

seems), the authors of this monograph have done a great deal of both in producing a work of exceptionally thorough scholarship. This book, however, is not easy to dip into. It can only be read slowly, carefully, and sometimes painfully, because notations and derivations are so explicit and detailed. The writers argue with some justice, however, that increased use of symbolic manipulation would only gloss over the real subtleties of the subject, which they have strived, successfully, to expose.

Thus, if one wants to learn the subject rather than to review a book, one *will* slow down, one will look up a few more references, and one will refresh oneself more thoroughly about some of the details of scattering theory that are only briefly presented as introductory materials. This volume will join my two-foot shelf of indispensable reference and *lehrbüche* on nuclear physics, and I will urge its study upon any student (they're all serious) of nuclear-reaction theory. The latter will learn not only about closed problems, but also about open ones; some of these won't remain so for long.

ABRAHAM KLEIN
University of Pennsylvania

Synchrotron Radiation

By A. A. Sokolov, I. M. Ternov
202 pp. Pergamon, New York, 1969.
\$16.00

Synchrotron radiation has become a very important subject for those dealing with large modern accelerators, as well as those studying radiation from galaxies. It also serves as a "known source" of photons for studies in the far ultraviolet range down to the one-Angstrom range for investigations on the interaction of electromagnetic radiation with matter.

Synchrotron radiation, sometimes known as magnetic bremsstrahlung, is the radiation emitted from electrically charged particles (with or without spin) when accelerated in a magnetic field. One can consider this system—charged particle and magnetic field—as a macro-atomic system, where both classical and phenomena may be studied. The authors have also written a book on quantum mechanics and have many publications in this field.

In this book they treat the classical and quantum theories of the behavior of charged particles with a magnetic field. Spin and polarization effects as well as inhomogeneities and fluctuations in the magnetic fields are also considered. Although this book is primarily devoted to the theoretical investigation of the subject, a chapter is devoted to the experimental investigations with some suggestions for applications.

About 150 references are quoted

with a very large fraction being the authors' works and many being other works in Russian, as is the case of most books written by the Russian school. I suppose the same implied criticism applies to Westerners writing reviews. An important Western contributor who was not cited was H. Olsen, who wrote a fairly comprehensive theoretical (classical and quantum) treatment in the early 1950's. Despite this flaw, the work is very comprehensive and presented in a rather orderly fashion. It will be of much value to those working in this field and to those who want to be introduced to it.

HAROLD MENDLOWITZ
Howard University

De l'imaginaire au Réel: Essai sur le Temps dans la Théorie de la Relativité

By William Rivier
86 pp. Dunod (Editions du Griffon, Switzerland), Paris, 1969. 14 F

When I was first asked to review *From the Imaginary to the Real: An Essay on Time in Theory of Relativity*, I eagerly accepted. I was fascinated by the title, which is suggestive of important contemporary problems regarding imaginary masses, counterdirected time and causality. I found nothing of the kind. What I found is well characterized by the author's discussion of the twin paradox. He bases his discussion on the following "principle" (page 70):

"If two processes begin simultaneously at the same point and terminate simultaneously at the same point, these two processes are of equal duration no matter what the observer's reference system may be."

Common sense, no? Ergo, no difference can arise in the ages of the twins, implies the author, because both start from the same point and end up at the same point.

The above should take care of his physics. What about his philosophy? Again I will let the author speak for himself. Here is a gem (page 60):

"Each philosophy which considers itself nonmaterialistic should rebel against Einstein's idea of assimilating the duration with a dimension of space . . . Einstein has rendered science more materialistic . . . by refusing or neglecting to recognize that duration is a necessary and sufficient condition of all existence."

Need I say more?

OLEXA-MYRON BILANIUK
Swarthmore College

Wave Interactions in Solid State Plasmas

By Martin C. Steele, Bayram Vural
285 pp. McGraw-Hill, New York, 1969.
\$15.50

Solid-state plasma—nearly a contradiction in terms, after all—consists of mobile charge carriers (plus their neutralizing ionic background) as they co-exist in a semiconductor, semimetal or metal. The study of such a system from the plasma viewpoint is a relatively recent discipline whose practitioners have come from both gaseous plasma and solid-state physics and are driven by interest in modeling controlled thermonuclear reactors in the small, or by potential device applications or perhaps by the sheer good physics of it all.

Martin C. Steele and Bayram Vural, whose origins at RCA Laboratories betray their biases in this respect, have rendered the rest of us a valuable service by undertaking the onerous task of reducing the research literature in the field to an advanced monograph of high quality. The primary emphasis of their book is on wave propagation and interactions in such a charged-particle ether, especially as regards the existence of unstable solutions.

The approach is summarized by the dielectric response tensor for electrokinetic waves in a magnetic field and encompasses passive and growing waves; their interactions with phonons, spin waves, and external circuits; negative resistance, and pinch effects. In level and content, and in its mix of both theory and experiment, the book serves as a connection between textbook and journal. Its primary lack is in photon-plasma interactions in solids at infrared through ultraviolet frequencies; but then this leaves something for others to do.

JOHN R. APEL
Johns Hopkins University

Mecanique Des Milieux Deformables

By Gerard Gontier
580 pp. Dunod, Paris, 1969.

What could possibly be interesting about another text on continuum mechanics? This one follows a familiar pattern. It proceeds from the algebra and calculus of tensors through general principles of kinematics and dynamics to the construction of some general constitutive equations, elasticity, Stokesian fluids and plasticity; it concludes with some applications.

What, then, is noteworthy about this book? Well for one thing, it is French. With Gallic precision the book makes clear, for example, the distinction between the transpose of a tensor and the

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FUNDAMENTALS OF GASEOUS IONIZATION & PLASMA ELECTRONICS

By ESSAM NASSER, *Iowa State University*

A volume in the Wiley Series in Plasma Physics, edited by S. C. Brown

This is the first book to give the new researcher or graduate student an understanding of the various basic principles underlying this subject. The author proceeds systematically from neutral gas to fully ionized gas, emphasizing the transition or the electrical breakdown that occurs. After the fundamental topics have been covered in each chapter, the reader is introduced to more advanced concepts. References for further study, a bibliography, and problems are provided at the end of each chapter.

1971 496 pages \$19.95

THEORY OF MOLECULAR SPECTRA

By WERNER BINGEL

A volume in the Chemical Topics for Students Series, edited by W. Foerst and H. Grunewald

Intended for physicists, physical chemists, chemists, and upper level students, this book provides an introduction to the significance and interpretation of the spectra of molecules. The author has confined his scope to the spectra of diatomic and simple polyatomic molecules, an area that has recently acquired special interest in that it can be used to establish the existence and properties of short-lived intermediates.

No detailed knowledge of wave mechanics is required, but a familiarity with the fundamental concepts of quantum theory and group theory is assumed. The author has included a list of references at the end of the book for more in-depth treatment of specific topics.

1970 180 pages \$7.50

UNDERWATER ACOUSTICS

Edited by R. W. B. STEPHENS, *Imperial College, London*

Arising from a course of lectures given at Imperial College, London, this volume gives an authoritative view of a number of basic aspects of underwater acoustics. Emphasis is laid on the importance of scattering phenomena in underwater propagation. The contributors examine the subject both theoretically and in relation to the practical application of echoes from fish and other targets.

1970 270 pages \$9.50



FAR-INFRARED SPECTROSCOPY

By K. D. MÖLLER, *Fairleigh Dickinson University* and W. G. ROTHSCILD, *Ford Motor Company*

A volume in the Wiley Series in Pure and Applied Optics, edited by Stanley S. Ballard

This new book will help researchers in any aspect of far-infrared spectroscopy to study the entire field, and will show workers in other fields what kinds of problems can be studied with far-infrared methods. To provide this type of review of the field, the authors have assembled, described, discussed, and inter-related representative examples of the literature available on far-infrared spectroscopy. An invaluable reference, the book covers a wide variety of phenomena in physical chemistry and physics, and includes four chapters on instrumentation, seven chapters on vapor and liquid phase spectra and two chapters on crystal spectra. To round out the picture, the authors have included specialized chapters written by researchers in several branches of solid state physics as appendices and an exhaustive bibliography.

1970 752 pages \$29.50

UNDERWATER ACOUSTICS

By LEON W. CAMP, *Bendix Corporation* and the *University of California, Los Angeles*, with contributions by Richard Stern, *University of California, Los Angeles* and B. M. Brown, *Southwestern University*

This volume is the result of a course in underwater acoustics offered by the Engineering and Physical Sciences Extension at U.C.L.A. It contains those aspects of the subject that the author found to be of particular value to engineers in need of an up-to-date view of the techniques used in communication and data transfer with water as the medium.

The author briefly outlines the essential technical background and then guides the reader through the actual design and evaluation of hardware and systems. Instead of employing a handbook approach to current techniques, this volume stresses basic approaches to the technology involved. Among the special features are a table of piezoceramic materials properties (now the popular choice for electroacoustic devices), illustrations, procedures for developing radiation patterns, an introduction to the theory of signal processing, and a working bibliography for the advanced student.

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REACTIONS UNDER PLASMA CONDITIONS

Volumes I & II

Edited by MUNDIYATH VENUGOPALAN, *Western Illinois University*

This new two-volume work presents a comprehensive survey of the fundamental physical theories and properties of the plasma state of matter, the types of reactions that can be achieved in such a medium—with special emphasis on the reaction-kinetical process—and the practical methods that can be applied to their investigation in both natural and laboratory plasmas.

Volume I emphasizes plasma physics and plasma diagnostics, making it particularly valuable to physicists. *Volume II* concentrates on the chemical physics of plasmas, currently a subject of interest to both physicists and chemists. 1971 *In Press*

PHYSICS OF III-V COMPOUNDS

By OTFRIED MADELUNG

Translated by DIETRICH MEYERHOFFER

A volume in the Wiley Series on the Science and Technology of Materials, edited by J. H. Holloman, J. E. Burke, B. Chalmers, and J. A. Krumhansl

"It is the opinion of this reviewer that Dr. Otfried Madelung has produced an extremely worthwhile contribution to the literature on semiconducting compounds and that the translator, Dr. Meyerhofer, has performed a commendable service. . . by the outstanding manner in which he has performed his task. The style of the translation is such that one is not led to suspect that the book was originally published in German. . . The book should be valuable to all those engaged in research on III-V compounds and, in addition, to a wider audience who will gain much from a study of the interpretive passages."—*Proceedings of the IEEE*

1964 409 pages \$15.95

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By BERNARD W. ROOS, *Gulf General Atomic, Inc.*

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1969 521 pages \$19.95

FUNDAMENTALS OF TRANSMISSION ELECTRON MICROSCOPY

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A volume in the Monographs and Texts in Physics and Astronomy series, edited by R. E. Marshak

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"...an excellent workmanlike presentation of transmission electron microscopy."—*Physics Today*

1964 414 pages \$19.50

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"Everyone who either does research in nuclear physics or is concerned with nuclear reactors would undoubtedly like to have both volumes of *Fast Neutron Physics* on his bookshelf. . ."—*Physics Today*

"...this book is recommended for two types of use: either as a sourcebook for the practical theory of fast-neutron physics; or as an aid to literature search in less recent experimental measurement and techniques."—*Nucleonics*

Part I: *Techniques* 1960 1007 pages \$35.00

Part II: *Experiments and Theory*
1963 1308 pages \$45.00

APPLIED MATRIX AND TENSOR ANALYSIS

By JOHN A. EISELE and ROBERT M. MASON, both of the *Naval Research Laboratory, Washington, D. C.*

The authors of this book have interwoven novel ideas, methods, and results with conventional definitions and practical examples. Theoretical concepts such as quantum mechanics and relativity can be perceived with a fresh perspective and grasped firmly. Intended for everyone in all fields of physics and engineering, the book will also be of interest to statisticians, computer science researchers, and mathematicians.

Outline of Contents: VECTOR AND MATRIX ALGEBRA. Vector Algebra. Matrix Algebra. VECTOR AND TENSOR ANALYSIS. Vector Analysis. Tensor Analysis. APPLICATIONS TO RELATIVITY AND QUANTUM MECHANICS. Application of Relativity. Applications to Quantum Mechanics. Bibliography, Index.

1970 337 pages \$14.95

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An Introduction to Current Algebra

By D. H. LYTH, *University of Lancaster*. This work is a simple introduction to the concepts of weak and electro-magnetic currents and the associated current algebra. Applications of the current algebra fall into two classes. The smallest and simplest class consists of those predictions which use just the current algebra itself, the other, larger class of predictions involves some form of meson pole dominance assumption. (*Oxford Library of Physical Sciences*.) Text—figures. Paper, \$3.00

Electronics for Nuclear Particle Analysis

Edited by L. J. HERBST, *Teesside Polytechnic*. This volume is based on a series of lectures given once a year at the Education and Training Centre of the Atomic Energy Research Establishment, Harwell, sponsored by the United Kingdom Atomic Energy Authority Research Group. The book covers the general principles of nuclear particle analysis and concentrates on the design of electronic nucleonic instrumentation. Tables, graphs. (*Harwell Post-Graduate Series*.) Paper, \$17.75

Complementary Variational Principles

By A. M. ARTHURS, *University of York*. This introduction to complementary variational principles deals with the theory of the simplest problem in the calculus of variations, its extension to a certain class of differential, integral, and matrix equations, associated variational problems, and some applications of the general theory to particular kinds of linear and nonlinear boundary-value problems. (*Oxford Mathematical Monographs*.) \$6.50

Thermal and Electrical Properties of Hong Kong Soils

By N. A. HALFTER, *Institution of Electrical Engineers, London*, and S. Y. KING, *University of Hong Kong*. In recent years, electrical engineers have used the soil as a means of grounding electrical systems to a safe level of voltage during electrical storms or in the event of insulation failure. This monograph examines the ability of Hong Kong soils to conduct electricity under such circumstances. In addition, a study has been made of the thermal properties of the soil. Tables, graphs. Paper \$4.25

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New York, N.Y. 10016

transpose of a matrix and distinguishes between different ideas of isotropy. The style proved surprisingly agreeable and easy to read for a reviewer with slight practice in the language.

The author, professor of the *Faculté des Sciences de Lille*, has designed the text to cover certain requirements of the *maitrise de mécanique* and *maitrise de mathématiques et applications fondamentales*. Recent rheological developments, such as Rivlin-Ericksen fluids and the circulations induced by flow through noncircular pipes, are covered to some extent. Not mentioned, however, are theories of materials that respond to their history of deformation, although these are playing a growing role in rheology. The applications are quite classical, for example, Hadamard's method of studying waves as propagating discontinuities and inviscid fluid flows derivable from a harmonic potential.

One pedagogic innovation is worth particular mention. Tensorial calculus is developed successively for orthogonal cartesian coordinates, orthonormal curvilinear coordinates, oblique cartesian coordinates and general curvilinear coordinates. This has the happy result of associating ideas of covariance and contravariance with nonorthogonality rather than with curvilinearity. It also delays the ritual of index up and index down, so often mysterious and confusing to the student, to the penultimate chapter of the book.

This is a fine introduction to theoretical continuum mechanics on a first-year graduate-student level. It is modern, written with care and logic and could prove well worth the effort of an English-speaking student willing to leap the language barrier that is, after all, not very high in this case.

ELLIOT A. KEARSLEY
Mechanics Division
National Bureau of Standards

Thermodynamics of Irreversible Processes

By Rolf Haas
509 pp. Addison-Wesley, Reading, Mass., 1969. \$11.00

Classical thermodynamics is essentially restricted to the study of matter in states of equilibrium, and naturally in its mathematical formulation the principal stress is on reversible processes. During the past 40 years, however, great interest has grown in the application of thermodynamics to irreversible processes, which are of course for the most part the naturally occurring kind.

The present book, by a professor of physical chemistry at the Technical University of Aachen in West Germany, provides a thorough and up-to-date de-

velopment of the theory of irreversible thermodynamics, with the needs of physical chemists, physicists and engineers primarily in mind.

After a rather lengthy recapitulation of the conventional theory of classical thermodynamics, the author extends the principles to the handling of irreversible phenomena. Much stress, of course, is on Lars Onsager's reciprocity relations. A wealth of illustrative material is presented, including both homogeneous and heterogeneous systems. Among specific problems treated are diffusion in electrolytic solutions, thermoelectric phenomena, as well as the behavior of viscous and heat-conducting media. Because the treatment is macroscopic and phenomenological throughout, there is no reference to statistical considerations.

The mathematical level is similar to the standard university courses in theoretical physics and chemistry. The book is clearly written and constitutes a useful addition to the literature in this important field.

R. BRUCE LINDSAY
Hazard Professor of Physics
Brown University

Diffuse Matter in Space

By Lyman Spitzer, Jr
262 pp. Wiley, New York, 1968. \$11.50

Interstellar gas and dust pervade our galaxy. The stars condense from this medium, process it through their internal furnaces and return the matter, enriched by the heavy-Z products of the stellar nuclear reactions, to the medium by supernova outbursts, solar-wind phenomena and other avenues of surface mass loss. New stars condense, with their structure and spectra reflecting the properties of this second-generation gas. This is the theme of *Diffuse Matter in Space*, the best of several recent works on the interstellar medium. It summarizes the field as it stood on the threshold of major recent discoveries by radio astronomers. Pulsars provide convenient streams of pulsed, linearly polarized radiation that permit us to determine electron and neutral hydrogen densities and magnetic field strengths along certain paths through the galaxy. Observations of interstellar molecule radiation, from the hydroxyl radical (touched on briefly by Lyman Spitzer), formaldehyde, ammonia and water vapor, and of the anomalous recombination lines of several elements provide important new tools for probing the state of galactic clouds.

Supplemented by an instructor's notes on pulsars, and on other new developments, and by appropriate problems, this volume would be an ideal text for an introductory graduate course on the