# SHAPE COEXISTENCE AND THE EFFECTIVE NUCLEON–NUCLEON INTERACTION

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The phenomenon of nuclear coexistence manifests itself in the presence of close-lying nuclear states with very different intrinsic properties. Spectacular examples of coexistence are superdeformed states, low-lying deformed states in spherical nuclei, yrast traps, and pairing isomers. One of the most exciting aspects of the coexistence phenomenon is the fact that the excited coexisting states often retain their identity at rather high excitation energies. Indeed, the lowest observed gamma transitions in superdeformed bands correspond to states lying several MeV above the yrast line, i.e., in the region of very high-level density. This means that superdeformed configurations do not mix with many near-lying states; they are very diabatic.

In most cases, energies of coexisting states strongly depend on particle number. For instance, the neutron-deficient Hg isotopes have well-deformed prolate ground states containing the high-$j$ proton orbitals “intruding” across the $Z$=82 gap, while the ground states of heavier Hg isotopes are only weakly deformed, and they can be associated with oblate shapes. Such crossings between coexisting structures are particularly interesting in light nuclei; they can give rise to the presence of deformed ground states in magic nuclei such as $^{32}$Mg.

The main objective of this work is to trace back the phenomenon of shape coexistence to properties of the effective nuclear Hamiltonian. In our analysis, we apply the self-consistent Skyrme-HF method and the nuclear shell model. The sensitivity of the interplay between the coexisting configurations is discussed in terms of several key quantities such as the single-particle splitting, pairing correlations, monopole energy, and quadrupole correlation energy.

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