

should, however, be read not as a book, but as individual papers by the various authors. Although occasionally there is a parenthetical comment (see chapter 2 and chapter 5), I could not find any detailed correlation between the various chapters. Thus each author refers to his own equations, but never to similar equations in other chapters. Also the units and the nomenclature from chapter to chapter are different, although the units are carefully stated and definitions for the terms are included, so that there is no question about the meaning of the terms in a given chapter. It does, however, set the tone of the collection as contributed by particular people without correlation or homogeneity.

The volume is divided into three areas: After what is called an "Introduction of Plasma Physics" by Wulf B. Kunkel and Marshall N. Rosenbluth, there are chapters on adiabatic charged-particle motion by Theodore G. Northrop, statistical mechanics by Burton D. Fried, and dissipative effects by Allan N. Kaufman. The volume then moves on to discussing the plasma state as a continuum with chapters by Norman Rostoker on stability; MHD characteristics, shock waves, and hydromagnetic flow by Arthur Kantrowitz, Harry E. Petschek, and Julian Cole. There is a section on waves and radiation by Charles B. Wharton, Alvin W. Trivelpiece, and Hans R. Griem. The last third of the book is taken up with practical discharges, energy conversion, propulsion for space vehicles and controlled thermonuclear fusion by appropriate experts in these fields.

The effort was made to ask working experts in the various fields to present the material, and although some of the more practical applications of the plasma state are somewhat out-of-date because of the length of time taken to produce the volume, it is still an excellent summary of the basic material. The bibliography includes considerably more modern material than the original set of lectures could have embraced.

The editor says that the material is "intended to provide, for active research workers and other scientists desiring a general knowledge of plasma physics, a comprehensive introduction to this . . . field." I believe this is

a statement that accurately reflects the tone of the book, and the editor has achieved his goal in a successful and readable manner.

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The reviewer is the author of Basic Data of Plasma Physics, 1966, a revision of his earlier book that has just appeared from the MIT Press.

No longer an art?

THE GROWTH OF CRYSTALS FROM THE MELT. By J. C. Brice. 192 pp. North-Holland, Amsterdam (Interscience, New York), 1965. \$7.00

by Martin S. Straumanis

The author, who is associated with Mullard Research Laboratories, Redhill, Surrey (England), writes in the preface of the book: "Crystal growth is slowly changing from an art to a science. At the present time, it is probably best described as a craft. The aim of this monograph is to give a simple account of the scientific principles which underlie the various processes associated with the growth from the melt. For details of the other methods used for growing crystals the books of J. W. Mullin (1961), W. D. Lawson and S. Nielsen (1959), Buckley (1951), M. H. Francombe and H. Sato (1964), and J. J. Gilman (1963) should be consulted."

Accordingly, in chapter 1 the kinetic theory of gases, the binding forces in solids, crystal lattices, intrinsic and grown-in defects, impure solids, the melting process, properties of liquids, phase diagrams and evaporation are discussed very briefly using a minimum of mathematics. The increase of vacancies that one finds when approaching the melting point of elements that may be important in crystal growth is also mentioned (but not the names of Simmons and Balluffi).

Chapter 2 deals with the kinetics of growth from the melt, starting with the equilibrium shape of crystals (according to I. N. Stranski) and continuing with nucleation, nucleation theories, and the growth of perfect, imperfect, and rough interfaces and the dendritic growth. The next paragraphs on constitutional supercooling and interface distribution coefficients are more elaborate.

Although the distribution of impurities in a growing crystal is treated from various aspects in chapter 3, very little is said about the distribution of admixtures soluble in the liquid melt but nearly insoluble in the solid (for example, distribution of Cd in a Zn crystal). More detail is provided for semiconductor single crystals.

In the last four chapters the experimental conditions for crystal growth are summarized, such as the growth methods, furnaces, temperature and

Reviewed in This Issue

- 87 GREENAWAY: John Dalton and the Atom
 - 88 MANENKOV, ORBACH, eds: Spin-Lattice Relaxation in Ionic Solids
 - 88 KUNKEL: Plasma Physics in Theory and Application
 - 89 BRICE: The Growth of Crystals from the Melt
 - 91 DAVID: La Conversion des Energies
 - 91 ORLANS: Contracting for Atoms
 - 93 NUFFIELD: X-Ray Diffraction Methods
 - 93 DEGENNES: Superconductivity of Metals and Alloys
 - 95 DENNERY, KRZYWICKI: Mathematics for Physicists
 - 99 ISAACSON, KELLER: Analysis of Numerical Methods
 - 99 MOISEWITSCH: Variational Principles
 - 99 CUMPER: Wave Mechanics for Chemists
-

new publications aimed at THE HEART OF MATTER



MANY-BODY DESCRIPTION OF NUCLEAR STRUCTURE AND REACTIONS

edited by C. BLOCH, *Centre d'Etudes Nucléaires de Saclay,
Service de Physique Théorique*

Course 36—Italian Physical Society—Proceedings of the International School of Physics "Enrico Fermi"

This volume reviews the basic concepts of the many-body theory, and discusses numerical results, analytical soluble models, and sum rule methods. It presents a systematic treatment of the nuclear field, collective motions, correlations and clustering in nuclei, and of the newest many-body approach to the theory of nuclear reactions.

CONTRIBUTORS: C. BLOCH, F. VILLARS, V. GILLET, J. P. ELLIOTT, A. MIGDAL, D. BRINK, J. B. FRENCH, N. AUERBACH, J. BAR-TOUV, K. BLEULER, J. Yoccoz, P. CAMIZ, J. DA PROVIDENCIA, B. H. BRANDOW, G. E. BROWN, C. J. VEJE, M. A. MELKANOFF, G. SCHIFFRER, E. HAYOWRD, R. A. RICCI, R. POTENZA.
1967, 589 pp., \$26.50

IN TWO PARTS

ATOMIC AND ELECTRON PHYSICS

edited by VERNON HUGHES and HOWARD L. SCHULTZ, *Yale University*

Volume 4 of *Methods of Experimental Physics*

edited by L. Marton

Presents the methods used by the experimental physicist in the production of free atoms and other low energy particles, such as electrons, positrons, photons and ions. Also discussed are the methods used for the detection of low-energy particles and for the investigation of their basic properties.

PART A: ATOMIC SOURCES AND DETECTORS

CONTRIBUTORS: G. A. HAAS, F. M. CHARBONNIER, L. W. SWANSON, W. P. DYKE, L. AMES, R. L. CHRISTENSEN, N. R. WHETTEN, J. AROL SIMPSON, H. J. SHAW, L. MARTON, H. A. FOWLER, J. S. GREENBERG, E. D. THERIOT, JR., H. LEW, E. LIPWORTH, C. E. ANDERSON, W. G. RATH, J. E. DRAPER, F. M. V. PICHANICK, V. HUGHES, M. POSNER.

September 1967, 508 pp., \$21.50

PART B: FREE ATOMS

CONTRIBUTORS: D. T. WILKINSON, K. G. KESSLER, H. M. CROSS-WHITE, H. E. REDFORD, K. ZIOCK, C. W. DRAKE, JR., G. E. BECKER, R. M. MOBLEY.

August 1967, 346 pp., \$15.50

PHOTOIONIZATION PROCESSES IN GASES

by GEOFFREY V. MARR, *The University, Reading, England*

Contains collected experimental and theoretical data on the ionizing of energetic photons with atoms and molecules and presents applications of this data to the fields of plasma physics, aeronomy, and astrophysics. Detailed references to original quantitative data are given, and absolute photoionization and autoionization cross-section curves are collected for individual species of atoms and molecules.

August 1967, 282 pp., \$12.50

HIGH FIELD TRANSPORT IN SEMICONDUCTORS

by ESTER M. CONWELL, *General Telephone and Electronics
Laboratory, New York*

Supplement 9 to *Solid State Physics: Advances in Research and Theory*

Beginning with a comprehensive survey of the phenomena found in Ge, Si, and the III-V compounds under the influence of high electric fields, this volume proceeds to develop the theory of intra- and inter-valley scattering by acoustic, nonpolar and polar optical modes and impurities, and to solve the Boltzman equation for different combinations of the scattering mechanisms and carrier-carrier scattering.

July 1967, 293 pp., \$12.00

A Selection of Important Titles In NUCLEAR PHYSICS

Scintillation Counters in High Energy Physics

by YU. K. AKIMOV
1965, 198 pp., \$9.50

Coulomb Excitation

A COLLECTION OF REPRINTS WITH AN INTRODUCTORY
Review by K. ALDER and A. WINTER
1966, 374 pp., clothbound \$8.50, paperbound \$4.50

Bubble and Spark Chambers: Principles and Use

edited by R. P. SHUTT
Volume 2: 1967, 319 pp., \$16.00

Oriented Nuclei: Polarized Targets and Beams

by J. M. DANIELS
1965, 278 pp., \$9.00

Nuclear Shell Theory

by AMOS DE-SHALIT and IGAL TALMI
1963, 573 pp., \$16.50

Isobaric Spin in Nuclear Physics

edited by JOHN D. FOX and DONALD ROBSON
1966, 896 pp., \$18.00

Nuclear Spin-Parity Assignments

edited by NORWOOD G. GOVE and RUSSELL L. ROBINSON
1966, 463 pp., \$7.50

Internal Conversion Processes

edited by JOSEPH H. HAMILTON
1966, 669 pp., \$22.50

Statistical Theories of Spectra: Fluctuations

A COLLECTION OF REPRINTS AND ORIGINAL PAPERS
With an Introductory Review by CHARLES E. PORTER
1965, 576 pp., \$9.50

Methods in Computational Physics:

ADVANCES IN RESEARCH AND APPLICATIONS
VOLUME 5: NUCLEAR PARTICLE KINEMATICS
edited by BERNI ALDER, SIDNEY FERNBACH, MANUEL
ROTENBERG
1966, 264 pp., \$11.50

Optical Model of the Atomic Nucleus

by IVAN ULEHLA, LADISLAV GOMOLCAK, and ZDENEK
PLUHAR
Translated by G. ALTER
1964, 147 pp., \$7.75

Nuclear Physics

edited by V. F. WEISSKOPF
1963, 186 pp., \$7.50

Mössbauer Effect: Principles and Applications

by GUNTHER K. WERTHEIM
1964, 116 pp., \$5.50

Methods in Bremsstrahlung Research

by O. V. BOGDANKEVICH and F. A. NIKOLAEV
Translation Editor, DAVID E. ALBURGER
1966, 217 pp., \$9.50

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

its control, crucibles, atmospheres, the Bridgman and the pulling (Czochralski) techniques. The final paragraphs in the book are on the control of dislocation density, dendritic crystals and growth without crucibles.

The book is well written, supplied with many figures, an extensive reference register and an author and subject index. It will be very helpful for those working with single crystals grown from the melt.

The book constitutes the fifth volume of the series of monographs on selected topics in solid-state physics, E. P. Wohlfarth, editor.

* * *

The reviewer worked with single crystals of Zn, Cd, Mg, with Zn-Cd, Zn-Sn, Zn-Bi crystals, with crystals of brass, and on eutectic crystallization.

Energy transformation

LA CONVERSION DES ENERGIES.
By Régis David. 128 pp. Presses
Universitaires de France, Paris, 1966.

by R. Bruce Lindsay

Because it is possible to interpret practically everything that goes on in the world of our experience as either a transfer or transformation of energy, any writing devoted to this general theme arouses agreeable expectations, and the present book is not entirely disappointing in this regard. It is another small volume in the very extensive series called "Que Sais-je?" (Le Point des Connaissances Actuelles). The author is an assistant to the Faculty of Sciences of the University of Paris. He has sought to present in as simple a way as possible the most important types of practical energy transformation, with special emphasis on new developments that promise technological success.

The book opens with a conventional discussion of the conversion of mechanical energy into electrical energy through the electric generator and the converse transformation in the electric motor. This very short chapter is followed by seven longer ones that treat in turn the transformation of light energy into electric energy (photoelectric effect); the direct conversion of electrical energy into radiation energy (electro-luminescence); the transfor-

mation of chemical energy into electrical energy (cells and storage batteries); the conversion of thermal energy into electrical energy (thermoelectricity); the mass-energy transformation of nuclear physics (fission and fusion); magnetohydrodynamic conversion; and finally miscellaneous types of transformation like piezoelectricity.

The treatment is in general descriptive with rather simple illustrations, but the basic mathematical formulas are presented, though in general without derivation. Much attention is given to modern developments such as fuel cells, thermoelectric generators, nuclear energy, and plasma physics. The last named subject is treated with particular effectiveness, though it does demand of the reader a substantial background of electromagnetic theory and physical statistics.

The author's style is clear and succinct. It is unfortunate that the book has no index and that the bibliography is very inadequate. However it will

make a useful addition to the library of any student of physics or engineering.

* * *

The reviewer is Hazard Professor of Physics and former dean of the graduate school at Brown University.

The changing AEC

CONTRACTING FOR ATOMS. By Harold Orlans. 242 pp. The Brookings Institution, Washington, D. C., 1967. \$6.00

by Bernard Hodes

Sociologist Orlans continues the great debate over the future of the aging Atomic Energy Commission with this broad study of AEC operations. His discussion includes the civilian reactor industry and AEC contractors, big science and the universities and (most interesting to physicists) the future of the national laboratories. Underlying his analyses is the (debatable) thesis



FUEL CELL replaces internal-combustion engine in demonstration arranged by Union Carbide.