for the graduate student in physics or biophysics as well.

The one respect in which this book fails to qualify as a bible for the beginner in radioisotopic research is its lack of a health physics section. This may be a calculated omission, based on the belief that the biologist or chemist must associate himself with a specialist in health physics if he wishes to avoid serious health hazards. However proper this attitude may be, and regardless of who makes the radiation measurements, it is the duty of any responsible investigator to inform himself about the radioactive hazards he and his subordinates might incur in carrying out their work. The widely spread use of radioactive isotopes may result in injurious radiation exposure if sufficient background information on health physics is not generally available. If this handbook becomes as widely distributed as its excellence deserves, it might well serve to supply this basic health physics information.

JOHN B. HURSH

Atomic Energy Project,
University of Rochester

Some aspects of the luminescence of solids. F. A. Kröger. New York-Amsterdam-London: Elsevier Publ., 1948. Pp. xi + 310. (Illustrated.) $5.50.

Although the war ended almost four years ago, conditions insuring an easy access and exchange of available scientific information have not yet returned. A great amount of valuable research has been done in some European countries during and after the war. However, because of the limited availability and circulation of European journals, the results of these researches are not widely known in this country. It is fortunate indeed that Dr. Kröger, who has contributed so much to the knowledge of the luminescence of solids, undertook the task of presenting in this monograph the results of his experimental researches and combining them with a critical review of the existing theories of the luminescence processes in solids. Dr. Kröger's association with one of the leading industrial laboratories,—the Philips Laboratories in Eindhoven, Holland—has enabled him to use freely all the rich resources of information amassed there in the course of many years of research.

The first chapter discusses schemes of energy levels for pure solids and for solids with lattices disturbed by the presence of impurities. A more detailed description is given of the atomic orbit approximation for the case of ionic lattices. Other topics are the processes of light absorption and emission, and the nature of metastable states of the activation, sensitization, and energy transfers through the lattice. Finally, a classification of all known luminescences of activated phosphors is attempted in the form of tables accompanied by very exhaustive references to original papers. The next four chapters consist of results of experimental work on particular systems—tungstates, molybdates, and luminophors activated by manganese, uranium, and titanium. The skillful identification of the tetravalent manganese ion as activator for the emission of a red band (Chapter II), and the correlation between the positions of the absorption edge and the maximum of the emission for tungstates and molybdates (Chapter III) are especially interesting. The sixth and final chapter compares the experimental results on the influence of temperature on efficiency of luminescence with the explanations of the quenching processes proposed by Mott and Seitz, Möglich and Rompe, and Klasens and Schön. It is shown that in some cases the excitation energy is directly transformed into vibrational energy (Mott-Seitz), in others the energy is dissipated via intermediate states (Klasens-Schön). A useful table of classification for all known types of temperature quenching is included. An appendix provides a few data on experimental techniques.

In general, the monograph is both interesting and informative. Great care has been exercised in both theoretical chapters to present a clear picture of the processes in solid luminophors and to establish a well-defined terminology for these processes. One section seems a little too condensed and could benefit by some additional explanations. This section deals with the energy level scheme. The use of expressions like "energy cost" (energy requirement) and "cheap transition" (low frequency transition), which are probably the result of a too-literal translation from Dutch into English, is unfortunate. In other respects the book is very readable and the reviewer feels that it fills an important gap in the literature on luminescence of solids. The successful effort made by Dr. Kröger to organize a considerable number of previously uncoordinated facts and correlate them with corresponding theoretical considerations is especially welcome in a field of physics where the richness of experimental data seems to be in contrast to the meagerness of our understanding of fundamental processes.

S. MROZOWSKI

Photoswitch Incorporated,
Cambridge, Massachusetts

Vision and the eye. M. H. Pirenne. London, W.C.1, Engl.: Pilot Press, 1948. Pp. xx + 187. (Illustrated.) 12/6.

As noted in the foreword by W. S. Stiles of the National Physical Laboratory of England, this little book offers a treatment of selected topics in vision rather than an attempt to cover the entire field in its many ramifications. The subjects selected for treatment are apparently those in which the author has done research and made scientific contributions; this makes the book particularly authoritative and forceful.

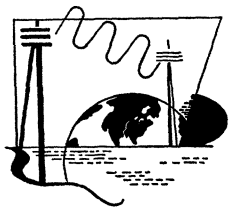
The first five chapters discuss in detail the several phenomena involved in image formation by the eye, from the physical and physiological points of view. A lengthy treatment follows of questions relating to the way in which the particle or quantum nature of light enters as a factor in determining visual response, and the experiments of Hecht, Shlaer, and Pirenne are quoted and discussed in detail. The final third of the book is devoted to the subject of color vision, except for a single chapter which relates to binocular vision.

It is hard to see exactly what audience the author had in mind for this book, since some portions seem elemen-

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