



Peter Ring, Peter Schuck

# The Nuclear Many-Body Problem

**Series: Theoretical and Mathematical Physics**

It is the aim of this book to describe in concise form our present theoretical understanding of the nuclear many-body problem. The presentation of the enormous amount of material that has accumulated in this field over the last few decades may be divided into two broad categories: One can either concentrate on the physical phenomena, such as the single-particle excitations, rotations, vibrations, or large-amplitude collective motion, and treat each of them using a variety of theoretical methods; or one may stress the methodology and technical aspects of the different theories that have been used to describe the nucleus. We have chosen the second avenue. The structure of this book is thus dictated by the different methods used—Hartree-Fock theory, time-dependent Hartree-Fock theory, generator coordinates, boson expansions, etc.—rather than by the physical subjects. Many of the present theories have, of course, already been presented in other textbooks. In order to be able to give a more rounded picture, we shall either briefly review such topics (as in the case of the liquid drop or the shell model) or try to give more updated versions (as in the cases of rotations or the random phase approximation). Our essential aim, however, is to present the more modern theories—such as boson expansions, generator coordinates, time-dependent Hartree-Fock, semiclassical theories, etc.—which have either never been seen, or at best had little detailed treatment in, book form.

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