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Nuclear Structure Studies Based on Energy Density Functionals

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The self-consistent nuclear mean-field framework based on universal energy density functionals provides an accurate description of ground-state properties and collective excitations over the entire nuclear chart, from relatively light to super-heavy nuclei, and from the valley of beta-stability to the particle drip-lines.
Based on this framework, structure models have been developed that go beyond the mean-field approximation and take into account collective correlations related to restoration of broken symmetries and fluctuation of collective variables. These include the generator-coordinate method with projections on particle number, angular momentum and parity, the collective Hamiltonian for quadrupole and octupole degrees of freedom, the microscopic interacting boson-fermion model. Among the most interesting recent applications of this framework are studies of shape evolution and shape-phase transitions: the occurrence of rigid triaxial deformations, quadrupole and octupole shape transitions in rare-earth nuclei and light actinides, and signatures of shape transitions in odd-mass nuclei.

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