physicists and may contain a great deal more of interest to nuclear engineers than does the present text.

An adequate subject index, but no author index, concludes the present volume.

Edward M. Eyring (BA, physics, 1955, PhD, physical chemistry, 1960, University of Utah) is professor and formerly chairman of chemistry at the University of Utah. His research involves the determination of rates and mechanisms of reactions in liquid solutions and at solid-liquid interfaces. Nanosecond laser flash photolyses, laser Debye-Sears ultrasonic absorption measurements, and laser photoacoustic spectroscopy (but not picosecond spectroscopy) are numbered among his frequently used laboratory techniques.

A Shell Model Description of Light Nuclei

Author I. S. Towner

Publisher Oxford University Press (1977)

Pages 383

Price $24.50

Reviewer Sidney A. Coon

This book is one of a series, titled "Oxford Studies in Nuclear Physics," aimed at the beginning research student. It presents the traditional calculational apparatus of the shell model in a form accessible to the student, but its true subject is of great interest to the general nuclear structure theorist and experimentalist. Or, in the author's words, "the central theme of this book is to trace the steps from the free nucleon-nucleon interaction to the properties of light nuclei." Towner's goal is slightly more ambitious than that of George Bertsch's *The Practitioner's Shell Model* (1972), which emphasized the "qualitative effect of configuration mixing on the physical observables" in terms of the properties of the nucleon-nucleon interaction. This more recent book features a clear, patient exposition with many references for further study, but one sometimes misses the deep intuitive insight and novel results of Bertsch's book. The evident care that has gone into Towner's derivations, in many cases an improvement in pedagogy over the originals in the literature, and a wider range of subjects make this book more suitable for self-study.

After a chapter on mathematical preliminaries, Towner begins by discussing the computation of the binding energy of a spherical closed-shell nucleus in the Hartree-Fock approximation. The free nucleon-nucleon interaction features strong short-range components. They were tamed by Brueckner with the construction of a reaction matrix that expresses the interaction between a pair of nucleons in a background of spectator nucleons. This weakened effective interation can be used in a Hartree-Fock-like mean field theory (misnamed Brueckner-Hartree-Fock theory) to compute the binding energy and static properties of closed-shell nuclei. The simple particle-hole excitations of these nuclei are then discussed with a schematic effective interaction rather than a realistic (i.e., derived with the Brueckner approach) interaction.

In the second half of the book, the author discusses the shell model approach to the calculation of the properties of closed-shell nuclei with one or more additional particles, the so-called open-shell nuclei. He gives a readable presentation of the Bloch-Horwitz demonstration that degenerate perturbation theory could be used to produce an effective Hamiltonian in a truncated model space whose eigenvalues were the true energies of the system. The often-confusing business of eliminating the energy dependence of the resulting effective interaction by the introduction of "folded" Goldstone diagrams receives an especially clear treatment here.

The final two chapters are more phenomenological in that the discussions could be made without reference to the free nucleon-nucleon interaction. Angular momentum considerations dominate the calculation of observables from the eigenfunctions of a Hamiltonian chosen to describe a nucleus or set of nuclei with more than two particles outside a closed shell. The last chapter develops shell model expressions for spectroscopic factors of direct nuclear reactions in which one or more nucleons are transferred from a target to a residual nucleus.

The first half of this book relies heavily on review articles already in the literature. It is good, however, to have this material together with the standard, but daunting, treatment of the Racah angular momentum algebra. Valuable features are the short histories of results and applications at the end of each chapter. These histories seem to end in most cases with papers published in 1974, although the publication date of this typewritten book is 1977. This time lag between the literature cited and the publication date leaves the reader with more pessimism than warranted about progress toward the goal of calculating the properties of nuclei from the two-nucleon interaction. Work in the last four years inspires a modest hope that it is not an unrealistic goal. At any rate, the groundwork is well described in this book.

Sidney A. Coon (PhD, physics, University of Maryland, 1972) is the author of papers on the free nucleon-nucleon interaction, static properties of closed-shell nuclei, and simple open-shell nuclei. He has worked at the University of Liège and the Technical University of Hannover and is currently a research associate in the Physics Department at the University of Arizona.

The Subnuclear Zoo

Author Sylvia Engdahl and Rick Roberson

Publisher Atheneum Publishers

Pages 101

Price $5.95

Reviewer Hugh F. Henry

This is an *extremely* broad-brush treatment of the entire field of atomic structure. In some 98 rather small pages