

hour or two of pondering model languages, law-like sentences, and the distinction between *explanans* and *explanandum*. It is perhaps easy to attack any technical work by such citations of its jargon, but the feeling is inescapable that the machinery here mounted far outweighs the results that the philosophers can place before the thinking reader. All theory, we are told by the poet, is gray, and the theory of theory becomes just the shadow of gray. The green bough of growing physical theory itself seems a better guide to its own meaning, by example, than are most of the earnest commentators with their somewhat forced precepts. Analysis is drawn here a bit too fine. It is good that discussions of operationalism and of logical positivism are found both in their classic formulations (Bridgman, Frank, Schlick, Carnap, Nagel) and in sharp criticisms at the hands of such writers as Carl Hempel. It is a pity that the magnificent piece of Professor Hempel on *Fundamentals of Concept Formation* is omitted in favor of some shorter pieces in the same vein, that of showing the inescapable and complex nexus relating theory and experiment, before which the effort to make sensory convenience into science seems at last to have fallen. Perhaps a touch more of the speculative, metaphysical philosophers would have done some good as a counterweight to the refined hard-boiledness of the works here emphasized.

Second, the pieces on the sciences of more complexity, like the social sciences, seem by contrast rather more meaty. There is always the fear that this reflects a physicist's ignorance, but it seems at least to be true that common sense and logical analysis are more patently fruitful in subjects where precision of measurements is perhaps not yet even to be desired, let alone obtained. A really impressive and down-to-earth essay by Edgar Zilsel is convincing (at least to a physicist) on the hope and the probability of finding laws of human history.

This anthology is perhaps a bit restricted for the average reflective physicist; he might prefer to read only the more familiar works, in fuller versions. But serious students will without doubt find it valuable. And it will be a long time before the usefulness of the really excellent annotated bibliography, with its more than five hundred citations arranged by subject matter, is approached elsewhere or outdated. For this last labor of skill and love the editors deserve special gratitude. Libraries of physics will find this volume well worthwhile; it would be justified by this bibliography alone.

Physical Properties of Solid Materials. By C. Zwikker. 300 pp. Interscience Publishers, Inc., New York, 1954. \$8.75. Reviewed by R. Smoluchowski, Carnegie Institute of Technology.

Books dealing with physical properties of solids are mostly either theoretical treatises placing stress on a systematic analysis of fundamentals or engineering textbooks, which discuss and tabulate various data of practical significance. Zwikker's book strikes the aim somewhere in-between and it does it in an unorthodox and

often interesting manner. A short introduction to the basic notions about particles and forces is followed by thirteen chapters on various selected subjects. These vary from such obvious and "conventional" matters as constitution (i.e., structure), elasticity, plasticity, thermal properties, transformations, ferromagnetism and ferroelectricity, electronic properties etc. to rather new treatments of such topics as heterogeneity, anisotropy, systematic relations (extensive and intensive parameters, reciprocal relations, etc.), porosity and permeability, surfaces, etc. Although the writing is very compact and sometimes difficult to follow, this is partly offset by the numerous illustrations and diagrams, many of them quite original. There are many references to papers in recent literature and also many examples of how various basic physical phenomena appear in engineering problems or even in daily life. This inclusion of treatments of several somewhat out of the ordinary matters in a book which tries to cover the huge field of physical properties of solids in about 300 pages necessitates various rather significant omissions or radically short mentions. For instance, there is no appropriate description of diamagnetic and paramagnetic properties or of the numerous kinds of lattice imperfections (with the exception of dislocations) nor of microwave resonance. The author makes a point of using the mks system except where it becomes too awkward.

The book should be of particular value to nonphysicists who need to have a rather good general background in physics and also to those physicists who want a quick survey of the field without going into the more detailed consideration of its problems.

Dislocations in Crystals. By W. T. Read, Jr. 228 pp. McGraw-Hill Book Company, Inc., New York, 1953. \$5.00. Reviewed by Harvey Brooks, Harvard University.

Although the theory of dislocations in crystals is relatively old, it is only within the last ten years that it has become a fashionable branch of solid-state physics and acquired a measure of respectability even among practical metallurgists. One of the primary aims of this admirable monograph is to increase the respectability of the subject by drawing attention to those features of the theory which are well-established and noncontroversial. About two thirds of the book is devoted to a logical deductive presentation of dislocation theory from a few relatively obvious geometrical postulates and crystallographic concepts, and the other third is concerned with two applications of dislocation theory to metallurgical problems in which the predictions of the theory can be tested critically and quantitatively—namely, Frank's theory of crystal growth, and the dislocation theory of grain boundaries as set forth first by Burgers and later by Shockley and Read.

The greatest practical interest of dislocation theory lies in the possibility of explaining the plastic properties of crystals. Mr. Read for the most part avoids these subjects because there exists at present no quantitative theory of mechanical strength, and no generally ac-