

the basal plane of graphite crystals.

The book is interesting and revealing, and the articles, supplied with many illustrations (some of them excellent), are well written.

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The reviewer is professor in the metallurgical engineering department and is working at the Materials Research Center of the University of Missouri-Rolla in crystallization of x rays.

Gamma-ray resonance

LECTURES ON THE MÖSSBAUER EFFECT. By J. Danon. 150 pp. Gordon and Breach, New York, 1968. Cloth \$7.50, paper \$4.50

by GUNTHER K. WERTHEIM

This volume is based on notes taken by E. de Alba, X. da Silva and M. A. Weber at a series of lectures given at the Latin American School of Physics at the University of Mexico during July and August, 1965. They were first published in *Many-Body Problems and Other Selected Topics in Theoretical Physics* edited by Marcos Moshinsky, Thomas Brody, and G. Jacobs, also issued by Gordon and Breach some years ago. The present version has been slightly augmented, mainly by the addition of reprints and an occasional appendix. The references, however, do not include work later than 1965.

Jacques Danon has been active in Mössbauer-effect research since its early days. In this book he covers the same ground, using a similar approach, as do a number of other introductory monographs of comparable length. However, his treatment is unique in presenting in detail the author's treatment of the isomer shift utilizing a molecular-orbital approach.

Another useful feature is a major section dealing with the theory of the recoil-free fraction. It was contributed by Yehiel Disatnik and provides more detailed information than is available in other monographs.

The spirit implied by "lectures" has been retained to a large extent. Figures showing data from the literature have been redrawn, omitting data points and providing only an approximate rendering of their essential character. Axes are incompletely labeled. It is unfortunate that there is no mention of other useful compendia.

The chief value of the book lies in

the areas mentioned above where it makes a unique contribution. The material chosen for reproduction in the appendix provides a good indication of its strong points.

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The reviewer, a member of the technical staff at Bell Telephone Laboratories, is the author of a number of papers dealing with the Mossbauer effect.

Experimental determination

OPTICAL PROPERTIES AND BAND STRUCTURES OF SEMICONDUCTORS. By David L. Greenaway and Gunther Harbeke. 159 pp. Pergamon, New York, 1968. \$9.00

by HAROLD MENDLOWITZ

The authors have put together a fairly broad review of optical properties and band structure of semiconductors through 1966. Although the emphasis is on experimental determination, a number of theoretical concepts and results are briefly treated in order to understand and "catalog" the experimental results.

The optical region covered is from the infrared to the vacuum ultraviolet. Band structures of cubic as well as anisotropic materials are discussed. Experimental methods for determining the band structure include optical absorption and reflectivity measurements, as well as the interpretation of deformation phenomena, excitons, electro-optical phenomena, photoemission and characteristic electron energy-loss experiments in solids.

The major emphasis is on classical methods, that is absorption and reflectivity measurements, with less than a page devoted to electron energy-loss experiments. Although this latter method is important for obtaining information on the optical constants in the vacuum ultraviolet, the authors apparently had access only to the first paper on this subject, an application to the optical constants of aluminum that appeared in 1962. They recognize its applicability to nonmetals, but were unaware of subsequent papers utilizing this method that appeared in 1964 on polystyrene, an insulator, in 1965 on beryllium, and in 1967 on germanium, a semiconductor. Of course, each author's point of view determines which methods to emphasize, and the classical methods are still the ones that yield the bulk of the data

utilized in determining the band structure. However, the omission of the 1967 paper on germanium is probably because the literature search was closed prior to publication.

Overall, the authors did accomplish their goal of making a substantial contribution by making a fairly complete review.

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The reviewer is a professor at Howard University and has been doing research on the optical properties of solids for the past decade.

Cosmological approaches

THEORIEN DER KOSMOLOGIE. (In German) By Otto Heckmann. 113 pp. Springer-Verlag, New York, 1968. \$6.00

by ERNST J. OPIK

This is an exact reprint of a first edition published in 1942, which sold out immediately after its appearance. Only a few corrections are now made, and three pages of notes superficially refer to modern developments.

The reprint has been produced under the pressure of demand, but the author, formerly director of Hamburg Observatory and now director of the European Southern Observatory, did not find time for a revision. Besides, a revision would mean rewriting most of the book in view of the enormous progress in observational research during a quarter of a century, including observations of radio sources, quasars and pulsars. Even Heckmann's more recent contribution, pointing out the possibility of an inbuilt angular momentum in preventing collapse of the universe, is not included.

Despite the outdated factual material, its permanent value consists of a systematic presentation of the three different approaches to cosmology: the classical or dynamical presentation, based on plain Newtonian mechanics; the Einsteinian general relativity, and Milne's kinematic cosmology. Contrary to widespread opinion, persisting even now, there is much common ground between the first two models. Finesses of general relativity, such as the advance of Mercury's perihelion, are not essential on the cosmological scale. Therefore, Newton's dynamical and Einstein's metrical methods lead to practically identical conclusions.

When first published Heckmann's