Book Reviews

Die Mathematischen Hilfsmittel des Physikers. 4th ed. Vol. IV of *Die Grundlehren der Mathematischen Wissenschaften in Einzeldarstellungen.* Erwin Madelung. W. Berlin: Springer-Verlag, 1950. 531 pp. Illus. $11.88.

Madelung's book has been considerably enlarged and in many parts completely rewritten in its fourth edition.

This work is not a textbook, neither is it a collection of formulas. Originating from the author's collection of mathematical notes to his lectures in theoretical physics, it was intended to be for the theoretical physicist what Kohlrausch's *Practical Physics* is for the experimentalist. This goal has not been attained. Kohlrausch's book is a text of experimental physics in terms of definite problems and their solution, whereas Madelung's is a compendium of mathematics (350 pp.), followed by a brief summary of theoretical physics (143 pp.) arranged in the conventional sequence of textbooks. Thus, the mathematical tools are developed and discussed in some detail without reference to the physical applications (see, for example, the introduction to spin matrices, p. 25, and Clifford's numbers, pp. 12 and 25). Special developments are included in an appendix of about 30 pages.

The sequence follows the outline of the third edition, which was reprinted by Dover during the war. A first chapter on numbers, functions, and operators is entirely new and has been added in view of the widespread use of operators by physicists in recent years. In this chapter some of the tools of quantum mechanical calculations are formally introduced.

A brief chapter on differential and integral calculus is followed by series and series developments, a chapter on functions (including some 50 pages on special functions), and a chapter on algebraic transformation. The detailed and well-developed chapter on vector analysis will be welcome to students and teachers. This is followed by discussions of special coordinate systems, group theory, differential equations, integral equations, calculus of variations, and statistics. Under group theory, a discussion of the crystallographic symmetry groups as used in structure analysis has been added. The chapter on theory of differential equations is written from the point of view of wave mechanics and modern physics.

The discussion of general relativity theory has been cut considerably—the Einstein effects formerly discussed in an appendix are now mentioned in three lines. This was inevitable, however, if the new mathematical techniques, modern developments in quantum mechanics, and the approach to problems of field theory were to be discussed.

Physics is discussed in separate chapters on mechanics, electrodynamics, relativity, quantum theory, thermodynamics, and statistical methods. Crystal optics, as part of electrodynamics, is particularly well summarized, and the same thing is true of the discussion of thermodynamics. However, some of the more modern applications would be welcome, particularly statistical applications to the theory of the solid state.

The literature contains only a few new references, published since the third edition came out. The index, quite important in a book of this type, has been cut to five and one-half pages for the 500 pages of text—whereas the index in the third edition was more than ten pages, covering a text of some 350 pages. The index is now so brief that it is not quite clear what will be found under a particular heading. For example, "Approximation methods" are quite important for the use of such a book; in the former edition there were five entries describing in detail the approximation referred to. At the present time there is just one entry.

This reviewer hopes that, if another edition comes out, particular care will be taken to make the index so complete that it will be simple for a physicist to find the material he needs for the understanding of theoretical developments in his own field.

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Survey of Biological Progress, Vol. II. George S. Avery, Jr., Ed. New York: Academic Press, 1952. 333 pp. Illus. $7.00.

This thin volume is the latest of a series begun in 1949. It covers a broad field of biology—ranging from genetics to physical chemistry and from anatomy to plant pharmacology. By and large it is a moderately interesting volume and one in which most biologists will find at least one article they can read with profit.

The first paper, "The Effects of Radiation on Biological Systems," by A. H. Sparrow and B. A. Rubin, is a most useful, concise presentation of modern thoughts on the inorganic and physical chemistry, physics, and biology of radiobiology. It includes a detailed discussion of the target theory and its interpretation in modern chemical terms. Here also is a precise summary of our knowledge of the ions and radicals formed by the varied kinds of high-energy radiations. Finally, the varied biological effects of radiation are treated with respect to mutation and cytology and physiology. Similarities and differences of the effects of high-energy radiations are outlined in an admirable way. This is an outstanding article—one that might well be read by all biologists not themselves specialists in the field.

"Progress in Human Genetics," by H. Kalmus summarizes the little we know about human genetics. Kalmus brings together, in rather general terms, much about the inheritance of human traits as well as modern information on mutation rates, and interesting calculations about the size of mating groups in the human community.