

emphasis were given to the very recent work on surface phenomena using field-emission microscopy. Although the work of Gomer and Ehrlich is mentioned, it is not treated in enough detail.

To summarize, *Physical Adsorption of Gases* is a useful text which can be recommended as a convenient summary and compilation of much of what is known about the adsorption of gases on solids. Although suitable for use by graduate students, the specialization of the subject makes the text of interest primarily to research workers in the field.

Topics of Modern Physics. Vol. 1, Geometrodynamics. By J. A. Wheeler. 334 pp. Academic, New York, 1962. \$6.50. *Reviewed by R. Bruce Lindsay, Brown University.*

IN spite of the important role it plays in our daily lives and its key position in macroscopic physics, gravitation remains a tantalizing mystery by no means entirely cleared up by the Einstein general relativity theory of 1916. Moreover, the many attempts to tie in electrodynamics with gravitation, as for example, that of Einstein to create a "unified field theory", have failed to produce satisfactory results. The search for further light on this whole business, however, continues, and the book under review is concerned with one promising lead in this activity.

For the past eight years or so, Professor Wheeler and his students have been studying the geometry of curved empty space to see whether one might not construct out of this alone a model for mass as well as an electromagnetic field. The content of this study Wheeler calls geometrodynamics. The present book is a collection of four articles in this general area, reprinted from

The Physical Review, *Reviews of Modern Physics*, *Annals of Physics*, and *Rendiconti della Scuola Internazionale di Fisica*. In essence, the task of geometrodynamics is to look upon fields and particles not as foreign entities that move around in space and time, but rather as things that are actually constructed out of space itself. This is a view of physics which essentially harks back to the older geometrizing attempts of Riemann, W. K. Clifford, and Einstein. With great ingenuity Wheeler has theoretically constructed entities called *geons* out of electromagnetic radiation in free space. The resulting gravitational field can be shown to be sufficient to hold such an entity together, and it can move through space as a particle exhibiting mass. Wheeler has carried through the construction of various types of geons, and has investigated their properties in detail. He has also sought to extend the treatment to quantum geometrodynamics, with the obvious ultimate aim of fitting the "elementary" particles of high-energy physics into his picture. Unfortunately, this part of the program has so far not met with success.

Genuine comprehension of the details of Professor Wheeler's program and its promise of future accomplishment is possible only to those with a thorough background in general relativity and its associated tensor calculus. Nevertheless, the style is so clear and the physical ideas are so engagingly expressed that most physicists will find a great deal of rewarding reading in these articles. To be sure, the unwary must be warned against possible misinterpretation of such catchy but cryptic phrases as "mass without mass" and "charge without charge".

The publishers are to be congratulated on bringing together these interesting and significant papers in such readily available form.

BOOKS RECEIVED

ATOMIC & MOLECULAR PHYSICS

The Modern Theory of Molecular Structure. By Bernard Pullman. Trans. from 1953 French ed. by David Antin. 87 pp. Dover, New York, 1962. Paper, \$1.00.

BIOPHYSICS & MEDICAL PHYSICS

Self-Organizing Systems 1962. Marshall C. Yovits, George T. Jacobi, Gordon D. Goldstein, eds. Conf. Proc. (Chicago, May 1962). 563 pp. Spartan, Washington, D. C., 1962. \$12.00.

Electrophysiological Methods. Part B of Volume 6 of Physical Techniques in Biological Research. William L. Nastuk, ed. 425 pp. Academic, New York, 1963. \$14.50.

Research Problems in Biology: Investigations for Students. Prepared under the director of the American Institute of Biological Sciences. Series 1, 232 pp. \$.95; Series 2, 240 pp. \$.95. Doubleday Anchor, Garden City, N. Y., 1963. Both paper.

ELECTRICITY & MAGNETISM

Electromagnetic Waves in Stratified Media. By James R. Wait. Vol. 3 of Internat'l Series of Monographs on Electromagnetic Waves, edited by A. L. Cullen, V. A. Fock, J. R. Wait. 372 pp. Pergamon, London, 1962. Distr. in US by Macmillan, New York. \$15.00.

Alternating Current Polarography and Tensammetry. By B. Breyer and H. H. Bauer. Vol. 13 of Chemical Analysis, edited by P. J. Elving and I. M. Kolthoff. 288 pp. Interscience, New York, 1963. \$12.00.

Magnetic and Electric Resonance and Relaxation. Proc. of Colloque Ampère, (Eindhoven, July 1962). J. Smidt, ed. 789 pp. (North-Holland, Amsterdam) Interscience, New York, 1963. \$25.00.

Fundamental Electromagnetic Theory (2nd ed; formerly titled: *Electromagnetic Engineering*). By Ronold W. P. King. 580 pp. Dover, New York, 1963. Paper \$2.75.

Gas Discharges and the Electricity Supply Industry. Conf. Proc. (England, May 1962). J. S. Forrest, P. R.

NEW BOOKS FOR PHYSICISTS

MICROWAVE SOLID-STATE MASERS

By ANTHONY E. SIEGMAN, Stanford University. *McGraw-Hill Series in Electrical and Electronic Engineering*. Off Press
A comprehensive, detailed treatment of the basic physical concepts involved in understanding the solid state maser and an equally detailed review of maser design, performance, and applications. Required quantum mechanical terms are introduced and used in a descriptive fashion, reducing the necessity for mathematical calculation.

INTRODUCTION TO RADIOLOGICAL HEALTH

By HANSON BLATZ, Director, Office of Radiation Control, The New York City Department of Health. Available in January, 1964.

A sound look at the importance of the various aspects of radiological health and the control of radiation exposure of both radiation workers and the general public. In addition to a detailed discussion of radiation sources, the book covers characteristics of radiation, interaction of radiation with matter, biological effects of radiation, maximum permissible doses and concentrations, radiation detection and measurement, shielding, contamination control, radioactive waste disposal, the control of radiological hazards, legal aspects of radiation control, and guarding against and handling of accidents. The text assumes the student has a working knowledge of nuclear physics and the elements of biology.

GROUP THEORY AND QUANTUM MECHANICS

By MICHAEL TINKHAM, University of California, Berkeley. *International Series in Pure and Applied Physics*. Available in January, 1964.

This new volume presents the elements of group theory most pertinent to physical applications and provides a brief but systematic analysis of the quantum mechanics of atoms, molecules, and solids, emphasizing the use of group theoretical techniques. Features: a lucid presentation of the calculation of energy levels and selection rules... a treatment of the magnetic groups with illustrative applications to real magnetic groups... exercises follow each chapter.

ELECTROMAGNETIC FIELDS

By J. VAN BLADEL, University of Wisconsin. *McGraw-Hill Electrical and Electronic Engineering Series*. Available in January, 1964.

A graduate level text which applies certain mathematical methods to the calculation of electromagnetic fields. The book utilizes systematically mathematical techniques such as eigen function methods, variational methods, formulation of problems in terms of integral equations, etc., which are well-known to the mathematical physicist but have only recently become familiar to electrical engineers.

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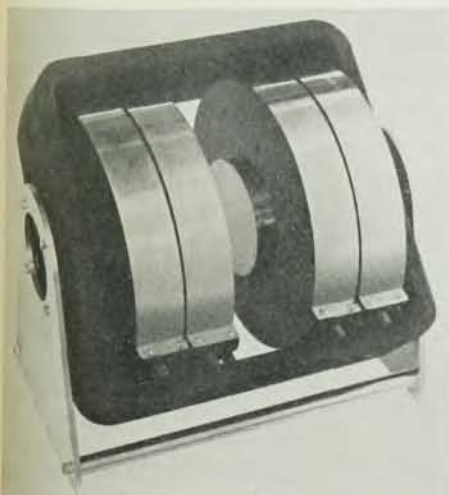


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Howard, D. J. Littler, eds. 677 pp. Butterworths, London, 1962. \$33.50.

EXPERIMENTAL TECHNIQUES

Nuclear Research Emulsions. Vol. 1, Techniques and Theory. By Walter H. Barkas. Vol. 15 of Pure and Applied Physics, edited by H. S. W. Massey. 518 pp. Academic, New York, 1963. \$18.00.

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Analysis Instrumentation—1963. Symp. Proc. (Houston, Spring 1963). L. Fowler, R. D. Eanes, T. J. Kehoe, eds. 261 pp. Plenum, New York, 1963. \$12.50.

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Le Signal du Sourcier. By Y. Rocard. 136 pp. Dunod, Paris, 1962. 19 F.

HANDBOOKS, TABLES, ETC.

Dictionary of Automatic Control in Four Languages: English/American, French, German, and Russian. Compiled by W. E. Clason. American Elsevier, New York, 1963. \$12.50.

HISTORY & PHILOSOPHY OF SCIENCE

Understanding Physics Today. By W. H. Watson. 219 pp. Cambridge Univ. Press, New York, 1963. \$5.50.

Science in Progress, 13th Series. Wallace R. Brode, ed. Sigma Xi—RESA Nat'l Lectureships 1961. 305 pp. Yale Univ. Press, New Haven, Conn., 1963. \$7.50.

On Formally Undecidable Propositions of Principia Mathematica and Related Systems. By Kurt Gödel. Transl. from German by B. Meltzer. 72 pp. Basic Books, New York, 1962. \$3.00.

Induction: Some Current Issues. Henry E. Kyburg, Jr. and Ernest Nagel, eds. Symp. Proc. (Wesleyan Univ., June 1961). 220 pp. Wesleyan Univ. Press, Middletown, Conn., 1963. \$10.00.

Introduction to Dynamic Morphology. By Edmund Mayer. 545 pp. Academic, New York, 1963. \$16.00.

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Foresight and Understanding. An Enquiry into the Aims of Science. By Stephen Toulmin. 115 pp. Harper & Row, New York, 1961. Paper \$1.15.

The Scientific Papers of Sir Geoffrey Ingram Taylor. Vol. 3, Aerodynamics and the Mechanics of Projectiles and Explosions. G. K. Batchelor, ed. 559 pp. Cambridge Univ. Press, New York, 1963. \$17.50.

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Mathematical Aspects of Physics: An Introduction. By Francis Bitter. 188 pp. Doubleday Anchor, Garden City, N. Y., 1963. Paper \$1.25.

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Mathematical Theories of Traffic Flow. By Frank A. Haight. Vol. 7 of Mathematics in Science and Engineering, edited by Richard Bellman. 242 pp. Academic, New York, 1963. \$9.00.

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Introduction to the Theory of Integration. By T. H. Hildebrandt. Vol. 13 of Pure and Applied Mathematics, edited by Paul A. Smith and Samuel Eilenberg. 385 pp. Academic, New York, 1963. \$14.00.

Mathematics and the Physical World. (1959 ed.) By Morris Kline. 546 pp. Doubleday Anchor, Garden City, N. Y., 1963. Paper \$1.95.

Mathematics for Science & Engineering. (Based on *Engineering Mathematics* by Charles P. Steinmetz.) By Philip L. Alger. 366 pp. McGraw-Hill, New York, 1963. Paper \$2.95.

Generalized Functions and Partial Differential Equations. By Avner Friedman. 340 pp. Prentice-Hall, Englewood Cliffs, N. J., 1963. \$10.00.

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Statistical Mechanics. By Kerson Huang. 470 pp. Wiley, New York, 1963. \$10.75.

Introductory Mechanics. By Edwin F. Taylor. 423 pp. Wiley, New York, 1963. \$8.75.

NUCLEAR PHYSICS

Atomic Physics: An Introduction. By Larkin Kerwin. 400 pp. Holt, Rinehart & Winston, New York, 1963. \$7.50.

Fast Neutron Physics. Part II: Experiments and Theory. J. B. Marion and J. L. Fowler, eds. Vol. 4 of Monographs and Texts in Physics and Astronomy, edited by R. E. Marshak. 2292 pp. Interscience, New York, 1963. \$45.00.

Strange Particles. By Robert Kemp Adair and Earle Cabell Fowler. Vol. 15 of Tracts on Physics & Astronomy, edited by R. E. Marshak. 151 pp. Interscience, New York, 1963. \$4.75.

Methods in Computational Physics. Advances in Research and Applications. Vol. 1 of Statistical Physics. Berni Alder, Sidney Fernbach, Manuel Rotenberg, eds. 304 pp. Academic, New York, 1963. \$10.00.

Cosmic Rays. By T. E. Cranshaw. 126 pp. Oxford U. Press, New York, 1963. Paper, \$2.90.

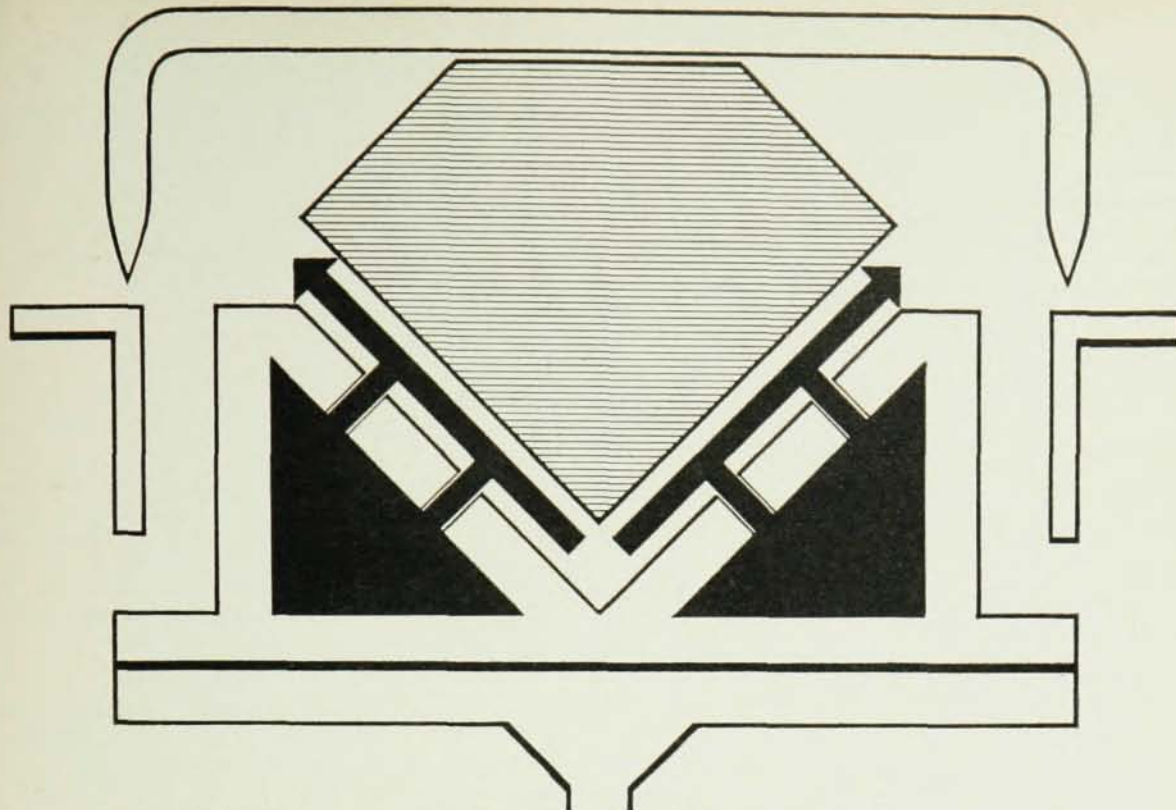
The Optical Model in Nuclear and Particle Physics. By P. B. Jones. Vol. 14 of Tracts on Physics & Astronomy, edited by R. E. Marshak. 118 pp. Interscience, New York, 1963. \$4.50.

Mass Spectroscopy of Organic Ions. F. W. McLafferty, ed. 730 pp. Academic, New York, 1963. \$24.00.

NUCLEAR POWER & TECHNOLOGY

A Manual of Experiments in Reactor Physics. Frank A. Valente, ed. 335 pp. Macmillan, New York, 1963. \$7.50.

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Treatment and Storage of High-Level Radioactive Wastes. Symp. Proc. (Vienna, Oct. 1962). 666 pp. IAEA, Vienna, 1963. Distr. in US by Nat'l Agency for Internat'l Publications, New York. \$13.00.

Radioactivation Analysis. By H. J. M. Bowen and D. Gibbons. 295 pp. Oxford Univ. Press, New York, 1963. \$8.00.

Gamma-Rays of Radionuclides in Order of Increasing Energy. By D. N. Slater. 201 pp. Butterworths, Washington, D. C., 1962. \$9.00.

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Infrared Physics and Engineering. By John A. Jamieson, et al. 673 pp. McGraw-Hill, New York, 1963. \$19.00.

Progress in Optics, Volume 2. E. Wolf, ed. 298 pp. North-Holland, Amsterdam, 1963. Distr. in US by Interscience, New York. \$11.50.

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Hydraulic Transients (2nd ed.). By George R. Rich. 409 pp. Dover, New York, 1963. Paper \$2.50.

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The Mathematical Theory of Viscous Incompressible Flow. By O. A. Ladyzhenskaya. Revised English edition transl. from Russian by Richard A. Silverman. Vol. 2 of Mathematics and its Applications, edited by Jacob T. Schwartz. 184 pp. Gordon and Breach, New York, 1963. \$9.50.

Laminar Boundary Layers. An Account of the Development, Structure, and Stability of Laminar Boundary Layers in Incompressible Fluids, Together with a Description of the Associated Experimental Techniques. L. Rosenhead, ed. Oxford Univ. Press, New York, 1963. \$14.40.

Rarefied Gas Dynamics. Symp. Proc. (Paris, June 1962). J. A. Laurmann, ed. Supplement 2 of Advances in Applied Mechanics, edited by H. L. Dryden, Th. von Kármán, et al. Vol. 1, 541 pp.; vol. 2, 529 pp. Academic, New York, 1963. \$16.00 per volume.

Encyclopedia of Physics, Volume VIII/2, Fluid Dynamics II. S. Flügge and C. Truesdell, eds. 696 pp. Springer-Verlag, Berlin, 1963. DM 198.

Hydrodynamic Resistance and the Heat Loss of Rotating Solids. By L. A. Dorfman. Transl. from Russian by N. Kemmer. 244 pp. Oliver & Boyd, Edinburgh, 1963. 63s.

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Radioactive Tracers in Physical Metallurgy. By C. Leymonie. Transl. from 1960 French ed. by Vernon Griffiths. 208 pp. Wiley, New York, 1963. \$8.50.

The Art and Science of Growing Crystals. J. J. Gilman, ed. 493 pp. Wiley, New York, 1963. \$20.00.

L'Emission photoélectrique et ses Applications. By P. Vernier. 155 pp. Dunod, Paris, 1963. 16 F.

Diffusion in Semiconductors. By B. I. Boltaks. Transl. from 1961 Russian ed. by J. I. Carasso. Edited by H. J. Goldsmid. 378 pp. Academic, New York, 1963. \$14.00.

Luminescence in Crystals. By D. Curie. Transl. from French by G. F. J. Garlick. 332 pp. (Methuen, London) Wiley, New York, 1963. \$8.50.

Invariant Imbedding and Radiative Transfer in Slabs of Finite Thickness. By Richard E. Bellman, Robert E. Kalaba, Marcia C. Prestrud. Vol. 1 of Modern Analytic & Computational Methods in Science & Mathematics, edited by Richard E. Bellman and Robert E. Kalaba. 346 pp. American Elsevier, New York, 1963. \$6.50.

SPACE SCIENCES & AERODYNAMICS

12th International Astronautics Congress (Washington, D. C., 1961). Robert M. L. Baker, Jr., and Maud W. Makemson, eds. Vol. 1, 500 pp., \$22.00; vol. 2, 497 pp., \$22.00. (Springer-Verlag, Vienna) Academic, New York, 1963.

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Space Carrier Vehicles. Design, Development, and Testing of Launching Rockets. By Oswald H. Lange and Richard J. Stein. Supplement 1 of Advances in Space Science and Technology, edited by Frederick I. Ordway, III. 317 pp. Academic, New York, 1963. \$12.00.

TEXTBOOKS

Physical Science. Origins and Principles. By Robert T. Lagemann. 458 pp. Little, Brown & Co., Boston, 1963. \$7.50.

THEORETICAL PHYSICS

Introduction to Quantum Mechanics. By P. T. Matthews. 170 pp. McGraw-Hill, New York, 1963. \$5.00.

Quantum Mechanics (1929 ed.). By Edward U. Condon and Philip M. Morse. 250 pp. McGraw-Hill, New York, 1963. Paper \$2.95.

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Heat Transfer and Fluid Mechanics. Anatol Roshko, Bradford Sturtevant, D. R. Bartz, eds. Inst. Proc. (Calif. Inst. of Tech., June 1963). 288 pp. Stanford Univ. Press, Stanford, Calif., 1963. \$8.75.

X RAYS

Advances in X-Ray Analysis, Volume 6. William M. Mueller and Marie Fay, eds. Conf. Proc. (Denver, Aug. 1962). 480 pp. Plenum, New York, 1963. \$17.50.