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.

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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