

system and rudiments of stellar cosmology), "energy" (mechanics, heat and electricity), and "matter and change" (atomic and nuclear physics, chemistry).

The level is elementary and no mathematical preparation is required, but the contents are definitely up to date. Wherever possible, a historical approach is used, including occasional anecdotes, and the experimental basis of the proposed concepts is described. The explanations at a high pedagogical level, are very clear, concrete and complemented by numerous excellent pictures. Care has been exercised to relate them to everyday life. Practical orders of magnitude are shown in order to help the reader visualize the units. Adequate remarks are introduced about the scientific method, the aims of science and technology, and their public understanding. The advantages of the international metric system are stressed.

Each chapter is concluded with a list of references to more detailed introductory physics books and with an abundant collection of questions and problems, some of which provide an opportunity to stress points of importance and enable the student to check his knowledge, while others will require the instructor's guidance.

The student may be allowed to read this text by himself with hardly a risk of going astray. (The reviewer spotted only one place where confusion might arise: on page 215, in fig. 14-11, the plus sign is placed on the wrong side of the conductor, and might be interpreted as representing a flow of positive charges into the paper while, as explicitly stated, the electron flow goes that way.) However, as is to be expected from a book on such a level, the critically-minded student will find occasional questions to ask his instructor, e.g., why (page 26) a force-free pendulum tends to swing along a fixed path with respect to the stars rather than with respect to the Earth (an appeal to Newton's unmentioned first law).

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The reviewer, who is now a scientific advisor for the Centre de Recherches Routières in Sterrebeek, Belgium, was formerly a teacher at the University of Elisabethville in the Congo.

Models of chemical affinity

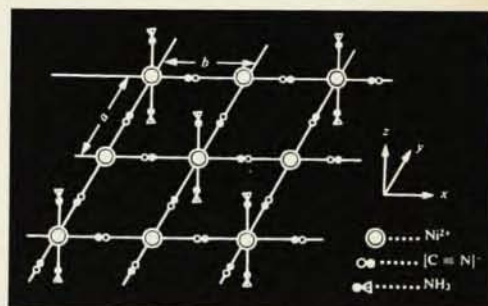
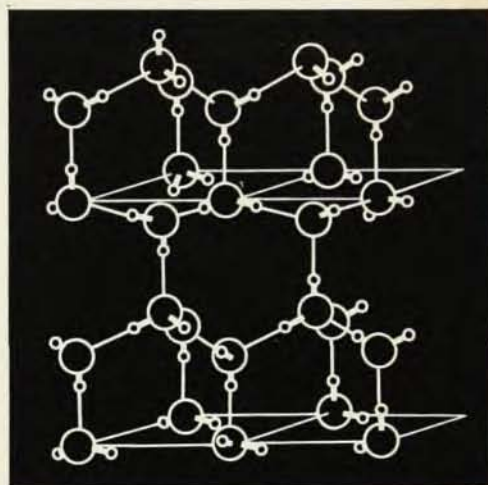
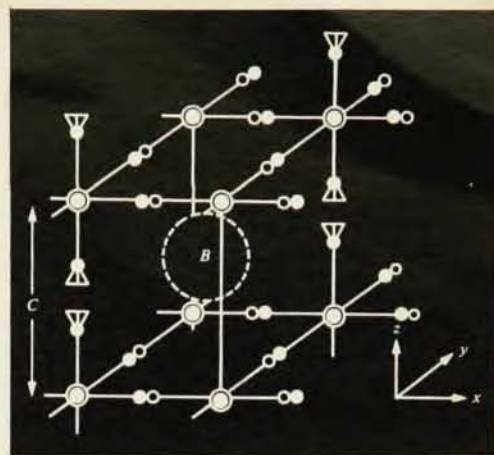
ELECTRONIC STRUCTURE AND CHEMICAL BONDING. By Donald K. Sebera, 298 pp. Blaisdell, New York, 1964. Paper \$3.50.

by M. E. Straumanis

The author of this fine book has been an Assistant Professor of Chemistry at the Wesleyan University in Middletown since 1958. Already in the introduction ("models of nature") he points out and emphasizes that our understanding of nature is based on models, which we build and which are more or less appropriate for the qualitative and quantitative description of natural phenomena. This limited understanding arises from the fact that we feel and recognize the outer world only through our senses, and, therefore, our knowledge about this world must be imperfect. Hence, there are phenomena which cannot be described by models at all. This is also the reason why it is so difficult to describe and understand chemical bonding. The modern ideas concerning bonding are based upon the wave-mechanical model of the atom developed by Heisenberg and Schrödinger in 1926. However, even this model is not the best for a quantitative description of the bonding occurring in various chemical compounds and solids.

The purpose of the book is to present the theories of bonding in such a form that they can be easily understood. The author prefers, therefore, the pictorial method, reducing the use of mathematics to a minimum. The models proposed and based on the present knowledge are explained by some 160 figures in the text.

The book starts with a concise description of the Bohr atom model on 28 pages. The chapter contains only as much in an elementary form as is necessary for the understanding of chemical bonding. Atomic structure and properties are discussed in the next chapter (also 28 pages). Then comes "ionic bonding" (19 pages). In the introduction to this chapter it is said that "... the properties of some substances can be described only by assuming a mixture of more



CRYSTAL MODELS from: *Electronic Structure and Chemical Bonding*. Top: structure of $\text{Ni}(\text{CN})_2 \cdot \text{NH}_3 \cdot \text{clathrate}$. Middle: ice. Bottom: layer structure of $\text{Ni}(\text{CN})_2 \cdot \text{NH}_3$. Symbol definitions in bottom drawing apply also to top one. Originals are black on white. These drawings are not grouped together in book.

than one kind of bonding force." This statement applies, for example, in the case of the nitrides of titanium, zirconium, and hafnium, the bonding

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PHYSICS

PART 1

By ROBERT RESNICK, *Rensselaer Polytechnic Institute* and DAVID HALLIDAY, *University of Pittsburgh*. To be published April 15, 1966. 709 pages. \$7.75.

PART 2

By DAVID HALLIDAY and ROBERT RESNICK. June 1966. \$7.75.

COMBINED EDITION

By DAVID HALLIDAY and ROBERT RESNICK. June 1966. \$13.50.

The new PHYSICS has retained the qualities that caused the older version to be adopted at over 530 schools. The organization remains the same, but a great deal more has been done to prepare the way for the generalizations of relativistic and quantum physics.

MOLECULAR BEAMS

Edited by JOHN ROSS, *Brown University*.

The articles in this volume are reviews of some of the current molecular beam research in the general area of chemical physics. The dominant theme throughout the volume is molecular interactions. The technique of molecular beams has long been recognized as particularly suitable for the determination of the interaction of a single molecule with another molecule, with a photon, with external fields, or with surfaces. The book reflects the increased interest in such experiments in the last ten years. *Volume X in the Interscience Advances in Chemical Physics Series*. 1966. 419 pages. \$15.00.

LASER RECEIVERS: DEVICES, TECHNIQUES, SYSTEMS

By MONTE ROSS, *McDonnell Aircraft*. The author is concerned with laser and electro-optical information systems; the conveying of information from one point to another via use of carrier frequencies from the IR through the visible to UV. The major theme of the book is the presentation of all the fundamental aspects to understanding laser information systems. The book allows you to bring yourself up to the state-of-the-art in laser systems and know its limitations and possibilities. 1966. 405 pages. Prob. \$11.00.

VAPOR DEPOSITION

By CARROLL E. POWELL, JOSEPH H. OXLEY, and JOHN M. BLOCHER, JR., *Battelle Memorial Institute*. Sponsored by the *Electrochemical Society, Inc.* This new work covers not only the many advances made in chemical vapor deposition during the past decade but also covers the increasingly important field of physical vapor deposition, i.e., vacuum evaporation and condensation. This makes available to the reader, in a single volume, an up-to-date and authoritative treatment of these two fields which are both competitive and complementary. Emphasis has been placed on the importance of recent developments in nucleation and transport phenomena as applied to crystal growth during deposition from the vapor. 1966. Approx. 720 pages. \$19.95.

VARIATIONAL PRINCIPLES AND METHODS

By B. L. MOISEWITSCH, *The Queen's University of Belfast, N. Ireland*. This book shows how the various equations of mathematical physics may be expressed as variational principles. Further, it demonstrates how variational principles may be employed to determine the discrete eigenvalues for stationary state problems and to find the values of quantities such as the phase shifts which arise in scattering theory. *Volume 20 in the Interscience Monographs and Texts in Physics and Astronomy*. 1966. Approx. 320 pages. \$14.00.

ELEMENTARY PARTICLE PHYSICS

By STEPHEN GASIOROWICZ, *University of Minnesota*. A new and comprehensive survey of the theoretical ideas which have proved useful in the analysis and interpretation of much of the experimental data obtained in elementary particle physics. 1966. Approx. 560 pages. Prob. \$14.95.

JOHN WILEY & SONS, Inc.

Dependable Tools for the Physicist . . .

THE PHYSICS OF ELECTRICITY AND MAGNETISM

SECOND EDITION

By WILLIAM T. SCOTT, *University of Nevada*. The first edition of this book was adopted by almost 100 colleges and universities. This new Second Edition is sure to have the same success. It is an intermediate, mathematical presentation stressing the physical nature of electric and magnetic fields and their interaction with charges and currents. The book also includes simple and clear derivations of magnetic mirror effects, Busch theorem, plasma oscillations, "freezing-in" of magnetic lines, and the Debye-Hueckel theory of plasmas and electrolytes. 1966. *In Press*.

ELECTRONICS FOR EXPERIMENTERS IN CHEMISTRY, PHYSICS, AND BIOLOGY

By LEON F. PHILLIPS, *University of Canterbury*. The aim of this book is to teach anyone how to design the most important types of switching, amplifying and regulating circuits from first principles, with either tubes or semi-conductor devices. These circuits are the ones which are most commonly involved in the solutions to instrumentation problems in the physical or biological sciences. The author presents a simplified treatment of transistor circuits which avoids the usual complicated formulae but which is still able to provide useful answers to most design problems. 1966. 266 pages. Paper: \$3.95. Cloth: \$5.95.

REFLECTANCE SPECTROSCOPY

By W. W. WENDLANDT and H. G. HECHT, both of *Texas Technological College*. Covers the field of reflectance spectroscopy, from fundamental physical concepts to diverse practical applications for the practicing spectroscopist. Presents the theory, instrumentation, and mode of application of this important spectroscopic technique. Volume 21 in *Interscience Chemical Analysis series*. 1966. 298 pages. \$12.00.

ANALYSIS OF NUMERICAL METHODS

By EUGENE ISAACSON and HERBERT B. KELLER, both of *Courant Institute of Mathematical Sciences, New York University*. Offers a careful analysis of numerical methods that shows the student how they work and why they may fail to work. By covering the most basic methods thoroughly and practically, they enable the student to devise and analyze other methods. Relations between diverse methods are made apparent and applicability to modern computing equipment is stressed, especially in the solution of partial differential equations. 1966. Approx. 528 pages. Prob. \$11.95.

DIFFERENTIAL AND DIFFERENCE EQUATIONS

By LOUIS BRAND, M.D., *University of Houston*. This book emphasizes the striking analogies in general theory and in methods of solution for differential and difference equations. The book develops the first treatment of the analogue of the Mikusinski calculus for difference equations and applies it to their solution. There is a fully illustrated treatment of discontinuous driving functions. 1966. Approx. 624 pages. Prob. \$11.95.

INSOLUBLE MONOLAYERS AT LIQUID-GAS INTERFACES

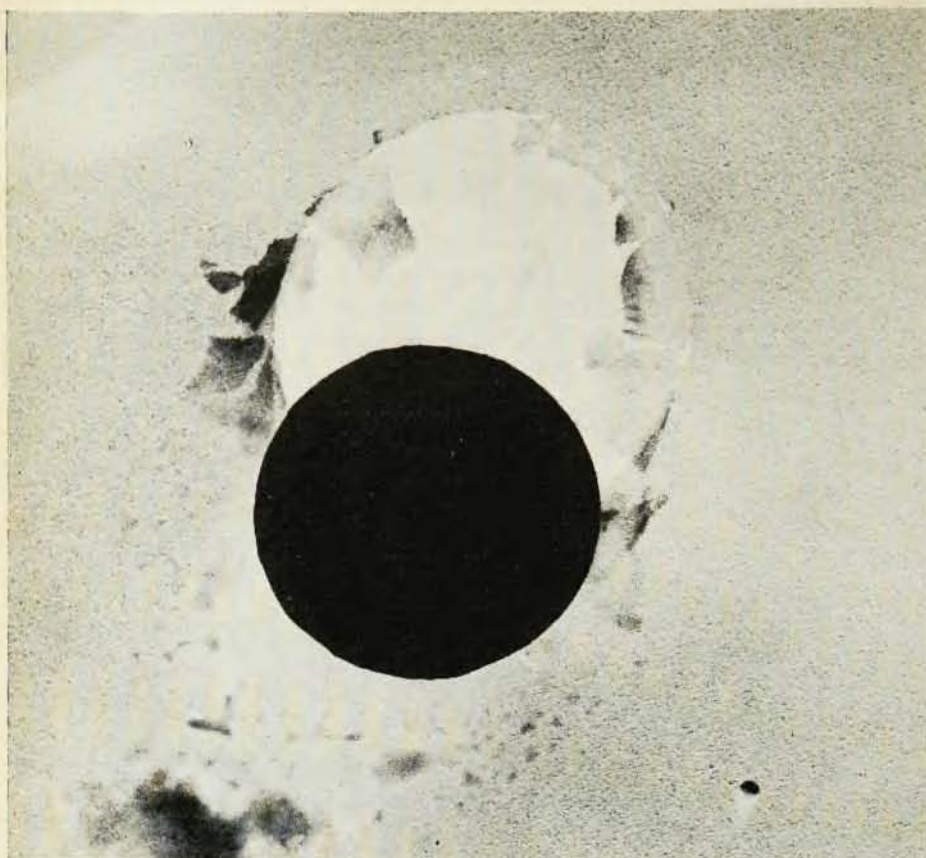
By GEORGE L. GAINES, JR., *General Electric Research Laboratory*. This is the only book (in any language) to deal exclusively with monomolecular films on liquid surfaces. It provides a clear picture of their behavior, as well as details of a large number of available experimental methods, including a discussion of the limitations of these techniques. A volume in the *Interscience Monographs on Physical Chemistry*. 1966. 386 pages. \$14.00.

THE COLLECTED PAPERS OF LORD RUTHERFORD OF NELSON VOLUME 3

Edited under the scientific direction of SIR JAMES CHADWICK, F.R.S. This volume presents Rutherford's scientific papers written during his period as Cavendish Professor from 1919 to 1938. An *Interscience Book*. 1965. 428 pages. \$15.00.

605 Third Avenue

New York, N.Y. 10016



MICROMETEORITE SPHERULE shown on a sheet of collecting material. Diam-

COURTESY C. L. HEMENWAY, DUDLEY OBSERVATORY

eter of sphere is about one micron. From: *Meteors, Comets, and Meteorites*.

of which is ionic and to a small extent metallic (in all probability 2–3%), according to the investigations of this reviewer. Then follows chapter 5: "The new uncertain physics" (7 pages), so called because it explains the de Broglie relationship (light as wave and as particle) and Heisenberg's uncertainty principle. The explanation of the "wave-mechanical model" of elementary particles is given on the next 29 pages; no mathematics is used, only figures and diagrams. The largest chapter of the book (47 pages) is devoted to the "covalent bond." Then follow the chapters: Resonance and molecular orbital theory (30 pages); Complex compounds (31 pages); The metallic bond and semiconductors (34 pages); and "Weak forces—weak bonds" (33 pages). In this last chapter, forces, previously known as van der Waals forces, polarization phenomena (dipoles, HF, H₂O, ice), hydrogen bonding and clathrate compounds are discussed. The last consist of a host lattice, in the cavi-

ties of which other molecules are entrapped, for example, xenon in water under high pressure and below 0°C: Xe (H₂O)₆.

There are some inconsistencies in the text, for instance concerning electrical conductivity of metals on page 235, as compared with the second footnote on page 243. There are also some misprints, for example, in eq. (3.1) on page 50. In some places "bonds" is written instead of "bands" (pages 252, 256, 259).

Nearly all main bonding problems are covered by the book; they are well discussed in an elementary manner. Besides, at the end of each chapter (except 5) references for further studies are given. The book is recommended to all who are interested in an elementary presentation of bonding problems.

However, the reviewer doubts whether chemistry freshmen, especially those without secondary school courses in chemistry and physics (see preface) are sufficiently able to understand the book.

Solar system irregulars

THE PHYSICS AND ASTRONOMY OF METEORS, COMETS AND METEORITES. By Gerald S. Hawkins. 134 pp. McGraw Hill, New York, 1964. Paper \$2.50.

by E. J. Opik

Published in the series in Undergraduate Astronomy, of which the author is consulting editor, one would have expected to see a concise textbook, with clear definitions of the basic notions and precise explanations of how the more advanced knowledge has been arrived at. We are presented instead with an impressionistic sketch of modern developments, to which the author has solidly contributed himself, which may appeal to co-workers in the field but which may baffle the undergraduate who will need guidance, probably from the author himself.

The statements are usually correct and the material presented is of a wide scope for so short a monograph. However, misstatements and faults of presentation are also rather numerous, some of which are quoted or corrected below.

Radiation pressure is not the driving force in comet tails (page 2). A micrometeorite is not necessarily an object "that completely melts" during passage in the atmosphere (page 4). More meteors are not necessarily seen at lower altitudes (page 6); the author has overlooked that the greater volume covered is opposed by the greater distance and faintness of the objects. I in Öpik's equation (1.1, page 7) is not "ergs/sec" but *visual* ergs/sec involving luminous efficiency. Contrary to statements on pages 16–18, almost all the heating of the meteoroid is due to reflected air molecules. On page 17, the deceleration equations lack the *minus* sign, and on page 18, the dimensionless coefficient of efficiency, τ , is given the dimension of "ergs sec⁻¹". The rather sophisticated figure 2.2 is inadequately explained, and its promised "open circle" (page 20) is missing. On page

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E. J. Öpik is a member of the department of physics and astronomy at the University of Maryland and the staff of the Armagh Observatory in Northern Ireland. Meteoritics is one of his specialties.