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dition to the fortunately still small collection needed to cover the contributions of positron annihilation to solid-state research.

A. T. STEWART
Queen's University
Kingston, Ontario

The Physics of Phonons

J. A. Reissland
319 pp. Wiley, New York,
1973. \$19.95

As a theoretical concept, the phonon resembles the photon; yet to most students the concept is less familiar and quite formidable. The reason is obvious. Every introductory course in modern physics discusses experiments that validate directly the concept of photons. The experiments that would correspondingly demonstrate the "existence" of phonons must be performed at low temperatures, with detectors incorporated in the solids. Such experiments have been done only recently. Instead, the phonon is explained as a consequence of the quantization of a classical wave. The photon, though theoretically similar, has acquired a status of physical reality.

For that reason, a book devoted to phonons is particularly welcome. Because phonons play a role almost everywhere in solid-state physics, it is not possible to say all about phonons in a book of modest size. J. A. Reissland has selected some topics. In addition to the formal theory of second quantization and the use of creation and annihilation operators, he has emphasized the lattice dynamics of real crystals and their thermodynamic consequences. He has also given a good and compact outline of how to treat the interaction of phonons with each other and with other wave-like excitations in solids. He skillfully describes the principles of the theoretical techniques—this is the strong side of the book. On the minus side, he can be criticized for giving a lot of theoretical techniques, while their applications to physical problems are often rudimentary. This criticism does not apply, however, to his excellent treatment of lattice dynamics.

Since many students are confused about the relation between the discrete lattice and the quantization of waves, two concepts that are unconnected (as the author also points out), it is perhaps unfortunate that he introduces the discrete lattice first, as if it were a necessary prerequisite to the concept of the phonon.

The book will not serve as a text for the usual courses on solid-state physics, but would make a good supplementary

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ANGULAR MOMENTUM THEORY FOR DIATOMIC MOLECULES

by BRIAN R. JUDD

This book develops the quantum theory of angular-momentum, and then applies it toward reformulating and simplifying the analysis of the properties of rotating diatomic molecules. In particular, it demonstrates the power and conciseness of the tensorial methods.

The starting point is the work of Racah on spherical tensors and angular-momentum vectors. The book then describes double tensors in terms of the rotation group in four dimensions. First, it applies the theory to the hydrogen-molecular ion, following the work of Shibuya and Wulfman in momentum space. Next it ap-

plies the theory to molecular rotations—with one foot of the double tensor standing in the molecular frame, the other standing in the laboratory frame. In addition, the book covers the effect of perturbations and the use of tensorial methods in multipole expansions.

CONTENTS: Tensor Algebra. The Rotation Group $R(4)$. $R(4)$ in Physical Systems. The Hydrogen Molecular Ion. Expansions. Free Diatomic Molecules. The Hydrogen Molecule. External Fields. Perturbations.

1975, 250 pp., \$22.50/£10.80

PHASE TRANSITIONS AND CRITICAL PHENOMENA

Volume 3/Series Expansions for Lattice Models

edited by C. DOMB and M. S. GREEN

Professors Domb and Green have classified the massive research literature on this subject under a number of major headings. Expert reviews have been written by leading workers in the field whose papers aim to provide an extensive account of all that is known at present about phase transitions and critical phenomena.

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tin, Computer Techniques for Evaluating Lattice Constants. M. Wortis, Linked Cluster Expansion. D. S. Gaunt, Asymptotic Analysis of Co-efficients. G. S. Rushbrooke, Heisenberg Model. C. Domb, Ising Model. H. E. Stanley, Generalized Heisenberg Model or University Hamiltonian: Properties of Isotropically-Interacting D-Dimensional Classical Spins. D. D. Betts, X-Y Model. J. F. Nagle, Ferroelectric Models.

1974, 712 pp., \$46.50/£18.00

ESSENTIALS OF PADÉ APPROXIMANTS

by GEORGE A. BAKER, Jr.

This book assembles the material of several major areas. It first presents the classical material on the algebraic properties (the part forming the underpinning for computer algorithms for the calculation of Padé approximants and many special functions) as well as their relationship to continued fractions and orthogonal polynomials. Then, it covers the convergence theory (both point-by-point and in measure, as appropriate). The book pays special attention to some widely occurring classes of functions for which

not only convergence, but converging upper and lower bounds, can be obtained. The book contains examples of several sort. There are numerical examples which show how well Padé approximants can converge; general examples which serve to illustrate the discussion throughout; and sample scientific applications from such fields as statistical mechanics, scattering physics, and electrical circuit theory.

1974, 328 pp., \$26.00/£12.50

APPLIED SUPERCONDUCTIVITY

edited by VERNON L. NEWHOUSE

This treatise presents, from both the theoretical and experimental standpoints, perhaps the most exhaustive treatment to date of the major areas of applied superconductivity. Since the subject is now too complex to be covered by a single author, the book provides, instead, self-contained chapters on several topics of importance.

CONTENTS OF VOLUME 1 A. H. Silver and J. E. Zimmerman, Josephson Weak-Link Devices. W. H. Hogan, Refrigerators and Cryostats for Superconducting Devices. W. S. Goree and V. W. Hesterman, Superconductive Switches and Amplifiers. K. Rose,

C. L. Bertin, and R. M. Katz, Radiation Detectors. A. R. Sass, W. C. Stewart, and L. S. Cosentino, Computer Memory.

Volume 1/1975, 416 pp., \$41.00/£19.70 set price: \$36.00/£17.30

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Volume 2/1975, about 300 pp., in preparation

CONTINUUM PHYSICS

Volume 2/Continuum Mechanics of Single-Substance Materials

edited by A. CEMAL ERINGEN

This three-volume treatise offers detailed discussion of the many fundamental advances of the last decade—a decade in which the geometry and kinematics of deformable media were rigorously established, as were the thermodynamics of continuous media, the theory of constitutive equations, and the balance laws for single media, mixtures of materials, and materials with microstructure.

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1975, 632 pp., \$49.00/£23.55

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text to a graduate course, for it shows clearly the limitations of the Debye solid. It could also give students an introduction to how one proceeds in advanced solid-state theory, before they are exposed to the heavy stuff in books such as Charles Kittel's *Quantum Theory of Solids*.

PAUL G. KLEMENS
University of Connecticut
Storrs

new books

Nuclei, Nuclear Physics

The Nuclear Many-Body Problem. (Conf. Proc., Present Status and Novel Developments in the Nuclear Many-Body Problem, Rome, 19-23 September 1972). F. Calogero, C. Ciofi Degli Atti, eds. 1655 pp. Editrice Compositori, Bologna, 1973.

Atoms and Molecules

Advances in Atomic and Molecular Physics, Vol. 10. D. R. Bates, ed. 347 pp. Academic, New York, 1974. \$35.00

Chemical Physics

Ion Mass Spectra. R. G. Wilson. 432 pp. Wiley, New York, 1974. \$20.95

Optics

Depolarization and Related Ratios of Light Scattering by Spheroids. W. Heller, M. Nakagaki, G. D. Langolf. 105 pp. Wayne State U. P., Detroit, Mich., 1974. \$12.00

Light Scattering Functions of Flow-Oriented Spheroids. W. Heller, M. Nakagaki, G. D. Langolf, eds. 1110 pp. Wayne State U. P., Detroit, Mich., 1974. \$50.00

Space Optics. (Summer School Proc., Marseille, 29 June-4 July 1970). A. Marechal, G. Courtes, eds. 389 pp. Gordon and Breach, New York, 1974. \$26.50

Quantum Electronics and Lasers

Laser Physics. M. Sargent III, M. O. Scully, W. E. Lamb Jr. 432 pp. W. A. Benjamin, Reading, Mass., 1974. \$22.00 hardcover, \$13.50 paperback

Materials and Solid State

Advances in High-Pressure Research. R. H. Wentorf Jr, ed. 297 pp. Academic, New York, 1974. \$19.50

Anharmonic Lattices, Structural Transitions and Melting. (NATO Advanced Study Inst., Geilo, Norway, 24 April-1 May 1973). T. Riste, ed. 451 pp. Noordhoff, Leiden, The Netherlands, 1974.

Composite Materials, Vol. 7: Structural Design and Analysis, Part 1. C. C. Chamis, ed. 345 pp. Academic, New York, 1975. \$32.00

Orbital Theories of Molecules and Solids. N. H. March, ed. 385 pp. Oxford U. P., New York, 1974. \$29.50

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Edited by
W. C. Schieve and **J. S. Turner**
University of Texas, Austin

These lectures, delivered at the Third Advanced School for Statistical Mechanics and Thermodynamics held in Austin, Texas in 1971, present various aspects of statistical mechanics from an interdisciplinary angle, using several detailed models. Lectures include

W. C. Schieve: Aspects of Non-Equilibrium Quantum Statistical Mechanics: An Introduction

C. George: Transformation Theory and Physical Particle Description of Dissipative Systems

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R. Miller: Computer Experiments on Self-Gravitating Systems

E. Montroll: Propagation of Waves in Discrete Media, Harmonic, Anharmonic, and Defective

J. Ford: Stochastic Behavior in Non-Linear Oscillator Systems

J. S. Turner: Nonequilibrium Thermodynamics, Dissipative Structures, and Biological Order

1974. vi, 342p. 76 illus. paper/\$9.90

Volume **29**

Foundations of Quantum Mechanics and Ordered Linear Spaces

Edited by
A. Hartkaemper and **H. Neumann**

These lectures, delivered at the Advanced Study Institute at Marburg, Germany in 1973, provide a coherent introduction into the field of ordered normed vector spaces and their application to the foundation of quantum mechanics. The lectures were intended to prepare a common basis for discussion between mathematicians and physicists and for future research in this field. Contributors include H. H. Schaefer, J. Mangold, R. J. Nagel, A. J. Ellis, A. Gouillet de Rugy, W. Wils, G. Wittstock, E. Størmer, A. Hartkaemper, H. Neumann, G. Ludwig, G. M. Prosperi, C. M. Edwards, K. Kraus, D. J. Foulis, C. H. Randall, M. Drieschner, V. Gorini, E. C. G. Sudarshan, U. Krause, L. Lanz, L. A. Lugiato, G. Ramella, M. Mugur-Schachter, E. Prugovečki, G. T. Ruettimann, and M. Wolff.

1974. vi, 355p. paper/\$10.70



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