

physics, the relatives and friends of research workers in general relativity who are always asking what we are doing—these people and the professionals will find this book an enjoyable and rewarding experience.

* * *

The reviewer is a professor at the University of Maryland where he has been since 1948. His article entitled "Gravitational Waves" appeared in the April 1968 issue of *PHYSICS TODAY*.

Atoms in a nutshell

MODERN PHYSICS: AN INTRODUCTORY SURVEY. By Arthur Beiser. 221 pp. Addison-Wesley, Reading, Mass., 1968. Paper \$2.95

by Thomas H. Osgood

After trying his hand at writing an imaginative but relatively difficult textbook of physics for high-school students, followed by coauthorship of an adequately rigorous introductory volume for university students of science and engineering, Arthur Beiser has prepared a compact introductory survey at a somewhat more advanced level—the present *Modern Physics*. As a free-lance writer his industry is to be commended, for he has accomplished all this within four years.

Beiser's *Modern Physics* occupies about 200 pages. The brevity of his treatment reflects the awareness, albeit of a qualitative nature, among students of elementary physics, of many of the interesting topics and interpretations of phenomena that can be discussed in simple terms from an atomic point of view; it capitalizes on the fact that the teaching of the fundamentals of the subject has undergone a rapid evolution within the last decade.

20% of the volume is devoted to electromagnetic waves and special relativity and another like amount to quanta and the atom. A brief treatment of complex atoms leads through molecules and ions to the solid state, and the concluding 20% deals with the nucleus and elementary particles. The reader is presumed to be familiar with elementary physics and to possess a smattering of calculus. In spite of these modest demands very few of the formulas that are used have to be accepted *ex cathedra*, and when it does happen, good qualitative arguments are given to make the statements appear reasonable.

To help the student, Beiser provides over 150 questions and problems judiciously distributed among the chapters (50% with answers), and in the text itself many numerical illustrations are worked out. For a great many students a worked-out numerical result is more cogent than an expression that includes only symbols. A few topics that require some algebraic development are relegated to a 20-page appendix. There is a brief but satisfactory index.

Judged by the standards that are ordinarily applied to scientific textbooks, Beiser's *Modern Physics* has one significant defect. Although many outstanding scientists are named as having contributed to the development of the subject, nowhere is there a reference to another treatise or to a research or review article in a journal. Even a page of such material would have given the reader a vision of larger fields to conquer.

In spite of this defect, the book is to be recommended for its businesslike attack, its clarity and its compactness. It will be useful as additional reading for the university freshman who learns faster than his instructor teaches, and for other students at a slightly more advanced level.

* * *

The reviewer is professor of physics and director of the Abrams Planetarium at Michigan State University.

Clear summary of liquid metals

LIQUID METALS. By N. H. March. 133 pp. Pergamon Press, Oxford, 1968. \$7.00

by Stuart A. Rice

To understand the properties of liquid metals one must know something about the properties of liquids and about the electronic states of disordered systems. In both of these areas significant progress has been made, and for the particular case of liquid metals there now exist at least beginnings of a first-order interpretation of observable properties. The key elements of that interpretation are provided by the use of pseudopotential theory and a free-electron model, an interpretation of the density of states using a superposition approximation and the gradual accumulation of data suitable for testing the extension of the theoretical constructs.

N. H. March has provided, in this small book, a clear and elementary summary of the current status of our understanding of the properties of liquid metals. The text, indeed, is so clear that it can be read at a sitting, but there is sufficient content that the student who wishes to go further by following up the references can plumb the depths of our knowledge and our ignorance. The English have long excelled in writing terse, pithy summaries; this book by March is a notable and valuable addition to that tradition in the literature of physics and chemistry.

* * *

Stuart A. Rice is director of the James Franck Institute.

Complementing Shilov

VECTOR AND TENSOR ANALYSIS WITH APPLICATIONS. By A. I. Borisenko, I. E. Tarapov. Trans. from Russian. 257 pp. Prentice-Hall, Englewood Cliffs, NJ, 1968. \$10.50

by Peter L. Balise

Seeing this volume, one is immediately reminded of Shilov's *Introduction to the Theory of Linear Spaces*. Both book were well translated from the Russian by Richard Silverman, they are similar in format, and their subjects are closely related. It is most surprising to find very little overlap in content. Briefly Shilov's book is a cogent treatment of n -dimensional spaces, emphasizing geometric interpretations, applicable to systems of linear equations. The present volume is an equally lucid presentation of three-dimensional tensor analysis, clearly illustrated, with applications in physics and engineering. This book appears less notable than Shilov's work only because the subject of the present work is similarly covered in many other books, whereas Shilov's arrangement is relatively unique.

Beginning with elementary vector algebra, the coverage is as expected. Tensor concepts are clearly explained with many examples of physical tensors. Transformations are naturally given much consideration, and there is an especially thorough discussion of pseudotensors. Scalar, vector and tensor fields are analyzed; having previously introduced the metric tensor, the authors can give a proper presentation