

the whole human element of the thing. However, this element cannot be spirited away so easily. Frank shows how it turns up time and again to embarrass and put on the spot scientists who have no opinion or who may be in the grip of some childhood philosophy. For instance, is relativity theory antimaterialistic? This may be an important question depending upon the prevalent climate of opinion.

Actually, as Frank concludes, the history of science has itself been less tough-minded than the attitude described above: "If we wish to speak in a brief and rather perfunctory way, we may distinguish between two main purposes of a theory: use for the construction of devices (technological purposes), and use for direct guidance of human conduct. The actual acceptance of theories has always been a compromise between the technological and the sociological value of the theory." We have here liberal education in the true sense from the pen of a great teacher and humanist.

Thermodynamics and Statistical Mechanics. By A. H. Wilson. 495 pp. Cambridge U. Press, New York, 1957. \$9.50. *Reviewed by M. Kac, Cornell University.*

This book is intended for students of theoretical physics since the author feels that most textbooks in this field have been written primarily for chemists. However, a number of topics (chemical reactions, solutions) usually associated with physical chemistry are treated in detail. The emphasis is supposed to be on the principles but the number of applications is so large and many of them are treated so sketchily that this worthy aim is somewhat obscured.

The first four chapters are devoted to classical (phenomenological) thermodynamics and a valuable innovation has been introduced by including the Carathéodory axiomatic approach (Chapter 4). This is one of the best parts of the book and it tends to emphasize the often overlooked fact that thermodynamics is logically quite a subtle subject.

The remaining nine chapters are devoted to statistical mechanics and these follow more or less standard lines.

The more delicate portions (notably the theory of condensation) are dealt with briefly, too briefly for the reviewer's taste. Still the style is lucid and the book contains an impressive amount of information without being ponderous and verbose.

It should be useful as a textbook and a reference book and the part on phenomenological thermodynamics is truly excellent.

Physical Properties of Crystals: Their Representation by Tensors and Matrices. By J. F. Nye. 322 pp. Oxford U. Press, New York, 1957. \$8.00. *Reviewed by R. B. Lindsay, Brown University.*

The literature on crystal physics is very extensive both from the standpoint of the elucidation of structure by means of x-rays and electron microscopy and that of the prediction of properties from the statistical

mechanics of the solid state. The author of the present text has set himself a rather limited task and within the framework of his purpose has produced what will undoubtedly be a useful book. He examines in detail those properties of crystals which can be expressed in tensor notation and the thermodynamic relations connecting them. This means that he regards a crystal effectively as an anisotropic continuum having certain symmetry properties and pays no regard to its atomic structure.

The book consists of four parts of which the first is an exposition of tensor analysis; this, though brief, is elegant, clear, and thorough. It is followed by a much longer group of chapters on equilibrium properties of crystals including magnetic, electric, elastic, and piezoelectric behavior. This part is concluded by a chapter on thermodynamic relations, presupposing a working knowledge of thermodynamics, but serving admirably to tie together the various properties with the assistance of numerous ingenious schematic diagrams. The third part discusses transport properties including thermoelectricity but not superconductivity. There is an adequate account of Onsager's principle in irreversible thermodynamics. Part Four is a brief presentation of crystal optics. There are eight appendices including a rather substantial one reviewing the fundamentals of crystallography. A useful feature is the inclusion of numerous exercises through which the reader can test his understanding of the text. The book is suitable as a text in most universities for senior undergraduate majors in physics or first-year graduate students, but it should also be helpful for all who are engaged in research involving any phase of crystal physics.

The Science of Engineering Materials. Edited by J. E. Goldman. 528 pp. John Wiley & Sons, Inc., New York, 1957. \$12.00. *Reviewed by Cyril Stanley Smith, Institute for the Study of Metals.*

"The present book is an outgrowth of a series of conferences and symposia, formal and informal, that culminated in the Carnegie Conference on the Impact of Solid States Science on Engineering Education which was held in Pittsburgh at Carnegie Institute of Technology in June 1954."

The conference and this book are manifest proof of the desire of the present generation of solid-state physicists—largely under the inspired leadership of Frederick Seitz—to interpret theoretical achievement in terms understandable by the average engineer.

The book contains 18 chapters, each written by an outstanding research man in the style which has come to be regarded as appropriate for the engineer. There is little really new in the book, but teachers of engineering who have kept abreast of their subject will be grateful for a handy reference and an outstandingly good presentation of all aspects of solid-state physics of concern to them.

There are chapters on cements, plastics, and glass—all non- or pseudo-crystalline and hence beyond the

range of current solid-state physics—and one on phase transformations in metals which well indicate the extreme complexity of real matter, and both the interest and the challenge of systems that are not ideally simple.

The introductory chapter, by Harvey Brooks, is particularly commendable, and supports the view that neither the pure scientist studying ideally simple materials nor the technologist with real complexities can be self-sufficient. What is now needed is another symposium with the interest reversed, to produce a book in which the engineer, *qua* engineer, writes for education of the physicist!

Microwave Principles. By H. J. Reich, J. G. Skalnik, P. F. Ordung, H. L. Krauss. 427 pp. D. Van Nostrand Co., Inc., Princeton, N. J., 1957. \$8.75. Reviewed by Charles Süsskind, University of California.

This is an abridgement of *Microwave Theory and Techniques*, which the same authors published in 1954. A year after the original version appeared, this reviewer made a survey ("Microwave engineering: How a new course is adopted", *Journal of Engineering Education* 46: 838-841, 1956) in which the book was shown to be one of the top three then used in American engineering schools offering courses in ultra-high-frequency engineering. (The other two were *Fields and Waves in Modern Radio* by Ramo and Whinnery and *Theory and Application of Microwaves* by Brownwell and Beam.) Nevertheless, the original version does not seem to have sold briskly enough to suit the publishers or the authors, and they have now issued a smaller book intended for use as a one-semester text for seniors, or as a quick review for practicing engineers, experimental physicists, and the like. According to the authors' own statement, the condensation has been accomplished largely by the elimination of mathematical details and the rewriting of waveguide equations and other vector relationships in scalar form. On the other hand, an appendix containing fifteen experiments developed at Yale over the years has been added, and there is some other new material. The resulting more compact book is sure to prove very popular with those among the large number of engineering schools (more than half) that the above-mentioned survey showed to offer no specific courses in microwave engineering at all, but which would like to include such a topic in their curriculum. The book will also serve as an excellent reference for any physicist, biologist, or chemist who would like to gain a general understanding of basic microwave techniques without necessarily mastering the detailed theory.

Elastic Waves in Layered Media (Lamont Geological Observatory Contribution No. 189). By W. M. Ewing, W. S. Jardetzky, F. Press. 380 pp. McGraw-Hill Book Co., Inc., New York, 1957. \$10.00. Reviewed by Arthur Beiser, New York University.

Very often the experimental and theoretical methods of approaching a complicated problem start from differ-

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