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Book Reviews

Thermonuclear Power. By T.S. Green. Published by George Newnes Limited, London. 168 pp., (45 shillings).

Although the title of this book might suggest that it is about how one might produce thermonuclear power, the fact is, unfortunately, that thermonuclear power doesn't exist. Serious research has been conducted for some ten years now with the hope that some way might be discovered to use the energy released in the fusion of light nuclei for the production of useful power. Doubtless progress has been made; however, it is impossible to estimate how much progress has been made since no one is quite sure in what direction the goal is. The problem in thermonuclear development has not turned out to be simply the development of the technology. What has proven to be a serious obstacle is the lack of knowledge of plasma physics. This field is almost as old as atomic physics, but until the last few years very little knowledge of the behavior of plasmas actually existed. Most of the attempts at producing thermonuclear plasmas have failed because the plasmas have not behaved as expected. As a result, a large part of thermonuclear research in the last few years has been in what one might call fundamental plasma physics. There is no doubt that considerable progress has been made in this field, and, since an understanding of plasma physics is essential to the development of thermonuclear power, progress has certainly been made in that direction also.

This relatively short book (160 pages) by T. S. Green is a rather clear and concise discussion of past and current research on thermonuclear power. Although the author occasionally goes to some detail in discussing certain aspects of particle behavior, the book is in no way a technical treatment of the subject. As the author explains in his preface, the purpose of the book is to acquaint scientists working in other fields with the overall problems of thermonuclear research. The book accomplishes this task very well. Any book that attempts to survey an active field of research is of necessity somewhat outdated by the time it is published, as this book is to some extent as far as the details of the results achieved. There are new experimental and theoretical results which might change the direction of some of the effort in this field. However, the book should remain useful for some time to anyone who would like to spend a few hours finding out what is going on in an important, if not too promising, field of endeavor.

A person familiar with thermonuclear research might find some of the author's comments about past failures interesting. In fact, if one reads the book carefully, he will notice that the philosophy behind the approaches to the problem has changed. This change has been brought about by the discovery that the problem is considerably more complex than it appeared at the start. Some of the attempts at producing a thermonuclear plasma have been rather ambitious, and in the early stages of the work, the general opinion was that success was just a matter of time. The failures of the early attempts have had the effect of causing the workers in the field to take a more scientific attitude toward the problem. Since Professor Green does occasionally assume the role of a critic the book is more interesting than it would be if it were simply a description of experiments and results.

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About the Reviewer. W. B. Ard received his Ph.D. degree from Duke University in 1955. Before joining the Thermonuclear Division of Oak Ridge National Laboratory as a Physicist in 1962, he served as Associate Professor of Physics at the University of Alabama and at the University of Florida.

Semiconductor Counters for Nuclear Radiations. By G. Dearnaley and D. C. Northrop. John Wiley and Sons, (November 11, 1963). 331 pp. $8.75.

Nuclear detection devices and the associated electronic techniques have been for many years in a continual state of development and evolution.

The last two decades have seen two major developments in radiation counters: the scintillation method (which was initiated ca. 1948-49) and the successful development of semiconductor detectors (which has occurred within the past four or five years). The excellent resolution of semiconductor counters, their fast pulse characteristics, compactness, and simplicity of operation have resulted in a widespread adoption of these counters for the detection and spectroscopy of heavy particles. Current efforts directed toward the improvement of semiconductor counters for use in gamma and beta spectroscopy are most encouraging. The rather enormous amount of work which has been concentrated in the development and perfection of these counters in just a few years has created an information gap, in that only a few reviews of the state of the art have been available thus far. The book by Dearnaley and Northrop thus meets a distinct need at the present time, and does so with commendable thoroughness and clarity.

The introductory section of the book reviews the essential points regarding energy loss of charged particles in matter, and conventional radiation-detection methods (ionization chamber, proportional counter, scintillators, etc.). Solid-state detection devices are then introduced through a discussion of the pertinent properties of solids, with emphasis on transport processes, the role of traps, and the kinetics of carrier motion. Energy resolution is considered in a chapter on the sources of noise in a conduction-counting device. The theory of operation of rectifying junction counters (e.g., a surface-barrier counter) is treated in some detail, and in a separate chapter the practical aspects of preparing and testing junction counters are enumerated. A discussion of electronic instrumentation for semiconductor counters focuses largely on pulse amplifiers and preamplifiers, with attention to electronic noise considerations. A chapter on applications of semiconductor detectors to problems in nuclear instrumentation covers a wide variety of topics, including the spectroscopy of nuclear reaction products and alpha particles, particle-discrimination techniques, studies in fission, high-energy physics, and the spectroscopy of betas, gammas, and neutrons. The final chapter on radiation damage and its effect on counter performance will be of particular interest to those engaged in measurements involving high fluxes of neutrons or fission fragments.

A particularly valuable feature of this book is that it provides an excellent entree to the existing literature. In addition to text references at the end of each chapter, a classified bibliography at the end of the book compiles references under various subject headings, as "Semiconductors - Surface Properties", "Ionization in Semiconductors", "Germanium Counters", etc. Happily this book has not suffered from an excessive time lag between writing and publication. References to the 1962 literature are frequent.

In summary, this book is directed to the designer and user of nuclear detection devices, and will surely be of value to those engaged in nuclear spectroscopy and closely allied fields. It is well-organized and clearly written. It might profitably be read by those contemplating experiments involving particle detection, and by students interested in general techniques of nuclear experimentation.

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About the Reviewer: Dr. R. B. Murray has been a member of the Oak Ridge National Laboratory staff since 1955 with the exception of one year spent as Visiting Associate Professor in the Physics Department of the University of Delaware. His research interests have been in nuclear instrumentation and physics of solids. The use of semiconductor counters for fast-neutron spectroscopy was first described by Murray and T. A. Love, who developed the Li_6F sandwich spectrometer.

Strange Particles. By Robert Kemp Adair and Earle Cabell Fowler. Interscience Publications. 151 pp. $4.75.

Recently a number of paperbacks and monographs have been published on the subject of the physics of elementary particles. This is a most welcome development in a field in which, as a result of new particle accelerators and advances in instrumentation, information has been accumulating at a very rapid rate with concomitant advances in the theoretical description and understanding of the phenomena. Among these new volumes is the well-written monograph *Strange Particles* by Robert Kemp Adair and Earle Cabell Fowler. The basic aim of this small volume is to provide a summary of the important properties of the strange particles. A brief description of the contents will give some idea of the scope of the subject matter.

Chapter one provides an introduction which traces the history of the first observations of strange particles and briefly discusses symmetry