mittee and the Council of the Indian Botanical Society are to be congratulated on the undertaking and its accomplishments.

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Physics

Solid State Physics. Advances in research and application. vol. 15. Frederick Seitz and David Turnbull, Eds. Academic Press, New York, 1963. xvi + 505 pp. Illus. $16.50.

Volume 15 of this distinguished series continues the traditions established by its predecessors. Each volume is a pot-pourri of specialized review articles, all written by recognized authorities, with the only unifying theme being the individual excellence of the articles. Any attempt to review such a book, in the sense of a critical evaluation, must be considered the height of folly, and so all we shall do here is detail the contents.

An exposition and review of the dynamical theory of x-ray diffraction, by R. W. James, constitutes fully one-third of the volume. The geometrical theory, which treats the diffraction of an x-ray beam by the geometrical array of the atoms in the crystal, is reviewed briefly and its inadequacies detailed. The dynamical theory, which worries about the interactions between the scattered waves and the crystal lattice, and with each other, is developed in a general form. The special cases of thick, relatively nonabsorbing crystals and crystals of finite thickness are considered in detail. James concludes with a brief section on the experimental implications of the theory.

In a shorter article, F. Stern treats the elementary theory of the optical properties of solids. Starting with Maxwell's equations, the Kramers-Kronig relations are developed, along with the relevant sum rules, and applied to the specific cases of the free-electron gas and the optic modes of ionic crystals. The free-electron gas receives most of the author's attention, since he discusses in some detail the wavelength-dependent dielectric constants.

An article with a more experimental viewpoint is the one by L. C. Hebel, who reviews the ideas of spin temperature and nuclear relaxation. The theory of this "semiequilibrium" statistical method—that is, the spin system is in internal equilibrium but not in equilibrium with the lattice—is covered in some detail. The method is then clarified and justified by considering such diverse phenomena as spin calorimetry, quadrupolar coupling, adiabatic demagnetization, and spin-lattice relaxation in metals, impure metals, and alkali halides.

Recent developments in the theory of electron-phonon interactions are considered in a charmingly written article by L. J. Sham and J. M. Ziman, who introduce a new member to the library of pseudoplane waves (OPW and APW). This is the pseudoplane wave (χPW), an eigenvector of the Hamiltonian with pseudopotential, and it is used throughout the discussion of rigid ion calculations. The intricacies of screening, exchange, and deformation potentials are considered briefly, and the authors conclude with a short section on experimental observations of the electron-phonon interaction, including estimates of superconducting behavior derived from liquid metal resistivities.

The volume is rounded out by P. Borelius' compendium of the temperature dependencies of specific heat, thermal expansion, and electrical resistivity, particularly in the vicinity of phase changes, for several of the elements.

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Rare Earth Research

Progress in the Science and Technology of the Rare Earths. vol. 1. LeRoy Eyring, Ed. Pergamon, London; Macmillan, New York, 1964. vi + 532 pp. Illus. $17.50.

The lanthanide rare earths contain more than one-fifth of the known metals of the Periodic Table, and if the actinide rare earths are included, these two groups comprise more than 30 percent of the known elements.

The lighter rare earths have been known for more than a century, and a considerable industry was developed around lanthanum, cerium, and the mixed rare earths, since these substances could be purified readily by conventional chemical processes. Although the lanthanides are not rare in nature, they always occur as mixtures, and the remaining members of the rare-earth series are extremely difficult to separate by ordinary chemical processes. With the discovery and development of the ion-exchange processes some 15 years ago, pure compounds of these elements became generally available. Scientists in many diverse fields quickly recognized that this availability gave them a powerful new set of tools which could be used in their basic researches and that these elements had many potential new applications for industry. As a result, a demand for pure compounds of the rare earths developed, and a number of companies started to produce them at reasonable prices. Contrary to a misconception widely prevalent before the war, the rare earths are not all alike.

In recent years a very large number of publications involving the rare earths, which cover a wide range of scientific fields, have appeared each month in the scientific literature, and periodic reviews of these fields are needed. Several reviews have been published—*The Rare Earths,* edited by Spedding and Daane; *Rare Earth Alloys,* edited by Gschneidner; and *Elé ments des Terres Rares (ou Lanthanides) Scandium, Yttrium,* edited by Loriers, Gaume-Mahn, and la Blanchetais—but the volume of literature is so great that the need continues.

The purpose of this book is to present a number of reviews written by well-known scientists in the field. The editor states in his introduction that "This volume presents the first of a series of surveys which will be prepared on an annual basis and, to provide a firm foundation for future volumes, the present work covers the years 1955 to 1961."

The surveys are "Aspects of the geochemistry of the rare earths," by L. H. Ahrens (with 72 references); "Mass extraction and separation," by K. J. Bril (356 references); "The separation of rare earths by ion exchange," by Jack E. Powell (74 references); "Liquid-liquid extraction of the rare earths (excluding the use of phosphorus based extractants)," by Boyd Weaver (9 references); "Fractionation of rare earths by liquid-liquid extraction using phosphorus-based extractants," by D. F. Peppard (37 references); "Solution chemistry," by P. Krumholz (304 references); "Recent Soviet research on the chemistry of rare earth complexes," by D. I. Ryabchikov and E. A. Terentyeva (80 references); "Kristallchemie der Oxide der Seltenen Erden," by