Books

Elementary Theory of Angular Momentum. By M. E. Rose. 248 pp. John Wiley & Sons, Inc., New York, 1957. $10.00. *Reviewed by B. T. Feld, Massachusetts Institute of Technology.*

A thorough knowledge of the quantum mechanical properties of angular momentum—the effects of its combinatorial properties on the nature of the stationary states of complex systems, on the angular and energy distributions and correlations in reactions, on the transition and decay properties of nonstationary systems, etc.—has become an indispensable member, if not the core, in the arsenal of the present-day experimentalist. Unfortunately, this is a subject usually rather inadequately covered in the standard texts on Elementary Quantum Mechanics and in most graduate courses at this level. Consequently, the graduate student of experimental leaning, if he does not go beyond such elementary courses, is frequently inadequately prepared to cope with the interpretation of the increasingly precise and detailed experiments made possible by the phenomenal improvements in technique of the past decade.

For the experimentalist desirous of bridging this gap the task is rendered more difficult by the scarcity of books and review articles on a sufficiently elementary, yet complete, level to introduce him into the field. Almost everybody, theorists included, who is today conversant with the manipulation of the Clebsch-Gordan coefficients first acquired this skill through study of the classic text of Condon and Shortley (*Theory of Atomic Spectra*, Cambridge University Press, 1935); but this book is hard sledding and the subject matter no longer commands the universal interest among physicists that it did twenty years ago. The very short monograph of Feenberg and Pake (*Notes on the Quantum Theory of Angular Momentum*, Addison-Wesley Publishing Company, 1953) contains applications to subjects of greater current interest; but it is all too brief.

Thus, the student who wishes to become acquainted with the elegant generalizations by Racah to systems containing more than two angular momenta and their applications in the spectra of complex atoms, with the pioneering applications by Wigner of the combinatorial properties of angular momenta to the systematics of light nuclei, with the recent triumphs of the shell model, in all of its ramifications, to nuclear spectroscopy is forced to rely almost entirely on the periodical literature, or on brief summaries of techniques given in texts on more general subjects. Since the treatments in these sources are usually far from elementary and certainly not uniform in approach, the reader is usually confused, frequently discouraged, and all-too-often ends by deciding to leave these complicated questions of interpretation to the "theoretikers".

This book will contribute greatly to the alleviation of the situation described above. The first half develops the general theory of the coupling of two or more angular momenta and the properties of tensor operators. The derivations and proofs are detailed and complete and, in some of the more important proofs, alternative approaches are developed. The second half contains a variety of applications mainly, but not exclusively, to nuclear structure and reactions. Three appendices give the properties and some tables of Clebsch-Gordan and Racah coefficients, the Rotation Matrices, and the Spherical Harmonics. These contain much useful material, but the inclusion of more extensive tables would have added much to the usefulness of this work.

In general the discussion is physically motivated and clearly developed. The examples are all interesting and cover a good fraction of the main fields of current research. However, it would have been perhaps pedagogically useful to include some simple examples, in which the extremely elegant and general techniques are not needed and sometimes even superfluous. Indeed, a thorough treatment of what, adopting the standards of this text, might be called "Elementary Theory of Angular Momentum" would still be a useful addition to the literature. Nevertheless, this is a badly needed and long awaited work, and one which is likely to broaden the horizons of many a physicist.

Causality and Chance in Modern Physics. By David Bohm. 170 pp. D. Van Nostrand Co., Inc., Princeton, N. J., 1957. $5.00. *Reviewed by R. B. Lindsay, Brown University.*

The theory of quantum mechanics has been well established for the past thirty years. Its great success in introducing order and predictability into atomic physics has made its position in modern physics a secure one in spite of the difficulties the extension to field theory and nuclear structure have encountered. Since the quantum mechanical concepts and postulates marked a radical departure from those of classical physics, it is not surprising that there has been a continuing interest in the logical structure of the theory; this applies not only to the philosophers of science but to physicists themselves. Any new and strange formalism is bound to stimulate a desire to interpret it in terms of macroscopic experience. Ever since the formulation of Heisenberg's indeterminacy principle the accepted interpretation of the quantum mechanical state function has been in probability terms, with the implication that the behavior of atomic systems follows statistical rather than deterministic rules. Since statistical reasoning has for a long time been acceptable in physical theorizing and has had notable success in providing a reasonable basis for such parts of classical physics as thermodynamics, this situation would hardly seem to call for raised eyebrows, were