

emphasis is put on analyticity properties, how they can be obtained from first principles, or postulated, and then thoroughly used. On the other hand, symmetries, which also play a prominent role in particle physics, are only mentioned to the extent that they provide relations among two-body amplitudes. The reader is assumed to be already familiar with them. In other words, collision amplitudes are analyzed and studied as obeying general properties, and only a little attention is paid to the colliding particles themselves in the initial or final states.

This being said, it is a very good thing that this book, which emphasizes the subjects that correspond to the author's highest interest, fully benefits from his thorough knowledge and experience; in a more neutral review, these particular aspects of high-energy physics could not have been so well presented. In particular, the chapters on bounds and more generally on the asymptotic behavior of collision amplitudes will provide the graduate student, or any interested reader, with a valuable introduction to this field.

If the student might not always find all the necessary material or guidance to carry to the very end

some by now rather standard calculations, he will easily find useful references to the pertinent literature.

R. J. Eden is among the most well-known workers in the field presented in this book. The book itself has been developed from lectures to graduate students at the University of Maryland, the Scottish Universities Summer School and in the Cavendish Laboratory, Cambridge. After a brief presentation of experimental facts, as well as of a general theoretical background, it gives a detailed discussion of analyticity properties of collision amplitudes. Then follows an introduction to Regge theory, first in potential scattering and then in its relativistic formulation. Regge phenomenology is discussed at the end of the book, where mention is also made of other special models. Before that, the book gives a thorough discussion of asymptotic bounds and general results on the asymptotic behavior of collision amplitudes. Each part of the book is a valuable introduction to more technical literature as well as an up-to-date summary of present knowledge in the field it covers.

* * *

The reviewer is a staff member with the CERN theoretical study division.

A different look at energy

THEORY OF ENERGY TRANSFERS AND CONVERSIONS. By Federico Grabieli. 217 pp. Wiley, New York, 1967. \$10.95

by Kurt E. Shuler

The prospective reader of this book is probably best served by the reviewer in having made available to him a number of direct quotations from the author's preface. The author is presently an operational analyst with Hughes Aircraft Company and lecturer in mathematics and theoretical physics at Loyola University, Los Angeles.

"This book presents the main body of my investigations concerning the laws of energy transfers and conversions. A linear theory of energy transfers and conversions is developed that encompasses the second and third laws of classical thermodynamics and their consequences as particular cases." "Constant confrontation, in the book, of the predictions of the theory with data from observation and experimentation has not been deemed necessary

in view of the fact that the results of the theory contain those of classical thermodynamics and others that are well known and readily accessible." "The presentation of the theory follows the rigorous form of well distinguished definitions, assumptions, theorems, and interpolated discussions and motivations." "Utility is not the sole criterion for employing the rigorous manner of presentation that has been chosen—the human mind delights in clearness of ideas, and precision of distinctions is indispensable for the attainment of depth of analysis and beauty of synthesis."

The book contains 49 references of which 27 are to papers or monographs in mathematics including such classics as Ullisse Dini, *Lezioni di Analisi Infinitesimale*, Vol. I: *Calcolo differenziale*, Stab. Tipografico Succ. FF. Nistri, Pisa, 1907 and Sophus Lie, *Geometrie der Berührungs transformationen*, dargestellt von Sophus Lie und George Scheffers, Druck und Ver-

lag von B. G. Teubner, Leipzig, 1896, and 12 references to monographs both recent and more ancient on thermodynamics and heat and mass transfer. There are also 3 journal references to the recent literature.

It would appear to the reviewer that this book should be primarily of interest to nonutilitarian thermodynamicists who would like to take a different look at the subject through the eyes of Federico Grabieli.

* * *

The reviewer was, until recently, a senior research fellow at the National Bureau of Standards. He is now chairman of the chemistry department at Revelle College, La Jolla, Calif.

Plasma reviews reviewed

COLLECTIVE OSCILLATIONS IN A PLASMA. By A. I. Akhiezer, R. V. Polovin, A. G. Sitenko, K. N. Stepanov. Trans. from Russian. 190 pp. MIT Press, Cambridge, Mass., 1967. 8.50

by Sanborn C. Brown

For physicists looking for a broad view of the effects of oscillations in a plasma, this small volume will be of considerable interest. It is not really a book in any cohesive fashion, but rather four rather independent reviews of the development of the dielectric tensor from the linear Vlasov equation, a discussion of stability theory, calculations of the fluctuation spectrum, and scattering of electromagnetic waves from these fluctuations. The independent parts of the book reflect the multi-author nature of the volume. The first two chapters are a concise compendium of the results of the theory of waves in collisionless plasmas, which is much more readable than the more detailed treatments of the same subject that have already appeared. The third chapter is an interesting account of the essence of stability theory, the discussion primarily dealing with beam instabilities. The fourth chapter, which deals with fluctuations in a plasma, suffers from the fact that the reader is unprepared by previous sections of the book for the subject matter in this particular chapter, and it reads rather more like a paper than a chapter in a book. It should be pointed out that one of the authors, A. G. Sitenko, has just published a translation of a separate book on this particular subject matter that

TWO RECENT PHYSICS TEXTBOOKS



PRINCIPLES OF SOLID STATE PHYSICS

by **Robert A. Levy**, Department of Physics,
University of Cincinnati

This textbook for a one semester or one quarter undergraduate course in solid state physics gives complete coverage to the important and basic topics of the subject and briefly touches on more advanced (and for the students, more fascinating) topics (e.g. superconductivity). A unified approach to the study of solids is achieved by studying a model of progressively increasing complexity beginning with a lattice of fixed mass points, subsequently associating additional characteristics with the model, then considering the necessity of using quantum statistics and quantum mechanics, evolving to the band theories, and concluding with a consideration of the effects of imperfections. Problems and textual references are given at the end of each chapter. Calculations done in the text carefully retain all the steps leading to the final result. Question-and-answer sections are included to aid in elucidating the material.

Features:

Unified presentation shows the interrelationship of the topics. The author's presentation is concise, thorough and lucid.

Includes both the fundamental topics and topics of current interest. The importance of problems is stressed in this text, and a large variety are included at the end of each chapter, along with textual references.

The equations in the text are carefully worked out step-by-step.

1968, 464 pp., \$11.50

BASIC ELECTROMAGNETISM

by **Eugene W. Cowan**, California Institute of Technology

The basic force law and Maxwell's equations are first related as alternate basic postulates, and the framework of the theory is begun with the introduction of the electromagnetic potentials, linked to quantum mechanics. Next follow general theorems of reciprocity and the conservation of energy and momentum that apply to fields from all sources. Fields from charge distributions of known form are described in terms of dipoles and multipoles, leading to the description of fields from the charge distribution represented by matter. Fields from charge distributions of unknown form are considered in boundary-value problems involving the family of curvilinear coordinate systems that give solutions in exact mathematical form. These simple exact solutions underlie successive layers of approximation in diffraction theory, transmission lines, and electric circuits.

Features:

Consistent use of vector potential in all wave problems, including diffraction and Babinet's principle.

A treatment of multipoles that establishes the relation between the coefficients of the multipole expansion and the coefficients in the expression using spherical harmonics.

Discussion of internal reflection and waves below cutoff in waveguides without special use of "nonphysical" solutions and "evanescent" waves. These solutions appear as a natural consequence of the boundary conditions on an equal footing with the ordinary solutions.

Equations are often repeated rather than giving a reference to a distant page.

Figures are placed at points where they are discussed in the text material.

1968, 476 pp., \$16.50

ACADEMIC PRESS
NEW YORK AND LONDON
111 FIFTH AVENUE, NEW YORK, N. Y. 10003

3 From Wiley



THEORETICAL MECHANICS

By **T. C. BRADBURY**, California State College
at Los Angeles.

Designed for the intermediate mechanics course primarily intended for physics majors, this book emphasizes Lagrange formulations of mechanics without undue neglect of Newtonian concepts. Covariance principles are stressed and they are developed more fully than usual in texts at this level. The treatment of vectors, tensors, and matrices will be useful to students in later courses.

1968 641 pages \$12.95

THE PHYSICS OF ENGINEERING SOLIDS

Second Edition

By **THOMAS S. HUTCHISON** and **DAVID C. BAIRD**, both of the Royal Military College of Canada.

A revision of a popular physics text which is ideal for acquainting the undergraduate engineer with the fundamental properties of the solid state. This excellent new edition introduces chapters on internal friction, radiation damage, lattice vibrations and superconductivity, and expands the discussions of semiconductors and optical properties of dielectrics.

1968 534 pages \$12.95

PLANETS, STARS, AND GALAXIES:

An Introduction to Astronomy

Second Edition

By **STUART J. INGLIS**, Rensselaer Polytechnic Institute.

Greeted with the same enthusiasm the first edition received, this second edition includes the newest techniques, observations, and theories of today's astronomy.

"For intelligent students and others outside the fields of science, I believe this book is one of the best I have even seen. . . ."—John W. Evans, Director, Sacramento Peak Observatory.

1967 482 pages \$8.50

JOHN WILEY & SONS, Inc.

605 Third Avenue

New York, N.Y. 10016

is rather easier to understand than this 23-page summary. The final chapter on wave scattering treats this matter in a very interesting way, although being short it cannot deal in depth with any of the areas touched upon.

The book is translated into English in masterly fashion by H. S. H. Massey, one of the leaders of the plasma-physics field, from a Russian book published in 1964.

* * *

Sanborn C. Brown is professor of physics at MIT and associate dean of the graduate school.

Electronics and electron physics

ADVANCES IN ELECTRONICS AND ELECTRON PHYSICS. VOL. 23. L. Marton, ed. 490 pp. Academic Press, New York, 1967. \$22.50

by *Gerald Rothberg*

This volume contains articles on superconductivity, magnetic fields, plasmas, semiconductors and image intensifiers. Despite the wide range of topics, L. Marton and his editorial board have done an outstanding job in presenting articles that are uniformly good in exposition. The more device-

oriented articles impress me, an experimentalist, as being truly *useful* in that they discuss the real problems of interest to specialists. In addition the first few pages of each article are introductory material that on the whole provides excellent perspective on the significance of the topics discussed and a survey of the theoretical concepts involved. These introductions could be especially valuable in broadening the background of graduate students.

There are two articles on superconductivity: E. A. Lynton and W. L. McLean, "Type II Superconductors," and C. Laverick, "Superconducting Magnet Technology;" the latter, by the way, unfortunately is not included in the table of contents. The relatively short article by Lynton and McLean is a summary of theory with an emphasis on physical models. An appendix contains a particularly lucid discussion of the Gibbs and Helmholtz free energies in the presence of a magnetic field. The article by Laverick is a survey of current practices and problems in superconducting-magnet design with detailed discussion of some recent magnets. Among the topics covered are magnet materials and conducting-cable design, refrigeration, pulsed magnets and the eco-

nomics of large magnets. On page 388 the author states erroneously that superconductivity is an example of a Bose-Einstein condensation and that the energy of the superconducting electron pairs is proportional to their momentum. Since all high-field magnets involve type II superconductors, the theoretical discussion by Lynton and McLean is particularly appropriate here.

In "Measurement of Weak Magnetic Fields by Magnetic Resonance," P. A. Grivet and L. Malnar discuss nuclear magnetic resonance and optical-pumping techniques for measuring magnetic fields of the order of 1 micro-Gauss. Before proceeding to detailed discussions of particular systems they give an interesting survey of non-resonant methods and discussion of the important characteristics of geomagnetic and interplanetary fields. A brief description is given at the end of the article of the use of superconducting interferometers as magnetometers, and as an article is scheduled for a future volume by J. E. Mercereau and D. J. Langenberg on the Josephson effect and devices, we may expect to see a more elaborate discussion.

The longest article in the volume is by H. Motz and C. J. Watson on "The Radio-Frequency Confinement and Acceleration of Plasmas." As the authors point out, earlier pessimism over the feasibility of these techniques discouraged people from performing experiments, and the few that were done are not always directly related to theory. Consequently this article is divided into about two thirds theory and one third discussion of experiments. Among other things, the authors point out that although the technical problems are still immense, they believe it may be possible to obtain a *net power output* from a radio-frequency-fed and confined thermonuclear reactor provided that losses in the cavity walls are reduced with superconducting materials. This possibility is discussed.

The two remaining articles are by E. R. Chennette, "Noise in Semiconductor Devices" and by W. C. Livingston, "Properties and Limitations of Image Intensifiers Used in Astronomy." Chennette's article summarizes theoretical results on junction diodes, bipolar transistors and field-effect transistors, and gives some comparison with experimental results. It also discusses some practical considerations in de-

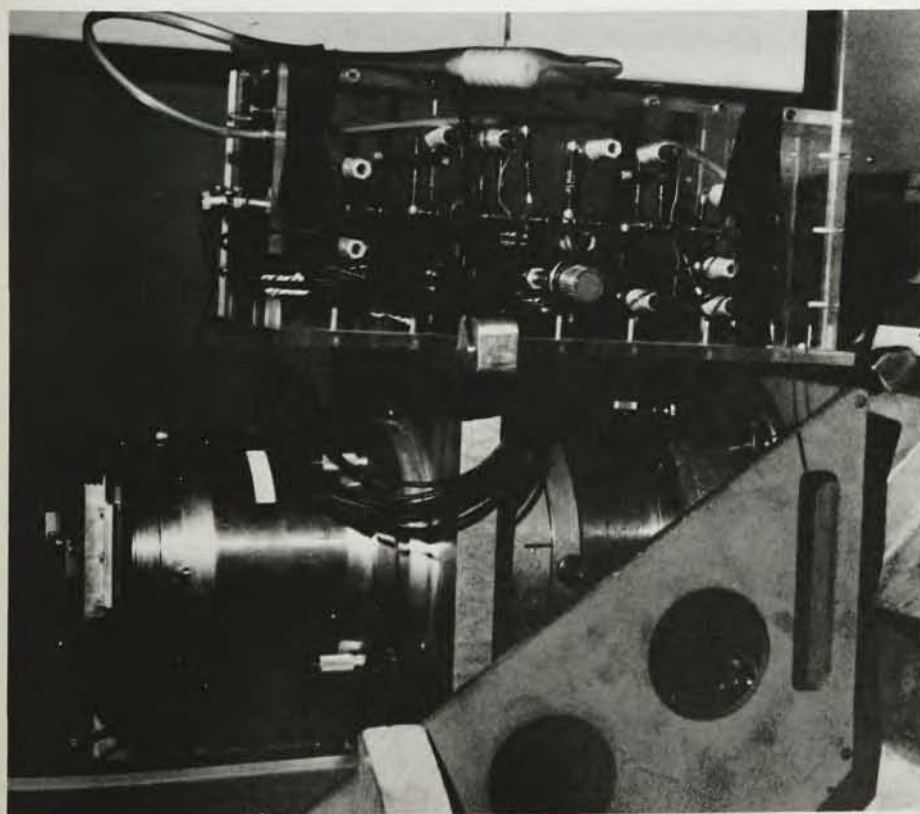


IMAGE INTENSIFIER TUBE SYSTEM at the Kitt Peak National Observatory. Intensified spectrum images are photographed in the plateholder on the left.