

All these publications were based mainly on certain results in the physics of metals and semiconductors. They aimed to explain the facts and their interrelationship to quantum-mechanical behavior of waves and charged particles in periodic lattices, but due to space restrictions these books did not entirely clarify the field in toto. Haug, a theoretical physicist, has started, with this first volume of his *Theoretical Solid-State Physics*, a construction on a sound basis, related to the methods of theoretical physics and quantum mechanics.

In the first section the author describes the fundamentals of solid-state physics, crystal lattices and the electric potentials therein. In section 2 the behavior of electrons in crystals is dealt with, starting in the first chapter with the one-electron approximation, which discloses in most cases the general properties of a solid-state structure. Band structure is derived from the behavior of a single electron in a periodic potential field that is in a one-dimensional crystal model as described by Kronig and Penney, but other methods useful for the case of more than one dimension—linear combination of atomic orbitals (LCAO-method), orthogonalized atomic orbitals (OAO-method) and others—are discussed. This chapter then continues with electron statistics, the equations of electron motion in a solid-state structure and the concept of effective mass. Band-band transition under strong field, radiation and emission conditions are discussed in detail. This first chapter is closed with a short consideration of contact phenomena. In the next chapter of the second section the one-electron approximation is extended to many electrons. Again the author considers two different points of view, the Bloch scheme where the electrons move in the periodic lattice potential, independently of the lattice particles and the Heitler-London scheme, which describes the electrons by atomic functions. Chapter 3 deals with the forces which form the crystal lattice, both in the quantum-mechanical formulation and in the classical description by Mie and Grueneisen. Metal crystals, ionic crystals, molecular crystals and valence forces are considered in detail. Chap-

ter 4 describes the magnetic properties of solid-state structures, para- and diamagnetism of atoms, free electrons, solid-state materials, ferromagnetism and antiferromagnetism. The fifth chapter then deals with dielectric properties of solid-state structures, both from the classical and from the quantum-mechanical point of view and also contains a paragraph on ferroelectricity.

In the third section the author considers the crystal lattice alone. Its potential energy is assumed as given, and the lattice points oscillate around its equilibrium position. A consideration of static and dynamic behavior of the crystal lattice leads to the principles of elasticity on one side and to the phonon phenomena on the other. With this basis, lattice oscillations are treated in extenso, and thermodynamic relations to heat parameters of the crystal are derived.

In two appendices the fundamentals of classical and quantum statistics and some mathematical relations are given. Only a list of fundamental books is given, and some references to derivations and proofs not given in the book are added to the appropriate paragraphs. A list of symbols and numerical values of constants as well as a subject index are included.

Haug's book is an excellent treatise on theoretical solid-state physics. It assumes that the reader is familiar with certain methods of theoretical physics and quantum mechanics. It gives most of the derivations of the theory considered and refers to literature only for further studies. The content of the book exceeds the amount of matter treated in solid-state courses, and will thus be most valuable for the solid-state physicist as a sound basis of the subject, provided he has a very good knowledge of the German language. In the reviewer's opinion, Haug's book is the best and most extensive modern theoretical publication on solid-state physics, and we would be very glad to have the second volume, dealing with electron-lattice interaction, luminescence and superconductivity, not too far in the future.

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A specialist in electricity and electron physics, Hans J. Hagger is associated with Albiswerk/Zurich.

BOOKS RECEIVED

ACOUSTICS

Physical Acoustics. Principles and Methods. Vol. III, Part B, Lattice Dynamics. Warren P. Mason, ed. 336 pp. Academic Press, New York, 1965. \$12.00.

ASTRONOMY & ASTROPHYSICS

Galactic Structure. Adriaan Blaauw and Maarten Schmidt, eds. 606 pp. University of Chicago Press, Chicago, 1965. \$15.00.

Neutrino Astrophysics. By Hong-Yee Chiu. 107 pp. Gordon and Breach, New York, 1965. Cloth \$5.00, paper \$2.50.

Progress in Radio Science 1960-1963. Vol. V. Radio Astronomy. Report of Commission V during the XIV URSI General Assembly. (Tokyo, Sept. 1963). E. Herbay, ed. 140 pp. American Elsevier, New York, 1966. \$12.50.

The First Book of Mars. An Introduction to the Red Planet. By David C. Knight. 96 pp. Franklin Watts, New York, 1966. \$2.65.

Structure and Evolution of the Stars. By Martin Schwarzschild. 296 pp. (Reprint of 1958 ed.) Dover, New York, 1965. Paper \$2.25.

Interstellar Gas Dynamics. (2nd ed.) By S. A. Kaplan. F. D. Kahn, ed. 126 pp. Pergamon Press, New York, 1966. \$6.50.

Solar Radiation. N. Robinson, ed. 347 pp. American Elsevier, New York, 1966. \$24.50.

ATOMIC & MOLECULAR PHYSICS

Optical Pumping. An Introduction. By Robert Bernheim. 272 pp. W. A. Benjamin, New York, 1965. \$9.00.

The Electronic Evolution in the Atoms of the Elements and the Construction of a New Periodic Table. By P. Y. Loung. 72 pp. Periodex Scientific Co., Palo Alto, Calif., 1965. Paper \$5.00.

The Fundamental Atomic Constants (2nd ed.). By J. H. Sanders. 98 pp. Oxford University Press, Oxford, 1965. Paper 12s. 6d.

The Structure of Atoms and Molecules. By V. Kondratyev. Transl. from Russian by G. Yankovsky. 530 pp. Dover, New York, 1965. Paper \$2.50.

BIOPHYSICS & MEDICAL PHYSICS

Radiological Monitoring of the Environment. Conf. Proc. (Berkeley, Gloucestershire, Oct. 1963). B. C. Gobold and I. K. Jones, eds. 425 pp. Pergamon, New York, 1965. \$17.50.

The Machinery of Life. By Dean E. Wooldridge. 212 pp. McGraw-Hill, New York, 1966. \$7.95.

Vision. Biophysics and Biochemistry of the Retinal Receptors. By Jerome J. Wolken. 193 pp. Charles C. Thomas, Springfield, Ill., 1966. \$9.50.

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Biomechanics and Related Bio-Engineering Topics. Symp. Proc. (Glasgow, 1964). R. M. Kenedi, ed. 493 pp. Pergamon Press, New York, 1964. \$20.00.

CHEMISTRY & CHEMICAL PHYSICS

Elemental Sulfur. Chemistry and Physics. Beat Meyer, ed. 390 pp. Interscience, New York, 1965. \$15.00.

Interpretive Spectroscopy. Stanley K. Freeman, ed. 295 pp. Reinhold, New York, 1965. \$17.50.

Precipitation from Iron-Base Alloys. Conf. Proc. (Cleveland, Oct. 21, 1963). Gilvert R. Speich and John B. Clark, eds. 420 pp. Gordon and Breach, New York, 1966. Cloth \$21.00, paper \$8.50.

Surface Interactions Between Metals and Gases. By V. I. Arkharov and K. M. Gorbunova. Transl. from Russian. 163 pp. Consultants Bureau, New York, 1966. \$25.00.

Transition Metal Chemistry, Volume 1. A Series of Advances. Richard L. Carlin, ed. 307 pp. Marcel Dekker, New York, 1965. \$12.75.

Molecular Beams. John Ross, ed. 419 pp. Interscience, New York, 1966. \$15.00.

Modern Quantum Chemistry. Oktay Sinanoglu, ed. Part II: Interactions. 311 pp. Academic Press, New York, 1966. \$12.00.

Modern Quantum Chemistry. Oktay Sinanoglu, ed. Part I: Orbitals. 242 pp. Academic Press, New York, 1966. \$10.00.

The Noble Gases. By Isaac Asimov. 171 pp. Basic Books, New York, 1966. \$4.50.

COMPUTATION & COMMUNICATION

Advances in Computers, Volume 6. Franz L. Alt and Morris Rubino, eds. 310 pp. Academic Press, New York, 1965. \$13.00.

Advances in Control Systems, Volume 2. Theory and Applications. C. T. Leondes, ed. 313 pp. Academic Press, New York, 1965. \$13.00.

EDUCATION

A Survey of the Teaching of Physics at Universities. 396 pp. Unesco, New York, 1966. Cloth \$6.50, paper \$4.50.

ELECTRICITY & MAGNETISM

Effective Field Theories of Magnetism. By J. Samuel Smart. 188 pp. W. B. Saunders, Philadelphia, 1966. \$5.25.

Electrical Properties and Structure of Glass. O. V. Mazurin, ed. Transl. from Russian. 158 pp. Consultants Bureau, New York, 1966. \$17.50.

Electrical Resistance of Metals. By George Terence Meaden. 218 pp. Plenum Press, New York, 1965. \$11.50.

Non-Linear Transformations of Stochastic Processes. P. I. Kuznetsov, R. L. Stratonovich, and V. I. Tikhonov, eds. 484 pp. Pergamon Press, New York, 1956. \$20.00.

Electromagnetic and Quantum Properties of Materials. By Allen Nussbaum. 424 pp. Prentice-Hall, Englewood Cliffs, N. J., 1966. \$15.00.

The Theory of Electric and Magnetic Susceptibilities. (Reprint of 1932 ed.) By J. H. Van Vleck. 384 pp. Oxford University Press, Oxford, 1965. Paper \$3.40.

Progress in Radio Science (1960-1963). Vol. VI, Radio Waves and Circuits. URSI Proc. (Tokyo, 1963). F. L. Stumpers, ed. 335 pp. American Elsevier, New York, 1966. \$24.50.

ELECTRONICS

Transistor Physics and Circuits. (2nd ed.). By Marlin P. Ristenbatt and Robert L. Riddle. 549 pp. Prentice-Hall, Englewood Cliffs, N. J., 1966. \$14.00.

Quantum Electronics. By John R. Pierce. 138 pp. Doubleday, Garden City, N. Y., 1966. Paper \$1.25.

Physics of Quantum Electronics. Conf. Proc. (San Juan, Puerto Rico, June 1965). P. L. Kelley, B. Lax and P. E. Tannenwald, eds. 861 pp. McGraw-Hill, New York, 1966. \$24.00.

EXPERIMENTAL TECHNIQUE

Stroboscopes for Industry and Research. By J. Rutkowski. Transl. from Polish by E. Lepa. 262 pp. Pergamon Press, New York, 1966. \$12.50.

Thermoanalytical Methods of Investigation. By Paul D. Garn. 606 pp. Academic Press, New York, 1965. \$19.50.

Measurement and Analysis of Random Data. By Julius S. Bendat and Allan G. Piersol. 390 pp. Wiley, New York, 1966. \$17.75.

Electron Microscopy of Thin Crystals. By P. B. Hirsch, et al. 560 pp. Butterworths, Washington, 1965. \$29.50.

Diffraction Methods in Materials Science. By J. B. Cohen. 357 pp. Macmillan, New York, 1966. Cloth \$8.95, paper \$4.95.

Electronics for Experimenters in Chemistry, Physics and Biology. By Leon F. Phillips. 268 pp. Wiley, New York, 1966. Paper \$3.95.

Reflectance Spectroscopy. By Wesley Wm. Wendlandt and Harry G. Hecht. 298 pp. Interscience, New York, 1966. \$12.00.

Applied Infrared Spectroscopy. David N. Kendall, ed. 560 pp. Reinhold, New York, 1966. \$23.00.

Advances in Mass Spectrometry, Volume 3. Conf. Proc. (Paris, Sept. 1964). W. L. Mead, ed. 1064 pp. Institute of Petroleum, London, 1966.

Electrical Instruments in Hazardous Locations. By Ernest C. Magison. 225 pp. Plenum Press, New York, 1966. \$22.50.

Coatings of High-Temperature Materials. By G. V. Samsonov, et al. 296 pp. Plenum Press, New York, 1966. \$15.00.

Dynamic Mass Spectrometers. By Erich W. Blauth. 185 pp. American Elsevier, New York, 1966. \$13.75. □