

Books

Progress in Nuclear Physics. Volume 2. Edited by O. R. Frisch. 295 pp. Pergamon Press Ltd., London, England; Academic Press Inc., New York, 1952. \$9.25.
Annual Review of Nuclear Science. Volume 2. Edited by C. D. Coryell, L. F. Curtiss, L. I. Schiff, E. Segrè, and R. E. Zirkle. 429 pp. Annual Reviews, Inc., Stanford, California, 1953. \$6.00.

There is good reason for reviewing these collections at the same time. They are not in competition with regard to subject matter, for even those articles in which there is an overlap present enough difference in approach to warrant attention to both.

Research physics still strives to remain a single science, to the mounting dismay of its graduate students. The two subject volumes are significant contributions to that effort. They present results and techniques of a variety of researches in nuclear physics for the edification of those in other fields and they record and evaluate the literature to the benefit of those actively engaged in particular subjects. In both volumes the articles present an average of one hundred references each. Thus, despite the universal tendency to 'quote only one's friends' the reference lists, as well as the contexts in which they arise, should provide valuable aids to those who are starting an exhaustive survey on a particular subject.

In trying to keep abreast of developments in a number of specialties it is necessary to call upon a large number of contributors. This brings with it a wide range in experience, perspective and writing ability among the authors. It is quite clear that the readability, and hence general usefulness, of the volumes could be improved by a more vigorous editorial policy. This is not meant as a criticism of the current editors who have many other things to do. In fact, those articles contributed by members of the editorial committee are among the best organized and carefully written. But there is room for improvement in some of these matters needed to bring the standard for all papers up to that exemplified by the reference lists.

As to differences between the two volumes we note that *Progress* presents eight titles in 295 pages and *Annual Review* sixteen titles in 410 pages. Moreover, the pages in *Progress* are several percent wider, for the same number of words, and are therefore considerably easier on the eye. Another difference is that over half the authors in the *Annual Review* are theoretical physicists whereas the contributors to *Progress* are predominantly experimentalists. This does not produce as much

disparity in mathematical content as one might think. In short, the technical level of the two is about the same and very acceptable to readers for whom the volumes are meant.

Charles Critchfield
University of Minnesota

Nuclear Physics. By W. Heisenberg. 225 pp. Philosophical Library, New York, 1953. \$4.75.

This short volume, based on a series of lectures delivered during the past war before the Association of German Electrical Engineers and last revised in 1948, serves as an excellent introduction to the subject for the technically trained nonphysicist. Especially noteworthy are the first two chapters, dealing with the historical background and with the basic ideas of quantum theory, which aid greatly in understanding the following portions. Although the physicist reader will not find in this volume the same wealth of insight and new ideas which still makes the reading of the author's little volume on *Quantum Theory* such a rewarding experience, there are, nevertheless, many original and useful pedagogical devices which should interest those faced with the problems of teaching nuclear physics on an elementary level.

As a scientific work, the volume is marred by the appendix. Here the author gives a highly personal history of the German war efforts in the field of atomic energy. The article adds little to the technical information already published on the subject and, as an historical document, leaves one with the impression of having viewed history through the wrong end of a telescope. (Readers interested in this aspect of the subject are referred to *ALSOS* by S. A. Goudsmit.)

The translation is excellent. Indeed, it is only rarely evident that the book was not originally written in English.

Bernard T. Feld
Massachusetts Institute of Technology

Introduction to Solid State Physics. By Charles Kittel. 396 pp. John Wiley & Sons, Inc., New York, 1953. \$7.00.

Professor Kittel has succeeded admirably in his purpose, announced in the preface, of producing a textbook suitable for an introductory course in the subject of solid state physics for seniors and graduate students. This book covers most, but not all, of the important topics of the field of the solid state. There are separate chapters on superconductivity, semiconductors (including transistors), ferro- and antiferromagnetism, ferroelectric crystals, diamagnetism, paramagnetism, and the band theory of metals; and two chapters on imperfections in solids. These are in addition to the expected chapters on crystal structure, lattice energy, lattice vibrations, thermal properties, dielectric properties, and the free-electron theory.

The topic of each chapter is developed in terms of both description and theory; the emphasis in general is on theoretical treatment of simple or idealized models.

Some complicated derivations are given in the excellent Appendix. A set of problems for the student and a bibliography are given at the end of each chapter.

The book is strikingly up-to-date; one evidence of this is the great preponderance of references of the last fifteen years in the numerous footnotes. Another is the terminology, e.g., *phonons* for lattice vibration waves and *excitons* for propagated excited electronic states.

Treatment of the solid state, even in an introductory course, cannot very well be given in "popular" language; the author has wisely made no attempt to write an armchair discussion for the average scientist. This volume is intended for a student well-grounded in physics; knowledge of atomic physics and elementary quantum mechanics, as well as a good mathematical background, is presupposed.

J. F. Masi

Gallery Chemical Company

Thermionic Valves. Their Theory and Design. By A. H. W. Beck. 570 pp. Cambridge University Press, New York, 1953. \$12.00.

There have been a variety of books written about vacuum tubes. Some are historical monuments to an early state of the art. Some emphasize mathematically neat problems, such as the calculation of the amplification factor of triodes, while largely neglecting such important matters as noise and bandwidth. Some are compilations of various published works, little altered and little digested. Recently, there have been a few specialized books on certain types of tubes. Among these is the earlier *Velocity-Modulated Thermionic Tubes* by the present author, in which he has treated well the particular field in which he has had most practical experience.

This new book is different. It is comprehensive. It is not an undigested reprinting of material from various sources. By and large, the space given to various topics is judiciously governed both by what there is to say and by whether, in the expert opinion of a practical worker in the field of microwave tubes, it is worth saying.

The topics covered are many. Part I treats thermionic emission, secondary, field, and photo-electric emission, and fluorescence. Part II considers electrostatic fields, and from thence goes to electron optics and electron flow, without and with space charge. Part III, which is longer than all the rest of the book, covers low-frequency negative-grid tubes, transmitter tubes, velocity-modulated tubes, ultra-high-frequency triodes, traveling-wave tubes and related tubes, magnetrons, and picture converters and storage tubes. Appendices discuss recent work on oxide-coated cathodes, space-charge waves, and noise in traveling-wave tubes.

The approach is theoretical, and the book deals with the general properties of tubes rather than with specific tube types; however, particular tubes are sometimes used to illustrate a point. The book will get one well started toward an understanding of each topic it treats, and it refers the reader to more detailed work. The author says that "a reader who has mastered the

contents should be able to make a critical appreciation of current research papers." This is true enough, but where can we find so energetic a reader?

This altogether admirable book is recommended as "of use to graduates with a first degree in physics or electrical engineering and those who are starting independent work in this field. . . ." The book is excellent for reference, but there is more material than could be covered thoroughly in a course of reasonable length. Some of the sections, such as that on noise, would be very tough going without the aid of a really able teacher. Also, to understand some topics thoroughly, one would have to draw on material outside of the book. This is particularly true of the very tricky field of thermionic emission, which is a study all of itself, and is related to the operation of vacuum tubes only in that tubes need a source of electrons. It is to some extent true of the sections on noise.

Should a course cover all aspects of a field, or should it explore one segment exhaustively? And, which should a text do? Mr. Beck has valiantly essayed to treat concisely but on a high level virtually everything important about vacuum tubes except valve techniques and manufacture. In this long and expensive book he has succeeded in doing this. He has produced a unique and important work which those in the tube field will want to have and to refer to.

J. R. Pierce

Bell Telephone Laboratories

High Altitude Rocket Research. By Homer E. Newell, Jr. 298 pp. Academic Press, Inc., New York, 1953. \$7.50.

Since the inception of the high-altitude rocket program in 1946 about 200 rocket launchings have been conducted with various instrumentations; most of the firings were made from White Sands, New Mexico, but a number were conducted from ships in the Pacific and Atlantic oceans. This research has been producing a flood of new data about the properties of the atmosphere and about the extraterrestrial radiations. The publications of the results, however, have not always kept step; many are still contained in internal and essentially private (although unclassified) reports, while published papers are scattered throughout the literature in journals of physics, geophysics, astrophysics, meteorology, electrical engineering, etc.

In these past eight years the high-altitude sounding rocket has proven itself a valuable tool for conducting *in situ* measurements of atmospheric properties which could only imperfectly be deduced from observations at lower altitudes. It is especially in the study of incoming photons and corpuscular radiations that the rocket excels; e.g. the solar spectrum in the far ultraviolet and x-ray regions could hardly even be inferred from sea level.

The present book is the first one which covers these new results and also describes the rocket techniques used in obtaining them. The author who has headed the Rocket Sonde Section of the Naval Research Labora-