

Books

Neutron Diffraction. By G. E. Bacon. 299 pp. Oxford University Press, New York, 1955. \$5.60. *Reviewed by Bernard T. Feld, Massachusetts Institute of Technology.*

Although the mechanisms of neutron and x-ray scattering by atoms are very different, the same wave phenomena (diffraction, refraction) are encountered in the scattering of beams of either neutrons or x-rays by material media. Consequently, the field of neutron diffraction, for the study of the structure of matter, has been able to take over, with only minor modifications, the vast store of theoretical and experimental knowledge already developed for the x-ray crystallographer. And, quite naturally, this new field has attracted many scientists already well versed in x-ray techniques and theory. This monograph is essentially a handbook to facilitate the rapid conversion of experimenters, already conversant with x-ray crystallography, to the use of neutrons. The first half describes the techniques of neutron diffraction, which are indeed very different from those involving x-rays, and summarizes the major theoretical differences between the two fields. The second half is a review of the major results already achieved by neutron diffraction techniques. The emphasis here is on those types of investigations for which neutrons are peculiarly suited; i.e., the study of crystals containing light elements, especially hydrogen, the study of alloys and compounds containing atoms of neighboring atomic number, and the study of magnetic structure.

Foundations of Quantum Theory. A Study in Continuity and Symmetry. By Alfred Landé. 106 pp. Yale University Press, New Haven, Conn., 1955. \$4.00. *Reviewed by E. Richard Cohen, North American Aviation, Inc.*

Quantum theory is usually introduced as the resolution of the paradox of black body radiation. This approach follows the historical development of the theory; it is not necessarily the best or most logical one. Professor Landé has assembled in three succinct chapters a logical development based on deductions from a few fundamental generalizations concerning the allowable models of a physical world. The principle of continuity of cause and effect—"infinitely small causes never produce finite effects"—is applied to the Gibbs paradox of the entropy of diffusion and this leads directly to the concept of fractional likeness values for the states of a system and the splitting of one state into component

states. The symmetry of the observable properties of states not only leads to the broad classes of Bose and Fermi statistics, but also (and perhaps more importantly) implies the Nernst heat theorem.

The material presented in this book has been collected from several articles which have previously appeared in the journals. Their compilation into a concise unit produces a thought-provoking book. It may, however, be debatable whether the development is as completely deductive as Professor Landé would like one to believe. At some points the uniqueness of the solution cannot be proven. It is possible that the postulates given here do not imply a unique solution; still they help to place quantum mechanics on a firmer philosophical basis and help to unite it with "classical" physics as a logical and necessary development of postulates which are apparently purely classical. That this is at all possible is, in itself, a unifying step in physical concepts.

Transmission-Line Theory. By Ronold W. P. King. 509 pp. McGraw-Hill Book Co., Inc., New York, 1955. \$12.00. *Reviewed by T. Teichmann, Missile Systems Division, Lockheed Aircraft Corporation.*

Since its early development, mainly at the hands of Kelvin, Heaviside, and Pupin, electromagnetic transmission-line theory has been treated almost exclusively from the electric circuit viewpoint. This is easily understandable because of the elegance and ready applicability of these techniques to infinite line problems. Unfortunately, strictly infinite lines do not exist, and though many long lines may, to a good approximation, be treated as infinite, the end effects, as also the effects of inhomogeneities and discontinuities, cannot be treated within the framework of ordinary circuit theory, though it is in some cases possible to modify long-line theory to take into account these phenomena.

In order to provide an esthetically satisfying, as well as a mathematically complete account of transmission-line theory, it is necessary to embed the usual telegraphy equations in an electromagnetic field theory setting, which shows both the nature of the approximations involved in obtaining these equations, as well as the corrections required when the equations are no longer completely valid. This is one of the aims of King's book; the other being the extensive development of the subject on the basis of such a comprehensive approach.

The book starts with a discussion of the infinite line, both from the circuit theoretic and field theoretic points of view. Validity of the telegraphic equations is discussed in some detail for various geometric configurations and some properties of the solutions are touched on. The next chapter deals with the properties of terminated lines, giving the relevant potential functions and voltage equations along the line. The equivalent uniform line with a long terminal impedance is presented, together with the solution and its interpretation in terms of effects. Various properties of the propagation functions and characteristic impedances