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Prevailing triaxiality of heavy deformed nuclei

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It has been widely believed that most of heavy deformed nuclei have axially-symmetric prolate ground states and gamma-vibrational excitations for the second 2+ states. This prolate-shape dominance is stated in many textbooks. Aage Bohr seemed to have found this structure from observed data. The pairing + quadrupole-quadrupole (P+QQ) model of Baranger and Kumar supported this hypothesis. But, observed double-gamma-phonon states show challenges. Recently, Monte Carlo Shell Model with more realistic interaction [1] showed that in many nuclei, this hypothesis is not the case, and that the low-lying states are triaxially deformed. This new picture is a consequence of the monopole-quadrupole interplay, which leads to the self-organization towards most favorable shapes [1,2]. Once the traiaxial shapes arise, the Davydov model can be used for the modeling of levels and transitions [3]. Although the rigid triaxiality is not a very precise picture, the Davydov model is useful. I would like to recall that Davydov is an Ukrainian physicist, who now contributes a lot to the deep understanding of nuclear structure.

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