STRUCTURE OF EXOTIC NUCLEI: A THEORETICAL REVIEW

Shan-Gui Zhou[1,2,3,4]

[1] CAS Key Laboratory of Frontiers in Theoretical Physics, Institute of Theoretical Physics, Chinese Academy of Sciences, Beijing 100190, China
[2] School of Physics, University of Chinese Academy of Sciences, Beijing 100049, China
[3] Center of Theoretical Nuclear Physics, National Laboratory of Heavy Ion Accelerator, Lanzhou 730000, China
[4] Synergetic Innovation Center for Quantum Effects and Application, Hunan Normal University, Changsha, 410081, China

Nowadays, the study of exotic nuclei—nuclei with ratios of neutron number N to proton number Z very different from those of nuclei found in nature—is at the forefront of nuclear physics research because it not only reveals novel nuclear properties and thus enriches our knowledge of atomic nuclei but also helps to understand the origin of chemical elements in stars and star explosions. With the development of radioactive ion beam (RIB) facilities around the world, more and more unstable nuclei become experimentally accessible. Many exotic nuclear phenomena have been observed or predicted in nuclei far from the β stability line, such as neutron or proton halos, the shell evolution and changes of nuclear magic numbers, the island of inversion, soft-dipole excitations, clustering effects, new radioactivities, the BCS-BEC crossover in dilute neutron matter, giant neutron halos, the shape decoupling between core and valence nucleons in deformed halo nuclei, etc. To describe the structure of exotic nuclei, one needs to modify traditional nuclear models or develop new theoretical approaches. In this talk, I will present a review of theoretical study of exotic nuclear structure. I will first introduce characteristic features and new physics connected with exotic nuclear phenomena and then highlight some recent progress.