

book is a useful introduction for anyone who wants to take his studies deeper. Personally, I would have preferred to see those references assembled in an appendix and not given in footnotes. There are so many of them that at times a layer of text seems to float on a heavy substratum of reference, leading to that heckling of the text by footnotes against which protests have been lodged in other spheres. But the references are given, which is the main thing.

Prof. Tintner would, I am sure, be the first to acknowledge the shortcomings of this book, some of which are due to the imperfections of the subject and some to the difficulty of expressing advanced statistical methods in terms which economists can assimilate, and a few of which are his own responsibility. But all students of econometrics will want to read it, and it should do much to widen interest in a frustrating but extremely important field awaiting scientific exploration.

M. G. KENDALL

PRINCIPLES OF QUANTUM THEORY

Quantum Theory

By David Bohm. (Prentice-Hall Physics Series.) Pp. ix+646. (New York: Prentice-Hall, Inc.; London: Constable and Co., Ltd., 1952.) 45s. net.

DR. DAVID BOHM has written a highly individual account of the non-relativistic quantum theory, his aim being to express the known results in terms of comparatively qualitative and imaginative concepts at an elementary level. The emphasis is mainly on the physical interpretation and logical structure of the theory, and the explanations given are unusually thorough. This is not to say that the mathematical development is neglected; the text contains neat derivations of most of the standard results. Altogether the book will be very valuable to the thoughtful student.

The first seven chapters develop the physical formulation of the quantum theory, which is built up rather inductively from the hypotheses of Planck and Einstein, the Bohr orbit theory and de Broglie's wave theory. This involves a careful discussion of the correspondence and uncertainty principles and of the changes produced by the process of observation. Dr. Bohm is successful in conveying the physical picture behind the quantum assumptions.

Chapter 8 is concerned with rather abstract matters. There are a discussion of the concepts of motion and of causes and an exposition of the difficult concept of complementarity. Dr. Bohm develops the interesting parallel between the uncertainties of quantum mechanics and the erratic nature of our thought processes; throughout the book are many biological analogies.

The second part of the book develops the mathematical formalism of wave functions, expectation values and probabilities, and the third part gives the usual solutions of standard problems. Proper importance is given to the classical limit, which is established by the W. K. B. approximation. There is a useful chapter on matrix methods, which are used effectively in various parts of the book, but the Dirac notation is not introduced. Three chapters are devoted to perturbation theory, both stationary and time-dependent. There is also an excellent chapter on scattering theory, which, in

keeping with the rest of the book, contains an adequate discussion of the validity of the various approximation methods and of the equivalence of the time-dependent and stationary methods of solution. It is perhaps surprising, in a book of 640 pages, to find no account of relativistic electron theory or of second quantization; even the treatment of the symmetry properties of many-particle wave-functions is sketchy.

That the text is discursive may be judged from the fact that the theory of the hydrogen atom does not appear until p. 345. Wave mechanics is at best a queer business; some readers might be more willing to accept the concept that "the properties of matter are opposing potentialities which become precisely defined only at each other's expense and in interaction with an appropriate environment" if preceded, rather than followed, by the evidence that this point of view does at least lead to agreement with the very precise spectroscopic experiments.

The concluding chapters contain an account of the quantum theory of measurement and include a discussion of the famous paradox of Einstein, Rosen and Podolski which has played such an important part in clarifying our ideas on this subject. This leads on to Dr. Bohm's argument for the orthodox view, which he stresses in many earlier chapters, that the peculiarities of quantum mechanical behaviour cannot be attributed to the effects of hidden parameters acting classically. The argument gains greater interest as later papers show that Dr. Bohm now regards this view as open to question.

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ADVANCES IN PROTEIN CHEMISTRY

Advances in Protein Chemistry

Edited by M. L. Anson, Kenneth Bailey and John T. Edsall. Vol. 7. Pp. viii+411. (New York: Academic Press, Inc., 1952.) 8.50 dollars.

THIS latest volume of "Advances in Protein Chemistry" is a feast for the physical chemist, for five of the six articles deal with physical methods applicable to the study of proteins, or the results of such studies. This is inevitable, as three of the articles, comprising well over half the volume, deal with various aspects of the fibrous proteins (the structure of collagen fibrils; muscle contraction and fibrous muscle proteins; and the proteins of the mammalian epidermis), and these protein systems have been studied mainly by physical methods. Perhaps the volume is rather overweighted by these related topics.

The articles vary widely in their treatment and complexity. The review entitled "Infra-Red Analysis of the Structure of Amino-acids, Polypeptides, and Proteins", by G. B. B. M. Sutherland writing from Ann Arbor, should be compulsory reading for every honours student studying chemistry, biochemistry or physics; it gives an excellent survey of fundamental principles, methods, results and difficulties. On the other hand, the article on "Muscle Contraction and Fibrous Muscle Proteins" (H. H. Weber and H. Portzehl, of Tübingen) starts simply enough, "Muscle works by alternating between contraction and relaxation", and ends honestly, "Neither the study of