Book Reviews

Scientific Detection

Life: Its Nature, Origin and Development. Aleksandr Ivanovich Oparin. Translated from the Russian by Ann Synge. Academic Press, New York, 1961. 207 pp. Illus. $4.50.

Life: Its Nature, Origin and Development is the latest of Oparin's books in which he treats, in mechanistic detail, the problems of life's beginnings. This book does not have numerical citations in the text, it contains few chemical equations, and it is otherwise written in a more popular style than Oparin's earlier volumes. (Also, it has no index.) The first edition of Oparin's *The Origin of Life on the Earth* was published in 1936, a second edition in 1941, and the third edition in 1957. The first edition beamed like a torch in the dark caves of ignorance and, for its time, outshone the later editions. Oparin's newest book, in a different style and with a different title, has recaptured some of the fresh vision and insight his 1936 book had.

The book is divided into chapters on the nature of life, the origin of life, the earliest period of the development of life, the further evolution of life, and a chapter entitled, "Conclusion." The states preceding life are now given by Oparin (page 95) as (i) an increase in complexity of organic substances, (ii) their polymerization, (iii) the organization of precellular forms (coacervate droplets), and (iv) the transformation of the latter into living things. In 1957, during a discussion at the First International Symposium on the Origin of Life on Earth, Oparin asked if life is merely a self-reproducing molecule or an entire multimolecular system. In this book, he clearly answers this and related questions in detail. On this particular question, Oparin favors the broader answer. In fact, the experimental work in his laboratory has focused mostly, or entirely, on the coacervate droplet as a precellular model, even though instability—for example, loss of form when centrifuged lightly—sharply distinguishes these units from the most primitive cells that we know.

Since 1936 biochemistry has come into its fullest flower. All of biochemistry and much of organic chemistry is indirectly related to the origin of the first organism. The problem may now be defined as one of selecting the "red thread" of events that were the actual order of processes preceding the first organism. A generally accepted minimal definition of the organism would also help to limit the range of controversy.

Although one may admire and honor Oparin's integrated thesis of the natural origin of life, he may also identify nuggets of thought which should ultimately confirm or deny Oparin's specific choice of the "red thread" of events.

Oparin speaks for a recapitulationist biochemistry in several places: for example (on pages 97 and 98) "these metabolic sequences are now carried out by the same combinations of chemical events which realized them many hundreds of millions of years ago"—but he specifically exempts protein synthesis from this relationship (page 63). This is not merely an inconsistency; it ignores the fact that amino acids are polymerizable, either biologically or chemically, by anhydride processes which are activated by phosphate. In yet other passages he rejects the total recapitulationist view of metabolic sequences (for example, on page 105).

The history of science is, to a marked degree, a history of the elimination of more or less firmly held preconceptions. In areas in which evidence is weakest, opinions are often strongest. Oparin holds some strong opinions, perhaps with the maximal justification that can be allowed for any one commentator. The requirement of organized systems for the synthesis of *ordered* protein molecules (page 67) does not comport with Pattee's recent theoretical conclusions derived from computer theory, nor with the experimental results of simple chemical copolymerization of amino acids by heating or by reaction of the Leuchs anhydride derivatives.

An almost lone touch of humor is found on page 161: "With the exception of the origin of Eve from the rib of Adam, as described in the Bible, we know of no case in which a person has reproduced himself vegetatively by simple division of the adult organism." In this book Oparin also uses the metaphor, "tree of life," with Biblical frequency.

On page 203 appears the statement: "any attempt at the direct, artificial reproduction or synthesis of even the simplest of living things must still be regarded as very naive." Perhaps, rather, such a preclusive negativism should itself be regarded as naive in 1961, when such scientists as H. J. Muller (using a definition of life that is unacceptable to Oparin) are willing to aver that the goal has already been accomplished. Although one should not anticipate laboratory synthesis of a cell within a few years, it would be ironic for such a cell to be produced as an indirect result of Oparin's intellectual stimulations; and it is often more unsafe to predict what will not occur than what will occur.

Alongside these and other provocative points, much pleasure and profit can be gained from reading the latest intellectual distillations of one who has devoted a major portion of his scientific life to the thesis that the matrix of life's beginning is understandable in chemical and physical detail.

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Radiation Protection

Strahlenschutz in Forschung und Praxis. vol. 1. Edited by Hans-Joachim Melching and others. Rombach, Freiburg, Germany, 1961. 245 pp. Illus.

Radiation protection has always been of special concern in Germany, and "Strahlenschutz-Richtlinien," based on research studies of the proper time period and on practical experience, were published early and systematically. Today radiation protection is well organized and controlled, not only by government officials, scientific committees, and institutions, but also by private organizations such as the "Vereinigung Deutscher Strahlenschutzärzte E. V."

(Society of German Radiation Protection Physicians). Volume 1 of this society's *Yearbook*, which gives the first report on the group's activities, presents topics discussed at the annual meeting of the society, held at Freiburg in January 1961. Cleverly edited by Hans-Joachim Melching and his associates, the volume gives an interesting progress report on the activities in different fields of radiation protection, including radiology in radiation protection, radiation damage incurred as the result of professional activities and its diagnosis, radiation protection laws and their practical application, radiation protection in industry, dosimetry, and problems of waste disposal. There are stimulating contributions by Holthusen, Zuppinger, Heilmeyer, Langendorff, Melching, Wideroe, and Sommermeyer—just to mention a few that are worthy of study. I found especially interesting the article by Umberto Cocchi, "Professional radiation damage in man," which presents valuable information (in both text and illustrations) on the early historical development of radiation protection measures.

The yearbook reflects well the activity of the society during 1961, activity which apparently inspired not only more systematic studies but also the participation of many outstanding scientists in the society's second meeting, which was held in January 1962. According to the announcement, volume 2 of the yearbook will present important contributions by Langendorff, Buu-Hoi, Faber, Mitchel, Bacq, Maisin, and other well-known scientists.

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For Engineering Students

Handbook of Vector and Polyadic Analysis. T. B. Drew. Reinhold, New York, 1961. vii + 103 pp. $5.50.

Drew begins by giving the standard treatment of vector algebra which one expects to find in a book for engineers and physicists. Then he goes on to discuss Gibbs's algebra of dyads, using the Gibbsian notation, and finally proceeds to a generalization of it called polyadic algebra. The various differential operators are defined, and their algebraic properties are developed. Integral formulas are nowhere mentioned.

The author states that the material is intended for the use of engineering graduate students in fluid mechanics, heat transmission, and diffusion. Unfortunately, formulas expressed in the notation of this book will be incomprehensible to most mathematicians and physicists, and I feel that it would be regrettable for students of engineering to learn it rather than the standard notation of Levi-Civita and Einstein or the more modern notation of the exterior differential calculus of E. Cartan, which is now finding its way into undergraduate courses on advanced calculus and applied mathematics.

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Wordy Labyrinth

Atlas of the Universe. B. Ernst and T. E. de Vries. H. E. Butler, Ed. Nelson, New York, 1961. 227 pp. Illus. $9.95.

This book, which was written in Holland by "non-specialists for non-specialists" to present the "picture of the universe developed by modern astronomy," consists of a series of photographs and illustrations and a short encyclopedia of astronomy.

Photographs presented in the usual order, starting with the earth and proceeding out to the universe of galaxies, constitute about one half of the book. The authors have assembled a fine collection of photographs and drawings, many of which are not usually seen in popular books and the reproduction is usually good, although some lack the contrast needed to bring out fine details. In this section the authors have crowded too much material into the text accompanying the photographs, for the text is a highly condensed survey and history of astronomy. For example, the caption accompanying the photographs of the Andromeda galaxy traces the history of the island universe theory from Wright and Kant up through Hubble. It includes the observations of Herschel (on star clusters), and Huggins (on gaseous nebulae), the problem raised by the supernova of 1885, and the solution of that problem by Hubble, using Cepheid variable stars. But no mention is made of how Cepheid variables can be used to determine distances! The nonspecialist certainly does not have the background to assimilate all of these details.

A better level is achieved in the second portion, which contains some good short discussions on subjects ranging from aberrations to zodiacal light. There are also numerous tables with useful astronomical information. But again the authors show lack of perspective when they give only a small discussion of the important topic of stellar evolution but include such things as zero velocity surfaces and Lagrangean points in a discussion of spectroscopic binaries.

The book will be of value to a high school student interested in astronomy or to an amateur who wants a ready reference together with some good photographs. Both should use the book with care, however, since there are many errors scattered throughout. The general reader who wants to learn about astronomy will get little from the book. He will find the first section too condensed and confusing for his purposes, while the second is useful only for reference.

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The Peacock Memoir

X-Ray Powder Data for Ore Minerals. The Peacock Atlas. L. G. Berry and R. M. Thompson. Geological Society of America, New York, 1962. vi + 281 pp. Illus. $8.25; GSA members, $6.

This excellent memoir is largely a collection of tabulated records of photographic x-ray powder diffraction patterns of ore minerals. Bragg angles, observed and calculated spacings, intensities, and indices are listed for the lines of each of the almost 300 patterns reported. Nearly all native metals, sulfides, sulfosalts, opaque oxide minerals, silver and mercury halides, calcite, dolomite, minerals of the wolframite and scheelite groups, and quartz are represented by these patterns. All of them were produced in the laboratories of the authors or in the laboratory of the late M. A. Peacock under whose direction the work was begun.

The tabulations are most complete.