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Structures, shapes theory

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Modern nuclear structure theory is rapidly evolving towards regions of short-lived nuclei far from stability. The principal objective is to build a consistent microscopic theoretical framework that will provide a unified description of bulk properties, nuclear excitations and reactions. Stringent constraints on the microscopic approach to nuclear dynamics, effective nuclear interactions, and nuclear energy density functionals, are obtained from studies of the structure and stability of exotic nuclei with extreme isospin values, as well as extended asymmetric nucleonic matter.

Recent theoretical advances in the description of structure phenomena in nuclei far from stability are reviewed: applications of the global shell model approach and the self-consistent mean-field framework in the study of the evolution of shell structure with isospin and the disappearance of spherical magic numbers, the onset of deformation, shape transitions and shape coexistence, the microscopic description of the evolution of neutron skin and the low-energy multipole response in neutron-rich nuclei.

Primary author: Dr VRETENAR, Dario (University of Zagreb)

Presenter: Dr VRETENAR, Dario (University of Zagreb)

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