

LITERATURE REVIEWS

Readers are invited to submit reviews of current literature relating to origins. Mailing address: ORIGINS, Geoscience Research Institute, 11060 Campus St., Loma Linda, California 92350 USA. The Institute does not distribute the publications reviewed; please contact the publisher directly.

THE ORIGINS OF LIFE ON THE EARTH. Stanley L. Miller & Leslie E. Orgel. 1974. Englewood Cliffs, NJ: Prentice-Hall. 229 p.
SPECULATIONS AND EXPERIMENTS RELATED TO THE THEORIES ON THE ORIGIN OF LIFE: A CRITIQUE. Duane T. Gish. 1972. San Diego, CA: Institute for Creation Research. 41 p.

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In recent years there has been a strong interest in possible mechanisms for the spontaneous generation of life, and a steady flow of books and other publications have recorded the results and speculations arising from these studies. The two recent volumes in this flow of literature which are the subject of this review present contrasting approaches to the problem. The volume by Miller & Orgel appears to be one of the better documented and most objective of those which seek to provide support for the theory of the spontaneous origin of life. By contrast, Gish's book represents one of the few serious, well-documented attempts to present a detailed critique of these theories from the standpoint of a creationist. It is particularly interesting to read both books concurrently and notice the differences in approach to and interpretation of the same basic experimental data. Of course, as in any field of science, much of the data is conflicting and thus does not necessarily lend unequivocal support to either viewpoint.

Miller & Orgel are deeply committed to the belief that life arose by a long process from simple organic precursors. Their book, although relatively small, attempts a rather complete presentation of the whole field ranging from the formation of the solar system through all the intricacies of the syntheses of both simple molecules and complex polymers necessary for life; they tackle the problems of the origin of the most primitive organism, the origin of optical activity and subsequent biochemical evolution with equal zeal. They consistently maintain a surprising objectivity regarding the available data and are frequently critical of the findings and theories of other workers in the field even though they all share a common perspective on the problem. Of course, they do minimize some of the problems which a creationist viewpoint

would tend to emphasize, and they make no serious attempt to consider the creation of life as a likely solution to the difficulties they point out.

Gish is equally committed to the belief that life arose by special creation and marshalls an impressive array of soundly based scientific criticisms of the possibility of spontaneous generation. Not surprisingly, but perhaps unfortunately, Gish does not leave quite as strong an impression of objectivity in evaluating the evidence as do Miller & Orgel and tends to fall into overkill in some of his arguments. I suspect this criticism will not be welcomed by some zealous creationists, but I feel it is a weakness of his presentation. However, Gish must be praised for an ingenious and painstaking analysis of the many weaknesses at every step in current theories of spontaneous origin of life. He writes with a good grasp of the many chemical problems involved in this area and can be quite devastating in his logic. Curiously, Miller & Orgel concede many of his points in their book either directly or indirectly.

Both volumes discuss the composition of the primitive atmosphere as a key factor in any theory of the origin of life. Gish points out that the idea of a reducing atmosphere was developed by Oparin and Urey as a necessary condition for the formation of organic compounds needed for living things. Miller & Orgel are frank to admit the problems and their own preconceptions in this area. "Geological and geophysical evidence is insufficient to allow us to state with any precision what conditions were like on the surface of the primitive earth. Arguments concerning the composition of the primitive atmosphere are particularly controversial. It is important, therefore, to state our own prejudice clearly. We believe that there must have been a period when the earth's atmosphere was reducing, because the synthesis of compounds of biological interest takes place only under reducing conditions" (p 33).

Gish places Abelson's theory of an atmosphere of CO, N₂ and H₂O against the methane-ammonia atmosphere of Urey but points out further that there is little evidence that outgassing of the primitive earth would produce either type of atmosphere. Gish further cites work by Davidson & Brinkmann which suggests that the oxygen concentration in the earth's atmosphere would have reached an appreciable fraction of its present level very early in the earth's history. Miller & Orgel consider most of the same evidence but cling to their admitted prejudice that a reducing atmosphere must have been present long enough for the formation of compounds needed to begin life on the primitive earth.

With this assumption, Miller & Orgel turn to a consideration of sources of energy and the nature of possible reactions involved in prebiotic syntheses. Although Gish does not concede the basic assumption of a reducing atmosphere, he proceeds to attack experiments of the type

described by Miller & Orgel. Both these authors have been active investigators in attempts to synthesize molecules of biological importance under primitive earth conditions; Miller became famous for the production of amino acids by sparking a mixture of CH_4 , NH_3 , H_2O and H_2 . Gish is particularly critical of this type of experimentation because of the immediate removal of the products of the reaction, once formed, from the energy source in order to prevent their destruction. Since there were no organic chemists present on the primitive earth to accomplish this, he contends (with the support of work by Hull) that it would be impossible for any significant quantities of useful compounds to accumulate. Miller & Orgel devote a chapter to the problems of stability of prebiotic organic compounds and another to concentration mechanisms but do not really answer Gish's criticisms.

Orgel has worked extensively on the formation of purines from HCN and pyrimidines from cyanoacetylene. A major problem in this area which he concedes and Gish emphasizes is that the concentrations and the conditions required are unlikely to be attained under any readily conceivable primitive earth conditions. The next step in the synthesis of the nucleic acids, the formation of nucleosides, is conceded by Miller & Orgel "to be unexpectedly difficult, so much so that no really satisfactory method has been reported" (p 112). Gish naturally emphasizes this as well as pointing out the serious difficulties encountered in synthesizing sugars and the high reactivity with amino acids of such sugars as might be formed.

Despite the low probability that any amino acids or nucleosides could accumulate sufficiently for polymerization, Miller & Orgel proceed to discuss possible mechanisms for protein and nucleic acid synthesis under prebiotic conditions! They report little success and conclude the chapter with the statement that "this chapter has probably been confusing to the reader"; Gish exploits this confusing situation in his discussion. Interestingly, Miller & Orgel discount the significance of the thermal synthesis of polypeptides developed by Fox almost as much as does Gish!

In a few brief pages, Miller & Orgel discuss the fantastic problems of going from random polymers to the most primitive organism. They devote most of the discussion to the problem of the origin of the genetic code and conclude that "we clearly do not understand how the code originated." Gish attacks the problem of ordered polymers from the probability standpoint and, as usual, leaves one breathless with improbabilities. Impressive as such calculations are, the validity of the assumptions used should not be accepted uncritically.

Gish devotes considerable effort to demolishing the significance of Oparin's coacervates and Fox's proteinoids as precursors of the primitive cell. From the standpoint of Miller & Orgel, he is wasting his time since

they do not give serious consideration to either of these approaches. On the other hand, Gish does not emphasize the very serious problem posed by optical activity; Miller & Orgel devote a chapter to discussing some possible but unimpressive solutions.

As a final evidence of their faith, Miller & Orgel devote a chapter to biochemical evolution and another to the origin of life elsewhere in the universe. A remarkably frank and objective summary of the successes and failures of their approach concludes their book. Gish concludes by affirming his faith in the necessity of the creation of life on the basis of a brief discussion of the complexities of the functioning and replicating cell.

Clearly the creationist stands on higher ground in the controversy over the origin of life. Miller & Orgel are to be praised for their objective although unrecognized (by them) revelation of this situation, but criticized for not conceding the inadequacy of their own philosophic presuppositions. Gish is to be criticized for over-reaction to the fanciful speculations of the less objective colleagues of Miller & Orgel, but praised for gathering the arguments for the creation of life in a positive and well-documented manner. Thus both books contribute significantly, even if inadvertently, to the development of a scientific base for creation.