topics. Each of the contributions is well written, and most do not require the reader to be familiar with the complexities of the particular system. In addition, many of the authors discuss the reasoning behind the design of their experiments and the interpretation of their results.

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Ancient Earth Processes

Origin of Life. Proceedings of a meeting, Jerusalem, June 1980. YECHESKEL WOLMAN, Ed. Reidel, Boston, 1981 (distributor, Kluwer Boston, Hingham, Mass.). xvi, 614 pp., illus. $73.50.

Mineral Deposits and the Evolution of the Biosphere. Papers from a workshop, Berlin, Sept. 1980. H. D. HOLLAND and M. SCHIDLOWSKI, Eds. Springer-Verlag, New York, 1982. x, 334 pp., illus. $19. Dahlem Workshop Reports. Physical and Chemical Sciences Research Report 3.

The geologic record indicates that life was present on earth about 3.5 billion years ago. However, because of the absence of terrestrial rocks older than about 3.7 billion years, there is no direct evidence available that can be used to determine either how or when it began or what the preexisting chemical conditions were. Even when a geologic record does exist (starting about 3.75 billion years ago with the Isua formation in southwestern Greenland) its interpretation is complex and often controversial. These two volumes of conference proceedings present some of the recent concepts, experiments, and theories used to reconstruct the processes and events that may have been involved in the origin of life on earth and in the formation of some of the earth's most ancient geological deposits.

Origin of Life is the proceedings of the latest in a series of international symposia on this subject begun in 1957 in Moscow. Reflecting the complex interaction of scientific disciplines that is important in research into the origin of life, the coverage is highly interdisciplinary, the topics of the 77 papers ranging from interstellar and prebiotic organic chemistry to the origin of chirality to possible early metabolic pathways. The papers vary considerably in rigor (and perhaps in validity) and some are highly speculative. They are short (most are from four to six pages long) and can be rapidly read or skimmed, and the collection gives the reader the opportunity to be exposed to some of the latest research and controversies associated with the question of how life on earth originated. Several papers deal with the synthesis of peptides, and the wide scope of experimental conditions that are used is a good illustration of the difficulties encountered in attempting to formulate a reasonable mechanism for peptide synthesis under the presumed primitive earth conditions. Also the papers on whether circularly polarized x-rays produced from β-particles had any role in the origin of chirality demonstrate that this continues to be a subject of controversy. In some cases the papers describe experiments or observations that may not have any significance with respect to our understanding of the origin of life on earth. For example, there is a paper concerned with the resolution of underivatized amino acid enantiomers by high-pressure liquid chromatography and one on the adaptation of microbes to cold saline environments. One asset of this volume is that the papers contain a large number of references, which make the volume a useful guide to the recent literature on the origin of life. Readers might also find it interesting to compare the papers in this volume with those in the previous proceedings volumes in order to see how research into the origin of life has itself evolved during the last 25 years. One particularly important development has been the realization that some meteorites contain abiotic organic compounds and thus provide excellent natural systems for testing some of the ideas proposed concerning pathways for the prebiotic synthesis of organic compounds. The suggestion that abiotic synthesis is a common interstellar process has also emerged within the last several years.

Mineral Deposits and the Evolution of the Biosphere contains 12 state-of-the-art papers concerned with some of the processes thought to be important in the formation of the earth's early geologic deposits and with how life itself has affected the chemistry of the earth. Many of the papers deal directly with the ancient rocks and mineral deposits. There are papers on stratified sulfide and banded ironstone deposits and on the distribution of both sedimentary deposits and mineral formations through geologic time. Another paper deals with the organic geochemistry of Precambrian rocks and the problems associated with ascertaining what organic molecules might be syngenetic with these deposits. There are also papers on present-day processes, especially those thought to be involved in the formation of certain minerals, such as the sulfides and iron oxides, and how these might be used in interpreting the ancient geologic record. The effects of microbial processes on the organic chemistry of recent sedimentary systems and how some organic molecules might be used to evaluate the environmental conditions that prevailed when ancient sediments were deposited are discussed in detail by Eglinton and co-workers. One paper (by S. L. Miller) is concerned with the organic chemistry of the primitive earth and how it can be used to establish the conditions that existed before life was present and before a relevant geologic record exists. The papers are, in general, well written and highly informative, and they constitute one of the better recent collections in this field of geochemistry. At the Dahlem conferences, from one of which this volume originated, workshops or discussion groups are held in addition to the presentation of the formal papers, and the reports of these are given at the end of the book. These four reports are probably the most valuable component of the volume. They indicate what areas of research may be important in the future and also give some cautionary advice about previously published research, perhaps most notably the claim that carbon isotopic data from the Isua rocks confirm the existence of life about 3.75 billion years ago. The report entitled "Biogeochemical evolution of the ocean atmosphere system" seems particularly significant, and a careful reading of it is recommended to the authors of some recently published papers who have proclaimed that the early earth's atmosphere was never reducing and may have actually contained oxygen, a scenario that is clearly at odds with the conclusions reached by the participants in the Dahlem conference.

Together these volumes contain an extensive amount of information about the processes, both geochemical and biological, that may have operated on the early earth. *Mineral Deposits and the Evolution of the Biosphere* is clearly the superior of the two and would be a valuable acquisition for scientists interested in this area of earth science. *Origin of Life* is more specialized and should be considered mainly by scientists actively engaged in research into the question it deals with.

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