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.

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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.

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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.

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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

of functions such as divergence and curl in generalized coördinates. A final chapter points out ramifications of differential and integral theorems, as in irrotational and solenoidal fields, with fluid and electrical applications.

Many tensor concepts seem most easily taught with matrix notation instead of the summation convention used throughout this volume, but one can hardly object to use of the appropriate convention. I would like to have seen a closer tie to *n*-space, and regret the deletion of the author's preface. But such criticisms are minor in view of the book's excellence; it well complements Shilov's book.

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The reviewer is professor of mechanical engineering at the University of Washington. His special interest is the mathematics of linear systems.

Spins and moments

MAGNETIC RESONANCE AND RELAXATION. Conf. proc. (Colloque Ampère, Ljublajana, Yugoslavia, Sept. 1966). R. Blinc, ed. 1241 pp. North-Holland, Amsterdam, 1967. $50.00

by Thomas A. Scott

Perhaps it was the enticement of a setting in Yugoslavia, or perhaps it was that there had not been a similar conference for two years previously; more likely it was the excellent planning of the organizing committee that was responsible for making the XIVth Colloque Ampère a major international conference and the largest one ever devoted primarily to nuclear magnetic resonance. More than 200 papers were delivered in 27 sessions over a period of four and a half days. Now after a delay of a year and a half, the proceedings containing the texts of 197 of the papers have been published.

Conference proceedings in general suffer from several faults. Because of the inevitable and often lengthy time lapse before publication, many of the contributions will have been made at least partially obsolete by prior publication of the work in journals, usually in greater detail and frequently with added information not available at the time of the conference. Furthermore, some authors tend not to give the same attention to the writing of these contributions as they do to a refereed journal article.

The present book does an exceptional job of rising above these faults, although readers will still look to the journals for the final word. However, the percentage of high-quality papers presented at the conference was remarkably large and the quality has been retained in the written version. Especially valuable are the 31 invited papers, a number of which are reviews that will not be published in the same form elsewhere. As a composite the papers constitute a valuable collection, reflecting the current status of the field.

Practically every aspect of nuclear-magnetic and electric-quadrupole resonance research of interest to physicists was covered in at least one session. Dynamic polarization, double resonance, acoustic resonance, NMR in metals including superconductors, NMR and NQR in solids, relaxation theory and experiment, and new experimental techniques received especially strong emphasis. The Mössbauer effect, optical methods in rf spectroscopy, EPR and ESR, and dielectric relaxation studies were also represented in one or more sessions each. Despite the length of the book (1241 pages), some of the longer papers have been edited and condensed. Unlike previous proceedings of Colloque Ampère that were dominantly written in French, about 85 percent of the present book is in English.

The book is handsomely (and, alas, expensively) printed. There is no other single volume that better displays the immense versatility of magnetic resonance.

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The reviewer is professor of physics at the University of Florida where he has been engaged in nuclear magnetic resonance and solid-state-physics research for a decade.

All the attributes of a good text

INTRODUCTION TO SPECIAL RELATIVITY. By Herman M. Schwartz. 458 pp. McGraw-Hill, New York, 1968. $14.75

by Richard B. Zipin

An introduction to the special theory of relativity can easily become highly mathematical and perhaps boring to some physicists if the author is careless in his writing. Herman Schwartz of the University of Arkansas, the author of this new book in the well-known International Series in Pure and Applied Physics, does achieve a reasonable balance between the mathematics and the physics of his subject. The book should be well received by students of both disciplines.

Introduction to Special Relativity has all the attributes of a good textbook. The subject matter is not comprehensive, but carefully selected to reflect the author's preferences and his three purposes: to teach the special theory of relativity, to prepare the reader for a study of the general theory of relativity, and to give the student an adequate background in relativity theory to enable him to go on to subjects of current interest such as the theories of elementary particles and of plasmas. The book begins with a chapter on the basic ideas of classical mechanics, starting with Newton, followed by a chapter on the historical development of the special theory of relativity. After giving the reader an overall perspective of the subject with these preliminaries, the author is then free to discuss the various topics of interest in the order of their difficulty as this is the most logical order for a textbook from the pedagogical point of view. An exposition of Einstein's special theory of relativity follows the two preliminary chapters and this is succeeded by discussions of relativistic mechanics, tensor analysis, continuous media and the electromagnetic field. The final chapter treats relativistic quantum mechanics. The author's preferences and his ideas on what subjects are significant are obvious from the topics he concentrates on. The first four chapters require 130 pages, the next two 90 pages, and the final two chapters are each almost 100 pages in length.

The chapters are carefully divided into sections and all chapters include problems for the students. Answers to many of the problems are included, and the problems are used not only for the readers to test their own understanding of the subject, but also to extend the discussion in the text. The book includes thorough documentation in the footnoted references and in the selective bibliography. Supporting material, germane to particular chapters but not of absolute necessity, is taken up in appendices to half the chapters. Illustrations are used very sparingly but with good effect wherever they appear.