Book Reviews

The Chemical Elements and Their Compounds, 2 vols. N. V. Sidgwick. New York: Oxford Univ. Press, 1950. 1703 pp. $14.00 the set.

The title *The Chemical Elements and Their Compounds* implies a comprehensive work, and the author has written a book to which that term certainly applies. This reviewer stands in awe of any one man who can "attempt to discuss in detail the properties of the elements and their compounds in the light of modern ideas of atomic and molecular structure." This is accomplished in 1,700 pages, which are divided into 25 chapters titled according to the groups and subgroups in the periodic table, and hence running from the chapter covering Group O, the inert gases, to Group VIIIC, palladium and platinum. The comprehensiveness of the book is illustrated by the fact that some 65 pages of "organic chemistry" appear in the chapter covering Group IV, in view of the position of carbon in this group (rather than in the chapter covering Group I, which includes hydrogen).

The most dependable books in the various fields of science seem to be those written by the actual participants in those fields. A yardstick based on this standard is clearly not justified in evaluating a book which covers all of the chemical elements. The value of such a book lies in putting in one place a broad range of essential and concise information, and it would be difficult to make it authoritative in all details. The present book is noncritical in numerous instances, giving incorrect along with correct information; since the information is so well documented with references it may have been the author's aim to do this intentionally, in emulation of the famous treatise by Mellor. It is, of course, inevitable that much of the information and interpretation considerably predates the publication date of 1950.

Perhaps the most surprising shortcoming of the book is the almost complete lack of the thermodynamic approach. Discussions in terms of oxidation potentials are almost completely lacking. Consideration of questions in the light of modern ideas of atomic and molecular structure, as promised in the preface, is not as extensive as one might have expected from the author of *The Electronic Theory of Valency.*

Criticism of details can only serve as examples. There are numerous small errors, as exemplified by the listing of the half-life of the neutron as infinite. The most important method for the separation of the rare earth elements from each other, the ion-exchange adsorption method, is not mentioned at all, even though most of the important wartime work was published as early as 1947. Also, the electronic structures given for the rare earth elements are not those that have been generally accepted for many years. The treatment of the transuranium elements and those immediately preceding them is probably the most confused in the book. These appear as members of the chromium group and are first discussed on this basis in a treatment which gradually veers over to the point of view that a rare earthlike transition series is involved. Thus curium is both a homologue of chromium and is explicitly said to have an electronic structure analogous to gadolinium.

In balance, however, the book, in the opinion of this reviewer, is valuable and probably an almost indispensable adjunct to the library of most chemists from the standpoint of its central purpose—that of an over-all and broad reference book. Many readers will feel that the 10,000 references to the original literature are of sufficient value to make the book worth owning regardless of its other merits.

GLENN T. SEABORG

University of California, Berkeley

Elementary Pile Theory. Harry Soodak and Edward C. Campbell. New York: John Wiley; London: Chapman & Hall, 1950. 73 pp. $2.50.

In rereading the notes of Harry Soodak's lectures on elementary pile theory I am reminded of the happy days of 1946–47, when a training school on nuclear physics and "atomic" energy was organized at the Clinton Laboratories with the intent of spreading for the public benefit some of the knowledge accumulated by the Manhattan Project during the war. Those were days of hope, when one thought that atomic energy would enrich mankind and unite the world.

Soodak's lectures were one of the high lights of the training program. They were attended mostly by engineers who expected to apply the acquired knowledge in their industrial work. Excellent notes were compiled by E. Campbell and distributed in dittoed form within the AEC. Now they are available to the public in book form. The few omissions imposed by security do not affect the continuity of treatment.

The text should prove very useful, as the lectures were, to anyone wishing to learn how a nuclear reactor works. Wisely, it does not discuss nuclear physics and does not require any knowledge of quantum mechanics.

Neutrons are considered as particles wandering through matter, following laws similar to those which govern the motion of the molecules of a gas. Their collisions with nuclei are described in terms of cross sections, whose theoretical interpretation is not given, but whose definition is clear and easily understood. The consequences of this approach are developed in a logical and well-organized manner, making the book more similar to a simple treatise on mathematical physics than to an engineering manual. In the first half the slowing down (moderation) and the diffusion of neutrons are discussed. The second half is devoted to reactors proper and includes such topics as critical size, transient behavior, and control.

If the engineering details, as well as some of the pertinent numbers, are missing, the basic principles of pile physics are all there. The reader who is interested in

"understanding" will satisfy his curiosity. The engineer who is interested in "using" (and who has access to more detailed information) will find this book a good introduction to the reading of technical papers.

S. DEBENEDETTI

Carnegie Institute of Technology

The Theory of Atomic Collisions. 2nd ed. N. F. Mott and H. S. W. Massey. New York: Oxford Univ. Press, 1949. 388 pp. $8.75.

The publication of a new edition of *The Theory of Atomic Collisions* would seem to call not so much for the customary critical review as for a formal expression of appreciation in behalf of the many whom it will doubtless serve so well. The first edition, invaluable in the education and activities of physicists since its appearance in 1933, has distinguished itself by its usefulness to theoretician and experimentalist alike; it is *the* reference on the subject in classroom, laboratory, and library. The book is a systematic exposition of the applications of quantum mechanics to collision problems—problems ranging from the scattering of ultrahigh-energy mesons, which provides information on the nature of elementary particles, to collisions between atoms at thermal energy, the treatment of which leads to the quantum theory of viscosity and diffusion. The scope is exhaustive, the development authoritative, the style lucid and incisive; moreover, the volume is singularly rich in its evocation of experimental results. Although the first edition is in no sense obsolete, the new version is greatly augmented in value, for it encompasses almost the whole of the old and a wealth of new material—later applications and new techniques of the theory as well as some advances in the theory itself; and this without unduly increasing the size of the book.

The most important addition is certainly that of extensive material on nuclear collisions. Specific major changes are: amplification of the treatment of scattering by a potential well and barrier; inclusion of the "dispersion" method and a variety of its applications; addition of much new material on the nuclear scattering of electrons and positrons; discussion of new methods for treating scattering by a central force and a more detailed analysis of the conditions for validity of the older methods; greatly extended consideration of "slow" collisions; addition of material on multiple scattering of electrons; a new chapter on nuclear collisions—neutron and charged particle transmutations, fission, and scattering, with an ample section on the scattering of slow neutrons (including scattering by bound atoms and magnetic scattering); extension of the final chapter, which deals with relativistic problems—largely by consideration of positron and meson processes. The chapter on collisions of electrons with molecules is deleted, but in compensation we are promised a new book, *Electronic and Ionic Impact Phenomena*, by Massey and Burhop, which is now in preparation and will deal in much greater detail with this and related topics.

It may be reassuring to many that this volume, coming as it does at a time when much of our basic theory is in a state of bewildering—not to say disillusioning—difficulty, reaffirms our confidence in the quantum mechanics by its account of that theory's long succession of triumphs in dealing with a great and remarkably diverse set of phenomena.

ROBERT L. PLATZMAN

Purdue University

Scientific Book Register

Advances in Colloid Science, Vol. III. H. Mark and E. J. W. Verwey, eds. New York-London: Interscience, 1950. 384 pp. $7.50.

A Geography of Europe. Jean Gottmann. New York: Henry Holt, 1950. 688 pp. $5.00.

College Chemistry: An Introductory Textbook of General Chemistry. Linus Pauling. 705 pp. $4.50. ***College Chemistry in the Laboratory: A Manual Designed to Accompany Pauling's College Chemistry.*** Lloyd E. Malm and Harper W. Frantz. 331 pp. $3.00. San Francisco, Calif.: W. H. Freeman, 1950.

A Histology of the Body Tissues with a Consideration of Their Functions. Margaret Gillison. Baltimore, Maryland: Williams and Wilkins, 1950. 220 pp. $3.50.

History of the Primates: An Introduction to the Study of Fossil Man. 2nd ed. W. E. Le Gros Clark. London: British Museum (Natural History), 1950. 117 pp. 2/6.

General Chemistry. 4th ed. H. I. Schlesinger. New York: Longmans, Green, 1950. 811 pp. $5.50.

Primary Batteries. George Wood Vinal. New York: John Wiley; London: Chapman & Hall, 1950. 336 pp. $5.00.

Vorstufe zur Theoretischen Physik. Richard Becker. West Berlin, Germany: Springer-Verlag, 1950. 172 pp. DM 7.50.

Tissue Culture Technique. Rev. 2nd ed. Gladys Cameron. New York: Academic Press, 1950. 191 pp. $4.20.

Marriage and Family Relationships. Rev. ed. Robert Geib Foster. New York: Macmillan, 1950. 316 pp. $2.75.

The Laboratory Guide in Chemistry. 2nd ed. Joseph H. Roe. St. Louis, Mo.: C. V. Mosby, 1950. 216 pp. $2.25.

The James River Basin: Past, Present and Future. Compiled by the James River Project Committee, Virginia Academy of Science, 1950. 843 pp. Order through Foley F. Smith, Box 1395, Richmond 11, Virginia. $6.00 postpaid.

Principles of Chemistry: An Introductory Textbook of Inorganic, Organic, and Physiological Chemistry for Nurses and Students of Home Economics and Applied Chemistry. 7th ed. Joseph H. Roe. St. Louis, Mo.: C. V. Mosby, 1950. 427 pp. $3.50.

An Introduction to Experimental Stress Analysis. George Hamor Lee. New York: John Wiley; London: Chapman & Hall, 1950. 319 pp. $5.50.