On the whole, this reviewer found it an interesting book but feels that the "pedestrian" would have to be reasonably fit to appreciate it.

*Malcolm Harvey*

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*About the Reviewer: Malcolm Harvey gained an Honours BSc (1st Class) in mathematics at the University of Southampton in 1958 and then a PhD in applied mathematics in 1961 studying first with H. A. Jahn and then J. P. Elliott. His thesis was concerned with a "New Method for Calculating Spectra of Light Nuclei" and dealt with the application of the group $SU_3$ as applied to nuclear structure. A National Research Council of Canada fellowship brought him to Chalk River in 1961 where he joined the staff in the Theoretical Physics Branch in 1962. Apart from a year spent on a Ford Foundation Fellowship in the Niels Bohr Institute in Copenhagen, he has remained at Chalk River. His professional interests are in the many-body problem as it exists in the atomic nucleus with the application of group theory.*

**Linear Transport Theory.** By Kenneth M. Case and P. F. Zweifel. Addison-Wesley Publishing Co. (1967). 342 pp. $17.50.

All students of neutron transport theory are aware of some of Professor Case's many contributions to the field. It is therefore a particular pleasure to welcome this authoritative and clear exposition of linear transport theory, or one-speed neutron transport theory as the work might almost equally well have been entitled. In some respects, this book is a successor to the earlier volume "Introduction to the Theory of Neutron Diffusion" by Case, deHoffmann, and Placzek. In both, the emphasis is on one-speed theory and on a thorough description of those few problems that have been solved in closed form. In the present volume, the class of solved problems is carried a good deal farther, partly because some progress has been made in the last 14 years and partly because the earlier Placzek work was designed to be followed by an analysis of further standard problems. Moreover, the present volume differs from its predecessor in that the standard problems are all solved by application of the method of singular eigenfunction expansion (commonly called Case's method) rather than Fourier transform or other techniques.

The book begins with a section on general properties of the transport equation and its solutions, including a belabored bit on symmetry properties and some nice material on uniqueness, Green's functions, and reciprocity. This is followed by a chapter on transport in purely absorbing media, including a development of integral theory and escape probabilities.

In the middle half of the book, the method for solving the one-speed transport equation by expansion in singular eigenfunctions is systematically formulated. Completeness and orthogonality of the eigenfunctions is proved and application is made to standard problems including the infinite-medium Green's function, half-space Green's function, Milne problem, albedo problem, and critical slab problem. The time-dependent infinite-medium Green's function is found in two different ways. Most of the development is for problems in plane geometry, but it is indicated how some results can be generalized to spherical or even to cylindrical geometry.

Numerical methods are next discussed, notably the $P_L$ and $S_n$ methods, and some comparisons (not all correct) are made with the exact results for standard problems. The method of invariant imbedding is described briefly. Finally, it is shown how the methods that were formulated for neutron transport can be applied to other fields of physics, including sound propagation, radiative transfer, and plasma theory. In a series of 12 appendixes some mathematical aspects are treated in some detail.

A student confronting this work should presumably have some familiarity with more elementary treatments of transport problems. In addition, he must know some theory of functions of a complex variable. The reviewer wondered whether it might even have been worthwhile to include a chapter reviewing relevant aspects of this theory and introducing methods for solution of singular integral equations. However, the level of mathematical complexity seems to have been kept near the necessary minimum. Indeed, the authors chose not to discuss some important problems, including the spectrum of operators in boundary-value problems, so as to avoid the mathematical difficulties.

In summary, this book contains an elegant and unified treatment of the most important solved problems in one-speed neutron transport theory. From a practical point of view, a knowledge of these solved problems is useful, first of all for developing intuition concerning solutions of transport problems in general, and more importantly, for comparison with solutions obtained by practical numerical methods so that one may judge their accuracy. This book, when combined with the extensive tabulations in the earlier Placzek work, should prove very useful for both purposes.

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**Introduction to Quantum Theory of Scattering.** By Leonard S. Rodberg and R. M. Thaler, Academic Press (1967). 389 pp. $11.50.

This book is addressed to the graduate student having a background in quantum mechanics of about one year. It concentrates on a few of the central ideas of scattering theory and has the unique feature of going at some important problems, such as potential scattering, from several different viewpoints. A particularly clear account is given in Chap. 2 of the wave-packet description and the justification of the stationary-state description of scattering. Chapters 3, 4, and 5 are devoted to the formulation of the differential and integral equations for potential scattering. Methods of solving these equations are presented and the commonly used approximations are discussed.

The next four chapters are devoted to more general methods and processes, including the operator formalism time-dependent approach, the $S$ and $K$ matrices, and