Books

Microwave Measurements. By Edward L. Ginzton. 515 pp. McGraw-Hill Book Co., Inc., New York, 1957. $12.00. *Reviewed by R. W. Hellwarth, Hughes Research Laboratories.*

Those who find themselves concerned for the first time with microwave experimentation and practice will welcome the appearance of *Microwave Measurements*. In this book the author has distilled from the mass of existing detailed literature a coherent, very readable account of methods which are fundamental to all microwave techniques. A description of the most common means of generating, controlling, detecting, and measuring microwave power in the laboratory occupies the first half of the book. The accompanying theoretical analyses of such components as klystrons, traveling wave tubes, triodes (magnetrons are omitted), stabilizing circuits, crystal rectifiers, barreters, etc., are designed to equip the reader with sufficient understanding to select appropriate elements for a given application and to use them without risking difficulties. Typical characteristics of the various elements are given along with helpful qualitative comparisons of reliability, ruggedness, reproducibility, and ranges of applicability.

The second half of the book deals with the measurement of frequency and impedance and the interpretations of these measurements in terms of the parameters which describe cavities, attenuators, and other simple waveguide structures. This section is prefaced by a theoretical digression on the generalized impedance concept and transmission line analysis which serves well as either an initial text or review of the subjects. Introductions to some of the more powerful methods and theorems of circuits analysis are also incorporated into the main discussion of standard measurement techniques. Copious footnotes supply many proofs and details, and provide an excellent introduction to the literature.

Those who are already familiar with the now classic works on microwave techniques in the MIT Radiation Lab series and elsewhere will probably not consider the present volume to be of added interest. Many special subjects such as transmitters and receivers, communication, antennas, propagation, and microwave interactions with matter have been purposefully omitted in deference to the more complete development of material considered to be fundamental. However, *Microwave Measurements* has distinct value to the graduate student who will find it the most clear and up-to-date initiation to the subject, to the more than casual experimenter who has become concerned with microwaves, and to the teacher who will appreciate the obvious teaching experience that has gone into the writing of the book.

Advances in Electronics and Electron Physics, Vol. 9. Edited by L. Marton. 347 pp. Academic Press Inc., New York, 1957. $9.00. *Reviewed by George H. Weiss, University of Maryland.*

According to its preface, Volume 9 of *Advances in Electronics and Electron Physics* represents an experiment in this series. The experiment consists in grouping the contents of the volume around a central theme; in this instance, geophysics.

The theme is an admirable and a timely one during the current International Geophysical Year. Geophysical experiments have provided many of the as yet unresolved problems in meson physics and cosmic-ray theory. There have recently been many exciting advances in radio transmission techniques such as the use of back-scatter and meteor-burst communication which have opened new fields for investigation both in modern physics and classical theory. The current volume contains seven articles which summarize some of the work in overlapping investigations of geophysical and electronic subjects. The articles and their authors are: Aurora Borealis, C. T. Elvey; Negative Ions, L. M. Branscomb; Radio Observations of Meteors, J. G. Davies; Intensity Variations in Cosmic Rays, D. C. Rose; Radio-Wave Propagation—A Review, R. L. Smith-Rose; Electronics in Oceanography, J. B. Hersey; Contributions of Electronics to Seismology and Geomagnetism, B. S. Melton.

The technical level of the articles is such that they can be read by a physicist without a too detailed knowledge of geophysics. Most of the papers deal with experimental work. Perhaps one or two theoretical papers would have increased the value of this collection. The papers are uniformly well written and one can only find minor fault with any of them. For example, the paper by Branscomb might have contained a more detailed account of the relation of his topic to actual transmission problems. The paper by Melton contains a bit too much of engineering detail for a physics volume. Otherwise the experiment is certainly a success, and the volume is an informative and useful introduction to adjoining fields in electron physics and geophysics.

Introduction to the Mechanics of Stellar Systems. By Rudolph Kurth. Translated by F. D. Kahn. 174 pp. Pergamon Press, London and New York, 1957. $9.00. *Reviewed by C. C. Kiess, National Bureau of Standards.*

This book is not easy reading, for, as its author states, it "is intended to serve as an introduction for more advanced students". For them many problems and refer-

ences to pertinent literature are appended to each chapter to stimulate them "into thinking critically". This means that its readers will not include many outside the small group interested in the mathematics of cosmogony. However, parts of the book may be read with profit by less advanced students, for in the summaries of the chapters the author explains the physical meaning of equations that otherwise might prove difficult and uninteresting to nonmathematically minded readers. The first two chapters, in nontechnical terminology, described the problem of the evolution of stellar systerms and the methods of attacking it.

The term Stellar Systems embraces all aggregations or assemblies of stars, such as star clouds, open and globular star clusters, and the extragalactic nebulae, which are universes of stars. To trace their development from past to present and future states it is necessary to know at any epoch the positions and motions of their component members relative to each other or to some center of reference. These data of observation are determined by the astronomer, the practical cosmogonist, who supplies them to the theoretical cosmogonist, who, in turn, uses them to test his equations for "the behaviour of the system along the whole time axis". The task is not an easy one owing to the scanty amount of available data applicable to the problem. Therefore, he sets up model stellar systems for which certain structural properties are postulated, and for which certain simplifying assumptions can be made.

In the third and fourth chapters the methods of celestial mechanics are used to analyze model systems composed of a very large number of gravitating particles (stars). In the fifth chapter the model analyzed represents a stellar system as a material continuum in which the interaction between pairs of stars is neglected, the motion of each being "determined by a smoothed-out gravitational force due to the whole system". In the sixth and final chapter analysis by the methods of statistical mechanics is made of a model composed of stars and a continuum.

The results of these analyses, at least for the first two classes of models, describe the types of motion followed by the stellar particles; the conditions for stability of the systems; their ages; the initial configurations of systems that remain similar with the passage of time. Only limited application of the models to real systems is found.

Spheroidal Wave Functions. By Carson Flammer. 220 pp. Stanford U. Press, Stanford, Calif., 1957. $8.50. *Reviewed by M. Abramowitz, National Bureau of Standards.*

The tabulation of spheroidal wave functions in a fashion similar to what has been accomplished for other special functions such as the Bessel function is well-nigh impossible. Here we must account for the oblate and prolate cases and under these classifications we have the angular and radial solutions which are dependent, in addition, on the interfocal distance. Finally for each of these conditions the functions must be cataloged as to their order and degree as in the case of the Legendre functions. It is clear that under such circumstances considerable work is necessary to study methods of computation of spheroidal functions and use of large-scale computers to avoid lengthy tabulations. This requires the development of efficient computer programs which are capable of producing numerical results for any of the parameters involved. For this purpose a knowledge of the mathematical properties of spheroidal functions is basic and the present volume attempts to outline systematically such facts as are known at present. In this regard this work affords a welcome supplement to the recent volume of tables by Stratton, Morse, Chu, Little, and Corbato and the treatise by Meixner and Schafke.

The numerical tables presented are a miscellaneous collection of eigenvalues, expansion coefficients, and the spheroidal functions. The graphs of the characteristic values are very instructive and it would be very desirable if some graphs of the functions themselves had been included. Preceding the tables there is a discussion of the mathematical properties of the functions and the various representations in terms of other special functions are given. Here, some numerical examples to demonstrate the efficiency of the various types of expansions would have added much for the reader. This volume will be greatly appreciated by those engaged in the computation of spheroidal functions because of its systematic presentation and format.

The Development and Meaning of Eddington's Fundamental Theory: Including a compilation from Eddington's unpublished manuscripts. By Noel B. Slater. 299 pp. Cambridge U. Press, New York, 1957. $7.50. *Reviewed by J. C. Polkinghorne, University of Edinburgh.*

Whatever the validity of the ideas with which Sir Arthur Eddington wrestled in the last twenty years of his life, there is no doubt that the magnitude and breadth of the task he set himself has fired the imaginations of many, especially of those who live in the more speculative and less pragmatic regions on the eastern side of the Atlantic. We like the picture, presented to us by Sir Edmund Whittaker, of Eddington as a latter-day Archimedes calculating π (so to speak) in face of the complaints of the professional π-measurers. However, it is because there are very grave doubts indeed about the validity of his principles, that Eddington has been less successful in firing the intellects of his readers.

Dr. Slater has had access to the considerable number of manuscripts left by Eddington at his death. These included several preliminary drafts of the text of *Fundamental Theory*. These have been collated with the final text and the greater part of this book is devoted to exhibiting the differences in presentation and argument present in these early drafts. There are also three