REACTIONS

Readers are invited to submit their reactions to the articles in our journal. Please address contributions to: ORIGINS, Geoscience Research Institute, 11060 Campus St., Loma Linda, California 92350 USA.

Re: Walton: The chemical composition of the earth's original atmosphere (ORIGINS 3:66-84).

One very important influence on the structure and evolution of the earth's atmosphere is the solar energy source. The fairly reliable results of stellar evolution theory suggest that in the past the sun's luminosity was considerably less than it is at the present. This could result in a very cold earth, below the freezing point of seawater, at a time when organic evolution theory would insist upon a thriving ecosphere. The difficulty is to explain how the temperature of the earth's surface and atmosphere could have been maintained near or even above the present value.

Carl Sagan & George Mullen (1972. Earth and Mars: evolution of atmospheres and surface temperatures. Science 177:52) consider this problem in some detail. They point out that a simple increase in carbon dioxide levels in the atmosphere, and hence an increase in the "greenhouse" effect, would not have been sufficient to compensate for the estimated 40% change in solar luminosity, the primary reason being that the strongest infrared absorption bands are almost saturated. Further, a number of other common oxides can be eliminated as possible candidates because they do not have the necessary absorption in the infrared. Their conclusion is that small amounts of ammonia in a reducing atmosphere would be quite adequate, since ammonia has an appreciable absorption at the necessary wavelengths.

Thus if the early atmosphere of the earth were oxidizing, as the evidence presented by Walton strongly suggests, one is left with the problem of explaining how the early earth was kept warm. Either some other mechanism must be proposed or else the basic assumptions must be modified.

To illustrate the sensitivity of the structure of the earth's atmosphere, consider the results of a paper presented by M.H. Hart at the January 1977 meeting of the American Astronomical Society in Honolulu in which he described a calculation of the habitable zone about the sun using a varying solar luminosity as well as an initial reducing atmosphere. The minimum distance for the earth to avoid a runaway greenhouse effect was 0.95 AU (astronomical unit equal to the mean radius of the earth's orbit) whereas the maximum distance to avoid runaway glaciation was only 1.01 AU.

It has been suggested that one possible mechanism is for the gravitational constant G to decrease slowly with time. This would mean that in the past it would have been greater leading to a smaller orbit for the earth as well as a

brighter sun. (See Fred Hoyle. 1975. Astronomy and cosmology: a modern course. San Francisco: W.H. Freeman and Co., p 540-545). However, this hypothesis has certain difficulties and is not well accepted.

Another contribution to the thermal equilibrium of the earth's surface is presented by D.L. Turcotte, J.L. Cisne, & J.C. Nordman (1977. On the evolution of the lunar orbit. Icarus 30:254). They have calculated that tidal heating in the past from the moon, when it would have been closer to the earth, could have significantly raised the temperature of the earth's surface. Actually, the problem is too much heat. At a separation of 10 earth radii (the present separation is about 60 earth radii) the energy dissipation from tidal friction would have been equal to the solar flux. The net result would have been a drastic increase in the surface temperature of the earth — several hundred degrees Celsius — which would not only melt any frozen oceans, but would also vaporize them!

It would seem that the simultaneous conditions of an increasing solar luminosity, an existing oxidizing atmosphere of Earth, and the tidal evolution of the moon's orbit put very tight constraints on any evolutionary calculation of the earth's atmosphere. For organic evolution to be possible the temperature of the earth's surface must be kept in the range for liquid water. Is this even possible?

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RE: Brand: Homologies (ORIGINS 3:109-111).

Dr. Brand has summarized the traditional creationist position concerning the meaning of biological homologies; namely, that essential similarities between groups of organisms reflect the master plan of an intelligent Designer. Certainly diversity among living organisms is one of the most obvious facts of nature. Beginning biology students are often overwhelmed by the tremendous variety of organisms and the classification schemes which attempt to bring order to an otherwise unmanageable and bewildering array of life forms. Classification schemes group organisms into categories based primarily upon structural similarities. The fact that structural similarities (not to exclude biochemical and other similarities) occur among organisms is recognized by all; the question of *why* these similarities exist is answered in a fundamentally different way by evolutionists and creationists. It is my purpose to analyze this question and to consider some of the ramifications of the creationist point of view. I will attempt to show why the evolutionary interpretation of homologies is the one held by most biologists.

We know that structural features of organisms have a genetic basis and that a given structure is subject to variation among offspring. Mutation, genetic

drift, and natural selection, among other factors, determine what structural features are produced and their subsequent destiny. So far as I am aware, creationists do not invoke supernatural intervention in any of these processes. These processes are known to be sufficiently efficacious to produce what biologists call new species. Species are characterized by structural and other differences of such a magnitude as to prevent interbreeding. There is therefore a natural, as opposed to a supernatural, explanation for structural similarities (homologies) and differences between newly produced species or between ancestral-descendant species.

Creationists respond to these facts by placing limits upon how much change can be accomplished by these natural processes. Similarities (homologies) *within* the taxa created by the Designer (the dog kind, for example) are accounted for by natural (genetic) processes; similarities *between* created taxa (dogs and cats) are accounted for not by common ancestry but by a common plan conceived by the Creator. Most creationists, for example, would recognize naturally derived homologies among the different breeds of dogs, and perhaps between dogs, foxes, and wolves depending upon the limits of the originally created taxon; structural similarities between the forelimbs of dogs, cats, bats, and man, on the other hand, are believed to be supernaturally derived, i.e., created according to a master plan.

For those creationists who believe that creation occurred relatively recently, the originally created taxa must be rather narrowly delimited. This is necessary because naturally derived taxa and consequent homologies ordinarily require much time. If the created taxa are conceived too broadly, the amount of natural variation leading to new taxa that must have occurred since creation within the restrictions of a short-earth chronology would have had to have proceeded at rates faster than can be accounted for on a genetic basis. In this paradoxical situation, the creationist believes in evolution more strongly than evolutionists!

Imagine an evolutionist and a creationist in a dispute over a given set of homologous structures between widely separated (distantly related) taxa. The evolutionist contends that the structural similarities before him are evidence that the organisms (taxa) involved have a common ancestry. He reasons from what he knows about evolutionary mechanisms and contends that they are sufficient to account for the disputed homologies. He believes he can account for observed differences and similarities on a natural basis and sees no compelling reasons why supernatural agencies need be invoked. The creationist cannot admit that the disputed similarities are due to natural causes and contends that the similarities reflect the fact that the taxa were designed and created according to a plan conceived by a master Designer. The creationist has certain advantages in this argument. He can attack the evolutionist at many points, questioning the possibility of this or that mutation, the efficacy of natural selection, that order cannot arise out of random events. The evolutionist is clearly on the defensive. His theories and assumptions are well known and readily available to the creationist who can pick and choose with what he does

and does not agree. The creationist position is difficult to attack because it has not been detailed in scientific journals and because it ultimately resides in the thought patterns of the Designer which are rather inaccessible to the non-believer. As long as this is so, the creationist position has the advantage (disadvantage?) of not being able to be proven false. It is similar to the argument that the earth was created in 4004 B.C. with all strata and contained fossils intact, trees with a number of "growth" rings, the first man with his navel; age and history are apparent — not real. There is no way to refute such a position and yet no one that I know seriously holds this view even though it is consistent with all possible evidence.

However, there are certain questions that one can legitimately ask of the creationist. A logical consequence of the creationist interpretation of homologies is that there should be a detectable difference between structural similarities produced by nature and those that have their origin in the mind of the Designer. If there is a difference, the creationist should be able to supply criteria to be utilized in distinguishing between natural and supernatural homologies and should be able to apply these criteria to living and fossil plants and animals. If there is no difference, the creationist interpretation appears to be an ad hoc argument designed to harmonize science and Scripture.

Again imagine a working paleontologist studying an array of fossil and living forms. Utilizing the criteria for distinguishing natural from supernatural homologies, he should be able to isolate all natural homologies and taxa from the array which would then facilitate recognition of the created groups. On the other hand, the paleontologist would be substantially aided in his understanding of the homologies and consequent classification of the forms before him if he knew something about the mind (thought patterns) of the Designer. This would give him some insight into the created groups and he would literally be "thinking the thoughts of the Creator after Him."

If the creationist paleontologist finds that he cannot distinguish between natural and supernatural homologies and natural and supernatural taxa, perhaps this suggests that he should examine his basic premises. Possible sources of error are:

1. his criteria for delimiting natural and supernatural homologies are faulty;
2. he has misunderstood the thought patterns of the Designer;
3. the evolutionary position is correct and variation among organisms cannot be divided into natural and created categories.

The master Designer view of homologies is not seriously entertained because it rests on an assumption not amenable to empirical analysis. So long as homologies can be explained without resorting to supernatural causes and in this way bring unity to a great mass of observations and accumulated information, the creationist view of homologies, even though consistent with its premises and technically not subject to falsification, will simply be ignored.

The analogy drawn between wheeled vehicles and organisms deserves comment. Certainly the author is correct in concluding that no one would conclude that cars evolved (in a biological sense) from two-wheeled carts even though one can arrange them in a series from primitive to complex based upon similarity of parts. The stated reason that they can be so arranged is that they were all designed to operate under the same natural laws. Diversity of types reflects the designers' efforts to satisfy different functional requirements by modifying basic parts or bringing them together in new ways resulting in different structural types. Unlike vehicles, however, organisms reproduce *themselves* and because of the genetic mechanism involved, offspring may differ from parents. These differences may lead to descendant types that are structurally different from their ancestors, but the ancestral-descendant relationship remains detectable by analysis of modified (homologous) parts. These processes are controlled by genetic and environmental factors and can be explained without recourse to a Designer. Therefore the contention that the same principles of comparison are applicable to vehicles and organisms is like comparing apples with bolts; apples can produce more apples — more bolts can be produced only by man. Only if one has evidence that man can produce apples is the logic satisfied.

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