BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

Lectures in Scattering Theory

Author	A. G. Sitenko
Publisher	Pergamon Press, Ltd. (1971)
Pages	269
Price	$13.50
Reviewer	Richard K. Osborn

In the Preface it is stated that these lectures on scattering theory are intended for presentation to students specializing in theoretical nuclear physics. This statement is more an indication of the level of sophistication to be anticipated in the presentation than of the range of interest and application of the contents. Students specializing in theoretical atomic and molecular physics should also find most of the subject matter of this book informative and useful. As to the level of sophistication, the first chapter is an excellent guide to what to expect. It consists of a brief review of some of the formalism of quantum mechanics important to the analysis of reactions. If it can be read easily, with the comfortable feeling that one is treading thoroughly familiar ground, then probably much of the content of half of the book is readily accessible and worth studying. The first six and the last (the twelfth) chapters deal with fairly conventional notions, e.g., the S matrix, the t matrix, relations between the elements of these matrices and transition probabilities and cross sections, and some of the symmetry properties of these matrices and their physical implications. The presentation is smooth, swift, and remarkably lucid if the frequently asserted relations or consequences are obvious enough to be passed over without immediate questioning. I have never read a more enlightening account of these matters than is provided here, but I cannot recommend it as introductory.

These lectures are devoted to the formal theory of reactions and may seem somewhat remote to the engineer or the applied scientist who encounters these notions in the context of his mathematical descriptions of macroscopic systems. The elegance of the formal analysis is due in no small part to the fact that it can allow (indeed require) infinite times during which, or infinite volumes within which, two-body encounters can be initiated and completed. But, for example, the description of reactions appropriate for incorporation into the Boltzmann equation must accommodate to finite times and/or finite spatial regions. This is emphasized by the fact that many important reaction rates are sensitive to the environment in which they occur. It is not at all a trivial matter to translate the insights gained from the formal theory into terms appropriate for practical application.

Chapters seven through ten provide a breathtakingly rapid coverage of the analytic properties of the scattering matrix. For many of us this is rather unfamiliar terrain and one must pick one's way carefully (and often times laboriously) in order to proceed successfully from one point to another. The path leads deviously, though always purposefully, through first the complex energy plane and then the complex angular momentum plane. Singular features are sought for, found, and identified as to their physical significance. There are many rewarding insights for the newcomer in these parts, but they are not gleaned effortlessly.

Chapter 11 is a formal introduction to scattering in a three-particle system.

In summary, I found the book remarkable for the breadth and depth of its coverage of the subject and for the smoothness of the presentation of it. But I would hesitate to recommend it to anyone who neither is, nor ever has been, a serious student of theoretical physics.

Richard K. Osborn (BS, MS, Michigan State University; PhD, Case Institute of Technology, 1951) after six years at Oak Ridge in physics and teaching in the reactor school, and as a lecturer in the graduate school of physics at the University of Tennessee, came to the University of Michigan in 1957. He has been a member of the Nuclear Engineering faculty since that department was created in 1958. Although his interests are so broad that he might be considered a jack-of-all-trades, he is certainly a master of nuclear physics, reactor dynamics, statistical mechanics, and plasma physics. He is also a master in the classroom, famous for his inimitable lecture style. He is co-author, with Sidney Yip, of The Foundation of Neutron Transport Theory *(1967).*