

Books

Quantum Theory of Solids. By R. E. Peierls. 229 pp. Oxford U. Press, New York, 1955. \$4.80. *Reviewed by Louis D. Roberts, Oak Ridge National Laboratory.*

In his book, *Quantum Theory of Solids*, Professor Peierls has given an excellent treatment of the fundamental aspects of this subject. The book is not encyclopedic in character; but rather, it is a careful, thorough statement of the topics he has selected. A very high degree of clarity is achieved, and the book is remarkably readable.

Approximately the first quarter of the text is devoted to a fairly detailed discussion of the crystal lattice, and the concepts unfolded here form the basis for the following development. This includes as major subjects the interaction of light with solids, electrons in the lattice, magnetism, and transport phenomena. In the presentation of these topics especial care is given to the statement of basic ideas and to the degree of approximation involved in their mathematical expression. Frequently, when evaluating the present status of a development, the author points out possible avenues for further work, and the experimenter as well as the theorist will find inspiration in these paragraphs.

Although the statement of ideas is, of course, mathematical, only comparatively modest demands are made on the mathematical capabilities of the reader. Mathematical techniques are subordinate and are seldom discussed as such. The reader is assumed to have an understanding of quantum mechanics equivalent to the usual graduate course on this subject, but for most of the text a reasonable familiarity with second order perturbation theory is sufficient. On the other hand, the reader should be conversant with the properties of solids for the text presents rather little experimental material. Adequate references to pertinent experimental work are given, however.

It has been many years since the last authoritative text on the quantum theory of solids was presented. Thus the need for Professor Peierls' book is obvious and it will clearly play an important role in the further development of solid state physics.

Basic Processes of Gaseous Electronics. By Leonard B. Loeb. 1012 pp. U. of California Press, Berkeley, California, 1955. \$13.50. *Reviewed by David J. Rose, Bell Telephone Laboratories.*

Roughly speaking, the field of gaseous electronics may be viewed in three different ways. The first in-

OUTSTANDING NEW McGRAW-HILL BOOKS

MODERN PHYSICS FOR THE ENGINEER

Edited by LOUIS N. RIDENOUR, Lockheed Aircraft Corporation, Calif. 522 pages, \$7.50

Atomic structure, magnetism, solid-state, semiconductors, atomic power and chemistry, information theory, and computers are among the topics treated in this unique collection of lectures. They give engineers and technical men an account of the more interesting developments in the fundamental physical science which underlies all engineering. Relatively non-mathematical, the book is both authoritative and interesting, and is a significant contribution to scientific literature in the 20th century.

MODERN MATHEMATICS FOR THE ENGINEER

Edited by E. F. BECKENBACH, University of California, Los Angeles. Ready for Fall Classes

The aim of this useful book is to generate in the minds of engineers and applied scientists engaged in research, design, and administration an awareness of the recent rapid advancement in applied mathematical thought. This advancement resulted largely from the demands of modern engineering programming and design. It was made possible, in part, by recent advances in basic mathematics and statistics, and by the development of analog devices and digital computing machines of extremely high capacity and speed. Each chapter is by an expert well known not only for his theoretical competence, but also for his applied experience.

MODERN CHEMISTRY FOR THE ENGINEER AND SCIENTIST

Edited by G. ROSS ROBERTSON, University of California, Los Angeles. In press

The work of 19 nationally-known chemists, both academic and industrial, this volume should have wide appeal to all chemists and chemical engineers. Its aim is to make them aware of the rapid advancement in the pure science and industrial applications of chemistry. Beginning with a discussion of the fundamental principles of physical chemistry, the work gradually extends with industrial examples and then treating the applications of chemistry to life. Emphasis is on the newer fundamental methods of kinetics, thermodynamics, and mechanism of reaction.

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volves consideration of individual interactions between the various particles; several good texts have been written in this vein. The second, which is Professor Loeb's principal point of view here, is the consideration of the statistical result of these interactions in a gas, insofar as they involve simple measurable averages. The third point of view, which is not attempted here, involves the synthesis of all these processes simultaneously into the complex electrical discharges that are generally observed. Thus the book deals largely with mobility, diffusion, ionization and attachment coefficients, recombination, and secondary emission; each process is considered more or less separately, except for certain corona and streamer phenomena discussed in the last chapter. The book does not dwell much on some esoteric ramifications, such as diffusion tensors, magnetic field, or high-frequency effects.

In writing this source book, the author attempts, generally successfully, to describe the more significant experiments in the field, together with brief summaries of applicable theory, where it exists. The tendency to describe the investigations author by author makes for some lack of correlation, which is the principal fault. One does not find often enough concise summaries and comparisons, perhaps in tabular form, of the conflicting results of different authors, so that they may be discussed together. It is sometimes difficult to find all the references on a given subject. There is some confusing repetition, as for example where two related electron energy distribution theories are presented in succession, but independently and with different symbols. A few errors of fact creep in. One might wish that the author had considered Poisson's equation as a basic process and discussed space charge phenomena in one chapter, but the line must be drawn somewhere.

The virtues of the book easily outweigh these faults, particularly when one recalls that it is primarily a source book, rather than a text. There is a tremendous amount of valuable information contained in it; the reviewer has found several references to work in his own corner of the field, of which he was previously unaware. There is at present no other adequate text which covers the field in this way, and very few that cover it at all. For serious workers in gaseous electronics, the book will be necessary as a detailed reference. In order to appreciate the extent of the field, the worker would do well to read it from cover to cover. The task of preparing it must have been very considerable; the reviewer is reminded of a statement attributed to Anthony à Wood: "A painfull work it is I'll assure you, and more than difficult, wherein what toyle hath been taken, as no man thinketh, so no man believeth, but he that hath made the triall."

Solar Energy Research. Edited by Farrington Daniels and John A. Duffie. 290 pp. The University of Wisconsin Press, Madison, Wisc., 1955. \$4.00. *Reviewed by S. F. Singer, University of Maryland.*

The book reports on the Symposium on the Utiliza-

tion of Solar Energy which was held in Madison, Wisconsin, in September 1953, under National Science Foundation sponsorship. Contributions were made by about 30 meteorologists, engineers, chemists, and physicists, who are interested in this field. The papers are loosely organized into subheadings such as: Expected World Energy Demands, Space Heating and Domestic Uses of Solar Energy, Solar Evaporation, Conversion of Solar to Electrical Energy, Photosynthetic Utilization of Solar Energy, and many other aspects of solar energy. In a section dealing with the conversion to electrical energy, thermoelectric generators and photovoltaic cells are described in detail; unfortunately, the newly developed Bell Laboratories silicon battery was not discussed. While the latter seems the most efficient although rather expensive method of obtaining electric energy directly, many of the other applications of solar energy, particularly those which use solar energy for heating of water or seasoning of timber, distillation of salt brines, etc., are of tremendous economic importance. Of special interest to physicists may be the technique of the solar furnace, probably one of the best methods for achieving the highest possible temperatures for laboratory research, of the order of 3000° C.

Essentials of Biological and Medical Physics. By R. W. Stacy, D. T. Williams, R. E. Worden, and R. O. McMorris. 586 pp. McGraw-Hill Book Co., Inc., New York, 1955. \$8.50. *Reviewed by E. R. Cohen, North American Aviation, Inc.*

This book is presented as the "first textbook on biophysics". Such a description may not be entirely true, but it does have a reasonably valid basis from which to maintain that position. Although several books on biophysics have appeared in the last fifteen years apparently none has been written primarily as a student text. Here at last is a textbook—two in fact; one is a freshman or sophomore text in physics, the other on a similar level in physiology. Unfortunately the attempt to combine two texts into a single volume has its disadvantages; the discussion tends to skim only the surface without going into detail. This is forced upon the authors (once they have chosen to cover the broad area available rather than to specialize on a few topics), in order that the book should not run to excessive length. However true this may be, it is still annoying to find that the chapter ends and a new topic begins just as the story gets interesting.

As an introductory text, either for the biologist or medical student interested in the physical aspects of biology or for the physicist interested in the biological applications of physics, the book will prove very useful. Its forty-three chapters are divided into ten parts covering the biological aspects of the major branches of classical physics—mechanics, heat, light, sound, and electricity. Two final sections are devoted to nuclear physics and a very short survey of theoretical biophysics.