

THE NATURE OF SOLIDS

Alan Holden. Today almost all scientific or engineering activity requires some knowledge of the physico-chemical properties of solids. Using a simply written, nonmathematical approach, Mr. Holden, a member of the research staff of Bell Telephone Laboratories, Inc., gradually introduces the concepts of modern physics by means of familiar models and analogies, preparing the reader for his sophisticated treatment of electrical conduction, semiconductors, transistors, and magnets. Nearly 200 diagrams.

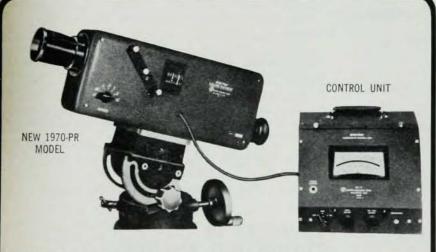
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Chapter 1 is devoted to the study of Boolean algebras from the point of view of finite Boolean operations only (part of the contents can also be found in Birkhoff's Lattice Theory and Herme's Einfuehrung in die Verbandstheorie). Chapter 2 seems to be the first systematic study of Boolean algebras with infinite Boolean operations, and it is the chapter that differs considerably from the first edition. Several sections of Chapter 2 have been extended, and others have been completely rewritten.

No knowledge of lattice theory or abstract algebra is assumed in Chapters 1 and 2, and only fundamental notions from general set theory and set-theoretical topology are needed to comprehend these chapters. Less familiar topological theorems are recalled, and only a few examples use more advanced topological means. All theorems in both chapters are given with full and accurate proofs. On the other hand, no complete proofs are given in the appendix, which contains mainly a brief exposition of certain applications of Boolean algebras to other parts of mathematics.

A comprehensive bibliography (consisting of almost twenty pages) is given at the end of the treatise. Another excellent publication of the Springer-Verlag.

Mechanics of Incremental Deformations. Theory of Elasticity and Viscoelasticity of Initially Stressed Solids and Fluids, Including Thermodynamic Foundations and Application to Finite Strain. By Maurice A. Biot. 504 pp. John Wiley, New York, 1965, \$17.50.

Reviewed by Jacques E. Romain, Gentre de Recherches Routières, Sterrebeek (Brabant), Belgium.

By "incremental deformation" is understood the deformation of a prestressed continuous medium under the action of an additional stress. The continuous medium may be initially at rest or not. The main subjects in which this concept is of use are stability problems and continuous flow; in the latter case the velocity field and rate variables are obtained by a limiting process. The bulk of this book is concerned with stability problems, especially in geophysical applications (horizontal structures submitted to gravity and prestressed by



OUTSTANDING PHYSICS PUBLICATIONS

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Most of the book can be described as a perturbation study of stability problems based on an original approach and a simplified technique that are taken over, systematized, and expanded, from earlier papers of the author. The essential feature is comoving coordinate axes that participate in the local rotation of the continuum. This procedure permits separation of the "physical" local relative displacements of neighboring points (that is, the effective strain to be related to the physical properties of the medium) from the "geometrical" part of the deformation due to the geometry of the strain field (that is, essentially, to nonlocal effects). Exact expressions for the stresses and strains are obtained, which can be linearized in the applications as required. The comoving axes provide a kinematical basis for decomposition of both stress and strain so that a general theoretical frame is available into which any stress-strain relation can be fitted; thus, elastic, viscoelastic, and fluid behavior can be handled from a unified starting point. Tensor calculus is banned from the exposition as likely to impose an unnecessary burden on the reader and to be the origin of possible misinterpretations. The concept of Cartesian tensor, however, is naturally present throughout the work, and tensor notation is used as a shorthand in expressing the final formulas.

Successive chapters deal with a kinematical introduction, statics of elastic media, elastic stability of isotropic or anisotropic media, dynamics of elastic media, mechanics of viscoelastic media (all under initial stress, of course). An appendix contains the essentials of the extension of the author's method to finite strain and continuous flow. The exposition is quite clear, orderly, and close to the physics. The basic concepts are introduced in two dimensions and then extended to three dimensions. The derivations are fully detailed and require little mathematical background.

When there is a second edition, the reviewer would like to suggest that an index of notations be included and that an explicit statement

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Optics

ATLAS OF OPTICAL PHENOMENA

Michel Cagnet, Maurice Françon, and Jean Claude Thrierr, all of the Institut d'Optique et Faculté des Sciences de l'Université de Paris, Fundamental optical experiments are demonstrated in this highly praised volume by means of photographs; each plate is accompanied by explanatory text concerning the experimental sequence in German, French, and English. Sections are divided as follows: geometric aberrations, phenomena of interference in the case of two and more waves, diffraction at infinite and finite distances, polarization, and application of phase contrast and interference contrast when transparent objects are observed. (Prentice-Hall/Springer-Verlag publication). 1963, 90 pp., \$24.00.

Chemistry

NUCLEAR PROPERTIES OF THE HEAVY ELEMENTS, VOL. I, II, III

A three volume set by Earl K. Hyde, Isadore Perlman, and Glenn T. Seaborg, all of the University of California, Berkeley. The most detailed and authoritative account of the properties of the elements from lead to lawrencium in print. These volumes contain the only modern account of the natural radioactivities as well as an extensive description of the 11 synthetic elements beyond uranium. VOL. I: SYSTEMATICS OF NUCLEAR STRUCTURE AND RADIOACTIVITY, 1964, 407 pp., \$15.00; VOL. II: DETAILED RADIOACTIVITY PROPERTIES, 1964, 1107 pp., \$25.00; VOL. III: FISSION PHENOMENA, 1964, 519 pp., \$18.00; Special three volume set price—\$49.50.

Physics

PHYSICS OF THE LOWER IONOSPHERE

R. C. Whitten and I. G. Poppoff, both Stanford Research Institute, California. This new book brings together in a coherent manner the results of recent publications on the subject; the primary purpose is to present current ideas concerning the quiet and disturbed lower ionosphere (50 to 160 km) together with related matters such as ionic reactions, ionization processes, atmospheric structure, etc. The reference list is comprehensive and up-to-date. 1965, 192 pp., \$7.50.

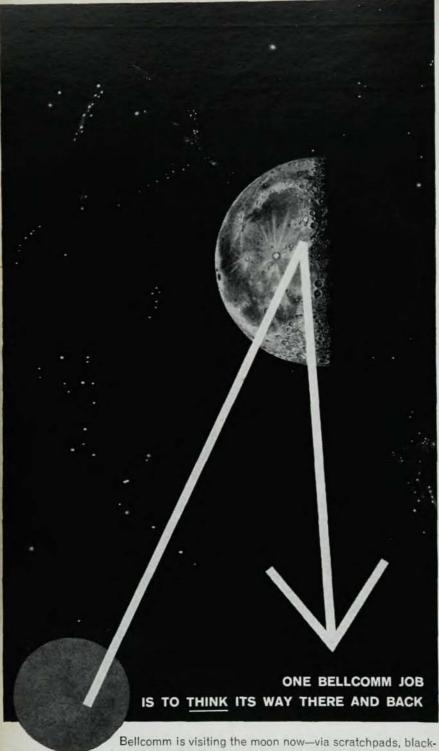
Quantum Mechanics

PROBLEMS IN QUANTUM MECHANICS

V. I. Kogan and V. M. Galitskiy, Moscow Institute of Engineering, Translated by Scripta-Technica, Inc.; Edited by Harold Gersch, Georgia Institute of Technology. This book contains 160 problems in nonrelativistic quantum mechanics—some drawn from the author's courses at the Moscow Institute of Engineering. The text is suitable for undergraduate students, particularly with respect to the mathematics used in the solutions of the problems, i.e., asymptotic expansions, Green's functions, the use of different representation spaces, and simple limiting cases. 1963, 369 pp., \$8.95.

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be made of the rules governing the orientation of the stresses in figures 4.1, 4.2, and 6.2 of Chapter 1, where there seems to be some inconsistency in this respect, probably due to an unstated intention.

Elementary Plasma Physics. By Lev A. Arzimovich. Transl. from the Russian by Scripta Technica. 188 pp. Blaisdell. New York, 1965. Paper \$2.25.

Reviewed by Sanborn C. Brown Massa-

Reviewed by Sanborn C. Brown, Massachusetts Institute of Technology.

There has been a real need for some time for a simple, readable account of what plasma physics is all about, and the present book goes far toward filling this need. Very often when students ask for guidance in finding their way into a subject, one tends to give them technical literature or textbooks to read which are really too detailed for the uninitiated. Professor Arzimovich has produced a very readable short book which can be read in a single sitting and which gives a clear picture of plasma physics.

In the Preface the author writes, "We shall attempt to interpret the fundamentals of plasma physics in a manner understandable to a reader with a high school knowledge of mathematics and physics." This is a little optimistic, particularly for the bulk of our American high-school graduates, since he uses trigonometric and exponential functions, vector and scalar products, as well as gradient operators. On the other hand, he explains in very clear language the meaning of his equations so that the intent of the mathematics is clear.

The author spends a fairly large amount of time discussing the motion of charged particles in electric and magnetic fields, and this would make the book very interesting to any undergraduate student who is taking a standard electricity and magnetism course and wants to look into plasma physics as an extension of the details of the more standard kind of E and M material.

I imagine that Professor Arzimovich did not consider a translation of his book when he originally wrote it. It is a little surprising that he makes no reference whatever to specific contributions outside the Soviet Union. Thus he credits progress to Ioffe, Sakharov.