the lizard was in plain sight, and appeared easy to move, God had planned for the animal's protec-

tion by this unique means. If animals adapted through evolution, a natural question is, why didn't some other animal evolve this same defense?

The chuckwalla can run very fast and jump several feet from rock to rock. E. L. Boynton⁵ has said that the lizard evolved this ability over a few thousand years by being chased by coyotes, hawks, and wild cats. This method of gaining the ability to escape looks superficially plausible. But upon close analysis, it would be difficult to explain through evolution how the chuckwalla learned to expand its lungs 300% to jam itself into a crack in the bedrock.

The chuckwalla lives in an environment where there is no water except a rare shower perhaps once a year. Thus water is a very limiting life factor. And dependency upon obtaining water from its food, the chuckwalla is limited to an active life in late spring and early summer, rarely more than four or five months. The chuckwalla emerges from winter hibernation about March 20 when the desert plants begin to revive. At this time the animal is a voracious eater of almost any juicy plant or plant part. He puts on flesh rapidly and his long blunt tail and his skinny legs fill out.

Under all the saggy, baggy skin along the sides from belly to head are accessory lymph spaces normally half full of water—which, after a rain or at the end of the growing season, are full of water.

By August desert plants stop growing and the chuckwalla goes into "dry weather" dormancy, tucked deep in a bedrock crevice. This dry weather dormancy often extends into a winter, cold weather dormancy which can continue into the next March. All through this hibernation the lizard lives on its food reserves.

With regard to food, the chuckwalla has to have a peculiar elimination system. Since the plants eaten all grow on alkali soil, they contain an abundance of sodium and potassium salts. When consuming these plants, during the growing season, enough salt is ingested to kill an ordinary animal of the same size, but the chuckwalla survives.

God has placed in his nasal passages two bean-shaped glands connected to ducts which run forward to a pool inside the nostril. Here the salts are expelled by sneezing.

Since the chuckwalla is most active in early summer hot weather, it must survive very hot weather—to 102°F. If the temperature gets too hot, an excellent panting ability is utilized.

Another amazing feature of the chuckwalla should be mentioned. This lizard is a late riser in the morning, and needs to warm up in the sunlight. At first he is dark in color which favors absorbing sunlight. As he gets thawed out and

needs less warmth his color becomes lighter to a more reflecting and less absorbing condition,

Any one of these four designed systems (oil-bird, arctic hare, Egyptian vulture, and chuckwalla) ought to demonstrate the gross inadequacies of the evolution theory. Taken together they form a bastion of evidence favoring creation design and negating evolutionary theories.

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IS NATURE CRUEL?

WILLIAM J. TINKLE*

Much more could be written in the vein of the remarkable harmony in nature, which could have been constructed only by Divine Intelligence. Yet we must admit that it is easier to hold this attitude when skies are fair and the bee is on the clover than when a big, burly wolf pounces upon a rabbit which is exhausted from running in the snow and no longer can dodge.

Alfred Tennyson, the Victorian English poet, was brought up in a Christian home and desired to believe what the Bible states about God. But during his lifetime came the attempt to turn Christian philosophy upside down in the name of biology. Desiring to believe the facts of nature and still keep his Christian faith, the poet was pulled this way and that, as the following lines reveal:

And he, shall he,

Man, her last work, who seemed so fair,
Such splendid purpose in his eyes, . . .
Who trusted God was love indeed,
And love Creation's final law,—
Tho' Nature, red in tooth and claw
With ravin, shrieked against his creed,—
Who loved, who suffered countless ills,
Who battled for the True, the Just,
Be blown about the desert dust,
Or sealed within the iron hills?¹

Many persons have shared this conflict which tore the emotions of the poet for a long time, and we would gain nothing by ignoring this problem. The dinner of one animal results in the end of the trail for another, which seemed as worthy to live as the predator. Then as our thinker pursues his cogitations he comes to the

problem of accident, pain, and loss and he despairs of reconciling them with the love of God.

The food habits of man and animals kill some plants and cause weakening of many plants which are not killed. Much of our food consists of the seeds of plants, and grazing animals devour large portions of the pasture, hopefully without destroying it. When we eat fruits, however, the result is different unless we consume the seeds. (The word *fruit* is used here in the botanical sense, meaning the developed ovary; the vessel which normally contains seeds.)

Fruits are formed with no profit to the plant unless it be as a bait to cause the scattering of the contained seeds. The fruit eater does not harm the plant which sustains him, nor does he steal from its offspring as does the person who consumes milk, butter, and cheese.

Thoughts on the Original Plan

Every biology student knows that plants are the ultimate source of food for all animals, even the carnivorous animals, for they prey upon the animals which eat plants. Could it be that the original plan was for all animals to eat fruit alone?

Foxes and bears eat some fruit but if they ate no meat we wonder if they would secure enough protein. A lion, along with other carnivores, does not have a large stomach like that of a cow, therefore it would be hard for it to get enough nourishment from low calorie foods such as leaves. Yet a lion's stomach is comparable in size to that of a man, and many a person has lived without meat.

It would be hard to delineate how every kind of animal at present could live without causing the death of anything. Some thoughtful scholars, however, are saying that this was the original plan.²

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Without claiming to have all the answers, I can say that probably the most helpful answer to the problem of evil is that God's original plan was otherwise. Nature originally was not altogether as it is now. That he should be more than a machine or an animal, man was given the power of choice; and using that choice, he fell. While we do not know just how, this fall involved the earth and the other creatures.

Cursed is the ground for thy sake; in sorrow shalt thou eat of it all the days of thy life; thorns and thistles shall it bring forth to thee; and thou shalt eat the herb of the field.³

Through changes, the details of which we do not understand, man was brought into contact with plants which did not bear nourishing fruits like those of the trees of the garden of Eden. Some were herbs, containing a little nourishment, while others were troublesome weeds. This condition will be rectified in time:

For the created universe waits with eager expectation for God's sons to be revealed. It was made the victim of frustration, not by its own choice, but because of him who made it so; yet always there was hope, because the universe itself is to be freed from the shackles of mortality and enter upon the liberty and splendour of the children of God. Up to the present, we know, the whole created universe groans in all its parts as if in the pangs of childbirth. Not only so, but even we, . . . are groaning inwardly while we wait for God to make us his sons and set our whole body free.⁴

These two portions of scriptures throw light upon the problem of pain and suffering. Much of it is outside God's original plan and was brought about by man's unfaithfulness. Man, however, is given the promise of restoration of the original condition at some time in the future.

Scientists do not inform us of these matters for their endeavor is based upon occurrences which take place at the present time. For the same reason, scientists cannot deny the record of conditions at the beginning nor prophecies of future conditions. To say that nature is eternally under one set of laws is a matter of faith, without proof. A scientist, like others, should recognize that he needs more than science to get a true and complete view of reality.

Pain Is Lessened

Considering these statements from God's Word, we see that he did not plan that the order of nature should be just as we find it today. Furthermore, pain, even in our fallen world, may not be so great as it seems. The problem of the suffering endured by an innocent victim is not an easy one.

When I was a graduate student, the head of the zoology department, Dr. Raymond Osburn, said that if one tries to find out how much pain an animal suffers he runs into a psychological blind alley. This is true because pain cannot be measured directly but only by the reactions of the animal.

A sensitive person experiences mental agony when he imagines the sharp teeth of a lion piercing the back of an antelope. Yet there is evidence that when an animal is overpowered by another it becomes numb and is conscious of nothing at all.

Bird banding gives evidence at this point. To learn the age and migrations of birds they are trapped, and numbered bands are placed on their legs.

I have noticed that when a bird is taken in the hand it struggles and shows fear, just as one should expect; but when it is held firmly it ceases to struggle and seems numb. While the band is being placed on the leg the captive seems entirely oblivious of what is going on. When the grasp of the hand is released the spell continues for a few seconds until the bird regains consciousness and flies away.

I have had the same experience with frogs and fish. There is good reason to believe that the victim of a predator is unconscious.

We suffer from a small wound and reason that death from a predator would be unbearable. But it is not valid to extrapolate so. A mashed finger has given me excruciating pain but when my arm was broken I had no need for the handful of pain pills which the surgeon gave me.

When animals die of starvation or fish are impounded in a brook which dries up, it may be that they also become numb and unconscious of their plight.

Animals Seem Happy

If we may judge by the actions of wild animals in nature we decide that they are happy.

We have learned much that animals do not know and developed many capacities that they do not have. But they know at least one thing which we seem progressively to be forgetting and they have one capacity which we seem to be allowing to atrophy. To them, joy seems to be more important and more accessible than it is to us.⁵

Birds chirping and flitting about and squirrels exploring to satisfy their curiosity⁶ lead us to think that they are happy. At the first unusual sound a bird gives a warning note and all freeze to silence and immobility. But shortly after the suspicious sound ceases the normal scamper and song are resumed. Wild things seem to have no foreboding of future ill.

When I was a boy I found many dead grasshoppers clinging to stalks of grass. I was emotionally moved, saying to myself, "They have clung to these perches to die." Later I could see how naive I had been to think grasshoppers have a foreboding of death, or of anything else.

There has been much discussion as to the motive of birds in singing. Some say the male bird gives notice from the center of his nest area that no other birds should build homes there. Yet sometimes a song sparrow sings in mid-winter when nest building is not the order of the day.

Birds sing more often in spring, just as people feel more joyous in good weather. I agree with Henri Fabre, whom Charles Darwin called "the inimitable observer." Fabre said birds sing to express the joy of living.

In textbooks, animals are described as self-centered beings, doing just the acts which will help them in the struggle for existence. It is true that they must work for themselves but they also do many things out of curiosity. Open a gate in front of a cow and she will go through to see what is on the other side, unless her suspicion has been awakened.

Conclusions

The questions raised in this paper are not all answered with finality but they are all good topics for observation and discussion. Man has fallen from his original state and in some way has involved nature also. In the struggle among creatures in our present world order there is tragedy, but suffering seems to be mitigated and happiness is evident. The Bible says, "God is love,"⁷ and this has not been disproved.

Henry W. Longfellow regarded the natural world as a picture book presented to a naturalist. We quote from his poem on the Birthday of Louis Asassiz:

It was fifty years ago
In the pleasant month of May,
In the beautiful Pays de Vaud
A child in its cradle lay.

And Nature, the old nurse, took
The child upon her knee,
Saying; "Here is a story-book
Thy Father has written for thee."

"Come, wander with me," she said,
"Into regions yet untrod;
And read what is still unread
In the manuscripts of God."

And he wandered away and away
With Nature, the dear old nurse,
Who sang to him night and day
The rhymes of the universe.

And whenever the way seemed long,
Or his heart began to fail,
She would sing a more wonderful song,
Or tell a more marvelous tale.

So she keeps him still a child
And will not let him go
Though at times his heart beats wild
For the beautiful Pays de Vaud.

Though at times he hears in his dreams
The Ranz des Vaches of old,
And the rush of mountain streams
From glaciers clear and cold.

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NEW BOOK ANNOUNCEMENT

Creation, Evolution, and God's Word. Edited by Paul A. Zimmerman. Concordia Publishing House, St. Louis, MO. \$2.50. 176 pp. p.b.

This excellent book, published previously on a limited scale, has now been rightly fostered by Concordia Publishing House in a handsome paperback edition. Chapter authors include Dr. John Klotz; Prof. Wilbert Rusch, Sr.; Dr. Paul Zimmerman; Prof. Richard Korthals; and Dr. Walter Lammerts.

Creation Research Society readers will recall that this book was originally titled, "Essays from The Creationist Viewpoint," and an extensive

review of the volume appeared in *Creation Research Society Quarterly*, 7(2):128-129. Two passages from that previous review are quoted herewith: "Each article is in keeping with a conservative understanding of Scripture, and each is written by a thoroughly qualified scientist . . . these articles in published form merit wide circulation. The inexpensive presentation coupled with the broad spectrum of article coverage (from philosophy and theology to genetics and geology) make this work a valuable supplemental text for high school and college science courses."

YOUNG AGE VS. GEOLOGIC AGE FOR THE EARTH'S MAGNETIC FIELD

THOMAS G. BARNES*

The rapid decay of the earth's magnetic field, predicted by the rigorous theoretical treatment of Horace Lamb and confirmed by 130 years of real time measurement, is presented as strong evidence that the earth's magnetic field is thousands and not millions or billions of years old. Attempts to substantiate a "geologic age" for the earth's magnetic field through a hypothesized self-excited dynamo to sustain the magnetic field are shown to be futile. Paleomagnetic "evidence" for reversals in the earth's magnetic field is shown, by references to the technical literature, to be fraught with inconsistencies and incapable of providing acceptable evidence for a long age for the magnetic field.

Present Decay Rate of the Magnetic Field

The rapid decay of the earth's magnetic dipole field, as deduced from real time measurements, is a formidable problem to conventional historical geology.¹ The first absolute measurements were made in the early 1830's and the decay of the field has been observed ever since then.

According to a 1967 government publication the earth's magnetic dipole field will vanish by the year A.D. 3991 if the present rate of decay is constant and continues.² The field is decaying at a rate of 32 gamma per year at the magnetic poles, 16 gamma per year at the magnetic equator, and at intermediate rates everywhere in between the equator and the poles.

To impress one with the magnitude of this decay rate it should be noted that one gamma variation in the earth's magnetic field is easily measured by present day magnetometers. In fact, some of these instruments are capable of measuring differences in the magnetic field of one hundredth of a gamma. Hence one can understand that the decay rate of the earth's magnetic field is so large that it cannot be ignored.

Conflicting Views on the Source of the Magnetic Field

It is fairly well established that the earth's magnetic field is due to circulating current in a molten core of the earth.³ There is, however, a wide divergence of opinion as to the source of this current. Some believe that the current was started by an event in the past and has been freely decaying ever since, as is evidenced by the present decay rate in the magnetic field.

Others believe that the present decay rate is temporary and not indicative of its long time behavior. They contend that the earth's magnetic field has reversed at irregular intervals and only temporarily loses its magnetic field, somehow maintaining the same average value of the earth's magnetic field throughout "geologic time." The reversed direction of magnetizations which

has been observed in some rocks is interpreted as evidence of reversals of the earth's magnetic field.

Lamb's Solution Supports the Young Age Theory

In 1883 Horace Lamb derived a solution to Maxwell's equations which showed that the earth's magnetic field could be due to currents that were started at some time thousands of years in the past and freely decaying ever since.^{4,5} His solution shows that the decay is exponential. There is no problem whatsoever with the physics of Lamb's solution. It provides a logical explanation of the earth's present magnetic field if one assumes an initial magnetic field, such as a magnetic field started at the time of creation.

Opposition to this explanation of the earth's magnetic field comes from evolutionists because Lamb's solution may be used to support a young age for the earth's magnetic field. Lamb's solution has the advantage of having predicted the decay which is now confirmed by 130 years of real time measurements.

From these data one can show that the earth's magnetic field has a half life of 1400 years.⁶ This observational support for Lamb's solution makes it highly implausible that the earth's magnetic field could be as old as evolutionists claim, limiting its age to thousands and not millions or billions of years.

Long Age Theory Requires a Dynamo

Because of their need to justify an age of billions of years for the earth's magnetic field, evolutionists suppose that some type of dynamo has kept the current running for billions of years. They have hypothesized "dynamoes" of various kinds, but none of these dynamo theories is without its difficulties.

A comprehensive summary of problems with these dynamo hypotheses is found in Mining Geophysics Vol. II, 1967, published by the Society of Exploration Geophysicists.⁷ One thing is clear, any geomagnetic dynamo theory is fraught with difficulties! Furthermore there is no satisfactory theory of a power source to drive the dynamo if there were one. The following quotation from reference 7 illustrates how unsuccessful the dynamo theories have been.

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In 1958 G. Backus and A. Herzenberg, working independently, each showed that it was possible to postulate a pattern of motions in a sphere filled with a conducting fluid in such a way that the arrangement acts as a dynamo producing a magnetic field outside of the conductor. In each case the motions were physically *very improbable* [emphasis added]; however, rigorous mathematical solutions were obtained, as was not the case with Bullard's numerical solution. The motions obtained by Backus all involved periods when the fluid is at rest. He needs these *periods* [emphasis added] of rest to insure that other fields generated by induction will not develop in such a fashion that they eventually destroy the whole process.

To make matters worse for the dynamo concept, Cowling⁸ (1934) *proved that it is not possible for fluid motions to generate a magnetic field with axial symmetry* (such as the dipole field of the Earth). *Cowling's theorem* is indeed a blow to the evolutionary efforts to develop a dynamo theory. It eliminates the possibility of a straight forward theory for a self-exciting dynamo to sustain the earth's magnetic field. Nevertheless futile efforts continue and one still finds claims, but no proof, of a dynamo in the core of the earth.

For example, Parker⁹ (1971) states:

The theory for the origin got under way with Elsasser's^{10,11} assertion that the only possible explanation of the dipole field of Earth was motion in the liquid metal core of Earth. . . . All other ideas such as thermoelectric effects, magnetostrictive effects, etc. are woefully inadequate. In view of Cowling's theorem Elsasser pointed out that the fields in the core need not have axial symmetry, nor are the fluid motions entirely symmetric. Elsasser worked out a mathematical formalism for treatment¹¹⁻¹⁴ and later Bullard¹⁵⁻¹⁷ explored the possibilities.

Then, in reference to Elsasser-Bullard dynamo theory, Parker¹⁸ states:

So the generation of field is complicated, but based largely on the streaming and twisting of loops. . . . Calculations¹⁹ show how variation in the strength and distribution of cyclonic turbulence in the core of Earth can lead to active destruction, and reversal, of the geomagnetic field.

Note that the only possibility of having a dynamo in the earth's core requires motion of fluid in the core of the earth; that such motion cannot be a simple rotation, or any other *symmetric* motion; and that all proposed motions have been unreasonably complex motions. As of

now there is no physical evidence, seismic or otherwise, that there is any motion within the core.

In order to emphasize the weak foundation upon which the Elsasser-Bullard based Parker theory rests we refer again to the Society of Exploration Geophysicist's Vol. II article on the Earth's Magnetic Field by J. A. Jacobs:

It must be pointed out that Bullard's solution merely shows that one particular set of motions could set up a self-exciting dynamo. It does not follow that his particular solution is the actual one. *There has also been some doubt cast on the convergence of his solution.*²⁰ [Emphasis added].

If the basic solution does not converge it is meaningless. This is indeed a severe inference about that work.

Association of Reversal Magnetization with Age of the Rocks

As previously mentioned, paleomagnetic observations are frequently cited as evidence that the earth's magnetic field has reversed its polarity many times in the past.²¹ Rock samples at some locations have been found to be magnetized in a direction opposite to the direction of the present magnetic field. Magnetic surveys in the oceans also show reversed magnetization in some formations near the floor of the ocean. Reversed remanent magnetization of the rocks is often cited as positive evidence that the earth's magnetic dipole has had reversed polarity in the past.

The assumption is made that molten rock will, when cooled down below the Curie temperature, have a remanent magnetization in the same direction as the earth's magnetic field at the time of cooling. It is known, however, that there are many exceptions and that this is an oversimplification of the problem.

Because of inconsistencies which will be mentioned later, the samples to be associated with reversal of the magnetic field always have to be selectively chosen. Attempts have been made to correlate these selected samples of magnetization with "geologic ages." This has led to various "histories" of reversals in the earth's magnetic field. The supposed reversals are said to have occurred at irregular intervals. These "histories" vary with different authors but the last reversal is said by some to have occurred about 700,000 years ago.

Difficulties with the Reversal Hypothesis

There is a high degree of uncertainty in interpreting reversed magnetization in rock. Many samples show inconsistencies with the reversal hypothesis. Jacobs (1963) after attempting to make a case for reversals of the earth's magnetic field, cautions:

However, before such an explanation is accepted, it must be asked whether there exist any physical or chemical processes whereby a material could acquire a magnetization opposite in direction to the ambient field. J. W. Graham (1949) found some sedimentary rocks of Silurian age which were reversely magnetized. He was able to identify the precise geological horizon over a distance of several hundred miles by the presence of a rare fossil which only existed during a short geological period. He found that some parts of the horizon were normally magnetized and some reversely and argued that this could not be accounted for by a reversal of the Earth's field which would affect all contemporaneous strata alike. . . . Graham thus wrote to Professor L. Néel of Grenoble and asked him if he could think of any process by which a rock could become magnetized in a direction opposite to that of the ambient field. Néel came up with not one but four possible mechanisms—and within two years two of these four mechanisms had been verified, one by T. Nagata for a dacite pumice from Haruna in Japan, and one by E. W. Gorter for a synthetic substance in the laboratory.²²

Although Jacobs subscribes to the field reversal hypothesis, the following quote shows that he recognizes that it is fraught with difficulties.

An extremely interesting finding is that all rocks of Permian age have normal polarity. . . . If the field reversal hypothesis is incorrect, it follows that mineral assemblages necessary for self-reversal are abundant in Carboniferous and Triassic rocks (both these periods have many reversals), but are missing in all Permian rocks. Such a conclusion is very difficult to believe . . . it is far more plausible to assume that the field did not alternate during the Permian.²³

Note that this is merely a choice between two possibilities: 1) a reversal of the earth's magnetic field at selected times, or 2) self-reversal in the rocks and no reversal of the earth's magnetic field.

Jacobs also points out the following evidence against the paleomagnetic reversal hypothesis:

E. Asami (1954) has examined some early Pleistocene lavas at Cape Kawajiri, Japan. Several hundred specimens were taken from closely spaced sites along the coastline. Along some stretches of the coast all the magnetization was normal; in other stretches it was reversed, and on some stretches normal and reversed were found close together. Such results show that one must be cautious about interpreting all reversals as due to a field reversal and the problem of deciding which

reversed rocks indicate a reversal of the field may in some cases be extremely difficult. To prove that a reversed rock sample has been magnetized by a reversal of the Earth's field, it is necessary to show that it cannot have been reversed by any physio-chemical process. This is a virtually impossible task since physical changes may have occurred since the initial magnetization or may occur during certain laboratory tests.²⁴

Permanent Magnetization of Rocks Is Found to Be Ill-defined

Chapman and Bartels, in their treatise *Geomagnetism*, give very little credence to the use of magnetization in rocks as an indication of the past state of the earth's magnetic field. They point out the difficulties in the following reference to the work of E. Thellier.

Thellier has developed convenient and accurate apparatus for such studies, and has made extensive measurements on rocks, bricks, and other objects of baked clay. After reviewing the evidence afforded by his own and other measurements, he concludes that the permanent magnetization of rocks is ill-defined, and gives no safe basis on which conclusions as to the past state of the earth's magnetism can be arrived at.²⁵

However credence is given to the use of magnetic measurements associated with less old objects made of *baked clays*, as can be seen:

Objects of baked clay, on the contrary, appear well suited to this purpose, when adequate particulars concerning them are available. By measurements on the magnetism of French bricks of known age, dating from A.D. 1400 onwards, he has obtained what he regards as a reasonably probable curve showing the variation of magnetic dip from this time until actual dip observations were made, at about A.D. 1780, for Paris. The later part of his inferred curve fits on well with the actual observations made at Paris, and also runs reasonably parallel with the earlier part of the dip-curve for London.²⁶

The London data extend back to 1540.

One obvious complicating factor in using rock magnetization to interpret the history of the magnetic field is local disturbances. For example, *lightning can magnetize rocks*. Strangeway, in attributing "erratic" effects in the remanent magnetism to lightning, states: "It is probable that much of the scatter observed is the result of lightning strikes."²⁷

Stresses and Folding May Alter the Orientation of Rock Magnetization

In addition to the four mechanisms for self-reversal which Néel discussed, Doell and Cox

(1967) point out that *magnetostriction* (magnetization causing change in dimensions of the body and the converse effect of stress on the body causing changes in the magnetization) can cause "remanent magnetizations of rocks to be in directions that are not those of the fields acting when remanent magnetization was originally acquired."²⁸

Alteration of the direction of remanent magnetization by pressure and other stresses is important. The effects of magnetostriction should not be overlooked in attempting to explain the magnetic variations where strata have been subjected to great stresses. To date that seems to have been ignored in selecting orientations for the reversal chronologies.

For example, the magnetic reversal anomalies near the floor of the ocean have been proclaimed as evidence of the reversals of the earth's dipole field; whereas great upheavals and folds in the earth beneath the oceans must certainly have yielded profound magnetostrictive effects, altering the orientation of the magnetization in the rocks.

Folding in rock formations may physically change the orientation of the rock. Hence the direction of the magnetization may be reversed where the formation has been folded backward. Magnetization in folds has been interpreted in two different ways: 1) that its direction of magnetization has been reversed by that movement, or 2) that the magnetization took place after the folding and was not affected by the fold. These interpretations have been an either-or option selected to fit the "assumed" history.

Conclusion

It is clear that paleomagnetic arguments for reversal of the earth's magnetic field are not conclusive and depend in the main on arbitrary interpretations of selectively chosen samples. Cowling's general theorem puts any geomagnetic dynamo theory into the category of the implausible. No acceptable dynamo theory to sustain or oscillate the earth's magnetic field has ever been conceived nor is one very likely.

Hence one may conclude that the strongest theoretical and observational evidence supports Horace Lamb's theory of freely decaying currents as the source of the earth's magnetic field. That theory implies an initial (created) field in the not too remote past. Extrapolation backward for

as much as twenty thousand years yields an implausibly large magnetic field.²⁹ The earth's magnetic field must be very young compared to the so-called "geologic age."

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SOME OBSERVATIONS ON THE SCIENCE OF NUTRITION IN THE LIGHT OF THE SCRIPTURES

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We are what we eat. That, of course, is quite true from a physical point of view. All our food comes from the ground. Even if we eat meat the original source of the food was the earth for "All flesh is grass." (Isa. 40:6) In the original creation the animal kingdom was noncarnivorous, and during the millennial reign of Christ on earth (Isa. 65:25) all animal life will again become vegetarian.

In eating our food we are really eating the earth and we are told that man was to eat of it "in sorrow" (Gen. 3:17) all the days of his life. "In the sweat of thy face shalt thou eat bread, till thou return unto the ground; for out of it wast thou taken: for dust thou art, and unto dust shalt thou return." (Gen. 3:19)

But the ground from which we derive our food has been cursed by God and we are told that it was cursed for man's sake. It was the ground (adamah) or top soil that was involved, not the planet, earth (eretz). This curse will remain upon the land until our Lord returns to establish His kingdom. (Rev. 22:3) As a result of this judgment, the earth was to bring forth thorns and thistles. (Gen. 3:18) The crown of thorns (Matt. 27:29) was a symbol of the curse.

Effects of God's Curse

Merson Davies¹ has pointed out that thorns are evidence of arrested growth in the branches. This is proved by the fact that they often disappear as a result of improved agronomy. The wild apple, for example, is a thorny plant but with proper cultivation the thorns disappear completely, and the same is true of the pear and the plum tree as well. Marie Stopes² has stated that "in the cactus the leaves are all reduced to needle-like spines."

It is also interesting to note that, according to the Geological Society of London³ the earliest forms of cactus (Cactareae) are found in the Pleistocene, that is the time when man first appeared. Hugh MacMillan⁴ has stated that "not one indisputable thorn or thistle has been found in the older rocks." These observations would indicate that the Divine judgment in Eden must have occurred comparatively recently.

The pappus in thistles is an abortive form of the calyx which has been changed into hairs so that it can be blown about in all directions and

thereby add to man's labor in the cultivation of the soil. Arrested development in the vegetation would, therefore, appear to have been the result of the Divine judgment, and since all the ground has been cursed all of our vegetation must have come under the same influence to a greater or less extent.

The curse upon the serpent was of a similar nature in the arrested development of its limbs (Gen. 3:14) as a consequence of which it was compelled to crawl on its belly. The loss of speech in the animal creation may well have been due to the same cause and we are reminded of the fact that the serpent spoke in the garden of Eden (Gen. 3:1) before it was cursed. Moreover, the story of Balaam's ass (Numbers 22:28) illustrates the fact that the function of speech is still dormant in animals.

Dr. Gertrude Himmelfarb⁵ has quoted Buffon to the effect that in the orangutan "the tongue, and all the organs of voice, are exactly the same as in man, and yet this animal does not speak: the brain is absolutely of the same form and proportion, and yet it does not think." It would appear, therefore, that there is a missing link somewhere between the organ of speech and the brain which, if the two were connected, would enable this creature to speak. Some faculty may have been arrested in the development of the orangutan and in other animals as well.

The wings of birds which are incapable of flight are another example of abortive structures or what MacMillan⁶ has described as "frustrated design." There are no such elements in man, however.

Darwin⁷ stated that "rudimentary organs will speak infallibly with respect to the nature of long-lost structures." His idea was that the so-called vestigial organs were once required by our ancestral forms in the course of evolution but that they are no longer needed by the organism today. Wierdersheim, the German anatomist, listed 180 of these structures in the human body. But with the increase of knowledge it has been found that every one of them has an important function. There are, indeed, no vestigial remains in nature but there is evidence of arrested or abortive development.

In this connection it is well to remember the importance of trace elements in the diet. Small amounts of copper are essential for the metabolism of iron in the hemoglobin. Unless sheep and cattle receive a little boron in their diet they develop pining disease and die like a love sick girl. The amount of these trace elements which

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is necessary in order to maintain health is very small.

As a result of the curse man has been compelled to till the soil with hard labor in order to produce enough food to live ever since he was expelled from the Garden of Eden. Cultivation of the land has usually been combined with animal husbandry which provides a natural enrichment of the soil.

But in 1840 Liebeig, the German scientist, introduced the modern fertilizers which are now so widely used. Rogation Days which come before Whitsuntide were once a time of prayer and fasting for Divine blessing on the crops. It was the custom in those days for the parish priest to bless the land at this time in order to insure a bountiful harvest.

However, with the advent of modern fertilizers the peasants discovered that they got just as good results with the fertilizers, if not better, than they did with prayer and fasting, as a result of which supplications to God and the priestly blessing were eventually discarded. Thus science has replaced faith in the cultivation of the soil.

Water, Air, Sunlight and Life

Water is absolutely essential to life. Some organisms can live without oxygen but no creature can exist without water. About 70% of the human body is water and 70% of the surface of the earth is covered with water. Water is a very simple compound, composed of H⁺ and OH⁻ ions, acid and alkali, in equal proportions, thus forming a perfect neutral solution. There is no indisputable evidence that water exists on any other planet.

Air is also essential to life, both animal and vegetable, with the possible exception of the few anaerobic forms. With the birth of an infant the air enters its lungs and the child begins an independent existence. It is well recognized that the first few minutes after birth are of vital importance. Unless respiration is started immediately irreparable damage may be caused to the brain. Air is the only element necessary for life that is not derived from the soil. It is truly amazing that man, the destroyer, should pollute the land and water and air all of which are essential for his own survival.

Perhaps sunlight should be mentioned as another extraterrestrial essential to life. This element is necessary in the photosynthesis of the vegetation which is eventually consumed by the animal kingdom, including man. But, although sunlight is needed to provide our food, we do not actually consume these rays.

In a recent paper by Jon Tinker,⁸ it has been shown that "the relative atomic stabilities of different elements determine their cosmic abundances which can be checked by analysis of

meteorites. The earth's crust follows the same cosmic pattern, and any human tissue is approximately similar." Thus we see that from a physical point of view man is indeed only the dust of the earth composed of the same elements in the same relative proportions as the rest of the universe.

The cash value of the elements in a human body would be about \$3.50 at today's prices. None of the radioactive elements except potassium-40 is present to any great extent and none of the precious metals except for minute traces of silver which are found especially in the thyroid and tonsils. Gold is present in sea water but it is never found in marine organisms or in man.

Very frequently one hears people complain today of lack of energy. Since we are what we eat physically and since our bodies are derived from the earth, it may well be that as a result of vandal cropping and improper cultivation of the soil we are not getting out of the earth what is needed to sustain life at its maximum level. The solution to all our physical and mental ailments may eventually be found in the soil. We are reminded of the tree of life whose leaves will be "for the healing of the nations." (Rev. 22:2)

But man is much more than just a lump of clay. Man was created in the image of God, three in one and one in three; body, soul and spirit. (1 Thess. 5:23) It is well to remember that "man shall not live by bread alone, but by every word that proceedeth out of the mouth of God." (Matt. 4:4) Spiritual nourishment is just as important as our daily food, if we are to attain to our full stature in the image of God. The Word of God has an important role in the science of nutrition.

Milk, Honey, Lentils and Alcohol

At the time of Moses the land of Canaan was flowing with milk and honey. Milk contains all the necessary ingredients to maintain life, protein, fat, carbohydrates, mineral salts, vitamins and water. Honey is composed largely of glucose and has no other particular food value. The sugar, however, gives us a quick pick up of energy and is a supplement to the essential elements of life by adding CO₂ to the bloodstream. Intravenous glucose is widely used in medicine today in the treatment of serious illness.

The story of Daniel (Dan. 1) in the court of Nebuchadnezzar shows the value of lentils, a small bean common in Egypt, in the treatment of one's complexion. Lentils may, indeed, be one of nature's own cosmetics, and they have been used in the treatment of acne. It would be interesting if some active principle in the lentils could be isolated and perhaps used to improve the complexion and for the treatment of this distressing complaint of adolescence.

Ever since the days of Noah (Gen. 9:21) man has consumed alcoholic beverages to excess. If taken with food the alcohol is absorbed slowly, but when taken on an empty stomach it is rapidly injected leading to a high alcoholic content in the blood. As the majority of alcoholics stop eating almost entirely when they go on a spree this may lead to delirium tremens and eventually to irreparable mental deterioration. Food containing thiamine, that is vitamin B₁, is necessary to protect the nervous system from the effects of alcohol.

During the days of prohibition no beverage in the U.S.A. could be sold with a content of more than 1/2 of 1% of alcohol according to the Volstead Act. But freshly baked bread may have an alcoholic content up to 3 or 4 per cent. As the bread dries out, however, the alcohol soon evaporates.

No one knows when he begins to drink whether he will end up as an alcoholic or not. One out of nine casual drinkers becomes an alcoholic. The earmark of an alcoholic is that when he takes one drink he cannot stop drinking. This is true even after 20 or 30 years of abstinence. The modern idea is that alcoholism is a disease, something like an allergy. No doubt it is harder for some people to drink moderately than it is for others, but from a spiritual point of view we recognize that alcoholism is sin and that only the grace of God can save a drunkard. Lint and Schmidt⁹ have shown that the number of alcoholics in a community is directly proportional to the total amount of alcohol consumed in that area. Rather than seeking to treat the alcoholics as an isolated group, every effort should be made to reduce the total consumption of alcohol and thereby decrease the number of alcoholics.

Tea and coffee are usually regarded as harmless non-intoxicating beverages and no doubt they serve a useful purpose. Some people get a quick pick-up from the small amount of caffeine in these beverages. But it is well to remember that both tea and coffee contain the astringent principle of tannin which is used to make leather out of the hides of animals.

"Dust thou art" and, as we have seen, each one of us is physically a part of the earth and "the earth is the Lords." (Ps. 24:1) But the earth is growing old. According to the principle of uniformity the earth and the universe will continue for millions of years until they finally burn out. But God has said that "the earth shall wax old as a garment." (Isa. 51:6) With the population explosion there just isn't enough land to go around so that every one may live in comfort. There are no more continents to plunder. "Nevertheless we . . . look for new heavens and a new earth, wherein dwelleth righteousness." (2 Peter 3:13)

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A GENERAL ANALYSIS OF THE BIBLICAL "KIND" (MIN)†

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*The biblical term **min** ("kind") is examined with regard to its etymology, form, and usage. It is shown that **min** is a strict classificatory term denoting definite "units of creation" and not a term signifying merely that "like begets like." The article concludes with a general analysis of the Mosaic lists of clean and unclean animals as a preliminary to an investigation of the taxonomic extent of the **min**.*

Introduction

Christian evolutionists contend that the phrase "after its kind" merely expresses the fact that life reproduces its overall pattern by embryos, seeds, or fruits^{1,2} Though this is of course true, in

addition, the "kinds" or *min* are distinct entities which did not result from any evolutionary process but are the direct "units of creation."

The Etymology of Min

The term *min* has been associated with the Hebrew *manah*,³ to distribute by number, order, or class of things.⁴ Some scholars associate it with *temunah*,⁵ i.e. form or representation, from the root meaning "to think out." Others claim it has an Arabic root meaning "split" or "division."⁶

†This article is dedicated to the memory of Dr. Jacobus Johannes Duyvené de Wit (1909-1965), late Professor of Zoology at the University of the Orange Free State, Bloemfontein, South Africa.

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This is from relatively late Arabic texts and post-Biblical Hebrew. In Biblical and inter-Testamental Hebrew, *min* is used only to specify a kind of animal or plant.

Grammatical Form

The term *min* occurs 31 times in the Old Testament,⁷ of which 30 are in the books of Moses and one in Ezekiel. It is always used in the singular with respect to the type of life it describes, even when the latter is plural (as in Ezk. 47:10).⁸ Thus it is a collective noun like the word *daghah* used for fish.⁹

The term *min* is followed by five suffixes, two masculine, two feminine, and one plural.¹⁰ This indicates that *min* is used to provide formal specification. It is always used with the *lamedh* preposition (1^e), thus indicating reference to a norm or standard and the suffixes give this preposition some distributive force¹¹ as in “according to all its kinds.” The presence of the preposition further substantiates the conclusion that the purpose of *min* is to provide formal specification.

Context of Use

In Genesis One the emphasis falls on the original distinction of kinds and on their individual continuance. In verses 24-25 we are told that on the sixth day God “made the beasts of the earth according to (all) their kinds and the *behemah* according to (all) their kinds and all the creepers of the ground according to (all) their kinds.”

Earlier, in verses 11-12, it is written of the plants that “the earth caused to go forth fresh-shoots, plants seeding seed according to (all) their kinds and trees making fruit as to which their (the trees’) seed is in it (the fruit) according to (all) their (the trees’) kinds.” This emphasis on the seed should be particularly noted for like so many emphases in these early chapters it provides a theme which continues through Scripture. In particular the phrase “*asher zar’o bho leminehu*” (“as to which his seed is in it according to his kind”) is alluded to in I John 3:9: “Everything that has been begotten of God does not commit sin because *His seed abides in him* and he is not able to sin because he has been begotten of God.”

In Genesis 8:19 the term *mispachah* is used instead of *min* as in Genesis 7:14. Now this term denotes extrinsic relationship and not genetic or intrinsic blood relationship. As Speiser¹² concludes, it is used “basically as an administrative rubric.” When blood relationship is indicated such terms as *am*, *moledheth* (kinsfolk) and *yach* (kinsfolk from *chuyah* “to live”) are used. This indicates that the different *min* are genetically unrelated and that even members of one *min* may not be genetically related.

In contexts where the possibility of cross-breeding is in view a different word, *klayim*, is used (Lev. 19:19, Deut. 22:9). For this word the meaning “of two kinds” is given, the lexicons referring to the Ugaritic *kl’t ydy* (“both my hands”) and to Akkadian, Arabic and Ethiopic roots meaning “both.” The implication is that different *min* cannot produce hybrids.

The Limits of the Min

The only passages which shed light on the precise limits of the *min* are the food law passages in Leviticus 11 and Deuteronomy 14. These passages are therefore of crucial importance and this section will deal with several general points.

The first and major point concerns identification. It is usually stated that although several of the animals in these lists can be definitely identified, a very large number cannot.¹³ But after a thorough study of the lists, I have come to a much less pessimistic conclusion. There are so many constraints that in most cases there can be little doubt as to the identification.

In the first place the exact meaning of the Hebrew class names must be considered. Figures 1-5 present a detailed analysis of these. However it must be borne in mind that these terms are those of the everyday language—they are *not* used with scientific precision.

In everyday English the term “bird” may be used of all feathered vertebrates, or restricted to those hunted as game, and the term “animal” may include or exclude man, or may be restricted to quadrupeds.

So it is in Hebrew. The term *behemah* is often used in reference to all quadrupeds and not simply to those which bear hooves. Similarly *tsippor* may be used of all birds or only of song-birds. Nevertheless the figures do give the stricter meanings which apply in the passages under investigation.

It should also be noted that the Hebrew classification cuts right across our modern biological classifications. An attempt to reconcile the order of creation in Genesis One with the evolutionary interpretation of the fossil record is consequently quite futile.

The second constraint is the recorded characteristics of the clean or unclean groups. For example, the A.V. translation “beetle” for a name in Leviticus 11:22 is quite incompatible with the definition of the group given in verse 21.

The third constraint is the presence or absence of the phrase “in all its kinds.” Terms with this qualification clearly denote a greater variety of animals than those without it.

The fourth constraint is the available philological and contextual evidence. In Hebrew a name was far more than a mere identifying label; it was usually intended to mark out the most

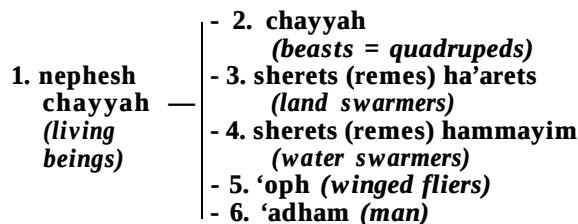


Figure 1. The Biblical Classification. 1. Outline.

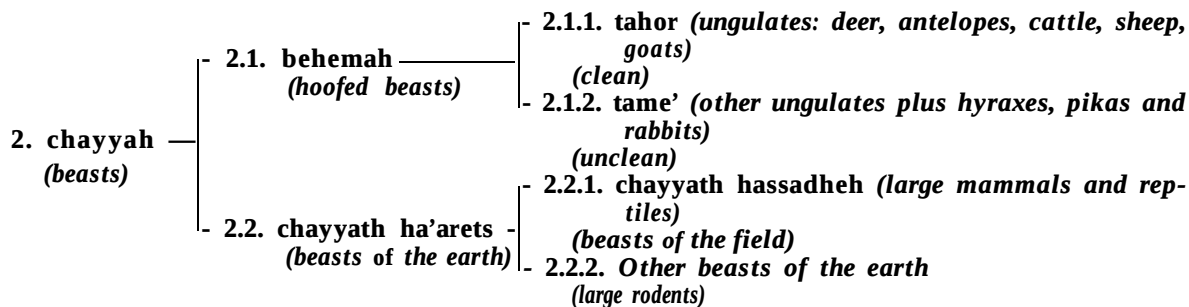


Figure 2. The Biblical Classification. 2. Beasts.

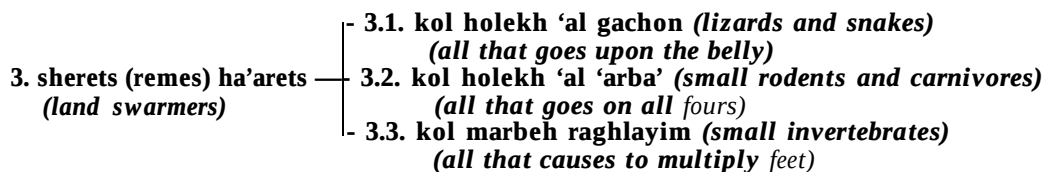


Figure 3. The Biblical Classification. 3. Land Swarms.

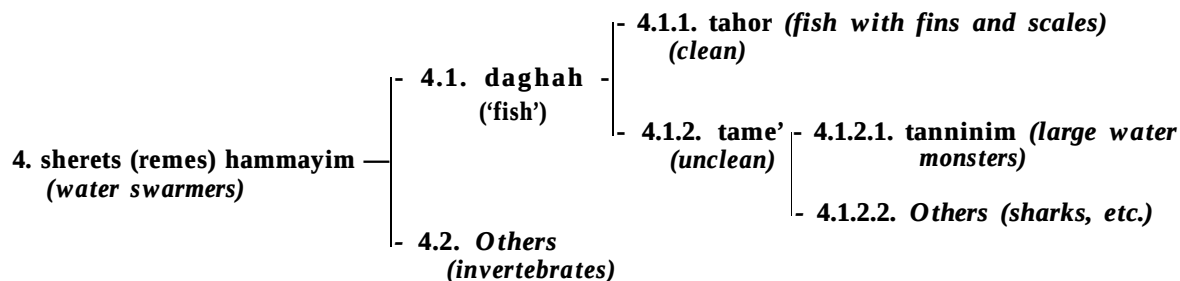


Figure 4. The Biblical Classification. 4. Water Swarms.

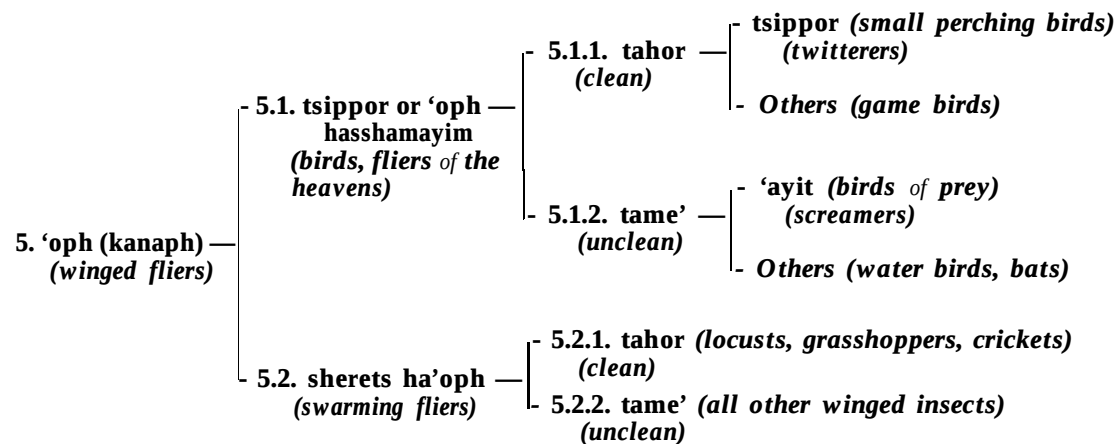


Figure 5. The Biblical Classification. 5. Fliers.

striking features of the thing in relation to man, e.g. 'orebh, "black one," raven (Dt. 5:11),¹⁴ 'arbeh, "abundant one," locust (Jdg. 6:5, 7:12). This class of evidence may therefore be very valuable.

The fifth constraint complements the previous one. This is the available biological evidence. This comprises both the lists of species which are found in the Bible lands (here primarily Egypt, Sinai and Palestine) and the available information on their characteristic behavior, ecology, etc.

Sixth, there is the available archeological evidence. The major sources of information on the animals of the Bible lands are, of course, the lists and discussions which deal with the animals *found there today*. It is therefore important to know whether these give us a true picture of the fauna of Moses' day.

Bodenheimer¹⁵ has analyzed the archeological evidence and come to the reassuring conclusion that throughout the historical period the fauna has remained basically unchanged; there has been no addition of new elements. There has been, however, a continuous reduction and thinning of the fauna such that many groups are now smaller in numbers and diversity than they were 3,000 years ago. Animals that are now restricted to areas outside the Bible lands (e.g. hartebeests) were then present, sometimes in abundance.¹⁶

The final—and most important—constraint is the structure of the lists. A major defect of modern exegesis has been the general failure to judge the Hebrew text in terms of its own principles of structure.¹⁷ When this is done a number of suggested identifications are at once excluded.

An analysis of structure is also important as regards the usage of the term *min* in the lists. If the addition of the phrase "in all its kinds" indicates that the type of life described comprises several kinds, then can we assume that where the phrase is not used we are dealing with a single kind or with a subdivision of a single kind? To answer this question a careful analysis of the structure of the lists must be made.

The Structure of the Lists

The (fuller) Leviticus list distinguishes six groups of animals which are dealt with in order: hoofed animals (11:2-8), water animals (11:9-12), fliers (11:13-19) swarming fliers (11:20-23), beasts (11:27), and land swarms (11:29-38). These groups are analyzed in Figures 1-5. In the lists, clean and unclean types are distinguished and the larger groups also reveal an ecological sub-grouping.

Within each group or subgroup the animals are listed in descending order of size. This was the usual practice in the ancient faunal lists and it is observed throughout these chapters.

In the case of terms which denote several forms it is the most prominent and well-known which determines the place in the list. However it must be emphasized that the size-grading is often approximate and general rather than scientifically exact.

These lists were written to enable all the Israelites to distinguish the clean and unclean animals. Consequently even the order is based on characteristics which allow easy distinction.

In most cases size is the most useful criterion, but when several forms of the same range of size are listed, characteristics other than size will determine the order. In such cases the size-grading will not be exact.

For example the griffon vulture heads the list of unclean birds. This is the commonest large vulture in Palestine and frequently mentioned in the Bible. It is therefore fittingly placed first, though in point of fact the less common lammergeier and black vulture are slightly larger. However in no group is a large animal placed after a distinctly smaller one.

The lists begin with the names of ten clean *behemah* (Deut. 14:4-5). The first three comprise the domestic forms: cattle, sheep and goats; the fourth and fifth comprise the wild forms of the forest and field; and the remainder are the wild forms of desert regions. The phrase "in all its kinds" does not occur and evidently in no case is more than a single kind involved.

There then follows a list of four unclean *behemah* (Lev. 11:4-1; Deut. 14:7-8), arranged into two unequal groups: three animals which do not divide the hoof and one which does not chew the cud. "In all its kinds" does not occur so we may conclude that, in the first group at least, no more than one kind is involved in each case.

Groups which contain only one name present particular problems. In these cases it may be that only one kind is involved, but it may equally be that although several kinds are involved these were difficult to distinguish (usually because of the animals' way of life) and normally were not distinguished.

In the latter case neither a more thorough analysis nor the addition of the phrase "in all its kinds" could serve any practical purpose (remembering again that the purpose of the lists was *not* scientific). It is fairly easy for the biologist to distinguish these possibilities, but since we have no *Biblical* criteria, these one-name groups will be excluded from later consideration.

The bulk of the list—the unclean birds (Lev. 11: 13-19; Deut. 14: 12-18)—presents more problems, but seems to be constructed as follows:

(1) Predatory and scavenging land birds (Lev. 11:13-17a, c; Deut. 14:12-16b).

(2) Long-toed marsh birds (Lev. 11:18a; Deut. 14:16c).

(3) Short-legged water birds (Lev. 11: 17b, 18; Deut. 14:17).

(4) Long-legged water birds (Lev. 11:19a, b; Deut. 14:18a, b).

(5) Hoopoes (Lev. 11:19c; Deut. 14:18c).

(6) Bats (Lev. 11:19d; Deut. 14:18d).

Groups (1), (3) and (4) list several types of bird and in two of these groups the phrase "in all its kinds" occurs. Evidently the other types comprise only one kind or a lesser division. Groups (2), (5) and (6), however, contain only one name and we can come to no conclusion, based on Biblical evidence. However the diversity of Palestine bats would certainly seem to comprise more than one kind, although the habits of bats have always meant that it is very difficult to distinguish them in the field.¹⁸

The next part of the list covers clean insects (Lev. 11:22). The definition of these ("flying swarming things that go upon all fours" and "which have legs above their feet with which to leap over the earth" Lev. 11:20-21) restricts us to the *Saltatoria* (*Orthoptera*) — the locusts, grasshoppers and crickets. As in all the groups of the lists, the order is from large to small.

The first name occurs 24 times in the Old Testament in contexts which leave no doubt that it denotes the large migratory locusts (with wing spans up to 15cm). The fourth occurs five times, usually in contexts which emphasize its smallness. It would include the small locusts.

The other two are *hapax legomena* and so constitute a special difficulty. They presumably cover the remaining *Saltatoria* — crickets and long-horned grasshoppers. In each case more than one kind is said to be embraced by the name.

The final section of the list deals with the unclean land swarmers and contains three unequal groups: the small carnivores (Lev. 11:29); the small rodents (Lev. 11:29) and the lizards (Lev. 11:29-30). Since the first two contain only one name we can come to no conclusion regarding the kinds involved. The third group, however, has six names of which the first bears the phrase "in all its kinds." Thus in the other cases we may assume that only one kind is involved.

Conclusion

Min is a strict classificatory term. It denotes definite "units of creation" and not simply that "like begets like."

The different *min* are genetically unrelated.

The Mosaic lists of clean and unclean animals do permit an analysis of the limits (or taxonomic extent) of the *min*.

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- ⁴Parkhurst, *Ibid.*
- ⁵Koehler, L. and W. Baumgartner. 1953. Lexicon in veteris testamenti libros. E. J. Brill, Leiden, p. 519 and p. 1031 (*temunah*).
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- ⁸Delitzsch and Gesenius argue that *leminehem* (Gen. 1:21) is plural "according to their kinds." Such indeed is the *Oere* (the text to be read as "vocalized" by Massorettes), but the *Kethib* (the text as written in the Hebrew consonantal script) is singular. The latter is undoubtedly correct.
- ⁹Cf. the general use of singular nouns to express kinds or classes of things (Davidson, A. B. 1901. Hebrew syntax. Third Edition. T. & T. Clark, Edinburgh, Sec. 17.
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- ¹⁴Driver, G. R. 1955. Birds in law. *Palestine Exploration Quarterly*, pp. 5-20. Driver regards 'orebh as descriptive of the call (cf. Greek *korax*) rather than being derived from the root meaning "black."
- ¹⁵Bodenheimer, F. S. 1960. *Op. cit.* (See Reference 13.)
- ¹⁶Bodenheimer, F. S. *Ibid.*; Cansdale, G. S. 1970. Animals of Bible lands. The Paternoster Press, London. Chapters I and II.
- ¹⁷For general discussion of this point see Lund, N. W. 1942. Chiasmus in the New Testament. The University of North Carolina Press. (Chapters III-V cover the Old Testament) and Ozanne, C. G. 1970. The First 7000 years. Exposition Press; New York (Incidentally this work is the best Biblical Chronology available).
- ¹⁸Consequently few, if any, languages contain more than one or two words for bats.

COULD THERE BE LIFE ON OTHER PLANETS OF THE SOLAR SYSTEM?

O. M. ERPENSTEIN*

The author considers life as we are familiar with it on the earth. The conditions under which such life exists are discussed, and then compared with whatever conditions, that might be suitable for such life, are to be found on the other planets of the solar system.

Introduction

It has been conjectured that life could exist on any other heavenly body, so constructed as to be able to exist in that particular environment. The inception of this thought, though in many circles it is rather widely held, is probably due to the French astronomer Camille Flammarion, who goes to great length on this matter in his *Popular Astronomy*. There is an out of print translation of this by Gore which may be found frequently in second-hand book stores.

Since such speculation has become rather common, the reader should understand that this article involves only life as we know it. Life, in any other form, is no more than a metaphysical speculation, incapable of proof.

What the real essence of life, in a scientific sense, is we do not know, and for that matter we might say with Dubois Reymond, *ignorabimus*, that is, we shall never know, in a scientific sense, i.e., in terms of physical or chemical law.

Certain Life Requirements

All living organisms are made up of a combination of various types of cells. There are single-celled organisms (protozoa) and multi-celled organisms. Single-celled organisms multiply by cell fission and in some cases sexual union, while in the more highly organized multi-celled organisms the reproductive functions are kept separate.

Life as we know it involves assimilation of oxygen by the animals, the *fauna*. In their metabolism the combustion product of carbon and oxygen, carbon dioxide, is released. In turn, with the plants in the light, the overall exchange is the reverse, carbon dioxide being absorbed and oxygen released. Here we can see a balance of natural events. However, the believer will see in this a marvelous provision by the all-wise God.

Consider now the conditions under which animals, including man, can exist. The factors of prime importance are pressure, temperature, and humidity. The latter becomes extremely important because life as we know it is impossible without water. Thus the chemical composition of the human body is predominantly water, the remainder consisting of a variety of chemical compounds that were around the year 1920

worth perhaps \$.75 (which today has probably risen to \$3.00, plus tax). Life as we are familiar with it cannot exist in the absence of water.

The atmospheric pressure limitations are from about 8 p/in² to 15 p/in². The larger value obtains at sea level. The smaller value is found in high mountainous regions, such as the South American Andes, where mules instead of horses must be used, since horses cannot live, or at least cannot work, in a very rarified atmosphere.

From the standpoint of human comfort the range of temperatures is extremely limited. Some people are quite comfortable at 60°F, while others require an "incubation" temperature of 80°F and perhaps 85°F. At any rate, *comfortable* limits of temperatures are from 60°F to 85°F. Temperatures of the outdoors go beyond these limits. In Arctic or Antarctic regions we may find -80°F, while the highest recorded, in the Sahara Desert, is close to +160°F (in the shade). For any appreciable length of time such temperatures are of course intolerable.

Relative humidity is the percentage of water vapor in the air as compared to the percentage the same volume of air *could* hold at a given temperature. For most people 40% relative humidity is about right.

Much higher than this (though many tropical plants require it—Orchids ca. 75-85%), results in discomfort, especially in a high temperature. Here the automatic refrigeration of the human body is hampered, i.e., you cannot perspire. Perspiration involves evaporation of water, which will in turn lower the body temperature. On the other hand, too low a relative humidity with a high temperature promotes excessive perspiration, tending to reduce the water content of the body and causing fatigue.

These points are stated to emphasize how important the balance of water is. If water is completely absent we need not talk about life as we know it. Depending on the individual, especially if a large amount of adipose tissue exists, the person can probably go without food for a month or more; but he cannot live without water for much in excess of three days.

General Features of Planet Orbits

Let us consider next the basic life factors on each of these planets as compared to the limits previously given for the earth.

The eccentricity of the orbit of Mercury is such that the ratio variation of its distance from

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Table I
Physical Data of the Solar System¹

Object	Distance from sun in astronomical units ²	Period of Revolution (d = days, y = years)	Time of Rotation (d = days, h = hours, m = minutes)	Diameter miles
Mercury	.3871 (av.)	88 ^d	59 ^d	2900
Venus	.7233	225 ^d	243 ^d	7600
Earth	1.0000	365 ^{d3}	23 ^h 56 ^{m4}	7913
Mars	1.5237	687 ^d	24 ^h 37 ^m	4200
Jupiter	5.2028	11.86 ^y	9 ^h 50 ^m	86800
Saturn	9.5388	29.46 ^y	10 ^h 02 ^m	71500
Uranus	19.182	84.01 ^y	10 ^h 45 ^m	29400
Neptune	30.0577	164.79 ^y	15 ^h 48 ^m	28000
Moon	_____	27 ^d	27 ^d	2160
Sun	_____	_____	24.7 ^d	864000

(Note: Figure 1 provides a scale drawing of planet size in relation to the sun.)

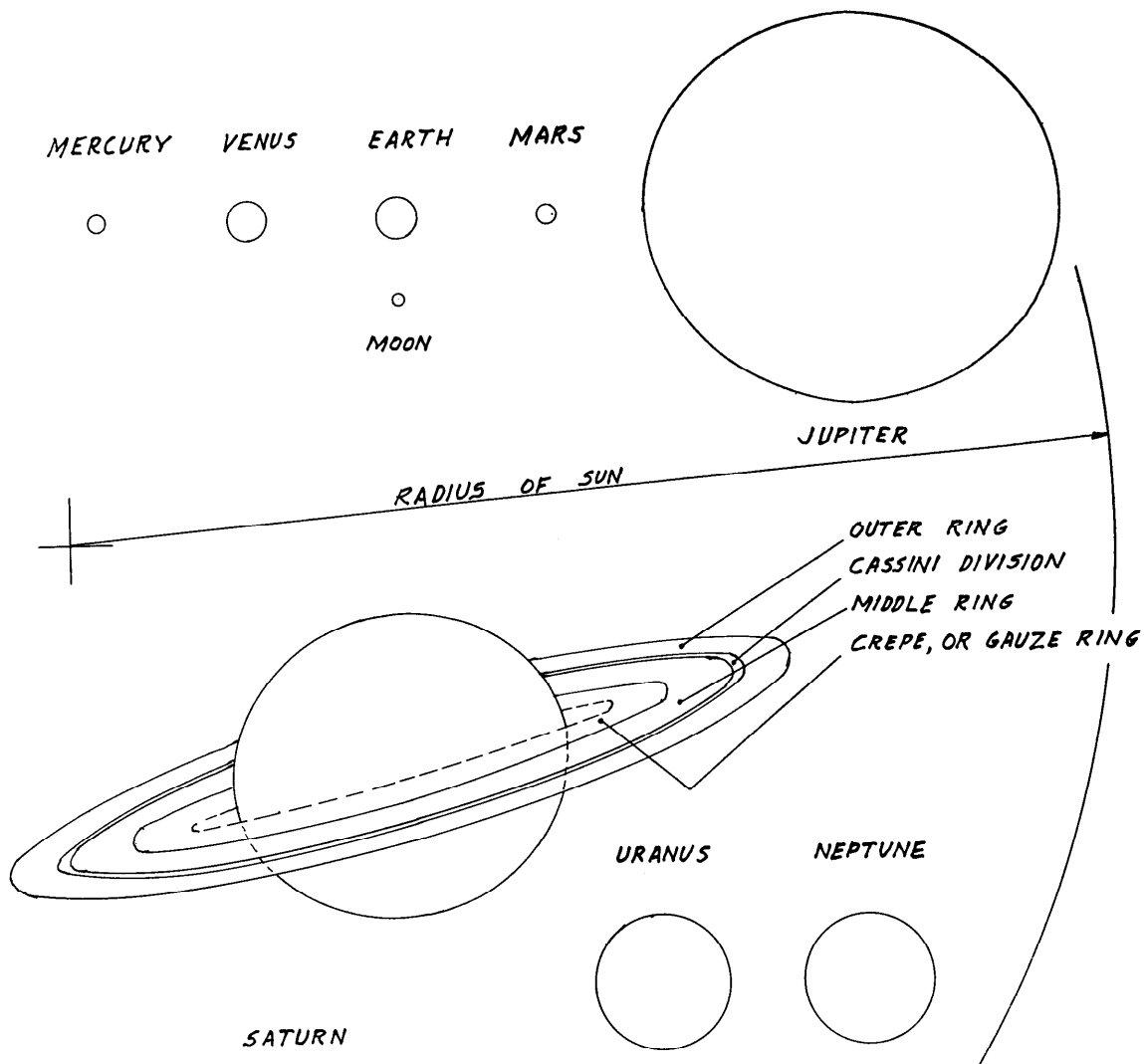


Figure 1. Scale drawing of planet size in relation to the Sun. Scale is .5 inch for earth's diameter.

the sun is 3:2. This would make the light and heat variation in the ratio $3^2:2^2 = 2.25:1$, which would clearly result in a most uncomfortable change for light and heat received from the sun.

The orbit of Venus is almost circular ($e = .007$.)

The distance of the earth from the sun varies by 3,000,000 miles. The closest approach is during the Northern hemisphere's winter. However, this variation of distance because of the eccentricity of the earth's orbit has no sensible effect on the seasons, the percentage variation being only $3,000,000/93,000,000 = .032 = 3.2\%$ —very small.

The eccentricity of the orbit of Mars is again fairly large. It is .093. A simple geometric calculation will show that the ratio of distance variation is 1.2:1, making light and heat received from the sun $1.2^2:1^2 = 1.44:1$. This is much greater than for the earth and would result in perceptible seasonal variations, even though the inclination of Mars' axis of rotation is 24° , almost the same as the earth's.

In passing we note that the orbit of Neptune is also almost a circle, the eccentricity being only .009.

Pluto has been omitted from Table I. It need not be given serious consideration because the low temperature is probably close to zero on the absolute scale. Many observers look upon Pluto as a rather erratic asteroid of large size. The orbit of Pluto is highly eccentric ($e = .249$), and the inclination of the plane of the orbit with respect to that of the earth takes it out of the classical 16° width of the Zodiac.

More Physical Characteristics of Planets

MERCURY. For many years, astronomers thought the surface of Mercury was very mountainous. It may not be unlike the surface terrain of the moon, or as recently noted in the case of Mars.⁵ There is no evidence of water vapor or oxygen. Water could not exist in the liquid state because of the undoubtedly high temperature, which need only be 200°F for an atmospheric pressure of 1 p/in².⁶

VENUS. The probe of some years ago substantiated fairly well the view of astronomers that Venus has an atmosphere with a large percentage of carbon dioxide (CO_2), and in addition, that it is heavily dust-laden. Again, the average temperature must be much higher than that of the earth's. There is some scant indication of oxygen.⁷

MARS. Recent photographs,⁸ showing Mars pitted with craters just like the moon, ought to be almost conclusive in settling the question of whether it is habitable by life as we know it. Besides, the density of the atmosphere is far below that of the earth's. The planet is actually too small, concerning mass, to hold an atmosphere indefinitely.⁹ The much vaunted canals

appear to be, in the light of photographs taken (photographs which show craters but not canals), some optical phenomenon not as yet explainable. (There are many things twixt heaven and earth that are not dreamed of in our philosophy as per Shakespeare, and this is one of them.)

The so-called polar snow caps have long ago been shown to be solid carbon dioxide (CO_2 —"dry ice"). And even if the existence of the canals were admitted, they would be visible only because of the imagined vegetation growing on their banks.

JUPITER. According to the latest model¹⁰ the atmosphere consists of hydrogen, contaminated with ammonia (NH_3) and methane (CH_4). Positively no chance for "life as we know it" on Jupiter, because of an additional fact that the average temperature is -100°F . If "life as we do not know it" could be imagined, involving a metabolism for which methane and ammonia are necessities, we have absolutely no scientific evidence. Thus, this would remain a philosophic postulate, for which a test cannot even be imagined—and it is certain that such a view cannot be considered axiomatic.

SATURN. The situation is the same as for Jupiter. Also, there is no evidence of water or oxygen and the average temperature is no doubt lower than on Jupiter.

We need hardly consider Uranus or Neptune. The temperatures there must be even considerably less than that of Saturn. Water could not exist there in the liquid state—which rules out the existence of life as we know it.

This much is now certain, without necessarily going even further, that the earth is the only planet on which liquid water is to be found, and this is absolutely necessary for the sustenance of life as we are familiar with it.

Light and Heat Received by Planets

Many other interesting facts can be brought to light. First attention will be given to the apparent diameter of the sun as seen from the various planets, which can be used to discuss the relative amount of light and heat received by these planets.

Table II
Apparent Diameter of Sun¹¹

Planet	Apparent diameter, as seen from earth = 1	Apparent diameter in angular units
Mercury	2.58 (av.)	$1^\circ 28'$
Venus	1.48	$47'$
Earth	1.00	$32' \text{ (av.)}$
Mars	.656 (av.)	$21'$
Jupiter	.194	$6' 12''$
Saturn	.105	$3' 24''$
Uranus	.052	$1' 40''$
Neptune	.033 (av.)	$1' 03''$

In connection with Table II, it will be interesting to note the apparent stellar magnitude. These are given in Table III, together with the proportion of heat and light received from the sun by each of the other planets, using = 1 for that received by the earth.

Table III
Apparent Stellar Magnitude of Sun
and Light Received¹²

Planet	Light received Earth = 1	Stellar Magnitude
Mercury	6.73 (av.)	-28.9
Venus	1.92	-27.5
Earth	1.00	-26.8
Mars	.43	-25.9
Jupiter	.037	-23.2
Saturn	.011	-21.9
Uranus	.0027	-20.4
Neptune	.0011	-19.4

In a purely general way, with the assumption that all the planets have an atmosphere of the same light-absorbing power as the earths, heat received may be taken as equivalent to light received.

While studying Table III, it is interesting to remember that perhaps the least stellar magnitude by the light of which average print may be read is that of the full moon, which is -12.6. Thus, even at the distance of Neptune, 2,700,000,000 miles from the sun, the sun is still 6.8 magnitudes brighter than the full moon, thus giving 525 as much light to Neptune as the full moon does to the earth! The sun's apparent diameter, as seen from Neptune, about one minute of arc (the average resolution of the human eye), would still be too bright to look at for any length of time without a shade screen.

Illustration of Stellar Magnitude

This effect may be illustrated by observing a very bright star, for example Alpha Canis majoris (Sirius), through a fairly large aperture. Suppose we have a telescope of 24-inch aperture. The minimum magnitude it can reach is given by the familiar formula,

$$M_g = 5 \log A + 9.2$$

where A = aperture in inches. The constant 9.2 is for the average eye. For less sensitive eyes it may be as low as 8.5, and for eyes especially sensitive to very small points of light it may be as high as 10.0. (In any individual case it must be determined by experiment. The author uses 9.6.)

Thus the lowest magnitude visible with 24-inch aperture is 16.1. Now, the average eye can see stars of the sixth magnitude. Therefore the increase is $16.1 - 6 = 10.1$ magnitude. The magnitude of Sirius is -1.4. Therefore, the magnitude for Sirius, when seen in a 24-inch, becomes

$-1.4 - 10.1 = -11.5$, i.e., very close to the magnitude of the full moon. This is intolerable to the eye, and an observer will experience a black spot "dancing" before the eye for some time.

Thus the light of the sun, as seen from Neptune, is still extremely intense—more than is needed for reading. From this point of view there is enough solar light at any of the planets for human comfort, which is about the only redeeming feature when we consider the possibility of the existence of human life on the planets.

Temperature, Physical Forces Considered

As far as temperatures are concerned, it is impossible to make any kind of accurate calculation. Perhaps the best that can be said is that the temperatures of the inferior planets, Mercury and Venus, are far too high as compared to that of the earth. If any water vapor were present, it could only exist in the superheated state. Likewise, temperatures of the planets outside of the earth's orbit are far too low. In all cases water would exist only in the solid state. But water in the liquid state is necessary for life as we know it!

The average temperature of the earth is +60°F. That of Mars is -40° (F or C).¹³ By spectroscopic methods, the calculation is -200° F for Jupiter, ammonia mainly solid, methane and hydrogen still gaseous. For Saturn it is -240°F. For Uranus and Neptune we can only conjecture, except with the certainty that it must be lower than that of Saturn. For the planets Mercury and Venus it must be extremely high: +800°F and +500°F for Mercury and Venus respectively might seem a fair approximation. It should be noted that +800°F is high enough to vaporize lead, which has a melting point of about 700°F.

Also questions of physical forces must be considered. The human body, as an example, is fearfully and wonderfully designed. The same applies to the vertebrate animals. The skeleton in all cases is designed to withstand all common stresses. The forces that produce these stresses depend on the value of gravity (g), which on the earth, and, curiously, almost the same on Uranus, is 32.173, or, for practical purposes 32.2 f/s². Table IV contains data that will help illustrate this matter.

One can hardly refrain from considering some of these aspects in a humorous vein. Consider the weight-conscious lady, tipping the scales at 250 pounds on the earth. On the moon her weight would have been reduced to 40.5 pounds, and without dieting! However, were she to live on Jupiter, she would tip the scales at 663 pounds, nearly one-third of a ton.

Appearance of Sky, Sleep Considered

We can, of course, also think about the appearance of the sky as seen from the different planets,

Table IV
Surface Gravity of Planets and Related Matters¹³

Planet	g	$\frac{g}{\text{Earth}} = 1$	Spring Scale weight, Earth = 250 pounds (p)	Distance (in feet) jumped vertically with same effort as three feet on earth
Mercury	12.05	.375	93.5	8.0
Venus	28.3	.96	220	3.4
Earth	32.2	1.00	250	3.0
Mars	12.6	.53	98	7.7
Jupiter	85.2	2.65	663	1.0
Saturn	37.7	1.17	293	2.5
Uranus	34.1	1.06	265	2.8
Neptune	44.1	1.37	343	2.2
Moon	5.2	.162	40.5	18.5
Sun	894	27.8	6950 = 3½ tons, nearly.	1.25 inch

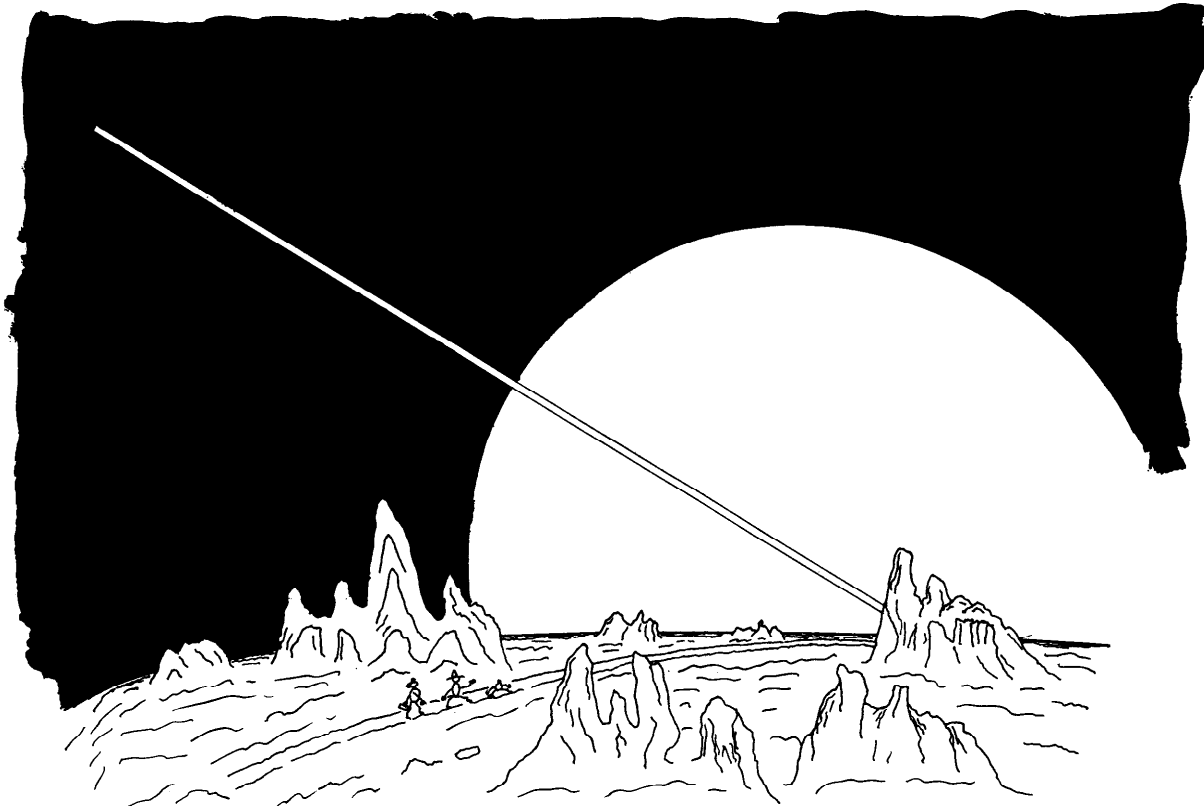


Figure 2. Saturn, as seen from the innermost satellite, Mimas, 115,000 miles from the planet.

were we to live there. We might as well forget about Jupiter. The satellites of Jupiter would be interesting to contemplate, but the intensity of the light that Jupiter casts would blot out such things as clusters and faint nebulae. For the remainder of the planets the celestial spectacle would in no wise be altered. Even the diameter of the orbit of Neptune (5,400,000,000 miles) will not, as far as the naked eye is concerned, alter the constellations; however, it would be desirable to live there because, with this enormous base line, we could obtain much more accurate values of stellar parallaxes.

Of greatest interest would be Saturn, the rings showing as a huge arc in intermediate latitudes. But the aspect of Saturn, seen from the innermost satellite, Mimas, 115,000 miles from the planet, would be stupendous. Such a view is represented in Figure 2. Yet another interesting feature could be investigated. The amount of sleep needed on the earth, by the average individual, is about six hours minimum, or one-fourth of the earth's rotation at the most. Translating this for the other planets, using the rotation periods given in Table I, and referring this to earth time, the length of sleep on the other planets is as given in Table V.

Table V
Sleep in Terms of Earth Time

Planet	Time	Time of Rotation
Mercury	14.75 days	59 ^d
Venus	61 days	243 ^d
Earth	6 hours	1 ^d
Mars	6.05 hours	24 ^h 37 ^m
Jupiter	2.46 hours	9 ^h 50 ^m
Saturn	2.5 hours	10 ^h 02 ^m
Uranus	2.66 hours	10 ^h 45 ^m
Neptune	3.95 hours	15 ^h 48 ^m
Moon	6.75 days	27 ^d
Sun	6.2 days	24.7 ^d

Conclusions

1. It is apparent that no life as we know it can exist on any of the other planets, the basic shortcoming being the absence of liquid water, without the consideration of other factors as shown in the various Tables.

2. We know of no other elements necessary for any other imagined kind of metabolism, which rules out all speculations concerning beings particularly adapted to their environment.

3. Scripture is silent on the question. We prefer to consider Psalm 115:16 as conclusive. In other words, the Word of God says so—not hu-

man sophistry. This is a close parallel to the question of evolution vs. creation. Why is creation an axiomatic truth? Because evolution cannot be substantiated scientifically? No. Because Gods Word says so, Gen. 1:1. The scientific refutation is there. But it is only a gratuitous, on the part of God, confirmation of the *sola Scriptura*.

4. Let us picture life on Jupiter. Let us consider the actual time of a classroom lecture as = one hour. Let us consider also the actual length of a sermon as 20 min.

On Jupiter each classroom lecture would then be 11.1 min. and the sermon will be 3^m 42^s.

Let us now go to Venus. The classroom lecture will be 2.55 hours and the sermon will be 49.2 minutes.

Let us now translate a sermon, say, into the tape recorder and adjust speeds. On Jupiter it will have a "chipmunk" effect, while on Venus it will be "Molto Lento Commodo."

5. Obviously the Lord knew what he was doing when he placed us on the earth and constructed us accordingly.

References

- ¹A similar table, with perhaps minor modifications, will be found in any standard textbook of astronomy.
- ²An astronomical unit = distance of earth from the sun, about 93,000,000 miles.
- ³The precise figure is 365.2422 solar days.
- ⁴This is the length of the sidereal day.
- ⁵Mars pictures from Mariner #6 & #7. 1969. *Sky and Telescope*, October, Vol. 38 (4), p. 212-221.
- ⁶See Steam Tables. Keenan. Joseph H. and Frederick G. Keyes. 1936. Properties of steam. John Wiley and Son.
- ⁷Baker and Frederick. Introduction to astronomy. Seventh Edition.
- ⁸See *Sky and Telescope*, October, 1969. Vol. 38, No. 4.
- ⁹See Baker and Frederick. *Op. cit.*
- ¹⁰Baker and Frederick, *Ibid.*
- ¹¹Geometric calculations by the author based on similar triangles.
- ¹²By agreement (definition), a star of the first magnitude is 100 times as bright as a star of the sixth magnitude. From this it follows that the ratio of brightness between two successive magnitudes is the fifth root of 100 = 2.512. Now, let A be the magnitude of one star, and B that of another, the relation between their light is given by

$$\log "A" - \log "B" = .4("B" - "A")$$
 where .4 = $\log_{10} 2.512$. Since "A" and "B" are measures of brightness (in any convenient unit) apparent magnitudes are readily computed. All logs are to the base 10. (Note: $\log "A" - \log "B"$ would ordinarily indicate that the right hand member should be "A" - "B". But remember that the magnitude scale is numerically an inverse scale, hence "B" - "A" is used. This derivation was independently worked out by the author.)
- ¹³Surface gravity ("g") varies directly as the mass and inversely as the square of the radius. That is $g = m/r^2$.

NUCLEAR SCIENTISTS UNWITTINGLY SUPPORT CREATIONISM

D. LEE CHESNUT*

Creationism is “the doctrine that the world and all things came into being out of nothing through an act—or series of acts—of a transcendent Creator.” So runs an accepted definition.

All things are made of “matter” in a host of forms and varieties. Man’s experimental chemistry has supported the conclusion that all things originally found in nature have been made of all kinds of chemical elements from hydrogen through uranium. Add to this his attempts at alchemy, pre-nuclear man had become convinced that whatever the original quantities of each chemical element, that total would always remain the same, considering both the amount of the pure element plus the amount of that element in chemical compounds.

This was the crux of the law of the conservation of mass and energy, one of the peers of the physical laws of the pre-nuclear period. But Einstein’s mass/energy equivalence theory—plus nuclear discoveries—changed some details of this picture very rapidly.

In the post-nuclear period, energy has been transformed into the basic particles; man has “seen” this take place in his particle accelerator/cloud chamber/hydrogen bubble-chamber experiments, and while he may not have seen specific man-made particles come together and form atoms, there isn’t the slightest doubt that this could take place—and undoubtedly has taken place.

If we insist that the word “creation” means that the Creator started with *nothing*, the foregoing experiments would have to be classified as *transformations* rather than as creations. But it is a “whopper” of a step to acknowledge that invisible energy has been transformed into sub-nuclear particles which, in turn, are ready to “gather themselves together” instantly to form chemical atoms. This backward progression is the way man has been learning things.

Questions Raised by Present Concepts

A leading scientific concept is that a common basic mass of matter—“ylem”—preceded all the particles. Here we are way out in the “deep dark blue” with the post-nuclear cosmologist who believes that, in the beginning, there had been a huge mass of ylem that weighed billions of tons per cubic inch. From the intense concentration of this amount of ylem, sufficient heat had been

generated to cause the “Big Bang” which was the starter of that which is commonly called the “great galactic explosion.” Several of the cataloged events in this hypothesis are, to say the least, generating these kinds of “wonderings” or “Why” questions or “how-could-it-have-happened-this-way” questions—or a whole sequence of such queries as these:

(1) From whence came the large mass of ylem?

(2) A massive explosion normally results in an irregular conglomeration of broken and jagged pieces of all sizes and configurations. But instead, this hypothesis assumes that the explosion generated mostly a host of neutrons. Unless planned and controlled, it could not have turned out this way.

(3) Without a plan and a guiding hand, how could these neutrons have acquired their radioactive-decay nature before they were combined with protons in the nuclei of atoms, but then become *stable* neutrons *after* their union with protons in atom nuclei?

(4) If neutrons were to break up into smaller masses, why didn’t they just remain as smaller *uncharged* particles? Looking ahead to the remarkable nuclear functions as we now know them to be, it is easy to see, now, that there *had to be* positively charged protons and negatively charged electrons; but *before the fact*, “what” was the sensory function that triggered this action?

(5) Again looking ahead to chemical elements as we now know them, from whence came the sensory function that set the free-neutron half-life at about 13 minutes so the needed ratio of protons to neutrons would be established?

(6) How is it that multiple positively charged particles combined in the nuclei of all atoms except hydrogen? Considering the mathematical level of this repellent force, this was a phenomenal occurrence. For example, if one gram of protons could be positioned at the north-pole of the earth and another gram at the south-pole, *then* the Coulomb repellent force of the two grams, some 8000 miles apart, would still be of the order of 28 tons!

Leaving the two polar regions and bringing these two packages of protons closer and closer together, the repellent force increases according to the inverse-square law.

No Known Rationalization

If we assume the Big-Bang hypothesis, we can rationalize the possibility that the short-lived force had been sufficient to have over-ridden the

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Coulomb force. But there is no known rationalization of the event that is now believed to take place as these multiple protons cross the nuclear boundary into a nucleus.

In her book, *The Nature of Matter*,¹ Amaldi presents an amazing picture of the strategic automatic transformation of mass into energy to accomplish specific purposes:

a. The atomic weight of a proton is 1.0081 units of mass, and of a neutron, 1.0090.

b. So, two protons and two neutrons, each weighed separately as they would be when outside atomic nuclei, would add up to 4.0342 units.

c. But the helium nucleus which is made of these four particles has a mass of only 4.0040.

d. Thus when two protons and two neutrons are forced inside the nucleus of an atom, there is a loss of mass equal to 4.0342 minus 4.0040, or 0.0302 units. Reach in, figuratively, and exert sufficient force to pull these particles outside the nucleus, and their mass is restored to 4.0342; force them back inside the nucleus and the mass again drops to 4.0040.

e. The loss of mass, 0.0302 units (known as the "mass defect"), is transformed into the binding energy required to hold the nucleus of the atom together against the Coulomb force of repulsion.

Other "Non-Explainables"

Subsequently, Amaldi tells of another "non-explainable" down inside atom nuclei. In the above illustration, as the protons and neutrons cross the boundary into the nucleus of the helium atom, an attracting force begins to operate when the particles are separated by a distance of about four "fermi." Farther down inside the nucleus the attracting force disappears, changing into a repellent force. Amaldi says judiciously:

. . . The nucleus is a world which is only partially explored and is full of uncertainty. We do not yet know how to write mathematical expressions for nuclear forces, or the equations which control the motion of nucleons—i.e., a combination of protons and neutrons—within the nucleus.²

Thus Amaldi introduces the reader to another elementary picture, but one which is outstandingly non-explainable. Acknowledging there are now about thirty named nuclear particles, named groups of particles and energy units, Amaldi states that:

Physicists now have reason to think that the atomic nucleus is effectively made up of only protons, of neutrons and of nothing else. That is, protons and neutrons belong to a class which is different from that of other particles. They are the "bricks" from which the nucleus is made.³

An atomic package containing six protons in the nucleus, and with the right number of neutrons so it will hold together long enough to be analyzed, is the element carbon. Similarly such a package with eight protons is oxygen; 29 would be copper; 50, iron; 79, gold, etc., all the way from hydrogen with one proton to uranium with ninety-two.

Explanation Missing

No scientists has come forth with an explanation as to why atomic packages with different numbers of *the same* proton "building blocks" or "bricks"—and their associated neutrons—make entirely different kinds of chemical elements; this does not make sense but it is a fact.

This situation is further supported in Seaborg's *Man-Made Transuranium Elements*. This approach refers to the newly synthesized elements from neptunium to lawrencium with from 93 to 103 protons in their nuclei. Throughout the text it is clear that in their experimental work they were making no attempt to predict the chemical nature of these prospective elements except by the conventional method of trying to fit the new elements into an extension of the Periodic Table of 1944. Even this procedure was not reliable as indicated by this example:

The Periodic Table of 1944 implied that the chemical properties of elements 95 and 96 should be very much like those of neptunium and plutonium, 93 and 94. The assumption proved to be wrong and the experiments directed toward the discovery of 95 and 96 failed. Again the undisclosed elements 95 and 96 apparently refused to fit the pattern indicated by the Periodic Table of 1944. . . . Thus we have the interesting result that the newcomers have affected the facts of the Periodic Table and a change has been made after many years even though it—i.e., the Periodic Table—seemed to have assumed its final form.⁴

How do we bring all these humanly irrationable data into focus? First, we would do well to listen to Vannever Bush; he has come forward with these sobering thoughts:

Within the atom occur phenomena concerning which visualization is futile, to which common sense, the guidance from our everyday experience has no application, which yield to studies by equations that have no meaning except that they work. Science here does two things. It renders us humble. And it paints a universe in which the mysteries become high-lighted, in which constraints on imagination and speculation have been removed, and which become ever more awe-inspiring as we gaze. . . .⁵

Note especially his conclusion that “constraints on imagination and speculation have been removed” and that which we observe has “become ever more awe-inspiring.” This conclusion is a distinct steppingstone to Creationism.

Revealing Admissions

George Gaylord Simpson, one of the “Deans” of the Neo-Darwinian concept of evolution, has openly concluded that the source of all the physical laws is: “. . . quite *unknown and probably unknowable to science*.” (Emphasis added) And then surprisingly, Simpson indicated the direction of his own thinking by adding: “Here religion may honorably enter the picture.”⁶

In the same vein the noted astronomer, Harlow Shapley, persistently probes behind or beyond the tangible supply of hydrogen and all the physical laws, searching for the origin of origins when he wrote:

In the very beginning were hydrogen atoms, so far as we now see, but actually there must have been something antecedent. Whence came these atoms of hydrogen . . . that we now surmise have become the material make-up of the universe? What preceded their appearance, if anything? That is perhaps a question for metaphysics. The origin of origins is beyond astronomy. It is perhaps beyond philosophy, in the realm of the, to us, unknowable.⁷

Michael Moravcsikof aptly summarizes this “blank wall” faced by scientists, in his book-review of Martin and Speakman’s, *Elementary Particle Theory*. He says, “It is impossible to write a book on elementary particle theory since, as the authors themselves emphasize at the very beginning of their preface, there is no such thing . . . “, as an elementary particle theory,

“in existence” though “The amount of activity that has taken place is staggering.”

Conclusion

The accumulated evidence—or more realistically, the *lack* of material evidence—points majestically to a great predetermination that this was the way in which all things were to be made. And a great predetermination required both *mind* to plan, and overall capability to perform the developed plan; that is, there had to be a Great Predeterminer who both planned and produced realities that had no prior existence. Here—within the realm of nuclear laws and nuclear particles—we behold majestic evidence of the Omniscient and Omnipotent Creator—GOD—at work.

And in *Science* of June 4 of 1971, a scientist of national repute—referring to these types of non-explainables—said openly: “. . . if you want to call *what’s underneath* a supernatural being, that’s all right with me. . . .” There will be more Davids.

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PRELIMINARY REPORT ON BOARD OF DIRECTORS MEETING

HENRY M. MORRIS*

This Annual Issue marks the beginning of the tenth year of publication of the *Creation Research Society Quarterly*. The main theme of the many excellent papers in this issue is that of teleology, the evidence of order, design, and purpose in the created world. The evolutionist speculates that natural selection might account for all the intricate harmony and complexity of relationships in nature, but an endless array of hard facts such as described herein can be used to proclaim otherwise. Effects cannot be greater than their Causes.

A number of interesting statistics were presented at the annual meeting of the Society's Board of Directors at Ann Arbor in April. Wilbert Rusch, Membership Secretary, reported a total voting membership of 391 scientists, an increase of over 50% in the past four years. Total memberships plus subscriptions add up to 1,913, an increase of 97% in the same period.

At the same time, the size and quality of our *Quarterly* continue to grow. Volume 8 was compared with Volume 5 in an interesting compilation by Emmett Williams, as follows:

	Volume 5 (1967-68)	Volume 8 (1970-71)	Percent Increase
Feature Articles	20	32	60%
Technical Notes	2	11	450%
General Interest			
Items	12	17	42%
Book Reviews	7	16	122%
Literature Reviews	4	4	0%
Letters to Editor	2	15	650%
Indices	1	2	100%
Total Items	48	97	102%

All of this has been accomplished with no increase in dues, in spite of a highly inflationary economy. Of course, none of the officers or members of the Society receive any salaries or other compensation for their work in connection with Society activities. We especially owe a debt of thanks to four men: George Howe, Editor of the *Quarterly*; John Moore, Managing Editor; Wil-

bert Rusch, Membership Secretary; and Richard Korthals, Treasurer. These men have put in many long hours for the Society, and their fine and faithful work goes largely unrecognized. Of course, many others have served in various ways and in particular many have contributed in an outstanding way in preparing the fine papers published in the journals.

Costs, however, have finally risen to the point where dues income is no longer adequate to pay for the *Quarterlies*. Four remedies have been suggested:

(1) Increase dues. The Board of Directors rejected this possibility for another year at least;

(2) Accept advertising in the *Quarterly*. A committee has been appointed to consider an appropriate policy on advertising, but this will be very limited at best;

(3) Reduce number of pages of *Quarterly*. Board members were very reluctant to consider any significant reduction, but Editors Howe and Moore do plan to reduce costs wherever possible without sacrificing quality or effectiveness of the publication;

(4) Request special contributions from members, for the specific purpose of helping to underwrite the cost of the *Quarterly*. This seems the most satisfactory solution, for the present at least.

Consider this report, therefore, to be such a request. All such designated contributions are, of course, tax-deductible; and I am sure they will be appreciated by all members of the Society if, as we trust, the *Quarterly* may be continued on the present basis with no increase in dues.

One other request. John Moore, Chairman of our Textbook Committee, is coordinating preparation of a teacher's manual and a laboratory manual to go with our Biology textbook. These two manuals will materially increase the acceptability of the textbook for school adoptions. If you are qualified and willing to work on either of these urgent projects, please contact Dr. Moore.

We are looking forward to our tenth anniversary in the summer of 1973. We trust this closing year of our first decade will be one marked by an ever-accelerating increase of scientific recognition of the fact of divine special creation. This Annual Issue is an important contribution in this growth.

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A MATHEMATICAL FORMULATION OF A CREATIONIST-FLOOD INTERPRETATION OF RADIOCARBON DATING

RAY HEFFERLIN*

Introduction

At various times the author has seen attempts to reconcile the creation-flood view of earth origins, on the one hand, and the results of C^{14} dating, on the other.^{1,2} These attempts have been more or less qualitative, the idea being that the C^{14} ages are in error due to (1) there having been a smaller production rate of the radioisotope before the flood, and/or (2) there having been a larger amount of C^{12} in the biosphere before the flood, and/or (3) there having been some sort of variation in the decay constant of C^{14} at the time of the flood.

This author is not attempting to investigate the validity of these concepts, nor to study the intricacies of the C^{14} dating method; but he does feel that the concepts merit *mathematical expression* so that they can be subjected to more rigorous testing. One such expression, for a different model, appears in reference 3.

This paper, then, simply develops a mathematical statement of the C^{14}/C^{12} ratio under a specific, simple, creation-flood model. Parameters are defined which allow for possible checking against data.

Theoretical Equations

1. General equation

The general equation describing the net rate of increase of C^{14} is

$$\frac{dN}{dt} = -\lambda N + C, \quad (1)$$

Where N is the number of nuclei, λ is the decay constant, and C is the rate at which nuclei are being formed (in the atmosphere, through cosmic ray bombardment). The solution to this equation is

$$N = N_0 e^{-\lambda t} + \frac{C}{\lambda} (1 - e^{-\lambda t}) \quad (2)$$

if the production rate C is constant during this time.

2. Model for earth's origins

It is necessary now to postulate a model for the earth's origins. It is hoped that this model is sufficiently flexible to allow for different understandings of the available data. Time is counted from creation ($t=0$), to the "beginning" of the flood (t_f). During this period (#1) it is assumed that the C^{14} count rose, as described by Equation (2), from nothing:

$$N_1 = \frac{C_1}{\lambda_1} (1 - e^{-\lambda_1 t}). \quad (3)$$

During this first period it is assumed that there existed a certain total number, M_1 , of C^{12} nuclei in the biosphere, and hence it follows that the ratio of C^{14} to C^{12} is Equation (3) divided by M_1 (not constant in time but well mixed in biosphere at any time).

When period #1 was over, at the "beginning" of the flood, a new period (#2) began during which, by hypothesis, there was the possibility of a different production rate and/or of a different decay rate. Hence the number of C^{14} nuclei will be described by Equation (2) with subscripts appropriate for period #2 and with, for N_0 , the entire right-hand side of Equation (3) evaluated at t_f :

$$N_2 = \left[\frac{C_1}{\lambda_1} (1 - e^{-\lambda_1 t_f}) \right] e^{-\lambda_2 (t - t_f)} + \frac{C_2}{\lambda_2} (1 - e^{-\lambda_2 (t - t_f)}). \quad (4)$$

During this period, by hypothesis, there was a certain number of inert carbon nuclei in the biosphere, namely M_2 . Note that this does not allow for *progressive* burial of biological material. Also, by hypothesis, the C^{14}/C^{12} ratio would be given by Equation (4) divided by M_2 (not constant in time but well mixed at any time).

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When period #2 was over, at the "end" of the flood, the number of C^{14} nuclei in existence would be given by Equation (4) with t_e substituted for t . This time t_e was the beginning of period #3, the post-flood era in which we now live. To make a first approximation, it will be assumed that N_2 at t_e exactly equals N_3 . In other words, the events during period #2 exactly put us on the equilibrium asymptote of the curve whose earlier, rising, parts are accepted by uniformitarianism (Equation (2) with $N_0 = 0$, $C = C_3$, $\lambda = \lambda_3$). It is as if one turns on a cold stove to "Heat #1," and then, before equilibrium is attained, pushes "Heat #2," and then, at the precise instant when the stove has attained the temperature which "Heat #3" is supposed to reach in equilibrium, pushes the "Heat #3" switch. And so we have

$$N_3 = \frac{C_3}{\lambda_3} = \left[\frac{C_1}{\lambda_1} (1 - e^{-\lambda_1 t_f}) \right] e^{-\lambda_2 (t_e - t_f)} + \frac{C_2}{\lambda_2} (1 - e^{-\lambda_2 (t_e - t_f)}) \quad (5)$$

It is assumed that there is no change whatsoever in the production rate (C_3) of carbon-14, or of the number (M_3) of ordinary carbon, since the flood. The ratio of radioisotopic carbon to ordinary carbon is then Equation (5) divided by M_3 .

This first approximation is very restrictive. The obvious generalization would be to say that N_3 is given by Equation (2) with N_0 given by Equation (5) and with $C = C_3$ and $\lambda = \lambda_3$. This generalization will result in such severe complication of the already taxing results [Equations (13) and (14)] that in this tutorial-type paper it would be best not to exhibit it. Those who advance the work will, furthermore, wish to include such effects as the rapid burning of fossil material in recent centuries.

3. The C^{14} age-dating procedure

The entire C^{14} dating procedure begins with the measurement of the disintegration rate of C^{14} in a sample. We argue, from Equation (1), that the disintegration rate gives us the desired knowledge of how many radionuclei there are in the sample:

$$n = -\frac{1}{\lambda_3} \frac{dn}{dt} ; \quad (6)$$

where n is the number now in the sample; the subscript indicates that we are doing our measurement in period #3 (the present). The next step in the procedure is to assume that we have exactly n nuclei because of uniformitarian decay from some initial number, n_0 , which the organic matter had in it when it "died," time T ago:

$$n = n_0 e^{-\lambda_3 T} . \quad (7)$$

Next we measure the amount of nuclei of C^{12} present, m , divide, and assume that the C^{14}/C^{12} ratio has always remained unchanged:

$$\frac{n}{m} = \frac{n_0}{m} e^{-\lambda_3 T} = \frac{N_3}{M_3} e^{-\lambda_3 T} = \frac{C_3}{\lambda_3 M_3} e^{-\lambda_3 T} . \quad (8)$$

The radio carbon age is obtained from Equation (8) and is

$$T = -\frac{1}{\lambda_3} \ln \left[\frac{(n/m)}{(N_3/M_3)} \right] = -\frac{1}{\lambda_3} \ln \left[\frac{(n/m)}{(C_3/\lambda_3 M_3)} \right] . \quad (9)$$

4. Relating radiocarbon age to actual age

We now wish to derive expressions giving the relation between a radio carbon age (based on the uniformitarian assumption) and the actual age (according to our model). Suppose that the organic matter "died" during period #2; then the number of radionuclei divided by the number of ordinary carbon nuclei at the time, t' , of death was

$$\frac{n_0}{m} = \frac{N_2}{M_2} = \left[\frac{C_1}{\lambda_1 M_2} (1 - e^{-\lambda_1 t_f}) \right] e^{-\lambda_2 (t' - t_f)} + \frac{C_2}{\lambda_2 M_2} (1 - e^{-\lambda_2 (t' - t_f)}) . \quad (10)$$

according to Equation (4). Now this number of radionuclei had, at time t_e , decayed to

$$\frac{n}{m} e^{-\lambda_2(t_e - t')} ; \quad (11)$$

and by now, at time t , this number had further decayed to

$$\frac{n}{m} = \frac{n_o}{m} e^{-\lambda_2(t_e - t')} e^{-\lambda_3(t - t_e)}. \quad (12)$$

We set this ratio equal to that which the uniformitarian method predicts on the basis of the present carbon ratio and a longer age (Equation (8)):

$$\begin{aligned} \frac{C_3}{\lambda_3 M_3} e^{-\lambda_3 T} &= \left\{ \left[\frac{C_1}{\lambda_1 M_1} (1 - e^{-\lambda_1 t_f}) \right] e^{-\lambda_2(t' - t_f)} + \frac{C_2}{\lambda_2 M_2} (1 - e^{-\lambda_2(t' - t_f)}) \right\} \\ &\quad e^{-\lambda_2(t_e - t')} e^{-\lambda_3(t - t_e)} \\ &= \frac{C_1}{\lambda_1 M_1} (1 - e^{-\lambda_1 t_f}) e^{-\lambda_2(t_e - t_f)} e^{-\lambda_3(t - t_e)} \\ &\quad + \frac{C_2}{\lambda_2 M_2} e^{-\lambda_2(t_e - t')} e^{-\lambda_3(t - t_e)} \\ &\quad - \frac{C_2}{\lambda_2 M_2} e^{-\lambda_2(t_e - t_f)} e^{-\lambda_3(t - t_e)}. \end{aligned} \quad (13)$$

Study of Equation (13) reveals that it is possible to write an expression for the radiodated age, T , as a function of numerous variables, but that it is not possible to arrange the t 's so that the actual age, $t - t'$, appears explicitly. In other words, it is impossible to obtain an equation for $t - t'$ in terms of T .

Suppose that the organic matter "died" during period #1; a very similar derivation shows that the ages are related by the equality

$$\frac{N_3}{M_3} e^{-\lambda_3 T} = \frac{C_1}{\lambda_1 M_1} e^{t_f(\lambda_2 - \lambda_1)} e^{t_e(\lambda_3 - \lambda_2)} e^{t(-\lambda_3)} e^{t'(\lambda_1)}. \quad (14)$$

This equation is analogous to Equation (13), even though the arguments of the exponentials have been arranged somewhat differently.

5. Limiting cases and checks

Equation (13) ($t_f \leq t' \leq t_e$) has the property that T is larger as the amount of C^{12} in the biosphere is imagined to have been larger (M_1/M_3 larger) and/or as the production rate of C^{14} is imagined to have been smaller (C_1/C_3 smaller). Simplification of the formula can be made if it is considered permissible to let $t_e - t'$ and $t' - t_f$ be small (letting the time of the flood be short). By expanding the exponentials with small argument, keeping only the largest term in the expansion, and letting $t_f = t_e = t'$, we have

$$\frac{C_3}{\lambda_3 M_3} e^{-\lambda_3 T} = \left\{ \frac{C_1}{\lambda_1 M_1} (1 - e^{-\lambda_1 t'}) + \frac{C_2}{\lambda_2 M_2} [\lambda_2(t - t')] \right\} e^{-\lambda_3(t - t')}. \quad (15)$$

If $\lambda_1 = \lambda_3$, then

$$\frac{C_3}{\lambda_3 M_3} e^{-\lambda_3 T} = \frac{C_1}{\lambda_3 M_1} (e^{-\lambda_3(t-t')} - e^{-\lambda_3 t}) + \frac{C_2}{\lambda_2 M_2} \lambda_2 (t-t') e^{-\lambda_3(t-t')}. \quad (16)$$

Finally, if we could ignore the term containing only t (time from creation to the present), we would obtain

$$\frac{C_3}{\lambda_3 M_3} e^{-\lambda_3 T} = \frac{C_1}{\lambda_1 M_1} e^{-\lambda_3(t-t')} + \frac{C_2}{\lambda_2 M_2} \lambda_2 (t-t') e^{-\lambda_3(t-t')} \quad (17)$$

in which the real age, $t-t'$, does explicitly, and uniquely, but transcendently, appear in the formula.

Equation (14) ($0 \leq t' \leq t_f$) has the same properties as Equation (13) as far as M_1/M_3 and C_1/C_3 are concerned. It has also the property that if we simply assume $\lambda_1 = \lambda_3$, then it reduces down to

$$\frac{C_3}{\lambda_3 M_3} e^{-\lambda_3 T} = \frac{C_1}{\lambda_1 M_1} e^{-(\lambda_2 - \lambda_3)(t_e - t_f)} e^{-\lambda_3(t-t')} \quad (18)$$

so that in this case the real age, $t-t'$, does explicitly and uniquely show in the equation,

Conclusion

Equations for carbon ages, as compared to real ages, have been presented for a specific model of the earth's origins. It is clearly evident that the useful application of the equations would be to determine C_1 , C_2 , M_1 , etc., from samples wherein radiocarbon age and real age are both known.

Acknowledgements

The author acknowledges that the idea for this work came from discussions with Dr. Robert Brown of Union College, Mr. Robert Gentry of Columbia Union College, and Mr. Henry Pearl of Glendale City College.

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COMMENTS ON SCIENTIFIC NEWS AND VIEWS

HAROLD ARMSTRONG*

Lines of Sight

We have often had occasion to notice some of the special features of various living creatures—features which are useful to them in their way of life. Another such feature has been mentioned recently: the fact that certain predators have marks which appear to be sighting marks to help them in catching their prey. These marks are typically lines along the bill or snout, and such marks are found in many kinds of creatures.^{1,2}

Sometimes there may be extra refinements; the heron's sights, e.g., it is suggested, may be set at

an angle to correct for the refraction caused by the water. The heron sights on the fish at its apparent depth under water, but the compensation introduced by the sights causes it to strike at the real depth.

Other markings around the eyes, especially dull ones, may, it is suggested, help to reduce glare. So many creatures have not only "gun sights," but also "sun glasses."

The significant question to this is apparent: how could such things as the sights have "evolved." For, like so many other features, they needed to be about perfect before they would be of any use at all.

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Moreover, did the instinct (or whatever it is) to use these sights come about by some mutation, which fortunately came at the same time as the mutation causing the sights themselves? If we are going to make appeals like that to coincidence, we should have no need of a rational theory.

Or, on the other hand, did a certain ancestor of these creatures just happen to have a little more instinct to use the sights than its fellows did? To state a thing like that would seem absolutely meaningless. No, we have examples of a good design to solve a problem, and a design that must have been right the first time.

Vitamin E and Prejudice

A number of readers of these pages will doubtless know of Dr. Evan Shute, of London, Ontario, who has written some very interesting articles on the wonders of nature, pointing out the absurdity of saying that such things could have evolved, or come about by chance.

Dr. Shute has also been known for his work on vitamin E. He used it for certain medicinal purposes, with considerable success. However, tests made by other people, in other places, sometimes gave conflicting results; and there has been much controversy about the matter.

A recent article in *Canadian Research and Development* suggests that the controversy may now be resolved, or nearly so.³ It seems clear that vitamin E is helpful in many cases.

As for the unfavorable reports, it appears that some of the controversy came about because the doses, and strength of the preparations, were not well standardized from one laboratory to another; thus people might not be discussing the same kind of treatment.

However, it is difficult to avoid the conclusion that some of the opposition to Shute's work was just the kind of prejudice which men trying to introduce new ideas into medicine have encountered before.

This matter is mentioned since it may be of some interest to friends or acquaintances of Dr. Shute. Also, it is another example of a thing that creationists know well: the opposition that one encounters when he disagrees with the "Official View."

Post-Flood Growth

A little while ago, I came across an observation by Samuel Johnson, which may be worth some thought by those of us who are interested in the Flood. He wrote:

Neither is it so easy to raise large woods, as may be imagined . . . ground sown with trees must be . . . inclosed . . . if cattle be suffer to graze upon it they will devour the plants as fast as they rise. Even in coarser

countries . . . not only the deer and the wild goats will browse upon them, but the hare and rabbit will nibble them. It is therefore reasonable to believe, what I do not remember any naturalist to have remarked, that there was a time when the world was very thinly inhabited by beasts, as well as men, and that the woods had leisure to rise high before animals had bred numbers sufficient to intercept them.⁴

We can see the same thing today. In Ontario, at least, there have been reductions in taxes, to encourage farmers to leave woodlots free from grazing. The difference between grazed and ungrazed lots is very striking.

Is it not likely that the time when the world was thinly inhabited by beasts was right after the Flood? Plants, and especially trees, may have grown from seeds, branches, etc., spread by the water; but the animals had to increase from one pair, and spread from Ararat. So the trees did, in fact, have a good start on the animals.

Discontinuities and The Flood

It is well known that there is a real discontinuity, in respect to fossils, between strata that are called Cretaceous and higher subsequent strata. It has been suggested that this break might indicate the effect of the Flood.

A recent article contains note of the fact that there may be other breaks in the series of fossils, and in particular between the Triassic and Jurassic. The author stated, in fact, that: "The Triassic-Jurassic faunal break is . . . profound . . . and there is still only one group, the phyllocerata, known to straddle the boundary."⁵

We must inquire how such a break would fit in with Flood geology. Is it possible that it, too, represents the Flood? Either different fossils were deposited in different places because of such causes as the sorting action of the water, or else there were different things living in different places before the Flood.

It would seem likely that, if the world had had a catastrophe about 1,400 A.D., future ages, sorting out the fossils in the Old and the New Worlds, might have assigned them to different periods. It is to be hoped that those interested in Flood geology will continue to follow up these matters.

Deep Ice and the Young Earth

Recent studies of the Arctic and Antarctic regions have yielded some results which may be useful to creationists. It is reported that at Camp Century, Greenland, boring has shown that the ice is about 1,400 metres thick. The rate of accumulation is estimated at about 35 centimetres per year.⁶

From this one might conclude that the ice has been accumulating about 4,000 years. In other

words, from the viewpoint of Flood geology (and geography, etc.), the accumulation of ice started not so long after the Flood.

The authors of the article cited, of course, are not interested in the Flood. They suggest a rather older beginning to the accumulation of ice, by having it accumulate more slowly long ago. But there seems to be no independent evidence for such a thing. Rather there seems to be evidence to show that there was formerly *more* precipitation than there now is.

It may be worth while to watch the work going on in boring into these sheets of ice, for they may provide useful clues when interpreted in terms of the Flood, although from the uniformitarian viewpoint they are just puzzling. The article cited, incidentally, has a number of useful references.

Confusion over *Homo habilis*

As well as the "book of the month" we seem lately to be having a "fossil man of the month" from Africa. Lately some questions have been raised, as to whether some of these relics ought to be called "Homo." It is remarked, in commenting on some of the remains from Olduvai:

. . . the new *Homo habilis* from Olduvai does not fulfill all the genetic criteria outlined in the 1964 revision . . . there is still some evidence of distortion in the reconstruction . . . if cranial capacity can not be accurately determined does this not undermine the validity of many of the cranial measurements . . . and . . . of the conclusions that are drawn . . . from those measurements . . . a badly crushed and distorted skull . . . presents some problems to those restoring it; it presents even more problems to those who try to decide, finally, what it is.⁷

All this would seem to say that no one is very sure what is to be made of these bits of bone. The cover of this issue of *Nature* carried a picture of one of these skulls; from the picture it appeared to be in such a condition that it could mean anything—or nothing.

Pollen, Plants, and Missing Fossils

The evidence for a young earth which is offered by such "micro-fossils" as spores and pollen has been mentioned in this journal from time to time, in particular the work done in this field by Clifford Burdick.

Another recent report of such fossils likewise shows that either certain plants are older, or certain rocks are not as old, as has been supposed.⁸ The spore tetrads, which have been found, are said to pre-date "by almost an entire period" the remains of the plants themselves.

Is the conclusion to be drawn from such findings not plain? Plants of such-and-such a kind were living at such-and-such a time, because

their spores are found in rocks deposited at that time. (According to the uniformitarian view.)

But no remains of the plants themselves from that time are found. Therefore the absence of fossils of the plants does not prove the absence of the plants. Q.E.D.

If this is admitted, then the uniformitarian theory is seen to be running entirely on guesswork. (Incidentally, the conclusion would seem to be as valid for fossils of animals as for those of plants.)

From the viewpoint of a young earth, and a Flood, this is just what would be expected. Micro-fossils might be carried by wind, water, etc., to places where macro-fossils would never get. For this reason, and because there are many more pieces of micro-fossils, they may give a better picture of the state of affairs. Developments in these investigations should be watched.

Petroleum: Possibly Not Very Old

Flood geologists or others who do not call for vast times, must give some thought to the question of the origin of such materials as coal and petroleum. There are reports of some observations that coal may be formed from wood, and something like petroleum from suitable material, in quite short times. Unfortunately, information on the matter is scattered.

Some recent reports contain remarks about the formation of petroleum, or at least how it could have been formed.^{9,10} Some investigation of sediments in the estuary of the Severn River, in England, show some conversion of oleic acid, from the remains of organisms, into saturated fatty acids. Moreover, it appears the conversion can take place relatively quickly.

Other investigations show that with the help of a catalyst, and especially at somewhat elevated temperatures, fatty acids are converted to petroleum-like paraffins. The times actually involved in the experiments were typically around 500 hours. It is suggested that the time for the formation of petroleum at 150°C might be around 6,500 years.

If catalysis is involved, however, presumably the time could be reduced considerably. In any event, there may be some useful evidence here, to show that the formation of petroleum certainly need not take anything like millions of years.

Pre-Cambrian Organic Intrusions

It has long been a difficulty to uniformitarian geologists that there are abundant remains of living things in the Cambrian rocks, but practically none in the pre-Cambrian. Indeed, it seems to be possible to maintain that no undisputed fossils have been found in the pre-Cambrian. (I am here using the standard geological terms for purposes of argument, without accepting the world-view that so often goes along with them.)

Sometimes, in lieu of undisputed fossils, attempts have been made to draw conclusions from the presence of organic chemical materials in the rocks. Some investigations now show that any such attempts are very risky; the rocks are more permeable than was supposed, and originally foreign material may well have found its way into them.¹¹

Indeed, the rocks, considered *in situ*, may well be yet much more permeable, because of the presence of cracks, etc. It is concluded that, in the case investigated: "... many of the Onverwacht cherts may have been host rocks rather than source rocks for some of the organic compounds they now contain." Clearly, if this is so generally, nothing at all is proved by the presence of organic compounds in rocks.

Big Bang versus Steady State

The "big bang" theory of cosmogony seems to be taken for a demonstrated fact, even by many who have some acquaintance with the sciences. This is perhaps due to all that has been written on the matter, and to the persuasiveness of some who have upheld the theory.

Actually, the evidence is very ambiguous, and could be interpreted otherwise. In fact:

The evidence in favor of a big bang cosmology is much less definite than is widely realized. ... Probably the strongest argument against a big bang is that when we come to the universe in total and the large number of complex condensed objects in it the theory is able to explain so little.¹²

In other words, a "big bang" might be a good way of getting a universe filled with a featureless, attenuated gas; it has certainly not been shown that it is a good way of getting the universe that actually exists.

It may be noted though, that the "big bang" does admit a definite, unique event, at some time in the past. To that extent, it is closer to the truth than any "steady-state" theory. For that reason, we might expect that, if anyone insists upon interpreting the evidence in terms of either "big bang" or "steady-state," he will likely settle for the "big bang." But that would merely show that, having refused to admit the truth, he settled for the theory which is less in error.

The Theory of Floccules

Apparently one of the theories in which the Solar System forms from a cloud of dust and junk floating around in space has been called the theory of "floccules." It seems to be really the old theory with a little new detail; that is, a collapsing cloud is supposed to gather into "floccules," which are small clouds of high density. These, then, are supposed to gather into the objects of the System somehow.

Some workers have calculated with a computer trying to follow up the course of the formation of the System according to this theory. The outcome, however, is to cast doubt on the whole theory. The resulting system, according to the calculations, was non-planar, and there were many retrograde orbits. This, of course, is quite unlike the real Solar System. It is concluded that: "... the present results ... throw considerable doubt on the tenability of the floccule theory."¹³

Origins and Heavy Elements

It is reported that uranium can no longer be considered the naturally occurring element of highest atomic number; plutonium 244, of atomic number 94, has been found as a trace in certain minerals.^{14,15} There is also some belief that elements of yet higher atomic numbers around 114, may be found.

There are at least two reasons why creationists might be interested in these things. First, these elements are radioactive; the fact that there is any of them left may put an upper limit on the age that can be assigned to the earth. Indeed, in the one article cited that matter is considered; and the world can be made as old as the uniformitarian theory would have it only by some rather arbitrary juggling.

In the second place, it has been proposed that an element of atomic number rather over 100 may have had something to do with the train of events that took place at the time of the Flood. So there may be some useful information in the results of this work on "super-heavy" elements.

Allochthonous Coal Considered

The problem of the origin of coal seams is one which we who believe in a young Earth must face. However, it can certainly be said that the usual "old-Earth," i.e. uniformitarian, theories are by no means free from difficulties. It is necessary for them to postulate some sequence of events which, to say the least, seems extremely unlikely.

A letter on that subject, while the author tries to help the uniformitarian theory, makes a point which may be useful to us.¹⁶ The writer points out that: "... it is known ... that a thick accumulation of peat can so alter edaphic conditions that a forest vegetation can no longer be supported."

In other words, it may be impossible to form as much peat as a coal seam would require. Now this fits in with what creationists have maintained: that there is now no peat bog that would make a good seam of coal, and that we have no evidence that there ever was.

In this case, the origin of the coal must have been "allochthonous"; the material was transported to the place where the coal now is. And

what better way of transporting it could there have been than a great Flood?

Glaciers and the Flood

One of the tasks of those who believe that the Flood was an important event in the world's history, and that it affected the world itself, as well as its inhabitants, is to find possible connections between the Flood and other events or conditions.

There is good reason to connect a canopy, believed by many to have existed before the Flood, with a former uniform, mild climate for which paleontologists give much evidence. Also it seems that the ice ages, whatever their actual nature may have been, should fit in some time shortly after the Flood.

Some investigations on related matters may be useful.¹⁷ This work studied, theoretically, the effects to be expected from more carbon dioxide in the air; and also of more aerosols. The latter, apparently, need mean nothing more unusual than fine dust.

Increased carbon dioxide, it appears, would raise the temperature, but not by much because an eight-fold increase in CO₂ would raise the mean temperature by only about 2°C. The aerosol would decrease the temperature, and more effectively.

An increase by a factor of 4 in the equilibrium dust concentration in the global atmosphere . . . could decrease the mean surface temperature by as much as 3.5° K. If sustained over a period of several years, such a temperature decrease could be sufficient to trigger an ice age.

The point about the dust is that it would increase both the greenhouse effect and the Earth's albedo (reflecting power), but the increased albedo would be more effective.

Can these considerations give us a hint about the connection between the Flood and the ice ages? At the time of the Flood, suppose that the Earth's albedo increased greatly, either because of dust stirred up, maybe during the breaking up of the fountains of the great deep, or because the amount of clouds became much greater than usual.

The water in the oceans, which may still have covered more of the Earth than it does now, was still relatively warm, and there was much evaporation. The colder climate caused much of this vapor to fall as snow, even in regions that are now temperate.

There may also have been inland seas, left from the Flood, and they may have frozen. Thus a considerable layer of ice and snow was built up quickly. Meanwhile, the climate was approaching that which we now have.

Incidentally, the readjustments of the Earth's surface, which probably went on for some time after the Flood, could have caused the glaciers to move much more quickly than is common now. And some of the ice may not have been in the form of glaciers at all, but rather icebergs and ice packs floating on the inland seas. After some time, the climate had settled down, and the sheets of ice melted in the temperate regions.

Incidentally, there may be some evidence on record, which could apply to this. Does anyone know of any observations to tell how long it took for ice caps, maybe even glaciers, to build up again on a tall volcano after an eruption?

Some such considerations as these may be able to help us see what really caused the ice age. It must be said that uniformitarian theories have not accomplished much toward answering the question.

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BOOK REVIEWS

Megalithic Sites in Britain. 1967. \$8. 174 pp. and *Megalithic Lunar Observatories*. 1971. \$7.50. 127 pp. by A. Thom, Emeritus Professor of Engineering Science at Oxford University. Published by the Oxford University Press, Oxford.

Reviewed by David C. C. Watson.*

For many decades British children have been taught that our ancestors emerged from the darkness of the Stone Age as grunting Cave Men. School textbooks abound with pictures of hairy-beary, club-wielding creatures who are supposed to have evolved *upwards* to become the Ancient Britons of Julius Caesar's annals—woad-painted, long-haired “barbarians.”

At the same time Britain's most famous prehistoric monument, Stonehenge, has repeatedly been dubbed a “mystery” because no one can understand how cave-men in coracles and dug-out canoes could hew stones weighing up to 30 tons, transport them over land and water for 200 miles, and erect them one on top of the other. Not only how, but why?

These two books by Prof. Thom may go far towards solving the mystery. Having surveyed some 600 megalithic sites dated 2000-1600 B.C. he comes to the conclusion that Megalithic Man was an expert engineer, metrologist, astronomer, geometrician and boat-builder. Some quotations from *Megalithic Sites*:

It is remarkable that 1000 years before the earliest mathematicians of classical Greece, people in these islands not only had a practical knowledge of geometry and were capable of setting out elaborate geometrical designs but could also set out ellipses based on Pythagorean triangles. We need not be surprised to find that their calendar was a highly developed arrangement involving an exact knowledge of the length of the year, or that they had set up many stations for observing the eighteen-year cycle of the revolution of the lunar nodes. (p. 3)

A civilization which could carry a unit of length from one end of Britain to the other . . . with an accuracy of 0.1 per cent, and could call for the erection of 5000 to 10,000 megaliths, must have made demands of its engineers . . . methods of obtaining time from the stars must have been well understood. To obtain time from the stars the date must be known, and this came from the sun at the calendar sites. (p. 2)

The greatest and most remarkable circle in Britain, if not in the world, is at Avebury. Its greatness does not lie in its size alone but

in the remarkable manner in which its arcs are built up from a basic Pythagorean triangle so that each retains an integral character, and in the exceedingly high precision of the setting out, a precision only surpassed today in high-class surveying. Avebury provides the final proof of the exact size of the Megalithic yard (2.72 ft.) and demonstrates the use of the larger linear units, 2½ and 10 yards. (p. 164)

Megalithic man was well acquainted with the small amplitude ripple on the moon's declination, and has left such definite indicators that we can, with their help alone, determine its magnitude. (p. 165)

Some quotations from *Megalithic Lunar Observations*:

Megalithic man was a competent engineer. Witness how he could set out large projects to an accuracy approaching 1 in 1000, and how he could transport and erect blocks of stone weighing up to 50 tons. He used the 3,4,5 right-angle extensively. He also knew the 5,12,13 right-angle triangle, the 8,15,17, and the 12,35,37. . . . These triangles were used in a peculiar geometry, in which he constructed rings, set out in stone, of various shapes: circular, egg-shaped, elliptical, etc. These constructions were made according to two rules: all linear dimensions had to be integral multiples of the unit, and the perimeters had to be multiples of 2½ units. (p. 9)

Megalithic man could also work on a much smaller scale. Among the “cup and ring” marks found incised on stones and rocks throughout Britain, we find a similar geometry with the same rules, but applied with even greater ingenuity. From a statistical examination of scores of these in Scotland there emerges another unit with a length of 0.816 inches, which is exactly one-fortieth of the Megalithic yard. To set out these small designs on polished rock demanded the use of trammels or beam compasses with the points set correctly to within a few thousandths of an inch. . . . (p.9)

Behind all this must have lain a solid background of technological knowledge . . . knowledge of levers, fulcrums, foundations, sheers, slings, and ropes. Involved in his linear metrology was his knowledge of how to make accurate measuring rods, shape the ends, and use them accurately. There is evidence that he did not use the slope length on the ground, but the horizontal distance, as does a modern surveyor, and that he could “range in” a straight line between mutually invisible points.

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There was also his ability to build and use boats; he travelled freely as far as Shetland, crossing the wide stretch of open water north of Orkney, as well as the exceedingly dangerous Pentland Firth and the North Channel between Kintyre and Ireland. This involved a knowledge of the tides and tidal currents. . . . At an early stage men living on the coasts of the Western Ocean must have noticed the connection between the tides and the Moon. Probably this connection was one of the factors that caused Megalithic man to study the movements of the Moon. It is the principal object of this book to show that he carried this study much farther, until he was able to predict which full or new moon would give rise to an eclipse of the Moon or of the Sun. (p. 9-11)

And again from *Megalithic Sites*:

When we think of the conditions under which these people worked and the limited material aids which they could employ, we begin to appreciate what they did achieve. Whatever we do we must avoid approaching the study (of prehistory) with the idea that Megalithic man was our inferior in ability to think. (p. 166)

Some archaeologists have questioned Thom's conclusion, but that may be because standard archaeology is based on the dogma of man's *ascent* from barbarism to civilization. Also, very few archaeologists are first class mathematicians or astronomers. The fact remains that this independent and disinterested research pursued by Prof. Thom for 40 years has produced results which tie in extremely well with the Bible.

To construct the Ark, Noah and his sons must have been expert engineers and metrologists and have had some knowledge, at least, of boat-building and geometry. From the exact notation of days, months and years it is evident that Noah kept a log like any ship's captain, and a log must be based upon a calendar. Today when you can get a free calendar at any Bank, hardly one man in a million knows how to construct a calendar from the sun and stars. But in ante-diluvian days you made your own—or went without!

Thus it seems extremely probable that Shem, Ham and Japheth emerged from the Ark (around the middle of the third millennium B.C.) as highly qualified scientists and experienced technicians. They imparted their knowledge of engineering, astronomy, geometry, metrology and boat-building to their sons and grandsons; and some of these eventually (2000 B.C.) found their way to Britain.

It seems, indeed, that at this date there were no "uncivilized" people anywhere in the world, unless the language groups that split off at Babel inherited very different shares of the common

culture. Only *after* 2000 B.C. did some groups get "lost" in desert, forest or mountain, and fail to use the ancestral lore which all must have once known.

What happened next? There seems to be only one possible answer: these highly civilized people for one reason or another *devolved downwards* into savage tribesmen. Just as the Incas and Aztecs disappeared into the jungles of Peru, so the builders of Stonehenge and Avebury degenerated into the Britons of whom Cicero (50 B.C.) wrote, "Do not obtain your slaves from Britain, because they are so stupid and so utterly incapable of being taught that they are not fit to form a part of your household!"

Thus these two slim volumes, to an impartial eye, go a long way towards restoring a true picture of Britain before Caesar. The archaeologists' dogma must yield to the logic of facts.

And just as the sudden emergence of the Chinese, Babylonian, Egyptian, Minoan and Indus Valley civilizations exhibited an astonishing "know-how-from-nowhere," so Megalithic man's mastery of the physical sciences points in the same direction.

A highly civilized world was destroyed—then re-occupied and restored by men carrying with them all the technology of the Old (antediluvian) World. This is the Bible account, with which the new discoveries of Professor Thom are in very close accord.

Darwin and the Beagle by Alan Moorehead. 1969. £3.75 or \$10.00. Publishers: Hamish Hamilton.

Reviewed by David C. C. Watson.*

Several books have been written about Darwin in the last two decades, but Moorehead gives us a new and refreshing angle. The reader shares with young Charles the nausea caused by heaving decks, the thrill of observing and collecting exotic fauna, his horror at the cruelty of savage tribesmen and "civilized" slave-owners.

The author admires Darwin's humanity, his enterprise in undertaking long journeys inland, and his efficiency in despatching hundreds of specimens pickled and alive. The reader sympathizes with Darwin's unbearable homesickness as the *Beagle* voyages into its fifth year, and the Captain insists on returning to England from South Africa via South America. Darwin emerges as a splendid warm-hearted young fellow, who *might* have done something really worthwhile for mankind.

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However, in matters of history, geography and biography the author has a sure touch, but when it comes to science and religion he is less well informed. His hero can do no wrong, and Moorehead seems quite unaware of the scores of discoveries since Darwin's day which invalidate the Theory of Evolution. Throughout the book Darwin, the progressive scientist, is favorably contrasted with Captain Fitzroy, the stuck-in-the-mud fundamentalist: but sometimes, at least, Fitzroy was right where Darwin was wrong.

For instance modern palaeontologists agree with Fitzroy that most dinosaurs probably died by drowning (p. 86); and few anthropologists are inclined to dispute the unity of the human race, which Moorehead seems to regard as a laughable "theory" (p. 90). Again, Moorehead wrongly assumes that because Fitzroy believed in the fixity of species, fixity of species must be taught in the Bible. For Moorehead, the Galapagos finches, with their differently developed beaks, prove the non-fixity of species; therefore, the stories of Adam and Eve and Noah must be "nothing more than a superstitious myth (p. 205)!"

With regard to these same finches the word "species" is used at one time to denote each different variety of finch, at another to include the whole tribe as one species. Thus the unwary reader is led to believe that evidence for microevolution is the same as evidence for megaevolution. He may not realize that the conclusion—"it was possible that all forms of life on earth had started from one common ancestor" (p. 205)—was a wild "guess in the dark," a speculation unsupported by any real facts discovered by Darwin or anyone since.

We are given a good example of Darwin's reasoning on the subject of Natural Selection, in the description of the coconut-eating crab (p. 236). This remarkable creature, it seems, has one pair of heavy claws, with which it tears away the fibres covering the coconut's three "eyes"; then it hammers open one of the holes; then utilizes a second pair of narrow pincers to extract the meat. Darwin describes this as a "marvellous example of a species adapting itself to its environment."

One has only to ponder these words for a minute to realize that we have now left the world of science and flown to Alice's Wonderland where anything is possible. Picture a heavy-clawed crab having the sense to know that there is soft meat inside a hard coconut; perceiving that its present claws are too big to enter the only way of access; nicely calculating the exact size of the required second pair of pincers; determining that it must have these; and finally, in the millionth generation, actually producing this

second set! Kipling's Crab That Played with the Sea could have done no better.

In regard to Bible chronology Moorehead repeats a popular fallacy: that Ussher based his figures on "a series of mystical calculations" (p. 260). He would probably be surprised to learn that the chronology is in fact based on Hebrew numbers which are as definite a part of the Bible text as Psalm 23 (and even more surprised to know that the figures were checked and agreed with by Isaac Newton, who firmly believed in Creation 4004 B.C.).

The last chapter gives a quick survey of Darwin's later life, including of course the famous Oxford Meeting of Bishop Sam Wilberforce and Thomas H. Huxley. The moral is plain for all to read when Dr. Charles Darwin dies full of years and honor, and is buried in Westminster Abbey; whereas Captain Fitzroy cuts his own throat at 59. See the reward of enlightenment, and the dire destiny of "blind faith!"

Thus into the hands of the British public comes another powerful piece of evolutionary propaganda. Beneath the surface lies a mass of contradictions and unsupported hypotheses, but few readers, one fears, will discern them. Authentic line-drawings, beautiful landscapes, scientific diagrams and accurate documentation—all these lend plausibility to the great Myth and Delusion of our day. Supposedly, even a child can now understand that Darwin has disproved the Bible!

Gists from Agassiz. 1953. Edited by John Kasper. Kasper and Horton Publishers, Box 552, General Post Office, New York 1, New York. p.b. \$1.00. 96 pp. (Available through the Christian Book Club of America, P.O. Box 638, Hawthorne, Ca. 90250.)

Reviewed by George F. Howe.

Few American biology students would know the life and work of Louis Agassiz and many would not even recognize his name. Yet it was Agassiz, according to this paperback, who had more influence on the teaching of biology in America than any other man.

On the inside back cover is found the following quotation from the noted teacher-scientist, David Starr Jordan: "Of the older teachers in America—the men who were born between 1830 and 1850—nearly all who have reached eminence have been at one time or another pupils of Agassiz."

Noted author-naturalist, Donald Colross Peattie asserted that: "It is safe to say no American scientist ever had as much influence on scientific education as Agassiz."

In a day when great stress is being placed on teaching methodology for the sciences, Lane Cooper's words about Agassiz are apropos:

"When the question was put to Agassiz, 'What do you regard as your greatest work?' he replied: 'I have taught men to observe'."

It is a double blessing that this great teacher also believed in divine special creation. The subtitle of this work makes that stand amply clear: "Passages on the intelligence working in nature." If time is spent on Darwin in high school courses, then more time should be spent on Agassiz—his ideas and his valuable methods. Inexpensive and yet substantial, this little book will serve as collateral to display the essence of a gifted naturalist.

Agassiz believed there is real purpose and design in nature. If it requires an intelligent mind just to study the facts of biology, reasoned Agassiz, "... it must have required an intelligent mind to establish them." Following his famous teacher Cuvier, he asserted that the major groups of animals do not represent ancestral branches from a tree of evolution but great plans used by the Creator to shape the different species.

Rather than trying to teach great lists of facts, Agassiz was content to stress the organization of facts:

Stringing words together in incoherent succession does not make an intelligible sentence: facts are the words of God, and we may heap them together endlessly, but they will teach us little or nothing till we place them in their true relations, and recognize the thought that binds them together as a consistent whole. (p. 19-20)

One gist demonstrates that Agassiz stressed the obvious principle that biological changes occur within the type, but do not lead beyond the type. Although he acknowledged the great changes that occur during metamorphosis, he showed that these are but a sequence of events in the history of one organism. Concerning the idea of evolutionary transformism, he asserted, "Thus far Embryology has not recorded one fact on which to base such doctrines."

The reader will learn that Agassiz imagined there was greater variability in the world of domesticated animals than in natural species. He held that man's ability to select breeds in domesticated lines was no basis to suppose that great evolutionary changes occurred in wild populations. Concerning breeds and species, he is quoted as having said, "... Breeds among animals are the work of man: Species were created by God." (p. 37)

Long before the gene theory of inheritance was popularized and before the process of natural selection had been carefully studied, Agassiz foresaw the harmful nature of mutation and the impotency of selection:

All the deviations known to us are monstrosities, and the occurrence of these, under disturbing influences, are to my mind only ad-

ditional evidence of the fixity of species. The extreme deviations obtained in domesticity are secured, as is well known, at the expense of the typical characters and end usually in the production of sterile individuals. All such facts seem to show that so-called varieties or breeds, far from indicating the beginning of new types, or the initiating of incipient species, only point out the range of flexibility in types which in their essence are invariable." (p. 51)

In a letter to Adam Sedgwick on fixity of species, Agassiz showed that a supposed evolutionary series of increasing finger numbers in lizards was no series at all because each member of the proposed chain came from an entirely different location on earth! (p. 55)

The reader will be interested to encounter Agassiz' bizarre view of fossils—each stratum representing a distinct ancient creation! Nonetheless, even in this opinion, he saw evidence for creation rather than evolution. Geologically minded readers will also appreciate the extensive section (pp. 56-64) revealing Agassiz' dynamic defence of glacial action over northern North America. Here too, he found unerring evidence of God's care for he spoke of the glacier as "God's great plough and he believed it was God's way of producing rich, grain-growing soils,

Teachers will benefit by finding the intense interest this man brought to the discovery of floating fish nests, the hairworm's care of its eggs, phyllotaxy in palm trees, fish populations in Brazilian rivers, autumnal coloration in leaves, and life cycles in the invertebrates (pp. 65-91.) In these excerpts one watches an eminent biologist use the beauties of nature to manifest the providence of God. Agassiz' awe and wonder in teaching and research were attributable in large measure to his deep conviction that he was observing the magnificent handiwork of a master Creator,

A treatise of 31 precepts listed at the end of the book caps his grand argument that the facts of biology "... can, therefore, not be understood otherwise than as established by a thinking being." (p. 96) To the Creator, Agassiz ascribed, "... premeditation, power, wisdom, greatness, prescience, omniscience, providence." (p. 96)

This book will furnish collateral on Agassiz for any course demanding it. While it will aid student and teacher, a shortcoming exists in that excerpts are largely undocumented. It is hoped that later editions of this work will include bibliographic references to sources used.

It has been stated before in Creation Research Society Publications that students who read Darwin's *Origin of Species* should also read the critical introduction given by the late Dr. W. R. Thompson in the Everyman's Library Edition of that classic. Gists from Agassiz should likewise be considered a "must" while reading Darwin.

FILMSTRIP REVIEWS

"The Origin of the Solar System" by John G. Read with numerous illustrations by C. D. Kishady. Published by the Creation Science Research Center, 2716 Madison Ave., San Diego, Calif. 92116. Price: \$25.00.

Reviewed by George F. Howe

As a layman to the field of cosmogony, one of the greatest problems I face is that of trying to visualize each contrasting view of origins. This difficulty has at last been overcome in a filmstrip which contains lucid diagrams that are excellent from the standpoint of art, and in addition are based upon detailed research. The booklet accompanying this filmstrip includes 59 citations from the literature. Although it is thus squarely rooted in the data, this presentation is not "stuffy" and the documentation actually adds to the general appeal of this filmstrip.

In this filmstrip, cosmogonic speculations of various men are examined and each in turn is shown to fall far short of the simple but effective Bible account of miraculous creation. Viewpoints studied include the following and many more: Descartes' view, Buffon's comet theory, Herschel's nebular concept, Kant's nebular hypothesis, Laplace's nebular hypothesis, Jeans and Jeffreys' view of stellar near-miss and sideswipe, Von Weizsacker's dust cloud model, Hoyle's torque coupling hypothesis, Darwin's moon origins scheme, Wise's revision of Darwin, and Urey's lunar capture theory.

Author John Read's approach in each case is that of exploring a cosmogonic tenet quite fairly and then exposing its flaws and weaknesses. Each view is finally put to rest as being far beneath the grandeur of the Biblical record—"In the beginning God created . . ."

The narration is blasé but extremely effective. In fluent, flat, but fascinating intonation John Read gives documentary evidence enough to demolish every major cosmogonic scheme. The tape is replete with droll comments and understatements which add a dimension of high-level humor that in no way detracts from the presentation.

Even a little detail like the musical score has been cleverly handled. When discussing the absurdities of cosmogonies, the "Dance of The Sugar Plum Fairies" is played as background at one point and "Danse Macabre" at another!

For those who would miss such features, Read has included some real laughs in the form of cartoons. One of these shows an ailing cosmogony reclined on a hospital bed surrounded by all sorts of life-saving equipment. It is accompanied by these words, "Moreover, it appears that the available emergency equipment is not adequate to save this particular invention."

For those wishing a breakdown of frames into various categories, the following is an approximate distribution: title frames (mostly at the beginning and the end)—6; pictures of noted cosmogonists—1; photographs of appropriate subjects under discussion—55; and diagrams (mostly color), illustrations of models under study, or cartoons—77. The photographs include many NASA and JPL Ranger IX shots as well as Lick Observatory photographs.

The tape and filmstrip move briskly and there is never a dull moment since the entire sequence of 136 frames lasts only 30 minutes. Major concepts and minute details are skillfully handled and it can be safely stated that John Read has produced a masterpiece in creation audio-visuals. This product packs a real "whallop" and should be a "whalloping" success with any group of high school age or older. It has particular value for serious students because illustrations linger in the mind and illuminate one's further study in this field. It is hard to imagine how this presentation could have been improved.

"The Necessity of Creationism" by Rousas J. Rushdoony. 1966. Film strip and tape produced by Publius and Associates, graphics by Granger Graphics, produced by Jotham Products. Obtainable through the Bible-Science Association, Box 1016, Caldwell, Idaho 83605. Purchase price \$12.50 with record and tape. Pamphlets 10¢ each.

Reviewed by George F. Howe.

Only God could bring life to the dry bones in Ezekiel's vision, but Rev. Rousas J. Rushdoony has shown that some lively interest can be kindled in the area of philosophical apologetics. A man's philosophy is the root stalk of his actions and the basis of all his deeds.

Yet it is sometimes difficult to show scientists or laymen that a careful study of underlying philosophies is absolutely essential to the intelligent analysis of origins. We may hear someone say at times: "Let's deal with the facts alone and avoid all philosophical speculation."

It is right here that Rev. Rushdoony and the producers of "The Necessity for Creationism" (TNC) have stepped in to smuggle a healthy package of sound philosophy across to the wary viewer. Nor will a viewer of this filmstrip feel that he has been given a distasteful portion of abstract medicine. He will sense rather that philosophy directly influences not only one's origins outlook, but also such tangible matters as law, social action, education, and patterns of moral behavior.

At the onset, Rushdoony makes a strong case for avoiding the outlook of neo-liberal churchmen who accommodate the Genesis scriptures to what are supposed to be respectable theories of science. Although such a message was important in the 1960's (when this was published) it is of keener urgency even now as leading spokesmen for science and faith have espoused a so-called "Biblical evolutionism."¹ Moreover, the author demonstrates that both Bible study and science will suffer from such abortive compromises: "If we assert that we can set aside the six-day creation doctrine, we have asserted our supremacy over Scripture . . . Clearly, therefore, the question of authority is at stake in Genesis 1: God or man? Whose word is authoritative and final?"

Rushdoony points to a strange contradiction which arises in the minds of scientists who demand the determinism of cause and effect as fundamentals of their science, yet hold that all things arose by chance: ". . . evolutionary science denies spontaneous generation as a fact but requires it in theory to account for the universe."

In the understanding of Genesis, the author boldly asserts the literal day view: "The Bible clearly asserts that God created heaven and earth, the whole created universe, in six days. If this statement be allegorized or interpreted away, no meaning stands in Scripture." Furthermore, Rushdoony maintains that every doctrine of scripture (including man's personal salvation) rests on this tenet!

He asserts that evolutionists have precipitated the destruction of man in four different ways: 1. Man is no longer viewed as created in God's image, 2. Evolutionists have convinced many that man is not personally responsible for his own actions, 3. Evolutionists have established a new religion—"evolutionism," and 4. They have taught the abolition of moral absolutes.

Concerning point one, Rev. Rushdoony demonstrates that each oppressive society has capitalized on the reduction of man to an animal level. He indicates that George Orwell's wildest dreams may be surpassed as godless workers find more efficient ways to enslave mankind such as bio-electric control of the human brain.

Secondly, it is asserted that the loss of man's personal responsibility in the wake of evolutionary theory has led to gross abuses at the individual and societal level. Relatives and environment are blamed for personal failure, while men in general ". . . look to scientific socialist planners for salvation rather than to Jesus Christ. Their maker is their savior."

At this point in the filmstrip, the viewer is introduced to the little-known racist concepts of Charles Darwin who believed in "higher" and "lower" races, imagining that evolution would soon eliminate the latter. Mention is made of

the "religious" character of evolutionary zealots while evolution in the church itself is seen as a frightening specter. Even in the supposedly evangelical churches there is a growing credence in scientific opinions as opposed to the plain statements of the Hebrew scripture.

Under the fourth and final topic, the areas of crime, sexual license, and total lawlessness are portrayed as outgrowths of atheistic evolutionism. This theme is illustrated twice in the production by diagrams of an evolution tree producing fruit from anti-god and anti-biblical roots. The answer to all this evolutionary outrage is shown to rest in a return to Biblical Christianity as founded on creationism.

In a day when "ecology" is fast becoming a hollow byword, Rushdoony properly portrays man as free from nature and not a slave to it. Accordingly, man is the one who should exercise dominion over nature under God. Man is said to be "lord over the world under Christ. This incidental aspect of TNC is especially timely in the early 70's when men blindly champion each environmental "cause" — sometimes to their own detriment!

Here and there in the narration a central motif of Cornelius Van Til's philosophy is emphasized—that there is no neutral knowledge. In every facet of his work, a scientist commits himself either for God or against Him, and there are no autonomous "facts" as "things in themselves."

This cosmonomic view is aptly summarized in the following passage quoted by Rushdoony from Van Til, "Every time any human being opens his mouth to say anything he either says that God is or that God is not a reality. It could not be otherwise. God claims to control every fact." The reviewer strongly agrees with this position and notes a disturbing trend among professed Christian scholars to treat with each profession (including education) as a world of its own, completely unaffected by Biblical realities.²

This work is generally well documented with quotations from noted individuals in widely divergent areas—science (Kerkut), drama (Shaw), philosophy (Van Til) and psychiatry (Freud). An additional benefit comes in that the entire tape is printed in pamphlet form available for 10 cents per copy.

Although they do not present scientific concepts regarding creationism, the pictures reflect and amplify what is under discussion. In a few frames there is redundancy (two views of Kru-shev, two of Marx in a worker's emblem, two of Dr. Ramm's book) and on other occasions it is hard to understand just how the picture is intended to enhance the text (e.g. a still-life shot of a man in a glass tube surrounded by glassware and a microscope slide labeled "bee hind leg"—

as perporting to illustrate the statement that man is at war with God and bent on denying Him!) But by and large the frames artfully correlate with the spoken message so that the viewer is drawn away from abstractions to concrete reality.

Of the 102 frames, approximately 33 are photographs of historical or present day appeal, six are portraits of people under consideration, 14 are Bible passages or other quotations clearly printed in white on blue, 11 are color diagrams, 18 are pictures of the Bible or other books and magazines, approximately eight are still-life shots, four are of great art works and about five are historical pictures including a scene from ancient Egypt and a drawing of Noah's ark.

Students of high school age and older will find this filmstrip of great value. Students below high school level may lack the political, historical, and sociological perspective necessary to appreciate some of the discussion.

Also it can be recommended certainly for presentation to adult audiences—especially college classes in philosophy, philosophical apologetics, origins, contemporary theology, and even ecology or biology. The low price should make it fit almost any budget.

References

¹Bube, Richard H. 1971. Biblical evolutionism?, *Journal of the American Scientific Affiliation*, 23(4):140-144.

²Hirst, Paul H. 1971. "Christian education," a contradiction in terms?, *Faith and Thought*, (England) 99(1): 43-54.

"Cataclysm from Space, 2800 B. C." by Donald W. Patten. 1971. Film strip and tape by American Media, graphics by Granger Graphics, produced by G. Edward Griffin and obtainable through the Pacific Meridian Publishing Co., 13540 39th Ave. N. E., Seattle, Washington 98125. Purchase price \$36.00, with record, \$39.00 with cassette, \$41.00 with 7-inch reel. \$6.00 rental of any of these for public showing.

Reviewed by George F. Howe

As of December, 1971, Mr. Patten states that over 400 copies of this filmstrip-tape combination have been sold. It has had a wide spectrum of viewers from various denominational groups as well as non-church audiences the total being estimated at 100,000 people to this December date.

The first section of four frames contains material regarding Mr. Patten specifically. A unit on secular texts follows and in 12 frames (mostly photographs of text quotations), the viewer learns that textbooks foster uniformitarianism and degrade Biblical catastrophism. Three frames are used to establish that the filmstrip is a presentation of a slide lecture delivered by the author before the New England Rally for God, Family, and Country in Boston, July 4, 1970.

The history of cosmogony and cosmology in general, and the nebular hypothesis in particular, is traced in eight frames that consist for the most part of color titles and portrait drawings. After stating that evolutionary uniformitarianism is a myth, the author examines the flood by posing these questions: how the rain could float the ark uphill to rest in mountains, how rain could supply enough water to explain the event, and how the waters would rise for 110 days if rain lasted only 40 days and 40 nights. Early in the filmstrip and at various intervals throughout its length, the viewer is introduced to Patten's belief that it was primarily the tides and not the rain which caused the flood.

After dealing with stratigraphical evidence for catastrophism in five frames, the author uses 16 frames to illustrate astral catastrophism. In well-made color diagrams the viewer learns of the possibility that a planet approached the earth and changed the gravity gradient to such an extent that tides thousands of feet deep were produced. Astronomical phenomena such as Halley's comet, Saturn's rings, the asteroid belt, Pluto's elliptical orbit and craters on the moon are presented as general evidence correlated with this concept of a planetary visitor.

In eight frames that follow, Patten extends his theory to explain mountain uplift. Diagrams from his book *The Biblical Flood and the Ice Epoch*, are reproduced to illustrate the great circle pattern of mountain distribution, and Patten attributes the mountain arcs to two stages of the earth's encounter with a planetary visitor. Patten estimates the age of these two cycles of mountain uplift to be about 5000 years ago, not 150 million.

In three additional diagrams the author proposes that possibly Mercury with a small icy satellite might have entered the earth's gravitational field. He holds that the icy moon fractured and the fragments were deposited at the vortex of the geomagnetic field around the earth.

In a unit of seven frames the author represents evidence of human foot tracks in Utah trilobite strata and dinosaur foot tracks in rock strata near Paluxy, Texas.

By means of aerial views of Niagara Falls, Patten discusses the rate at which the rock ledge has been eroded annually since the glaciers retreated. He asserts that Lyell's estimate of 40,000 years is grossly inaccurate and that, with more reasonable assumptions as to the yearly rate, the Niagara evidence would place the ice are only 5000 years ago. In one frame and considerable discussion he dwells on great ice depth at the South Pole below sea level as evidence in support of the ice-dump hypothesis.

In seven frames the story of the quick-frozen mammoths is retold with pictures of mammoth

tusks and one of the quick-frozen mammoths discovered in Siberia, the Beresovka mammoth.

Through six frames Patten expands his idea of ice descent. He has concluded that ice particles from the fragmented icy moon in part would have entered the earth's atmosphere directly, causing a massive global rain but the larger part would have revolved around the earth, become electrically charged, and then would have been deflected and descended in cycloid orbits in the vortex of the geomagnetic field, falling for a period of 40 days and 40 nights. Further details of this hypothesis are available in Patten's various publications which have been reviewed in previous issues of this journal (C. R. S. Quarterly, 7(2):130-131, and C. R. S. Quarterly, 4(4):129-132).

Ten frames contain a description of the earth's climate before the flood as related to a postulated canopy of carbon dioxide and water vapor that caused a temperature equilibrium and the lack of rain or winds before the flood. Patten also envisions the flood catastrophe as altering the earth's climatological scene, resulting in a post flood climatology wherein vertical wind systems bring ozone down into the atmosphere. Changing oceanic temperatures are thought to have profoundly affected carbon dioxide concentration in the atmosphere. He attributes giantism in fossil men and animals to differences in the pre-flood environment.

In about four or five concluding frames he stresses the negative aspects of most mutations and the high odds against evolutionary changes. He recommends Biblical catastrophism as superior to evolutionary uniformitarianism.

The filmstrip includes about 49 frames which would be classed as: diagrams, charts, title headings, and drawings—skillfully done and mostly in color. About 38 frames are photographs of objects related to themes under discussion (Mariner photographs, shots of fossil beds, etc.) There are about 17 frames of marked passages in the Bible or other texts.

The color diagrams and photographs generally show excellent technical production. Mr. Patten's narrating voice throughout is relaxed and pleasant. The frames move rather slowly with extensive tape discussion but in nearly all other regards the author and producers are to be congratulated for developing a filmstrip of high technical quality.

Certain aspects of the filmstrip will appeal to creationists in general: 1. the Bible is revered as absolute authority in historical and scientific questions, 2. evolutionary uniformitarianism is often said to be a "myth," 3. catastrophism is fostered from both Biblical and scientific fields, 4. special creation is espoused rather than mutation as the means of life origins, and 5. a recent date (5000 years B. P.) is suggested for the flood.

Yet, as the title clearly indicates, the filmstrip was primarily intended to promote a theory of astral catastrophism. In this context, we must ask, is it possible for man to understand any of the causal mechanisms which God used in producing the flood? Will man be able to find any clues or evidence as to possible physical agencies involved?

On the premise that God has arranged it so that man can gather some facts about the flood's causal basis, Patten's filmstrip and his books could prove helpful. They illustrate what can be said in favor of one particular astronomical view. It is the reviewer's opinion that the tape and filmstrip will help students and others see just how such evidence has been aligned. In this connection, I have requested that Patten's production be purchased for the audio-visual collection of the Los Angeles Baptist College where I teach,

But at the same time we can likewise be grateful to Mr. Charles Morse for his careful attention to that which can be said regarding sub-oceanic sources of flood waters and a geocentric rationale, or to others who might research yet other concepts of flood processes. (See Morse, Charles P. 1971. Source of the Water and driving energy in the Genesis Flood, Bible-Science Newsletter, 9(7-8):1-4, July-August.) Mr. Morse's proposal that the flood was "triggered" by a nuclear fission reaction below the ocean basins is based on detailed and systematic chemical, mathematical, and physical research. (See Morse, Charles P. 1971. Research to determine the driving force for continental drift. Privately published and available from the author 16505 Las Casas, Pacific Palisades, Calif. 90272.)

With the exception of Dr. Loren Steinhauer's recent analysis of Roche's limit (C. R. S. Quarterly, 8(1):63-65), however, almost no mathematical or physical analysis has been published by Patten or his collaborators regarding his sweeping concepts of planetary interaction, magma tides, and mountain uplift. This is a continuing deficiency in Mr. Patten's proposals but he informs me that time alone is the determining factor, and that research is in progress now that involves technical analyses which will provide results basic to his proposals. While both Patten and Morse are apologists for their own schemes (which are for the most part mutually exclusive) uncommitted workers will benefit from such labors—even if the uncommitted workers should finally decide that one cannot speak with any certainty about flood forces at present! There is, however, an inherent danger that numerous uninitiated laymen will orbit fully to Patten's concept or to Morse's without realizing all the problems involved or all the possible alternative schemes which do exist. It is well to recognize here that even the "water vapor canopy" which

many creationists cherish as a likely factor in the flood is itself largely an extra-Biblical conclusion based at best on the meaning of one or two Bible verses! It is for this reason that the reviewer believes the most generally valuable sections of the filmstrip are those incidental portions that deal with overall evidence for catastrophism such as the Niagara Falls data, the fossil footprint section, the frozen mammoths, and the great depths of polar ice.

Finally, it is refreshing to realize that the reality of the flood event depends on the sure statements of God's Word and is unaffected by the rise or fall of Mr. Patten's theory, Mr. Morse's theory, or anybody's theory of how God might have produced the flood. Certain (if not all) of the aspects of the global flood discussed in Genesis were miraculous. While one would expect to find evidence of this miraculous event, he has no Biblical guarantee that he will be able to

understand its cause or the cause of any other Scriptural miracle. It is for this reason that the reviewer believes it is more important to stress evidences of the flood's occurrence than it is to try to fathom the means by which this great event might have taken place. Only in the future will it be obvious whether the reviewer's attitude is correct as opposed to the attitude of Mr. Patten, Mr. Morse, and others who continue to believe that they have discovered God's modus operandi for Genesis 7-9.

All in all, it must be recognized that "Cataclysm from Space . . ." is not an average "run of the mill" item in terms of its circulation or its impact. Sensing too that it is clearly creationistic and non-uniformitarian, we can pray that through this product the reality of creation and the flood may reach out beyond the traditional evangelical groups.

LETTERS TO THE EDITOR

Perhaps I am flogging a dead horse but I would like to add one word of support for Dr. Whitcomb's review of Dr. Custance's book (Sept., 1971, pp. 134, 137).

Dr. Custance quotes two Greek lexicons to neither of which I have access at present. However, one does not have to look further than the New Testament to see that the particle "de" is used in two quite distinct ways: 1) *adversative* (as Thayer says) = "but," and 2) *connective*, when it must be translated by the English "now" or "and."

For example: Acts 6 in the Revised Version (1881): verse 1: "Now in these days . . ."; verse 2: "And the Twelve called . . ."; verse 8: "And Stephen . . ." (N.B. This is a very common usage, picking up a word previously mentioned and giving further information about it/him. An exact parallel, I suggest, to Gen. 1:2—the earth—and 2:12, the gold), and verse 9: "But there arose . . .". The words emphasized are in each case a translation of the same particle "de."

Of course no one now can tell precisely what was in the mind of the LXX translator of Gen. 1:2—whether he meant the "de" to be adversative or connective. But in view of the exact parallel with Gen. 2:12, where the adversative sense is impossible, it seems very probable that the connective sense was intended, corresponding to the circumstantial "waw."

I conclude, then, that Dr. Whitcomb is right in translating Gen. 1:2, "Now the earth was . . ."; and Dr. Custance is mistaken in thinking the Hebrew could ever have meant "But the earth became . . .".

DAVID C. C. WATSON
20 Lansdowne Ave.
Slough, Bucks, U. K.

(Note: A creationist student organization has been established at the University of California, Santa Barbara. The group is called the Christian Education Association and their activities have been reported in the UCSB Daily Nexus, Friday, November 12, 1971, page 11. An excerpt from the president of the society, Mr. Robert Harris (UCSB student) follows.)

We (the Christian Education Association) have been operating our book table each Wednesday from 9:00 a.m.-1:30 p.m. and have received some interest, and have sold a fair number of books.

Last night (November 9, 1971) we passed out about 400 or 500 copies of the enclosed broadsheet in front of the first Darwin Centennial Lecture. (UCSB is sponsoring four lectures to commemorate the 100th anniversary of *Descent of Man* by Charles Darwin.) We passed out about 500 more today on campus.

I'm also enclosing a copy of our latest booklet, a very slightly enlarged version of the old one. We plan to pass out three more broadsheets at the other three lectures, so I will send you a copy of each of those. . . .

ROBERT HARRIS
P.O. Box 11361, UCSB
Santa Barbara, California 93107

(It is hoped that Mr. Harris' lead in this direction will encourage many other college students to organize creationist groups and take a bold stand right on campus for the Scriptural account as opposed to evolutionary uniformitarianism.—Editor)

NEWS FEATURES:

CREATIONISTIC OUTREACH IN CEYLON

Dr. Felix Fernando, M. B. B. S., of Ceylon, has sent a copy of his reply to some assertions made by the noted science fiction writer Arthur Clarke, in *The Ceylon Daily News*, December 8, 1971.

Dr. Fernando's letter was bold and forthright and is republished here in its entirety. It is encouraging to realize that men of science and faith are standing for the scientific veracity of Scripture even on the Isle of Ceylon!

Incidentally, C. R. S. readers should know that Dr. Fernando has met with certain difficulties in trying to order and secure creationist books and/or journals. He would appreciate receiving any spare copies, back issues, or reprints from C. R. S. *Quarterly* as well as any other creationist literature. These materials may be mailed to him at: Dispensary and Surgery, Wennappuwa, Ceylon.

WILL GOD BE THERE IN TIME?

To the Editor:

(*Ceylon Daily News*—20th December, 1972)

According to a front page report appearing in C.D.N. of December 8, Mr. Arthur C. Clarke, doyan of science-fiction writers, is busy grappling with a so-called "astro-theological problem." Mr. Clarke seems to be worried whether God will be there "in time."

In time for what, is not clearly stated, but refers apparently to intervention in man's present troubles on this earth, and the possibility of his total annihilation in the not too distant future.

The limiting factor according to Mr. Clarke is the speed of light. He says, "If God obeys the laws He apparently established, at any given time He can have control over only an infinitesimal fraction of the Universe."

Permit me to point out that the problem as stated by Mr. Clarke involves no less than two distinct fallacies and is therefore a clear case of arguing from false premises. As far as Biblical cosmology is concerned.

(1) According to the Bible, God is said to have created light (Genesis 1:3); so that the question of His being tied down by the velocity of something which He himself created simply does not arise.

(2) The very idea of a Creator God, by definition itself, involves the concept of an entity which transcends both space and time. The Bible itself repeatedly asserts that God's time-scale just cannot be equated to our own. "A thousand ages in thy sight are like an evening gone." (Psalms 90:4 and 2 Peter 3:8).

Mr. Clarke says that one of the most firmly established facts of modern physics is that the velocity of light is the speed limit of the material universe. True enough, but so is the Second Law of Thermodynamics, which stated in simple terms, says that all things left to themselves get into disorder and degenerate. But according to the theory of Chemical Evolution of Life, this firmly established universal Law of Physics, suddenly began to reverse itself a couple of thousand million years ago for no accountable reason, on this tiny insignificant planet, culminating in the evolution of *Homo sapiens* (Man, the wise).

If Mr. Clarke can subscribe to such a view, involving as it does a negation of one of the fundamental laws of physics, it is difficult to see how he can insist that God's own movements must necessarily be limited to the speed of light.

As regards the question whether God will be there "in time" to save mankind from the possibility of total annihilation he now faces, Mr. Clarke might be able to find a possible answer in Matthew 24:21, 22:

For then shall be great tribulation, such as was not since the beginning of the world to this time, no, nor shall ever be. And except those days should be shortened, there should no flesh be saved: but for the elect's sake those days shall be shortened.

DR. FELIX FERNANDO
Wennappuwa, Ceylon

Teaching of creation as a theory equal to evolution is a break through in the right direction here in Columbus (Ohio), as is evidenced by the following quoted, "Administrative Guideline for Columbus Schools":

Section 910—Etiological Theory

Section 910—Teachers in all fields are encouraged, when considering or teaching the origin of life or the universe, to present all major theories, including those of creation and evolution. These should be stressed as theories, rather than established fact, and accorded proper treatment in time, emphasis, and attitude to protect the rights of all students. An adequate amount of reference material shall be provided by the Columbus Public School Libraries to lend support to each theory. Teachers should supplement Board of Education adopted texts with materials which attempt to provide unbiased information about the various theories of the origin of life and the universe. (p. 111)

Sincerely,
HUGH MILLER
Columbus, Ohio

CREATION RESEARCH SOCIETY

Board of Directors **Biochemistry:** Larry Butler, Ph.D., Vice-president, Purdue University, Lafayette, Indiana 47907; Duane T. Gish, Ph.D., Institute for Creation Research, 2716 Madison Avenue, San Diego, California 92116. **Biological Sciences:** Wayne Frair, Ph.D., The King's College, Briarcliff Manor, N.Y. 10510; George F. Howe, Ph.D., Publications Editor, Los Angeles Baptist College, Newhall, California 91321; Wilbert H. Rusch, Sr., M.S., Sc.S., Membership Secretary, Concordia Lutheran College, Ann Arbor, Michigan 48104. **Genetics:** John W. Klotz, Ph.D., Concordia Senior College, Fort Wayne, Indiana 46805; Walter E. Lammerts, Ph.D., Freedom, California 95019; William J. Tinkle, Ph.D., Secretary, 112 South Street, Eaton, Indiana 47338. **Geology:** Clifford L. Burdick, M.S., 629 East 9th Street, Tucson, Arizona 85705; Harold Slusher, M.S., Director, Kidd

Memorial Seismological Observatory, University of Texas at El Paso, Texas 79902. **Medicine:** Karl W. Linsenmann, M.D., Midland Medical Center, Midland, Michigan 48640. **Physical Sciences:** Harold Armstrong, M.S., Queens University, Kingston, Ontario, Canada; Thomas G. Barnes, D.Sc., University of Texas at El Paso and Consultant to Globe Universal Sciences, Inc., El Paso, Texas 79902; John J. Grebe; D.Sc., 11604-114th Drive, Youngstown, Arizona 85363; Richard G. Korthals, M.S., Treasurer, Arcadia, Michigan 49613; Henry M. Morris, Ph.D., President, Institute for Creation Research, 2716 Madison Avenue, San Diego, California 92116; Emmett L. Williams, Jr., Ph.D., Bob Jones University, Greenville, South Carolina 29614. **Science Education:** John N. Moore, M.S., Ed.D., 136 Brody Hall, Michigan State University, East Lansing, Michigan 48823.

History The Creation Research Society was first organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a real need for an association devoted to research and publication in the field of scientific creationism, with a current membership of about 400 voting members (with graduate degrees in science) and over 1300 non-voting members. The **Creation Research Society Quarterly** has been gradually enlarged and improved and is now recognized as probably the outstanding publication in its field.

Activities The Society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible.

Membership Voting membership is limited to scientists having at least an earned graduate degree in a natural or applied science. Dues are \$7.00 (Foreign, \$8.00 U. S.) per year and may be sent to Wilbert H. Rusch, Sr., Membership Secretary, 2717 Cranbrook Road, Ann Arbor, Michigan 48104. Sustaining membership for those who do not meet the criteria for voting membership, and yet who subscribe to the statement of belief, is available at \$7.00 (Foreign, \$8.00 U. S.) per year and includes subscription to the Annual Issue and Quarterlies. All others interested in receiving copies of these publications may do so at the rate of the subscription price for all issues for one year: (\$10.00 (Foreign, \$11.00 U.S.).

Statement of Belief Members of the Creation Research Society, which include research scientists representing various fields of successful scientific accomplishment, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution), both of the universe and the earth with its complexity of living forms.

We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. In 1970 the Society published a textbook, **Biology: A Search for Order in Complexity**, through Zondervan Publishing House, Grand Rapids, Michigan 49506. All members of the Society subscribe to the following statement of belief.

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

2. All basic types of living things, including 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.

INSTITUTE FOR CREATION RESEARCH ESTABLISHED AT CHRISTIAN HERITAGE COLLEGE

The *Institute for Creation Research*, with Dr. Henry M. Morris as Director and Dr. Duane T. Gish as Associate Director, has been established as the Research and Publications Division of Christian Heritage College in San Diego. The activities of the Institute center around three main emphases: (1) research in problem areas of creationism; (2) writing of creation-oriented textbooks; (3) teaching courses and seminars in scientific creationism.

Of immediate interest to readers of the *Quarterly* are two intensive *Summer Institutes in Scientific Creationism* scheduled for San Diego, July 17-21, in cooperation with *Azusa Pacific College*, and for Springfield, Missouri, July 31-August 4, in cooperation with *Evangel College*. These courses may be taken for either two graduate credits or for audit as preferred. Tuition is \$60 for credit students, \$30 for audit students. Faculty for the two Institutes includes Dr. John Moore and Professor Harold Slusher, in addition to Dr. Morris and Dr. Gish, and also Dr. Robert Franks in San Diego and Dr. Robert Cooley in Springfield. Further information can be obtained by writing the *Institute for Creation Research*, 2716 Madison Avenue, San Diego, California 92116.

The *Institute for Creation Research* will also publish this summer a new creationist-oriented textbook on World History, for high schools, written by Dr. Albert Hyma, for many years Professor of History at the University of Michigan

and now on the faculty at *Christian Heritage College*.

A new 80-page paperback book, *A Biblical Manual on Science and Creation*, written by Dr. Henry Morris, has just been published by the *Institute*. The first in a series of Technical Monographs, *Speculations and Experiments on the Origin of Life: A Critique*, by Duane Gish, will be issued in June. Several other publications in the Technical Monograph Series are in preparation.

Harold Slusher will join Morris, Gish, and others during the summer in working on a junior-high general science text series.

The *Institute for Creation Research* has no formal connection with the *Creation Research Society* or with other creationist organizations. In particular, the *Creation-Science Research Center*, with which Dr. Morris and Dr. Gish were formerly associated, has separated itself from *Christian Heritage College* and has moved to a new location in San Diego.

The *Center* is continuing its radio ministry and marketing of the *Science and Creation Series*, under the management of Everett Purcell, as Acting Director, and Kelly Segraves; but it has no connection with the *Institute for Creation Research*. Most of the former staff members of the *Creation-Science Research Center*, as well as its Technical Advisory Board members, have moved to corresponding positions with the *Institute for Creation Research*.

GUIDELINES FOR CONTRIBUTORS

Editors of Creation Research Society publications ask all contributors to use the following guidelines for preparing manuscripts submitted for publication. It is our goal to keep such restrictions to a minimum thereby insuring a freedom of expression not often found in scientific writing.

Manuscripts should be submitted to the Editor in triplicate—one original copy and two photocopied or carbon copies for use by reviewers. Manuscripts must be typed double-spaced with good black ribbon on one side of the page only. At least one inch should be used for all four margins so the Editor will have space for his instructions to the printer, or for queries to the author. All manuscripts should be in English. Pages should be numbered consecutively, including all inserted pages. Typing the contributor's last name before the number of each page is good insurance against loss of any pages in editorial handling.

An abstract of from 100 to 200 words should be included with the manuscript. The abstract should contain a summary of the entire article, briefly giving representative coverage to such possible areas as data presented, concepts discussed, conclusions established, etc. Letters, book reviews, or articles less than one journal page need not contain an abstract.

If corrections and insertions in the manuscript are very brief, type or print them legibly above the line involved. If corrections are lengthy, then re-type the page involved with carry-over on a new page with number consistent with entire manuscript.

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References

¹Smith, G. M. 1950. The fresh-water algae of the United States. Second Edition. McGraw-Hill Book Co., Inc., N. Y., p. 434.

²*Ibid.*, p. 436.

³*Ibid.*, p. 307.

⁴Ris, H., and R. N. Singh. 1961. Electron microscope studies on blue-green algae, *Journal of Biophysical and Biochemical Cytology*, 9:63-80.

⁵Smith, G. M. *Op. cit.*, p. 482.

⁶Corner, E. J. H. 1961. Evolution (in) Contemporary botanical thought. Edited by Anna M. MacLeod and L. S. Copley. Quadrangle Books, Chicago, Ill. p. 417.

⁷A "clone" of plants is a group of adult plants originally derived from one parent plant by means of vegetative reproduction.

⁸Ris, H., and R. N. Singh. *Op. cit.*, p. 69.

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