relate nuclear models to each other and to first principles. In 1964 he published a book with the title *Unified Theory of Nuclear Models*. Here his unifying element was the notion of the self-consistent field. When this field was spherical, it provided the usual shell-model potential. In other instances, the self-consistent field was nonspherical, and then the nucleus possessed rotational excitations. In either case, certain linear combinations of particle-hole excitations in the self-consistent field had the character of vibrational states. Thus, a single framework was available for treating the different nuclear models.

Actual calculations require matrix elements of the true nucleon-nucleon interaction between particles moving in the states of the self-consistent field. Since 1964, Brown and his collaborators have carried out an ambitious program of calculating these matrix elements, using techniques of modern many-body theory to handle the hard core of the internucleon potential. Thus Brown believes that he has brought nuclear forces within his unified scheme, and has amplified his book to include these new developments. Chapters on the theory of nuclear matter and on Brueckner theory have been added also. Both the original volume and this one contain a chapter on the optical model of elastic scattering.

The first time nine chapters of this book, also included in the 1964 edition, could serve as a text for a graduate-level course in nuclear structure theory. Brown's arguments are always very physical. He is not afraid of formalism, but the formalism is always presented in a way that makes its physical content transparent. However, the pace is swift, and the reader must be prepared to fill in many of the intermediate steps himself. It seems to me that the chapters added in this second edition are more difficult. They provide a summary of progress to date in this rapidly developing field, one that will be useful to the specialist but not to the student coming to this material for the first time.

This book is thoroughly modern in its outlook. It gives an excellent picture of nuclear structure theory in the 1960's, a field to which Brown himself has made many contributions. Finally, its bibliography is a valuable list of important recent papers.

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August 30, 1967

About the Reviewer: The reviewer, now an Associate Professor in the Physics Department of the University of Minnesota, did his undergraduate studies, in chemical engineering, at Cooper Union and his graduate studies at the University of Edinburgh. He has worked in the Bohr Institute at Copenhagen and has served on the faculty at Princeton. Dr. Bayman's present professional interests concern nuclear structure and nuclear reactions, particularly nucleon-nucleon correlations derivable from reactions that transfer two nucleons to or from a target.

Lie Groups for Pedestrians. By H. J. Lipkin. 2nd Edition. John Wiley & Sons, Publishers, New York, N. Y. (August 4, 1966). 180 pp. $6.50.

In this little book of less than 200 pages, the author shows in a painless way how Lie Groups are applied in physical problems. Here many of the standard proofs, properties, and problems of group theory are neglected in favor of understanding the few properties needed in physics.

The book is based on two series of talks—at Argonne National Laboratory in 1961 dealing with the atomic nucleus, and at Illinois University concerned with elementary particles. The merger actually concentrates more on the applications to elementary particles. The main text contains mostly general principles with Appendixes A, B, and C dealing with the specific example of the group SU_3 in the field of elementary particles. Appendix D merely reminds us what a headache phases can be.

The author has approached his subject in an unconventional way by a direct study of the finite number of infinitesimal or generating operators of the continuous Lie Groups of infinite dimensions. In fact, only a fleeting glimpse is given of the connection between the generating operators and their associated group. Since, however, most physical properties are deduced from the algebra of the generating operators, this neglect is in keeping with the general theme of this book. Because of the unconventional approach, references in the text are avoided. In the Bibliography only a few (less than 25) general references are given. This drastic step could be annoying to the reader intending a further study when he comes across, as he will on many occasions, such phrases as " . . . it can be shown . . . " and " . . . it is well known that . . . ." There is also the risk of misleading a student who may not be aware of theorems and properties well established using the conventional approaches. (This reviewer never found, for example, the definition of a group!)

The book opens with a discussion of the algebra of angular momentum operators, the connection with the rotation group in three dimensions being covered by an " . . . it is well known . . . " phrase. We are then shown the simple generalization of the angular momentum concept to other Lie Groups and how their properties are shared by bilinear combinations of creation and destruction operators. With operators like the fermion creation and destruction operators for neutrons and protons, it is shown in Chapter 2 how to construct the isospin group and we are thus lead to a simple demonstration of the power of the group concept in physical problems (consequences of charge independence, etc.). Chapter 3 extends the logic with the addition of a third fermion particle, the Λ-hyperon, and develops the algebra and predictions of the Sakata model of elementary particles with the symmetry of the group SU_3. The abstract properties of the group SU_3 are emphasized in Chapter 4 where the three types of operators of the previous chapter are replaced by three types of boson operators in the three-dimensional Harmonic Oscillator. The connection is then established with the Elliott classification of states in the nuclear many-body problem. The algebra of pairs of fermion operators is extended in Chapter 5 with the introduction of the pairs that change the number of particles. Here the questions of "pairing quasispins" and symplectic symmetry are considered. The chapter ends with a brief but interesting look at pairs of boson operators that do not preserve the number of quanta and the non-compact groups. Chapter 6 skips lightly over the general ideas of permutations, bookkeeping, and Young diagrams in seven pages with the specific example of SU_3 relegated to Appendix A.

In the second edition of the book, a Chapter 7 has been added which extends the ideas of the previous chapters to groups of higher rank: These have been in nuclear theory for some time and have been used in recent years in the discussions on elementary particles.

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

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September 12, 1967

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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September 14, 1967

About the Reviewer: George Bell is a member of the Theoretical Physics Division of the Los Alamos Scientific Laboratory. His work in reactor physics includes contributions to the theory of cavity reactors, resonance absorption, neutron transport, and stochastic theories of neutron multiplication. He is a fellow of the American Nuclear Society and the American Physical Society.

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