

BOOK REVIEWS

The Science of Science. Methods of Interpreting Physical Phenomena. By Russell Fox, Max Garbuny, and Robert Hooke. 243 pp. Walker, New York, 1963. \$5.95.

Reviewed by R. B. Lindsay, Brown University.

The enormous growth of all branches of science, which is one of the characteristics of our time, points up the need for continued attention to the public presentation of modern scientific ideas in terms which the intelligent layman can understand. Actually, the many books that have been written to popularize the achievement of twentieth-century physics have been by no means uniformly successful. Many tend to bog down in a mass of factual detail, while others concentrate primarily on elaborate but not too well explained pictures. The authors of the present volume have limited themselves to the attempt to examine with care some aspects of physics which are basic to its existence as a science. Thus, they discuss at length such topics as the nature of experiment and what it means to measure something, the need for precise units for physical quantities, the handling of errors of measurement, the importance of the use of mathematics in physics, etc. The result is a kind of small-scale, pragmatic philosophy of physical science. It does not pretend to go thoroughly into the nature of physical law and theory, but it does give the reader a rather good idea of what the physicist is up against in the laboratory and what he does about it.

One chapter, entitled "Extending the Senses," contains an instructive but at the same time entertaining account of the way in which physical methods and instruments have been able to extend the domain of human sensation to sounds the ear cannot hear and light which the eye cannot see. This provides an appropriate introduction for a survey of atomic and nuclear physics, treated mainly from the standpoint of instrumentation. In order that the reader may not get too exaggerated an impression

of the precision of physical measurements the authors have inserted several chapters on the limitations imposed on measurement by "noise" in its various forms. The treatment of fluctuation phenomena is adequate, but probably should have been developed in somewhat greater detail in order to be meaningful to the average reader. Toward the end of the book, indeed, the treatment tends to become a little too sophisticated for the purposes the authors have in mind.

The style of writing throughout is both clear and agreeable. There are a large number of clear diagrams and attractive halftones. The book is pleasant to read and should appeal to a wide range of readers.

Mechanical and Electrical Vibrations. By J. R. Barker. 221 pp. (Methuen, London) Wiley, New York, 1964. \$3.50.

Reviewed by C. H. Holbrow, Haverford College.

Vibratory behavior is a phenomenon of great importance to physics. Nearly every physical system is capable of vibration in some sense. The richness and high state of development of branches of mathematics suitable for describing linear systems make available some particularly powerful and useful mathematical tools for physical analysis. One consequence is that systems which are apparently different physically have important underlying features in common. For example the similarity of a simple pendulum and an *LC* circuit is not immediately evident, nor is it clear what a mass bobbing at the end of a spring has in common with a gyrating object.

Dr. Barker has written this book to emphasize the underlying similarity of the different vibratory systems while developing and explaining the mathematics used in their analysis. The subject is developed carefully with numerous examples drawn from a variety of oscillatory systems. After an analysis of simple free vibrations, simple forced vibrations, and damped forced vibrations, he discusses lumped

and distributed systems, duality, linearity and nonlinearity, superposition, and the response of a linear system to a general forcing function. All of these topics are discussed with careful reference to physical example.

The latter portions of the book introduce the use of generalized and normal coordinates, generalized forces, and Lagrange's equations for the construction of a general theory of linear vibrating systems. Analysis of linear systems in terms of complex numbers is also developed with particular reference to electrical circuits. There is no attempt to discuss Fourier series or integrals in any detail. This omission is purposeful with the aim of keeping the level of the book suitable for undergraduates.

The book is very well written and for the most part is at a level suitable for undergraduates. It serves admirably to illustrate the underlying similarity of outwardly disparate phenomena and clearly reveals the power and utility of the methods used to analyze such systems. The price of the book is reasonable, and I strongly recommend it for undergraduates studying mechanics beyond the introductory level.

Monte Carlo Methods. By J. M. Hammersley and D. C. Handscomb. 178 pp. (Methuen, London) Wiley, New York, 1964. \$4.75.

Reviewed by George Weiss, Rockefeller Institute.

Monte Carlo methods have the apparent attraction of providing results, while requiring a minimum of cerebral effort. It is the moral of this book that careful design of Monte Carlo experiments can pay off, often in orders of magnitude of calculation time saved. Dr. Hammersley, in particular, has made many contributions to Monte Carlo methodology, particularly in the introduction of the technique of antithetic variables, to reduce considerably the variance of estimates.

This monograph, a worthy addition to the Methuen series, gives an