

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-