Books

Astrophysique générale. By J. C. Pecker and E. Schatzman. 756 pp. Masson et Cie, Paris, France, 1959. Clothbound 13 000 fr.; paperbound 12 000 fr. *Reviewed by C. C. Kiess, Georgetown College Observatory.*

WHEN William Herschel, professional musician, turned amateur astronomer, he led the way into the field of physical astronomy, the domain now designated as astrophysics. Although the tempo of progress since his day has fluctuated, yet the net result of nearly twenty decades of research has been the accumulation of a surprisingly large amount of information on the physical properties of the stars and systems of stars that make up the universe. There are many books that classify, analyze, and interpret various aspects of this information. Only a few, however, attempt to organize and systematize it for the use of students; that is, to present it in textbook form.

The book by Pecker and Schatzman does just that. It was written primarily for students of mathematics and physics at the Sorbonne and other French universities, who are preparing for a certificate in astronomy. For non-French students with a similar goal translations of the book should not be long in forthcoming, for the book is outstandingly good. It is comprehensive and thorough in its treatment of each of the five main topics under which the subject matter is presented. The first two, which take up about one-third of the book, discuss the principles of physics on which modern astronomy is built and the observational procedures by which the materials for the structure are acquired. The third and fourth topics take up more than half of the book to describe the properties of individual stars, of the classes to which they belong, and of the systems, or galaxies, of stars that constitute the universe. The fifth section, of about 100 pages, is devoted to the sun and the members of the solar system. Each of the five parts of the book is a self-consistent presentation of the subjects it discusses, and could be issued as a separate book.

The text is clarified with numerous diagrams, half-tone illustrations, and tabulations of data, many of them with explanatory legends and captions, frequently omitted in French publications. Two indexes, one of symbols and notations, the other of authors and subjects, are appended to the book. They are extensive and thorough, and by giving directly the page number on which an item is mentioned avoid cross references to other index entries to which a reader would have to turn before he could locate what he is looking for. Although the price of the book appears to be high, its excellence recommends its wide usage. It should be within easy reach of all advanced students of astronomy.

The Transits of Venus: A Study of Eighteenth-Century Science. By Harry Woolf. 258 pp. Princeton U. Press, Princeton, N. J., 1959. $6.00. *Reviewed by Ernst Öpik, University of Maryland.*

THE transits of Venus of 1761 and 1769 offered to the contemporary scientific community a long-awaited opportunity of fixing the scale of the solar system. Expeditions were dispatched all over the world, and scientific cooperation between the nations was realized for the first time in the history of mankind. The importance of the observations of the transits went far beyond the immediate objective and had a deep influence on the subsequent development of modern science and international cultural relations. The numerical outcome was a value for the distance of sun to earth which exceeded by about two percent the currently adopted value.

The author is master of his task. In an epic style he gives an account of the technical problems and results, as well as of the vicissitudes and fate of the actors of the drama, not forgetting the environment and people of near and distant lands. A bibliography numbering 44 entries of manuscript sources and 561 titles of printed sources bears testimony to the completeness of documentation and the amount of work involved.

The monograph makes pleasant reading and is a valuable source in the history of science.

Fast Neutron Physics. Part 1, Techniques. Edited by J. B. Marion and J. L. Fowler. Vol. 4 of Interscience Monographs and Texts in Physics & Astronomy, edited by R. E. Marshak. 983 pp. Interscience Publishers, Inc., New York, 1960. $29.00. *Reviewed by H. H. Barschall, University of Wisconsin.*

WHILE research in fast-neutron physics is carried out by a relatively small number of investigators, an increasing number of those concerned with nuclear energy need to have information about this field. This book is the first volume of a reference work and describes techniques used in the production and detection of monoenergetic neutrons of energies between about 1 kev and 40 Mev. A second volume will treat experiments and theory.

It is difficult to make comments which would be applicable to all twenty-four chapters written by thirty-three authors. One of the most valuable features is the fact that much of the information contained in the book had not been previously published, at least not in readily accessible form. For example, those who use "long counters" can find a discussion of the energy dependence of the sensitivity of this supposedly flat-response counter, and those who use

Physicists...

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neutrons from accelerator sources will find much helpful advice about targets.

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An unavoidable drawback of a book which describes in detail experimental techniques in an active field is that parts of the book are somewhat out of date by the time they appear in print because of the long delay between writing and publication. Since the writing of the book, the difficult problem of distinguishing in a scintillation detector between fast neutrons and γ rays has been partly removed by the use of the different pulse shapes.

A reviewer is expected to mention some misprints to show that he has looked at the book. In regard to having his name misspelled in the book, this reviewer finds himself in the distinguished company of Glaser and Wilkinson.

The book can be recommended highly as a complete and competently prepared reference work in techniques used in fast-neutron physics.

Irreducible Tensorial Sets. By U. Fano and G. Racah. 171 pp. Academic Press Inc., New York, 1959. $6.80. *Reviewed by Freeman J. Dyson, The Institute for Advanced Study.*

THIS is a monograph in the strict sense of the word. Its subject is the algebra of tensor operators and their transformations under the rotation group. Most of the tools in daily use in atomic physics, for example, the use of wave functions with definite angular momentum or the *LS* and *jj* coupling schemes for handling two or more interacting particles, are special cases of this algebra. The authors develop the theory systematically from first principles, paying great attention to fine points such as the consistent definition of phases of tensor components. Their work will be of value to anybody who has to make calculations of complicated atomic processes; in such calculations a major fraction of the time is usually spent in establishing a consistent set of conventions for the phases.

The second half of the book is headed "Quantum Mechanical Applications". However, the reader will be disappointed if he expects to find here any discussion of the physical consequences of the formalism. The policy of the authors is to carry the mathematical development just far enough so that "any competent physicist can take over from here". Unfortunately, they stop short of explaining in detail how the physics is to be put into the formulas. To take one example, an important application of their methods is to the theory of angular correlation of successive radiations from a decaying nucleus. The short chapter devoted to this subject contains formulas of such tremendous generality that only one who is already an expert could understand how to use them.

Another example of the authors' refusal to digress into physics is their treatment of conjugation. They define and discuss in detail the algebraic operation of conjugation and its formal mathematical properties. A brief footnote calls attention to the fact that one physical interpretation of conjugation is the time-reversal operation of Wigner. The operation of charge conjugation is never mentioned. A clear discussion of the physical notions of time reversal and charge conjugation, and of their relations to the algebraic notion of conjugation, would have greatly increased the book's usefulness.

The authors have excluded from their book not only real physics on the one side, but also real mathematics on the other. Although their algebraic manipulations smell all the time of group theory and are often easier to understand in group-theoretical language, they sternly resist the temptation to talk in terms of groups. Their strange self-denying ordinance is the more regrettable, because Racah himself is a master of group-theoretical methods.

Perhaps one should not complain that a book like this is too narrow in its scope. The authors in the preface explain what they set out to do, and they do it well. They deliberately decided to walk along a tightrope of pure algebra, without falling into the morasses of physics on one side and of group theory on the other. The advantage of restricting their field in this way is that they were able to deal with their chosen subject thoroughly and with full attention to detail. Still one may wish that their taste had been a little less puritanical.

Quantitative Molecular Spectroscopy and Gas Emissivities. By S. S. Penner. 587 pp. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1959. $15.00. *Reviewed by Rolf Landshoff, Lockheed Missiles and Space Division.*

PHYSICISTS, chemists, and engineers are vitally concerned with high-temperature phenomena among which the processes of emission and absorption of radiation play a dominant role. An understanding of such radiation processes is essential to the solution of problems which involve for example the interpretation of observed spectra, the minimization of radiation losses, the utilization of radiative transfer of energy, or the control of destructive effects of radiation. Such problems appear every day and it is very useful that the relevant concepts and techniques have at last been made more accessible.

Prior to the publication of this book the scientist involved in these problems had to consult many sources such as Heitler on the theory of elementary radiative processes and Herzberg on molecular spectroscopy, which contain much of the information collected by Penner but also a great deal which is only of interest to specialists in other fields. In addition to information which is, with some labor, available in standard texts, the author also presents an up-to-date discussion of many specific results. Several chapters are devoted to the radiative properties of specific atoms and mole-