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Book Reviews

Nuclear Research with Low Energy Accelerators. By J. B. Marion and D. M. Van Patter. Academic Press, Inc., New York (1967). 515 pp. $13.00.

The benefits of topical conferences should be readily apparent to the reader of this collection of 22 papers that comprise the formal presentations made at the symposium held at the University of Maryland in June 1967, sponsored by the National Academy of Sciences–National Research Council. The accompanying discussion sessions were not recorded in order to bypass the impedimenta of microphones, tape recorders, etc., that tend to make discussion less lively and vigorous. As a result, the discussions were spirited, illuminating, and particularly valuable to participants from less active institutions.

The emphasis was divided between experimental techniques (mostly in using, rather than producing, particle beams) and reviews of specific areas of research. While the symposium was naturally weighted heavily toward experimental physics, there were several throughtful theoretical reviews and enough theorists around to keep everyone more-or-less honest. With few exceptions, the papers are very well organized to present a candid overview of a given technique or research area. The speakers were obviously carefully chosen from those actively involved in their subject and recognized for their leadership.

One strong motivation for the symposium was to reemphasize the continuing vitality and validity of "low energy" nuclear physics research. If one has doubts about it, one would almost surely change after reading this book. In fact, it seems that there is new blood in the veins of experimental nuclear physics in the low-energy range. This is probably because of several factors, the most important of which are 1) new techniques in detectors, electronics, and "ion sorcery"; 2) the advent of on-line computers that enable far more sophisticated and complicated experiments; 3) new theoretical interest in nuclear structure details, brought about by more sophisticated models; and 4) intensified prodding from astrophysicists for information on cross sections, etc., needed for testing and developing models of stellar evolution and nucleosynthesis.

The contents of this book collectively give a concise, up-to-date, broad review of the state-of-the-art of experimental techniques and current research being performed in this energy range. This is valuable for two reasons. First, there are a number of physics departments that own, or contemplate owning, low-energy accelerators (beam energy ≤ 5 MeV) but are not quite sure what can, could, and should be done with them in research and graduate training. Second, the book should be of great value to the science administrator who is concerned about optimizing the fruitfulness (in education and research) of his available capital in alternative areas of research.

One reason this range of energy in nuclear physics is destined to remain of great interest is because it is just this range in which most of our real world–from the centers of stars to the cores of nuclear reactors–exists. We have an immense amount of work to do before we understand the nature of nuclear matter at low excitations sufficiently well both to appreciate it fully and to exploit it. I invite those who feel that exciting experiments are becoming scarce in this field to read the book–especially Tombrello's little gem on astrophysical problems.

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Following completion of his gradute studies at Duke in 1954, John Gibbons became associated with the Oak Ridge National Laboratory where his research has been in nuclear cross sections and in time-of-flight measurements with pulsed particle accelerators. Dr. Gibbons' undergraduate training was at Randolph-Macon. He has broad interests in academic and in socioscientific fields.

The Particle Kinetics of Plasmas. By I. P. Shkarofsky, T. W. Johnston, and M. P. Bachynski. Addison-Wesley Publishing Company, Reading, Massachusetts (1966). Pages x + 518. $17.50.

This book is claimed to be both a reference book for the plasma researcher and a text on plasma kinetics at the graduate level. It succeeds admirably in its first goal, but does not do as well in the second. The first five chapters cover the Boltzmann equation, expansion of the solutions of the Boltzmann equation in spherical harmonics, applications to the problem of electron-atom interactions, and a chapter on elastic collisions and scattering cross sections. The researcher will realize that the major use for the results reported in these chapters lies in applications to gaseous discharges and weakly ionized plasmas. The graduate student may well flounder in trying to fit this material into the general scheme of things.

The next chapter concerns bremsstrahlung and high-frequency electrical conductivity. Unfortunately, this chapter seems out of place, since many of the considerations concerning the validity of the results entail concepts and work reported in later chapters. However, the collection of results given here is quite useful for the researcher in the field.

The next two chapters of the book concern plasma transport theory and are particularly useful and quite well written. The work reported here was originally started by Bernstein and Robinson, but the authors have found a way of compiling these results that allows a wide range of utility in computing transport coefficients in the presence of a magnetic field.

The last two chapters concern the foundations of mag-

netohydrodynamics and the Chew-Goldberger-Low system of equations. Here, unfortunately, too many topics are covered very briefly to be of great use for either the researcher or the graduate student. On balance, however, the book as a whole is a useful addition to the researcher's library.

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About the Reviewer: Our reviewer is Edward Frieman, Director of the Plasma Physics Program at Princeton University and Professor of Astrophysical Sciences. Dr. Frieman completed his graduate studies at Brooklyn Polytechnical Institute following his undergraduate work at Columbia. He has, from time to time, been associated with the Lawrence Radiation Laboratory and the Los Alamos Scientific Laboratory of the University of California and with NASA. His research interests are in theoretical plasma physics, stability in hydrodynamics, and, of course, in astrophysics.