BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

VERY READABLE PRIMER

Title Particle Acceleration

Author J. Rosenblatt

Publisher Methuen and Co. Ltd., London, 1968

Pages viii + 183

Price $5.50

Reviewer J. Robb Grover

This small book is intended for those "biologists, chemists, physicians, solid-state and high-energy physicists" who depend on and are concerned with accelerators, mainly as research instruments, but who must nevertheless learn the principles of their operation. "Emphasis has been put on questions such as possibilities and limitations of different machines or their beam structure in space and time---."

Professor Rosenblatt has written a collection of lucid descriptions at the advanced undergraduate level, of how accelerators work. After two short introductory chapters, in which a few necessary facts of mechanics, electromagnetism, and nuclear science are set out, he devotes most of the book to various kinds of accelerators in order of increasing complexity, beginning with the Van de Graaff generator and other static machines, proceeding to linear accelerators, circular machines, and finally, after describing the principle of strong focusing, to alternating gradient synchrotrons and azimuthally varying field cyclotrons. The eighth and final chapter is devoted to some interesting speculations about the future of particle acceleration, including such topics as colliding beams and the possible use of superconductors. The author has given careful attention to focusing and phase stability, and to their explanation in words, as well as in mathematical expressions. At several points in the book he has used "worked problems" as a pedagogical device to help confer a feeling for the orders of magnitude of the various quantities involved.

The title means exactly what it says, for emphasis is very much on the acceleration process itself, to the virtual exclusion of ion sources or of characteristics and handling of the final beams. In my opinion this limitation is too strict and narrows the book's market, since there could be little or no consideration of important types of accelerator-related topics that the author's intended readers might hope to find included, e.g., polarized beams, intense sub-nanosecond beam pulses (of great interest to radiation chemists), whether a given heavy ion is available in useful beam intensities, etc. Also, the bibliography is too small to provide convenient guidance to the literature for such problems. Contrary to the author's statements on pp. 36 and 39, helium does indeed form negative ions that can be accelerated in a tandem Van de Graaff.

The book is well-edited and reasonably free of typographical and similar errors. However, two that might prove troublesome are the following: on page 42, $C = 0.02\,\mu F$, not 0.02F; equation 5.27, which should relate orbit radius to magnetic field at relativistic energies, was omitted but is repeatedly invoked in the text (it is readily derived by substitution of equation 5.26 into equation 5.24). The index is small, but seems adequate.

In conclusion, this book's main usefulness is for education, and it can be recommended to readers of *Nuclear Applications* as a very readable first introduction to particle acceleration methods for those who know little of accelerators.

J. Robb Grover has been a member of the Department of Chemistry of Brookhaven National Laboratory since 1957 when he received his PhD from the University of California (Berkeley) under Professor Seaborg's guidance. He also serves as Associate Editor of Annual Reviews of Nuclear Science. *His past research contributions have been mainly in nuclear reactions, while his current interest is the application of nuclear detection techniques to the study of chemically interesting collisions in crossed molecular beams.*

VERY INTERESTING—BUT EXPENSIVE

Title Magnetohydrodynamic Energy Conversion

Author Richard J. Rosa

Publisher McGraw-Hill Book Co., 1968

Pages xv + 234

Price $17.50

Reviewer Martin S. Zucker

In our view this book admirably informs the modern engineer or engineering physicist on the application of magnetohydrodynamics (MHD) as

an intermediary in the transformation of energy. This is an unusually difficult subject to write about since it involves bits and pieces of so many other disciplines—a list would include plasma physics, thermodynamics, economics, chemistry, pollution control, nuclear energy, etc. The author, by exercising considerable care in deciding what topics to include and in what depth to go into them, has overcome what is a failing in certain otherwise excellent books on MHD. They are either too simplistic for an engineer or applied physicist trying to design an experiment or write or evaluate a proposal, or else, at the other extreme, present what seems almost like a compulsive repetition of all the mathematics, physics, etc., that possibly bear on the subject, complete with obscure notation and derivations best left to specialized texts.

Dr. Rosa, at present a research scientist at Avco Everett Research Laboratory, is in an excellent position to make this sound editorial judgement, being one of that enthusiastic band of former students of Dr. Arthur Kantrowitz.

This group, first at Cornell University and more recently at Avco, has contributed perhaps more than any other to the technical aspects of plasma dynamics and its various aerodynamic, space, and other applications. Dr. Rosa has been involved in many of the significant experiments in MHD, and has authored numerous key reports and papers in the field.

Thus, the book is not only authoritative but also is clearly and simply written. References from the literature are extensive and well chosen to illustrate points made in the text. Derivations of some results are outlined to an extent necessary to make a critical reader feel at ease with the subject, but never with such detail and pedagogical rigor that the trees obscure the forest. Derivations that are too involved or difficult to present in detail are outlined or adequately referenced. The implications and limitations of formulas are commented upon and there is, interleaved throughout, a discussion of economic points as applicable; both of these lend an air of reality to the discussion as do the many photos and drawings of actual experiments. Much useful design data, equations, and methods are included. Often left out of MHD discussions is the design and construction of the field magnet; this book covers the subject well. As is only appropriate, most attention is given to stationary power plants but other applications are mentioned as well. Readers of this journal will wish for more detail on nuclear-MHD for commercial power than is given. On the other hand, perhaps this is just a reflection of the poor support by the USAEC for such work! (Actually federal support in the US for MHD lags far behind that given in many of the technologically advanced countries, so no particular blame need go to the USAEC.)

The only complaint we have about this book is its price—$17.50 for a 234-page book seems hard to justify.

Martin S. Zucker earned his doctorate in nuclear physics from the University of Wisconsin after graduating in engineering physics from Cornell University. At Brookhaven National Laboratory, where he has been (first in the Physics Department and now in Nuclear Engineering) for a total of more than ten years, he has engaged in accelerator development and construction, fast neutron physics, editorial work for the Physical Review, *trying to apply nuclear energy to MHD, plasma physics, and calculations on energy deposition in matter.*

ALGORITHMS IN AN LP ALBUM

Title Advanced Linear-Programming Computing Techniques

Author William Orchard-Hays

Publisher McGraw-Hill Book Company, 1968

Pages xi + 355

Price $12.50

Reviewer Margaret Butler

In the Preface the author delineates his three objectives for the book. The first is to establish a consistent notation and nomenclature for the field; the second, to impart necessary background information for the use of today's computerized mathematical programming systems; and the third, to provide a course text. The book suffers thereby, like other multifunction items such as sofabeds, which while uncomfortable as either sofa or bed do permit one to either sit or lie, as desired.

The author has pioneered in the computer implementation of linear programming systems from the development of the RAND simplex code, for the IBM CPC in 1953, to his contributions in today's General Electric 625/635 LP/600 system and the OPTIMA mathematical programming system for Control Data's 6000 series machines. A more readable and more valuable volume could well have resulted if the author had concentrated on his first two objectives leaving the third to be satisfied by already existing texts, such as that by Saul Gass entitled *Linear Programming Methods and Applications* issued by the same publisher in both a 1958 and a 1964 edition, and the reference books of Dantzig, *Linear Programming and Extensions*, and published symposia papers. With this restricted intent, the organization of the book could have been better structured to convey to the practitioner the advanced linear-programming computing techniques of its title.

Orchard-Hays and his colleagues have been responsible for devising, developing, and/or implementing many algorithms and computing techniques for the solution of operations research problems minimizing computing time and memory allocation requirements. The value of this book lies in that substantial portion describing such algorithms and techniques. These descriptions present step-by-step explanations of the procedures to be followed and are often accompanied by numerical examples.

Throughout, the familiar though unaesthetic uppercase computer mnemonics are used to reference standard procedures. For example, PARRHS is the symbol employed to designate the algorithm parameterizing the right-hand side of the linear equation system. This practice, together with the italicizing of the definitions of models, concepts, and variables on their initial appearance, is designed to promote the objective of a consistent notation and nomenclature for the field.

Of particular interest to this reviewer were Appendix B and Chapter 13. Appendix B, "Design Criteria for a Complete Mathematical Pro-