

Emergence of two simple, dominant structures in nuclei

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The last decade has seen a number of views of nuclear structure placed into sharper contrast. The occurrence of low-energy quadrupole vibrational degrees of freedom is in doubt [1]. The occurrence of shape coexistence in all mass regions may be realized [2, 3]. From this stark contrast, two irrefutable types of structure emerge: deformed nuclei with associated rotational excitations and spherical nuclei with associated seniority-dominated excitations.

The best cases of the two types of structure will be presented. This will be followed by consideration of the mixing of such structures: mixing of two different deformations, of two seniority structures, and of a deformed structure with a seniority structure. This will be illustrated using data, i.e., at a phenomenological level. Mixing appears to follow distinct patterns and hierarchies.

Within this framework, low-energy vibrations emerge as weakly collective (RPA-type) modes that are limited to one-phonon excitations. The challenge is to understand the emergence of deformation in regions at and near closed shells. These issues will be considered from the perspective of data and future experimental needs.

[1] P.E. Garrett and J.L. Wood, *J. Phys. G: Nucl. Part. Phys.* **37** (2010) 054028.

[2] K. Heyde and J.L. Wood, *Rev. Mod. Phys.* **83** (2011) 1467.

[3] Focus on shape coexistence in nuclei, edited by K. Heyde and J.L. Wood, *J. Phys. G: Nucl. Part. Phys.* **43** (2016) No. 2.