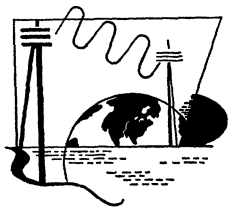
tary whereas others are quite sophisticated. Surely it would not serve as a textbook, but rather as a reference book for those who are looking for a comprehensive treatment of certain important phenomena of vision, from the physical rather than the psychological point of view. The book appears to be in the tradition of that distinguished American biophysicist, the late Selig Hecht, a fact which will be appreciated by the many admirers of Hecht's work in vision.

STANLEY S. BALLARD

Tufts College



Microwave magnetrons. George B. Collins. (Ed.) (Massachusetts Institute of Technology Radiation Laboratory Series.) New York-London: McGraw-Hill, 1948. Pp. xviii + 806. (Illustrated.) $9.00.

As a result of the great program of work in radar that was set off by British success in exploiting the magnetron, a previously more or less familiar laboratory microwave generator, it is natural that a tremendous amount of information concerning it was accumulated during the war, both here and abroad, and in both university and industrial laboratories. This important volume of the M.I.T. Radiation Laboratory Series summarizes that knowledge in a very thorough manner. It will of course be of most interest and value to those who have had some experience with the device or are contemplating its use. With its great wealth and detail of material, this book will undoubtedly be the standard reference work for years to come.

For those who have little familiarity with the magnetron and want to know more, an introductory chapter summarizes some of the elementary facts about its operation. Following this introduction, the work is divided into sections: resonant systems, analysis of operation, design, tuning and stabilization, and practice. The last section includes not only details on the fabrication of magnetrons but also measurements of their properties and descriptions of some of the various types. Of necessity, the first two sections include much analysis which has a formidable look; these sections, important as they are, will consequently appeal to a smaller group of readers than the other more descriptive sections.

For all the variety of detail to be found in the book, there are nonetheless some omissions and some points too briefly discussed. For example, there is no discussion of two types of magnetron resonators that, although they are not used, practically every worker in the field invents at one time or another. There are other minor omissions —the problem of harmonic generation, the mechanical changes that may be produced in the resonator system by extreme operation, and the effects of cathode eccentricity. The cathode and magnetron life might have been more thoroughly discussed. Other widely used magnetrons, particularly those developed in England, with which the Radiation Laboratory was not so closely connected, might well have been included as typical magnetrons. A brief discussion of magnetron development in enemy countries during the war would have been illuminating and not necessarily irrelevant.

It is to be expected that such a work, done by many writers in short periods of time and in widely separated locations, should include errors. Those few that came to notice are errors in detail—references to material or sections not included or pictures mislabeled. This is all small criticism. *Microwave magnetrons* represents a very large task excellently done.

PAUL L. HARTMAN

Cornell University

Cosmic rays. L. Jánossy. Oxford, Engl.: Clarendon Press; New York: Oxford Univ. Press, 1948. Pp. xiii + 424. $10.00.

The investigation of cosmic rays since their discovery by Victor F. Hess in his balloon ascensions in 1911–1913 has become one of the most important branches of research in modern physics. Since 1926 the hypothesis of Hess as to their extraterrestrial origin has been accepted and proven to be correct. Numerous investigators, of all nationalities, all over the globe, are engaged in these researches, but aside from some brief monographs and symposia reports, this book by Janossy is the first compendium on cosmic rays. The author, senior professor in the School of Cosmic Physics at the Dublin Institute for Advanced Studies, has himself contributed many original investigations in the field during the last 15 years.

The book opens with an historical introduction sketching the trend of discoveries and the successive problematical changes. It discusses the penetrating power of cosmic rays, the question as to the nature of cosmic rays, the cosmic ray particles (positron and meson both discovered in the cosmic radiation by Anderson), the geomagnetic effects, and the question of the origin of cosmic rays, particularly the meson. The introduction thus serves as a summary and the various chapter headings follow this outline. Since cosmic rays are high energy particles the experimental technique for their detection and the theory of high energy interactions are discussed in some detail. Each of the experimental techniques—ionization chambers, counters, cloud chambers and the photographic plate method—is briefly described. (The photographic plate method, unfortunately, is discussed all too briefly; an appendix mentions some of the beautiful and important new experiments of Powell and his school at Bristol.)

A chapter on the theory of fast collisions serves as an over-all introduction and foundation for the theoretical discussion which follows in later chapters. This discussion is based on classical and semiclassical theories and the quantum mechanical treatment is omitted. Each

chapter opens with a presentation of the experimental evidence, illustrated by tables and graphs; this is followed by detailed theoretical discussion, a comparison between theory and experiment, and an interpretation of the experimental results. An appendix on the statistical treatment of observations and auxiliary tables for the cascade theory computations will be useful to the research worker and student. The great compass of literature covered will make this compendium an invaluable help to anyone working in cosmic ray physics. It should be pointed out, however, that the student will have to make use of the original literature quoted, since so much is digested in the treatise that it is impossible to give detailed derivations for every formula.

It should be mentioned that, although the author addressed this book primarily to the specialist, he has followed it up with a small text for the general reader—*The frontiers of science series: cosmic rays and nuclear physics*—which will be useful to students as an introduction to the larger volume.

K. LARK-HOROVITZ

Purdue University

Vacuum tube amplifiers. (Massachusetts Institute of Technology Radiation Laboratory Series.) George E. Valley, Jr., and Henry Wallman. New York-London: McGraw-Hill, 1948. Pp. xvii + 743. (Illustrated.) $10.00.

This book, the 18th volume in the Radiation Laboratory series, discusses amplifier types that are used in radar systems, but are more generally applicable to the whole field of instrumentation, control, and special communication devices. It is recommended to engineers in these fields as a valuable reference and to others as a good introduction to the subject.

The introductory chapter treats the analysis of linear circuits by operational methods. Subsequent discussions cover video amplifiers; wide band, high frequency amplifiers; low frequency, band pass amplifiers; and direct-coupled amplifiers. In each case a theoretical analysis of pertinent circuitry is supplemented by a detailed exposition of design principles. Particular attention is directed to those factors affecting gain, band width, dynamic range, and fidelity of response. Much practical design advice is included. However, in some cases practical difficulties may not be sufficiently stressed. Inveterate optimists are warned against the suggestion (p. 193) that a stagger-tuned IF strip might be realized with only inductance tables, a soldering iron, and a pair of pliers. Final chapters cover the theory of amplifier noise, minimal noise design, and the measurement of amplifier noise.

The technical level of the discussion is uniformly high. The material presented is up to date and definitive of current design practice. Some of it has heretofore been available only in periodicals or in reports having limited circulation.

Excellent editing is apparent. The 14 chapters, separately written by 10 contributing authors, maintain very satisfactory continuity. Illustrations are plentiful and references adequate. The index appears too brief, but a detailed table of contents facilitates location of material.

J. G. REID, JR.

National Bureau of Standards

The face of the moon. Ralph B. Baldwin. Chicago: Univ. Chicago Press, 1949. Pp. xiv + 239. (Illustrated.) $5.00.

Over a period of several years, Dr. Baldwin has been studying the moon's surface particularly from photographs made at the great observatories, and his conclusions have been set forth and justified in his new book. His contention is that meteorite impact is solely responsible for all lunar features except the obvious blowholes that are lined up in curving rows in many regions of the moon. Lunar lava has altered many of the features thus produced by impact, but even the great Mare Imbrium, "tolerably circular," and 700 miles in diameter, is included as an impact explosion crater.

His too-rapid dismissal of slow igneous processes, in which he largely falls into the usual error of comparing lunar formations with present-day terrestrial volcanoes, will hardly serve to convince those who continue to wonder how craters 50 or even 100 miles in diameter can be only two or three miles deep, if formed by meteoritic bombardment. He discusses this problem in a chapter on "correlations," but somehow it doesn't quite convince. The violence of an impact explosion would have been so great that large craters, whose walls would be below the horizon for an observer at the center, could hardly have been formed. On a plane surface, perhaps it would be possible, but the moon's surface is too sharply curved.

But Dr. Baldwin's book is the only modern comprehensive championing of the impact hypothesis, which was advanced casually and intuitively in the past. No one has more intimately studied the lunar surface, with a view toward demonstrating the truth of the impact hypothesis, nor, for that matter, has anyone so completely discussed the terrestrial meteorite craters. In two chapters totaling 50 pages, Dr. Baldwin has given a very valuable description and discussion of the known and suspected impact craters on our own planet. It is somewhat amazing, however, to find him quoting, with a straight face, the weird "contraterrene" hallucination of La Paz, in connection with the great 1908 Siberian meteorite fall.

Other important sections of the book are his discussions of the lunar atmosphere and hypothetical lunar history during the period outlined by the theory of tidal evolution. This latter section is a very well thought out attempt to account for the obviously different ages of the lunar features.

It is a good and valuable book, and it does not matter that it will not convert many who now believe in an igneous origin of the lunar craters. Any discussion of the moon's features by someone as thorough as Dr.