

theory of liquid helium in its earliest form had just been proposed, second sound, although predicted, had not yet been discovered experimentally, and although x-ray determinations of the structure factor of liquid helium had already been made, the use of neutron spectroscopy for the same purpose and for the determination of the spectrum of elementary excitations was still many years away. All of these topics are thoroughly covered by Atkins, together with discussions of the more recent theories of liquid helium of Bogoliubov, Feynman, Onsager, and Yang and Lee. The book is rounded out with a presentation of experimental and theoretical information regarding properties of helium films, He^3 , and He^3 - He^4 mixtures. In discussing various theories of liquid helium Atkins is careful to give the experimental data which prompt the theory, and experimental results are discussed in the light of the existing theory. Notwithstanding the wealth of material contained in this comparatively short book and its rather detailed presentation, it is still a very readable book.

Almost any book on recent developments in the study of liquid helium could have won a place in the literature for itself by default; Atkins' monograph accomplishes this on its merits.

Progress in Elementary Particle and Cosmic Ray Physics, Vol. 4. Edited by J. G. Wilson and S. A. Wouthuysen. 470 pp. (North-Holland) Interscience Publishers, Inc., New York, 1958. \$12.50. *Reviewed by R. D. Sard, Washington University.*

LIKE its predecessors, this fourth volume of an approximately biennial series consists of critical, self-contained surveys by active workers in the field. The editors have maintained the international character of the series, the authors of the present volume being from Geneva, Madison, Bristol, Durham, Maryland, and Moscow.

The broadening of the title and the editorship, to straddle accelerators and cosmic rays, as well as theory and experiment, is to be welcomed. Compartmentalization should be resisted as long as possible.

The first article, "Some Theoretical Aspects of the Strong Interactions of the New Particles", by D'Espagnat and Prentki, is a critical exposition of the theoretical speculations up to early 1957 on the physical significance of the "strangeness" quantum number. The main experimental results to be correlated were already known at the time of writing, and it appears that this explicit account should still be of value to a reader versed in the transformation properties of abstract spaces.

"The Properties and Production of K-Mesons", by W. D. Walker, is a brief survey of the experimental results again as of early 1957. It includes a presentation of the strangeness scheme, and a presentation of the data on energy and angle distributions in tau decay and the theoretical arguments based on them about spin and parity of the parent. The Revolution of Janu-

ary 1957 has demolished the parity arguments, but the considerations about spin are still cogent.

"The Interaction of Mu-Mesons with Matter", by G. N. Fowler and A. W. Wolfendale, is mainly of interest as a survey of experiments bearing on apparent anomalies in the behavior of fast mu mesons, in many of which the authors have been involved. To the reviewer, who has also worked in this field, the evidence for anomalies seems on the whole rather ghost-like, enveloped in the clouds of uncertain particle identification, naïve sampling, and noise analysis, and uncertain theoretical prediction. A major step toward clarification has recently been made by Fukui et al. (*Phys. Rev.* 113, 315, 1959). The survey under review is required reading for anyone venturing into this difficult field, if only for the warnings it contains.

"The Primary Cosmic Radiation and its Time Variations", by S. F. Singer, is a well-written and well-organized presentation, some 125 pages long. It contains a wealth of reference material on geomagnetic theory and high-altitude observations, as well as some stimulating comments on current research problems.

V. L. Ginzburg's "The Origin of Cosmic Radiation" is a presentation of his theory that most of the cosmic radiation comes from supernovae, and perhaps novae, in our galaxy. The nonthermal radio and optical emission from them is regarded as evidence for very high-energy electrons, up to some 10^{12} ev, and whatever mechanism it is that accelerates the electrons is assumed also to accelerate protons and complex nuclei. The article surveys present knowledge of the primary cosmic radiation near the earth and of cosmic radio-emission, presenting many useful theoretical results on magnetic bremsstrahlung. The reviewer is not competent to compare Ginzburg's theory with its rivals, but he is impressed by the physical insight and breadth of view shown in this article.

The book is attractively printed and bound, but there are more typographical and editorial slips than one is accustomed to in this series.

Applied Mathematics for Engineers and Scientists. By C. G. Lambe. 518 pp. The Macmillan Co., New York, 1959. \$8.50. *Reviewed by J. Gillis, Weizmann Institute of Science.*

THIS is a welcome addition to the series of excellent textbooks which have been appearing under the general editorship of Sir Graham Sutton. Let us hope that the dichotomy "engineers and scientists" will not cause offense to members of the first group.

The material is all completely standard and includes dynamics of particles and of rigid bodies; Lagrange's equations with applications; statics of a rigid body and of ropes and chains; structural statics, hydrostatics, hydraulics, and elementary hydrodynamics; the wave, heat-flow, and Laplace equations, leading to the study of Legendre and Bessel functions. The examples, both those worked out in the text and also those set as exercises for the student, are abundant and well chosen.

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Edited by K. Lark-Horovitz and Vivian A. Johnson

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August 1959, 548 pp., illus., \$14.50

Volume 10, December 1959

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By William Low

November 1959, about 200 pp., illus., approx. \$7.50

Advances in ELECTRONICS and ELECTRON PHYSICS

Edited by L. Marton

Volume 11. Contributors: G. E. Barlow, W. Brauer, P. Görlich, O. Hachenberg, R. Clark Jones, R. L. Königsberg, J. A. Ovenstone, Z. G. Pinsker, Henry R. Riblet, R. M. Sternheimer, and F. F. Thonemann.

September 1959, 523 pp., illus., \$15.00

Volume 12. Photo-Electronic Image Devices as Aids to Scientific Observation

Proceedings of a Symposium Held in London, 1958

Edited by J. D. McGee and W. L. Wilcox

Late 1959, about 425 pp.

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1959, 171 pp., illus., \$6.80

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Expanded and Improved Edition

By Eugene P. Wigner

Translated from the German by

J. J. Griffin

1959, 372 pp., illus., \$8.80

Volume 6 Mathematics in Physics and Engineering

By J. Irving and N. Mullineux

THIS BOOK describes the analytical and numerical (desk calculator) methods which arise most frequently in present-day pure and applied science. The subject matter of the volume has formed the basis of lecture courses given to students of mathematics, physics, and engineering, at both undergraduate and graduate levels.

1959, 883 pp., illus., \$11.50

Volume 7 Absorption and Dispersion of Ultrasonic Waves

By K. F. Herzfeld and T. A. Litovitz

This book demonstrates what ultrasonic investigations can reveal about the molecular processes occurring in fluids. Theoretical arguments and calculations are given in considerable detail.

1959, 535 pp., illus., \$14.50

Volume 8 Wave Propagation and Group Velocity

By Leon Brillouin

With a contribution by

Arnold Sommerfeld

The first three chapters are translations of classical papers which are not readily accessible today. The remainder of the volume brings the subject up to date.

November 1959, about 160 pp.

ACADEMIC PRESS, New York and London



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Moreover, the author seems to have taken care to pick examples with a live physical interest.

In the space of some 500 pages it would hardly have been possible to deal completely with all these subjects, but one is surprised at how well they have in fact been treated. The book is certain to prove popular in colleges of technology, and if a second edition is contemplated, perhaps it might also contain a section on elasticity.

It is a matter of common experience that the level of mathematical education actually attained by many "engineers and scientists" is often below what is desirable, and even below what is formally demanded by the educational institutions involved. One can only express the hope that the existence of Prof. Lamb's book will contribute something to the solution of this problem.

The Way Things Are. By P. W. Bridgman. 333 pp. Harvard U. Press, Cambridge, Mass., 1959. \$5.75. Reviewed by R. Bruce Lindsay, Brown University.

FOR the past thirty years the interest of P. W. Bridgman in problems connected with the foundations of physics has been reflected in a stream of books and articles which have received careful attention by scientists and philosophers. The first two of his books *The Logic of Modern Physics* (1927) and *The Nature of Physical Theory* (1936) presented not only a distinguished experimental physicist's searching critique of concept-making in science but also developed a characteristic viewpoint with regard to physical theorizing to which the name "operational" has come to be attached. As the years have passed Professor Bridgman has widened the scope of this viewpoint to include other aspects of human intellectual activity, particularly with reference to the relation between the individual and society. This in turn has led him to consider more deeply the whole process of understanding human behavior in general. In the present volume he has assembled the results of his latest thinking. It is not quite correct to say that herein lies his whole philosophy, since he has made no attempt to construct a formal system. Rather he considers here in turn a whole series of puzzling topics, ranging from language and logic through physical methodology to psychology and sociology.

Needless to say the volume is as provocative of thought as all Bridgman's writings have been, and it will be examined with great interest. The very title arouses a query: is it as dogmatic as it seems to be? The author would deny any such imputation, since he evidently means the title to imply that the book is on "the descriptive level". Yet throughout the interpretations are those of Bridgman. It could hardly be expected to be otherwise since the author quite honestly takes the extreme individualistic standpoint about human knowledge, and continually stresses as his cardinal principle that "we never get away from ourselves". Those critics who in the past have called him a solip-

sist, will find much in the present volume to reinforce their conclusion.

The physicist will inevitably be most interested in the discussion of topics in logic, probability, and the physical sciences, including references to the nature of "truth" in science, experiment, measurement, and the concepts of quantum theory. The treatment throughout is strongly colored by the operational attitude. Bridgman appears to be as unhappy as ever with the arbitrary construction of concepts and hypotheses which characterizes modern physical theorizing (and in a certain sense has also characterized most successful physical theories of the past considered in the light of their time), and still gropes for more meaning for theories on the macroscopic level of actual experience. This is an interesting and valuable point of view. There seems however to be no guarantee of its ultimate effectiveness as a tool in scientific discovery. The psychology of scientific invention is still a mystery. We know only that there have existed clever people with ingenious ideas which they have been able to sell to other competent people for exploitation. At first these ideas look very arbitrary. Familiarity later seems to remove much of the arbitrariness, particularly if the theories actually "work".

The present reviewer is not competent to judge the impact of the psychological and sociological implications of the author's point of view, as set forth at the end of his book, on the professionals in these fields. Speaking for himself he does not find the conclusions about the place of the individual in society very convincing, particularly for example with reference to the author's adversely critical attitude toward the graduated income tax and related matters. This might seem peculiar since the reviewer has always thought himself as much of an individualist as Professor Bridgman. But these are much more difficult matters than theoretical physics and demand a more elaborate analysis than the author has been able to give in the restricted space at his disposal.

It is to be hoped that Professor Bridgman's book will be widely read by both scientists and nonscientists since it contains many ideas which must be reckoned with, expressed in vigorous and challenging fashion.

Theorie der Stabilität einer Bewegung. By Joel G. Malkin. Translated from Russian into German by W. Hahn and R. Reissig. 402 pp. R. Oldenbourg, Munich, Germany, 1959. DM 47.00. Reviewed by T. Teichmann, Lockheed Missiles and Space Division.

THE stability theory of differential equations is of interest not only because of its intrinsic importance in the complete theory of differential equations but also because of its growing significance in practical applications. In the latter field, it is basic for the effective application of numerical and approximate methods to the solution of equations and to the determination of stable regimes of physical systems. There are three main approaches to dealing with prob-