

the basal plane of graphite crystals.

The book is interesting and revealing, and the articles, supplied with many illustrations (some of them excellent), are well written.

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The reviewer is professor in the metallurgical engineering department and is working at the Materials Research Center of the University of Missouri-Rolla in crystallization of x rays.

Gamma-ray resonance

LECTURES ON THE MÖSSBAUER EFFECT. By J. Danon. 150 pp. Gordon and Breach, New York, 1968. Cloth \$7.50, paper \$4.50

by GUNTHER K. WERTHEIM

This volume is based on notes taken by E. de Alba, X. da Silva and M. A. Weber at a series of lectures given at the Latin American School of Physics at the University of Mexico during July and August, 1965. They were first published in *Many-Body Problems and Other Selected Topics in Theoretical Physics* edited by Marcos Moshinsky, Thomas Brody, and G. Jacobs, also issued by Gordon and Breach some years ago. The present version has been slightly augmented, mainly by the addition of reprints and an occasional appendix. The references, however, do not include work later than 1965.

Jacques Danon has been active in Mössbauer-effect research since its early days. In this book he covers the same ground, using a similar approach, as do a number of other introductory monographs of comparable length. However, his treatment is unique in presenting in detail the author's treatment of the isomer shift utilizing a molecular-orbital approach.

Another useful feature is a major section dealing with the theory of the recoil-free fraction. It was contributed by Yehiel Disatnik and provides more detailed information than is available in other monographs.

The spirit implied by "lectures" has been retained to a large extent. Figures showing data from the literature have been redrawn, omitting data points and providing only an approximate rendering of their essential character. Axes are incompletely labeled. It is unfortunate that there is no mention of other useful compendia.

The chief value of the book lies in

the areas mentioned above where it makes a unique contribution. The material chosen for reproduction in the appendix provides a good indication of its strong points.

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The reviewer, a member of the technical staff at Bell Telephone Laboratories, is the author of a number of papers dealing with the Mossbauer effect.

Experimental determination

OPTICAL PROPERTIES AND BAND STRUCTURES OF SEMICONDUCTORS. By David L. Greenaway and Gunther Harbeke. 159 pp. Pergamon, New York, 1968. \$9.00

by HAROLD MENDLOWITZ

The authors have put together a fairly broad review of optical properties and band structure of semiconductors through 1966. Although the emphasis is on experimental determination, a number of theoretical concepts and results are briefly treated in order to understand and "catalog" the experimental results.

The optical region covered is from the infrared to the vacuum ultraviolet. Band structures of cubic as well as anisotropic materials are discussed. Experimental methods for determining the band structure include optical absorption and reflectivity measurements, as well as the interpretation of deformation phenomena, excitons, electro-optical phenomena, photoemission and characteristic electron energy-loss experiments in solids.

The major emphasis is on classical methods, that is absorption and reflectivity measurements, with less than a page devoted to electron energy-loss experiments. Although this latter method is important for obtaining information on the optical constants in the vacuum ultraviolet, the authors apparently had access only to the first paper on this subject, an application to the optical constants of aluminum that appeared in 1962. They recognize its applicability to nonmetals, but were unaware of subsequent papers utilizing this method that appeared in 1964 on polystyrene, an insulator, in 1965 on beryllium, and in 1967 on germanium, a semiconductor. Of course, each author's point of view determines which methods to emphasize, and the classical methods are still the ones that yield the bulk of the data

utilized in determining the band structure. However, the omission of the 1967 paper on germanium is probably because the literature search was closed prior to publication.

Overall, the authors did accomplish their goal of making a substantial contribution by making a fairly complete review.

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The reviewer is a professor at Howard University and has been doing research on the optical properties of solids for the past decade.

Cosmological approaches

THEORIEN DER KOSMOLOGIE. (In German) By Otto Heckmann. 113 pp. Springer-Verlag, New York, 1968. \$6.00

by ERNST J. OPIK

This is an exact reprint of a first edition published in 1942, which sold out immediately after its appearance. Only a few corrections are now made, and three pages of notes superficially refer to modern developments.

The reprint has been produced under the pressure of demand, but the author, formerly director of Hamburg Observatory and now director of the European Southern Observatory, did not find time for a revision. Besides, a revision would mean rewriting most of the book in view of the enormous progress in observational research during a quarter of a century, including observations of radio sources, quasars and pulsars. Even Heckmann's more recent contribution, pointing out the possibility of an inbuilt angular momentum in preventing collapse of the universe, is not included.

Despite the outdated factual material, its permanent value consists of a systematic presentation of the three different approaches to cosmology: the classical or dynamical presentation, based on plain Newtonian mechanics; the Einsteinian general relativity, and Milne's kinematic cosmology. Contrary to widespread opinion, persisting even now, there is much common ground between the first two models. Finesses of general relativity, such as the advance of Mercury's perihelion, are not essential on the cosmological scale. Therefore, Newton's dynamical and Einstein's metrical methods lead to practically identical conclusions.

When first published Heckmann's



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Course 40

NUCLEAR STRUCTURE AND NUCLEAR REACTIONS

edited by **M. JEAN**, Institut de Physique Nucleaire, Orsay, France
and **R. A. RICCI**, Instituto Nazionale di Fisica Nucleare, Firenze, Italy

The trend to explain all nuclear properties in terms of the Schrodinger equation and the elementary interactions between nucleons has led to many fruitful ideas and techniques. The application of these ideas to the theory of nuclear reactions has led to promising results,

giving rise to the expectation that the microscopic description of all nuclear properties and phenomena may be realized. This volume will serve as an interim report on the progress being made in the study of these two inter-related fields of nuclear physics.

1969, 813 pp., \$30.00

Course 41

SELECTED TOPICS IN PARTICLE PHYSICS

edited by **J. STEINBERGER**, Nevis Laboratories, Columbia University, New York, New York

This volume will serve to introduce the student to some of the most fruitful concepts used in the study of elementary particles. Current algebras are reviewed and current divergences are discussed using the SU_3 picture of the weak and electromagnetic interactions. Current algebra techniques are applied to local densities and the difficulties encountered are

investigated. The fundamental properties of Regge poles are presented to enable the reader to analyze any two-body reaction. Consideration is also given to relations between coupling constants, experimental information available on particles and vector mesons and the electromagnetic properties of hadrons.

1968, 194 pp., \$12.00

Course 45

LOCAL QUANTUM THEORY

edited by **R. JOST**, Seminar für Theoretische Physik, Zurich

This volume is the result of a summer school session on Local Quantum Theory held under the auspices of the Italian Physical Society. While most of the main lectures are devoted to the problem of the existence of nontrivial

models for relativistic field theories, others cover the fields of C^* -Algebras, linear partial differential equations, and general quantum-field theory and the emphasis of the pure algebraic aspect.

1969, 266 pp., \$14.50

Course 39

PLASMA ASTROPHYSICS
edited by **P. A. STURROCK**
1967, 364 pp., \$19.50

Course 38

INTERACTION OF HIGH-ENERGY PARTICLES WITH THE NUCLEI
edited by **T. E. O. ERICSON**
1967, 330 pp., \$16.00

Course 37

THEORY OF MAGNETISM IN TRANSITION METALS
edited by **W. MARSHALL**
1967, 454 pp., \$18.50

Course 36

MANY-BODY DESCRIPTION OF NUCLEAR STRUCTURE AND REACTIONS
edited by **C. BLOCH**
1966, 589 pp., \$26.50

Course 35

HIGH-ENERGY ASTROPHYSICS
edited by **L. GRATTON**
1966, 461 pp., \$23.00

Course 34

THE OPTICAL PROPERTIES OF SOLIDS
edited by **J. TAUC**
1966, 434 pp., \$22.00

Course 33

STRONG INTERACTIONS
edited by **L. W. ALVAREZ**
1966, 225 pp., \$11.50

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treatise contained the only positive presentation of Einstein's theory of gravitation in the Germany of 1933-1945, which may partly, though not entirely, account for its success at that time. Yet it has more lasting merits than that.

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Ernst J. Opik is a professor in the physics and astronomy department, University of Maryland and astronomer at Armagh Observatory, Northern Ireland. He has worked at the Hamburg Observatory under the directorship of Otto Heckmann.

Racah and company

SPECTROSCOPIC AND GROUP THEORETICAL METHODS IN PHYSICS. (Racah Memorial Volume). F. Bloch, S. G. Cohen, A. deShalit, S. Sambursky, I. Talmi, eds. 462 pp. Wiley (Interscience), New York, 1968. \$22.00

by DON B. LICHTENBERG

One of Giulio Racah's most important contributions to theoretical physics was his application of powerful methods of group theory to problems involving angular momenta. His work on the recoupling coefficients that bear his name contains, together with the parallel work of Eugene Wigner, many fundamental ideas on the subject.

It is therefore fitting that this volume, in memory of Racah's untimely death in 1965, begins with four contributions to the theory of Racah coefficients and the corresponding Wigner symbols. These papers explore a few of the many fascinating mathematical properties of Racah coefficients, such as their semiclassical limit for large values of all relevant angular momenta and their connection with states with permutational symmetry.

The complete book consists of 25 separate contributions by 38 of Racah's friends and colleagues on a variety of subjects. A number of well known physicists are among the authors, including Wigner, who has written on some aspects of group representations, and Yuval Ne'eman, who has emphasized the role of Lie groups in strong-interaction physics.

The individual works fall roughly into three categories: theoretical papers of some mathematical interest, and some that apply known concepts to problems in nuclear and elementary-particle physics and experimental

papers in atomic and nuclear physics. In addition, a paper by Abraham Pais gives a short historical review of our knowledge of invariance principles in physics.

Most of the articles are of high quality. A few, especially on elementary particles, already contain some obsolete material, a fact that testifies to the impermanence of many theoretical ideas in this field. However, even these articles contain items of current interest.

For whom is this book intended? The book contains a collection of articles that, with only a few exceptions, are suitable for the *Journal of Mathematical Physics* or for *The Physical Review*. The papers are on the average somewhat higher in quality and are more closely related in topic than the usual journal article. The abundant references to Racah's works and praises of this work are further departures from a typical journal paper. But, most important, this collection advances our understanding of physics in the areas that Racah contributed to so much.

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A professor of physics at Indiana University, the reviewer has been interested in the applications of group theory to elementary-particle physics.

Counting configurations

PRINCIPES DE COMBINATOIRE. By C. Berge. 149 pp. Dunod, Paris, 1968. 34F

by FRED L. WILSON

Arrangements are configurations, and counting configurations possible within the given constraints is what this book by Claude Berge is all about.

The author has been director of the International Computation Center in Rome, Italy since 1964. Probably his best known work is *Théorie des Graphes et Ses Application*, published in 1958.

The present work is concerned only with denumerment, counting the number of configurations, rather than with enumeration, or listing the configurations. It is written in modern terminology, without using symbolic calculus. Berge's applications are drawn from the relatively new domain of information theory rather than from the theory of numbers.

The text of this book was the mate-

rial for a course taught at the Faculté des Sciences de Paris in 1967-1968. It could be used in a graduate course, provided the language barrier could be overcome, but is also an excellent reference book that is well illustrated and has an excellent bibliography of modern literature for each chapter. It could be read simply for pleasure.

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Fred L. Wilson is the educational specialist, College of Science, National Technical Institute for the Deaf, at Rochester Institute of Technology, and academic coordinator for deaf students majoring in physics, mathematics, biology, chemistry and medical technology.

NEW BOOKS

CONFERENCE PROCEEDINGS

Applied Mechanics. (Conf. 12th International Congress of Applied Mechanics, Stanford Univ., 26-31 Aug. 1968). M. Hetényi and W. G. Vincenti. 420 pp. Springer-Verlag, New York, 1969. \$27.00

Advances in Solid State Physics (Conf. proc., German Physical Society, Munich, 19-22 March 1969 and IEEE "Semiconductor Device Research," Munich, 24-27 March 1969). O. Madelung, ed. 391 pp. Pergamon Press, New York, 1969. \$17.50

ELEMENTARY PARTICLES

Models of Elementary Particles. By Bernard T. Feld. 546 pp. Blaisdell, Waltham, Mass., 1969. \$19.50

NUCLEI

The Theory of Beta-Decay. By Charles Strachan. 213 pp. Pergamon Press, New York, 1969. Cloth \$6.25, paper \$4.75

ATOMS, MOLECULES, CHEMICAL PHYSICS

Stochastic Processes in Chemical Physics. K. E. Shuler, ed. 391 pp. Wiley (Interscience), New York, 1969. \$19.50

Progress in High Temperature Physics and Chemistry, Vol. 3. Carl A. Rouse, ed. 328 pp. Pergamon Press, New York, 1969. \$14.00

OPTICS

Applied Optics and Optical Engineering, Vol. V: Optical Instruments: Part 2. Rudolf Kingslake, ed. 382 pp. Academic Press, New York, 1969. \$17.00

Progress in Optics, Vol. VII. Emil Wolf, ed. 431 pp. Wiley (Interscience), New York, 1969. \$21.00

ELECTRICITY AND MAGNETISM

Magnetic Domains. By R. S. Tebbble. 98 pp. Barnes & Noble, New York, 1969. \$4.00

Absolute Measurements in Electricity and