Dorfman, and the influence of gonadotropic hormones on end-site metabolism by W. H. McShan and J. F. Perdue. Finally, W. D. Davidson and R. E. Davies provide an interesting description of gastrin and the duodenal hormones, although, as the authors point out, the primitive state of knowledge in this area precludes meaningful consideration of their action mechanisms.

The book is attractive, easy to read, and well edited, although I noted occasional errors in formulas, figure legends, and references. It is highly recommended to all who are interested in biochemical endocrinology.

E. V. JENSEN

Ben May Laboratory for Cancer Research, University of Chicago

Semiconductors

Physics of III-V Compounds. Otfried Madelung. Translated from the German by Dietrich Meyerhofer. Wiley, New York, 1964. xiv + 409 pp. Illus. $13.

The III-V compounds are semiconductors made from the elements of the third and fifth groups of the periodic table, notable examples being gallium arsenide and indium antimonide. Although they can be made n and p type, it is unlikely that they will ever replace silicon and germanium for use in transistors. They do, however, offer characteristics which are different from the two classical semiconductors and which can result in specialized uses. These include high mobilities and small impurity-binding energies that are useful for certain high-frequency devices and for infrared detectors, and direct band gaps that lead to efficient radiative hole-electron recombination and have resulted in injection lasers. It is probable that the purely scientific aspects of these materials are almost all a direct extension of those developed for silicon and germanium.

During the last 12 years these compounds have been intensively investigated, and in this book Madelung sets out to present an account of their physical properties, specifically excluding the technology and applications of these materials. These somewhat limited aims have been admirably met. In general, the author gives a brief but useful outline of the theory of a branch of the subject, such as optical properties or transport properties, and then presents an exhaustive account of what is known concerning these topics for each of the III-V compounds.

Very little has been left out, and the book is remarkably up to date. About 1300 references are cited, many of them published in 1964. The presentation of the results is reasonably critical, for in most cases an effort is made to decide between conflicting views. In addition, the properties of the compounds are compared and contrasted with one another and, to the extent possible, a unified picture is presented. There are useful summarizing tables. The translation is well done, and I noted very few errors of fact. The only misprint that I noted was in the publisher's blurb. Perhaps, with the spread of scientific literacy, scientific publishing houses will one day know that the English form of the most successful transistor material is silicon, not silicium.

This book is not intended for students, but, for some years to come, it will surely be a most useful volume to anyone active in the field of semiconductors.

D. G. THOMAS

Bell Telephone Laboratories, Murray Hill, New Jersey

History of Biology

Circulation and Respiration: The Evolution of an Idea. Mark Graubard. Harcourt, Brace, and World, New York, 1964. x + 278 pp. Illus. Paper, $2.95.

The compiler of this excellent little book is professor of natural science at the University of Minnesota where, for a number of years, he has been using the historical approach in teaching science to undergraduates. Mark Graubard, who is primarily a biologist, is well qualified to prepare a book such as this one.

He traces the historical development of the idea of the circulation of the blood through pertinent and well-selected extracts from the writings of 17 workers from Aristotle to Borelli. Most of the texts, including of course readings from Harvey, relate to the circulation, while only four represent the beginnings of our understanding of respiration. Graubard has added pungent and provocative commentaries to each selection. The reader is thus guided along the difficult and tortuous path by which we developed our knowledge of circulation and respiration during a time span of 2000 years.

This book is recommended to anyone interested in the history of science in general or the biomedical sciences in particular. It will be especially useful as a case history illustrating scientific methodology.

MORRIS C. LEIKIND

Washington, D.C.

Geochemistry

Interprétation Géochimique des Éléments en Traces dans les Roches Cristallines. Denis M. Shaw. Masson, Paris, 1964. vii + 237 pp. Illus. Paper, F. 56.

In recent years the trend in geochemistry has been swinging more and more toward laboratory experiments designed to simulate the natural environment, particularly under conditions of very high temperature and pressure. It is not as common to find a major work in geochemistry that approaches the subject from the viewpoint of rocks as they actually occur rather than how they ought to occur. Shaw's treatment of trace elements in crystalline rocks starts with field data, and then proceeds to a consideration of concepts of genesis that are consistent with these data. It is built on the traditions of V. M. Goldschmidt, pioneer geochemist and author of *Geochemistry*, a classic monograph that covers the distribution of elements not only in igneous rocks, but in natural waters, vegetation, and atmosphere. Shaw's principal contribution is to present an updated version of Goldschmidt's review insofar as it applies to igneous rocks.

The first 74 pages of Shaw's monograph treat purely technical problems in the analytical chemistry of trace constituents of silicate rocks. The next 109 pages present data on the trace-element content of genetically related rocks and of coexisting minerals. The data are arranged according to the various natural laws that have been proposed for the partition of major and minor elements between the solid and the liquid phases. The final 28 pages are devoted to the possible application of trace-element studies in deciphering the geologic history of rocks. Of the 78 figures and diagrams in the body of the text, 61 present pure observational data; only 17 show hypothetical or theoretical relationships. The reference list of 198 items covers most of the important literature on the distribution of minor elements in igneous rocks.

In its favor is the fact that Shaw's book offers an extremely valuable assemblage of data, ideas, and references on the determination and distribution of minor elements in igneous rocks. In its disfavor is what I found to be a wholly inadequate index. More than half of my attempts to use the index to rediscover material already spotted in the text were unsuccessful.

In summary, Shaw's book is a must for every geochemist who needs to know what rocks are really like in the field—and who reads French.

H. E. HAWKES
Department of Mineral Technology, University of California, Berkeley

Science in High School

Secondary School Science Teaching Practices. H. Seymour Fowler. Center for Applied Research in Education, New York, 1964. xiv + 113 pp. $3.95.

This book reviews the changes in high school science curricula during this century and describes current science teaching practices in high school. There is no discussion of the new courses in biology, chemistry, and physics which have been developed by the Biological Science Curriculum Study, the Chemical Bond Approach Project, the Chemical Education Materials Study, and the Physical Science Study Committee. These new programs will be considered in a forthcoming volume.

In separate chapters the author discusses the four science courses commonly offered in high school—general science, biology, chemistry, and physics. For each of these courses he gives the historical background and discusses the changes in content and in teaching philosophy that have taken place over several decades. He emphasizes the role of popular textbooks in dictating the organization of science courses in high school.

Various types of courses in each subject matter area are outlined. For example, in the chapter on biology courses, Fowler describes "The Principles Course," "The Problems Course," and "The Social Implications Course." It would have been helpful if he had indicated how widely each course is, or was, used.

High school science is taught in schools that range from excellent to poor by teachers with much, and by teachers with little, preparation in science. For this reason it is not possible, in a book of this size, to do more than give some idea of what an "average" course is like. In general, this objective has been achieved. However, there are some statements about common teaching practice that may be questioned. For example, Fowler states that "most high school chemistry teachers have insisted on provision for a double period as laboratory time" (p. 46). I have visited many high schools where the time for chemistry laboratory work is limited to a single period.

One chapter is devoted to discussions of miscellaneous science courses —physical science, earth science, and advanced science courses. In another chapter, the author considers the effects of science fairs, science clubs, and other cocurricular activities on the science education of high school students.

In the final chapter, Fowler looks on the future and predicts the effects of current curriculum developments on science teaching. He emphasizes the importance of improved teacher education in science, particularly as the high school science courses become more rigorous.

ARTHUR H. LIVERMORE
AAAS, Washington, D.C.

Physics Yesterday

J. J. Thomson and the Cavendish Laboratory in His Day. George Paget Thomson. Doubleday, Garden City, N.Y., 1965. xii + 186 pp. Illus. $4.95.

In 1871 Maxwell became the first Cavendish Professor of Physics at Cambridge. He was succeeded in a few years by Rayleigh, and then, in 1884, by J. J. Thomson, who was at that time 28 years old. Thirty-five years later Thomson resigned the professorship so that Rutherford could have it. But those 35 years span what is surely one of the most remarkably fruitful periods in physics. Few men have been as productive as Thomson, and no single laboratory has housed so many significant experiments per decade as did the Cavendish under his direction.

Younger scientists may best understand the character and accomplishments of J. J. Thomson by thinking of the late Enrico Fermi, despite the obvious differences in the external circumstances of the two men. Both made remarkable contributions in theoretical *and* in experimental physics. Both inspired a generation of students. Each preferred to work out his own thoughts *before* searching the literature. Each was capable of first-order mathematical sophistication, but each one also had profound physical intuition. (J. J. "liked a theory he could feel with his fingers. . . .") And not least, each was an excellent expositor of his own work.

Sir George Thomson, whose fame as a physicist rests securely on his own accomplishments, has written a pleasant book about his father and about the Cavendish of his time. If the book contains little factual material not already available in the fourth Lord Rayleigh's biography (*J. J. Thomson*, Cambridge University Press, 1942), it does provide, in compact form, a portrait of a giant whose laboratory was clearly a tremendously exciting place.

Actual biographical matter is confined to three chapters: one on Thomson's early years, one on his work for the British Government during World War I, and one on his later years as Master of Trinity College, Cambridge. For the benefit of nonscientists there is a chapter that reviews (perhaps too succinctly) the basic experimental and theoretical work on electricity up to 1890. Three chapters then discuss Thomson's crucial work on cathode rays and on the electronic charge, while his many contributions in other areas (for example, in electrical conductivity of metals, atomic structure, ion mobilities, and in early mass spectroscopy) are treated briefly in later chapters.

In view of the rather poor quality of the printing, the American edition of the book is overpriced.

DAVID L. ANDERSON
Oberlin College, Oberlin, Ohio