discussions of some species and many genera that are also present in our area. And, besides, we can often learn how to study our own species by reading what has been found in related species in another area. This volume should prove very useful, especially to those interested in the biology of beetles. I have never seen so much detailed biological information on beetles assembled in one place.

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Aardvark to Zorilla

The Management of Wild Mammals in Captivity. Lee S. Crandall. University of Chicago Press, Chicago, 1964. xv + 761 pp. Illus. $13.50.

The modern zoological park has come a long way from the earlier menagerie, but its basic purpose is still the same—public exhibition, with emphasis on large, unusual, exotic animals. Bars and screen fencing have given way to moats or glass enclosures, but their purpose is still restraint of the animals and ease of viewing them. Maintenance is aimed at satisfying the animals' physical and psychological needs and displaying them with at least a suggestion of their normal habitats and ways of life. Today another objective is often the perpetuation of threatened species. Curators and keepers measure their success by the number and rarity of the species displayed, and by the general health of their specimens, as indicated by longevity records and breeding performance. Most of their technique has been acquired by dint of hard labor, trial and error, and frequent disappointment. There has long been a need for a compilation of husbandry data—a bible as well as a record-book—for the profession. Lee Crandall now provides such a book dealing with the mammals. No one is better qualified than he to do so, and he has done it magnificently.

At an early age the author forsook a medical tradition in favor of zoology. Schooled at Cornell and Columbia universities, in 1908 he joined the staff of the New York Zoological Park, without salary, and began learning the game the hard way, as a keeper's assistant. His talents were soon recognized, and he ascended through the ranks to the position of general curator in 1943. He worked as an associate of William T. Hornaday, Raymond L. Ditmars, and William Beebe. He participated in collecting expeditions to British Guiana (1909), Costa Rica (1914), New Guinea (1928), Australia (1929, when he was shipwrecked between Port Moresby and Sydney), and made frequent visits to zoos in Europe and elsewhere. He developed special interests in the breeding and speciation of marmosets, in birds of paradise, and in display forms for birds. Besides numerous journal articles, he wrote two books—*Pets and How to Care for Them* (1919) and *Paradise Quest* (1931). Known and honored internationally for his knowledge, judgment, and warm personality, he is a fellow or honorary member of many American and foreign societies. But above all, in the present connection, is that rare trait of mutual understanding between him and his charges, his intuitive perception of the animals' personalities and problems. In 1952 he was retired as Curator Emeritus. The years since have been just as busily occupied in gleaning, from his many friends throughout the world, from his personal experiences, and from an exhaustive survey of the literature, the materials for this volume.

In scope, the book considers all kinds of mammals with definite captivity histories. Cetaceans are excluded as inappropriate, but treated in detail are countless species, and occasionally subspecies, representing 82 families of 18 orders. Common and technical names are given; descriptions deal with color, general appearance, weight, shoulder height, and such external characters as may be observed on living animals; habits are discussed, particularly as they affect treatment in captivity; longevity records are presented; breeding habits, gestation periods, quantities and kinds of food, general care, and management methods employed are all covered as fully as may be. Related, among others, are accounts of the highly specialized care accorded a pair of platypuses, of the reception of a rhinoceros newly arrived from Africa, and of the attention that resulted in successful breeding by a pair of Florida otters. Data for each order are assembled by chapters, together with appropriate references. A good index is included. Far from a recital of dry technicalities, the book is filled with interesting observations, is written in an engaging style, and is enlivened with frequent anecdotes. It surely will prove indispensable to zoo keepers, pet dealers, and others concerned with the care of wild mammals, and will be of much popular and technical interest to a far larger audience.

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Botany in India

Maheshwari Commemoration Volume. *Journal of the Indian Botanical Society*, vol. 42-A. T. S. Sadasivan, Ed. Indian Botanical Society, Madras, 1963. xxxiv + 330 pp. Illus. $7.

This commemorative volume is dedicated to the distinguished botanist, Professor P. Maheshwari, on the occasion of his 60th birthday. The honor is bestowed on Maheshwari for his many accomplishments and for the great influence he has exerted on the development of botany in India. In the words of the editor of the volume, Maheshwari is "regarded as the father, mother, and attending gynaecologist for the subject of plant morphology and embryology in India." His writings, which number 134 titles over a broad range of topics in a span of 34 years, including several authoritative books, represent a tremendous accomplishment.

There is a dedication and a biography with a list of Maheshwari's publications, but the main body of the volume consists of 37 articles contributed by botanists from all over the world. Among the subjects and fields represented by the articles are algae, mycology and plant pathology, bryophytes, pteridophytes, angiosperm morphology and taxonomy, anatomy, palynology, embryology, cytology, cytogenetics, plant breeding, in vitro culture studies, and paleobotany. The character of the articles ranges from reports of original studies to limited reviews and discussions.

It is perhaps appropriate that emphasis on morphology should prevail, but the coverage should hold some interest for all readers. Most articles are timely, and many of them undoubtedly deserve to be considered as significant contributions. Notations concerning the specific topics presented cannot be made here. In general, the volume is well done. The Commemoration Com-

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