BOOK REVIEWS

Reports on Progress in Physics, Vol. 23 (1960). Edited by A. C. Stickland. 629 pp. The Physical Society, London, 1960. *Reviewed by D. Keefe, Lawrence Radiation Laboratory.*

THE ten review articles in this latest volume of *Reports on Progress in Physics* may be divided into three broad categories: solid-state physics, low-energy nuclear physics, and optical spectroscopy. Broad classification of the articles in any volume of these *Reports* is misleading since they are usually devoted to quite special topics and are rarely general or synoptic. Indeed, the high reputation this series enjoys among all classes of physicists derives largely from the basic and, above all, enduring nature of its reviews; in time it has become a very valuable source book upon a wide range of subjects. The format remains characteristically attractive and, as usual, there are a large number of highly legible figures.

O. S. Heavens gives a comprehensive account of the construction and use of thin films in optics and a summary of the underlying electromagnetic theory and its extension to multilayer systems. Recent sophisticated and ingenious developments in the field of interference spectroscopy are discussed by P. Jacquinot; following a description of new types of Fabry-Perot instruments he contrasts the two classes of spectrometers which select different wavelengths, in the one case by the amplitude, in the other by the frequency of their interferometric modulation. There is a brief summary of the many applications of photoelectric detectors in photometry by H. J. J. Braddick. The article on planetary nebulae by M. J. Seaton includes a specialized discussion of the spectroscopical data and the inferences which may be drawn therefrom about the structure of these gas clouds which surround certain hot stars.

There are three long articles on solid-state physics, two theoretical, the other on experimental analysis. The paper by D. F. Johnston is a fundamental and comprehensive account of the uses of group theory in this field; basic theory is developed in the first half, and the second is devoted to a discussion of more special applications, such as time-reversal theorems, many-electron systems, etc. The various methods of calculating band structures in solids are critically reviewed by L. Pincherle. A. E. Pippard describes how different experimental methods are used to elicit the various details of models of the electronic structure of metals.

Following a review of the general properties of orbital electron capture by the nucleus, R. Bouches and P. Depommier present formulae for transition probabilities using the latest results on the β interaction and discuss how the calculated L/K and K/β ratios agree with experiment. For experimentalists, the most readable paper in this volume is that by G. A. Bartholomew, J. W. Knowles, and G. E. Lee-Whiting on precision gamma-ray spectrometers where the various forms of instruments are described and their relative advantages appraised. The survey of experimental results on ^{3}He-induced reactions by D. A. Bromley and E. Almqvist is unlikely to have much appeal to other than the specialist.

Individual articles published in this volume are available singly from the publisher at prices depending on their length.

Source Book in Astronomy 1900–1950. Edited by Harlow Shapley. 423 pp. Harvard U. Press, Cambridge, Mass., 1960. $10.00. *Reviewed by C. C. Kiess, Georgetown College Observatory.*

THE function of a source book is to bring together the documentary material from which lecturers and authors of books may derive their factual information. A debt of gratitude is owed, therefore, to the collector of source material who compiles it in book form for ready reference. Of prime importance in selecting an article for this purpose are its priority in introducing new ideas and its impact on the subsequent development of research.

In Dr. Shapley's compilation the selected articles are grouped into thirteen categories, of which the first deals with the new instrumental aids to observation. Two categories are devoted to the sun and the planetary system; seven to stellar systems, including nebulae and the interstellar medium; and one each to galaxies, cosmogony, and astrophysical progress. Each category is introduced with a brief preface relating the selections to their historical and scientific backgrounds. In making the selections the compiler's judgment evidently was not limited by the requirements of priority and impact; for in several instances, apparently with the purpose of reaching a wider than purely technical circle of readers, the more popular rather than the technical version of an original work was chosen.

More selections might have been added to these categories; and more categories might have been included in the compilation. These criticisms, however, have been met in the compiler's general preface on the grounds that the originals are "too technical", or "too fragmentary", or "too specialized". Their omission abridges the scope of the book, and limits the meaning of the words "source book" in the title. That these original contributions to astronomy exist and were made during the first half of this century may be news to many students and searchers for source material. If a companion volume containing them is not contemplated, the value of the present book would have been enhanced if a bibliography of the omitted work had been

included in the appendix. Furthermore, it would have been a convenience to the reader if the references to the selections had been placed after their titles rather than grouped together in an appendix.

The above criticisms, the editor's as well as the reviewer's, should not deter one from reading an informative and fascinating chapter in astronomical history. In the words of the compiler and editor, these contributions "satisfactorily illustrate the vigorous march of astronomical science during the interval 1900 to 1950—contributions which are at the same time informative to the general reader".

Space Research. Symp. Proc. (Nice, Jan. 1960). Edited by Hilde Kallmann Bijl. 1195 pp. (North-Holland, Amsterdam) Interscience Publishers, Inc., New York, 1960. $24.00. *Reviewed by Herman Yagoda, Air Force Cambridge Research Laboratories.*

THIS encyclopedic volume on space physics is subdivided into seven major headings dealing with the earth's atmosphere, the ionosphere, tracking of space vehicles and the telemetry of data, the solar radiation, cosmic radiation, interplanetary dust, and lastly the moon and the planets. The book contains about 100 contributions from diverse lands by the participants in the first international space science symposium held at Nice in January of 1960. With the exception of 10 papers written in French, the remainder is printed in English. The individual papers have abstracts printed in both English and Russian, and all the Russian contributions have been either presented in English or translated. The subject matter is largely concerned with recent measurements secured since the first Sputnik was launched and extends into the second half of 1959, a period which includes the data from the American Explorer VI satellite and the three Russian moon probes.

The diversity of topics treated in this ponderous volume makes it very difficult to present a unified review of the contents. However, judging by the excellent quality of the papers on the cosmic and trapped radiations, with which the reviewer has a current working familiarity, it can be assumed that the rest of the volume is of comparable worth. The papers dealing with high-energy space radiations occupy 270 pages, a veritable book in itself, and contain the results of cosmic-ray studies secured not only by rocket and satellite exposures, but also by balloon-borne equipment. A series of 20 Skyhook balloon flights made over a period of five years clearly demonstrate the existence of large changes in the cosmic-ray flux near the top of the atmosphere which exhibits an inverse correlation with solar sunspot activity. Vernov and co-workers of the Russian Academy of Sciences give a detailed description of their observations on the trapped radiation for which they have coined a designation of TCR—terrestrial corpuscular radiation. This appears to be an apt nomenclature, as future interplanetary space probes may well reveal that some of the other planets have magnetically trapped radiation belts. Meanwhile, the Russian lunar probes indicate the absence of a lunar radiation belt. A large part of the data has not been published elsewhere, and in general, the reports are presented in greater detail than space allotments in current journals would permit. It is perhaps well to caution the reader that not all papers of a given genus are grouped under the same heading. Thus, the cosmic-ray physicist may read with interest about the correlation between Forbush cosmic-ray decreases and satellite drag which appears in the group of papers dealing with the earth's atmosphere. Likewise a short but excellent review on the interaction of cosmic radiation with meteorites is located under the category of Interplanetary Dust. The editor, Hilde Kallmann Bijl, deserves credit for setting a high standard of quality in this report which should serve as a model for future symposia in this series.

Towards a Unified Cosmology. By Reginald O. Kapp. 303 pp. Basic Books, Inc., New York, 1960. $6.50. *Reviewed by Richard Schlegel, Michigan State University.*

"IN physics a generalization that is logically possible is also physically possible. It can therefore be represented by an actual example and is so represented by a frequency that is determined by statistical considerations only." Professor Kapp calls this statement the principle of minimum assumption, and it is the basis on which he rests a group of physical hypotheses. The minimum assumption about a physical process, he tells us, is always the true generalization, and such an assumption has many times led to new and valuable discoveries in physics. He cites Dirac's prediction of the positron as one of his examples; it was a minimum assumption to accept the possibility of negative energy states, in contrast to the specific assumption that denies their existence.

We might argue that we have in minimum assumption a new form of Leibniz' principle of sufficient reason rather than a universal principle of physics. Still, this does not deny that there is interest in Kapp's bringing this canon of reasoning to physical problems. The most striking result of his considerations is the hypothesis of the impermanence of matter. He accepts the continuous creation of matter from empty space, as in steady-state cosmological theory, but makes the further assertion that for the existence of an element of matter there is no more reason to believe the "always will" than the "always has". Matter has a half life then, and any bit of it will eventually disappear. No certain determination of the half-life magnitude is given, but it is suggested that matter disappears in units of entire nuclei.

The major portion of the book is taken up with a presentation of developments from the impermanence hypothesis. A theory of the development and rotation of galaxies is presented. Space curvature waves, and hence gravitation, are hypothesized as being associated with the extinction of matter, whereas the expansion of