$j-1$ Anomaly Across the Shells

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The nuclear shell model and the particle-deformed core models are two of the cornerstones in the modern nuclear physics. Their success in describing low-energy features in atomic nuclei is guaranteed by the adiabatic principle which allows to disentangle single-particle from collective excitation modes. As a consequence the nuclei with well pronounced shell-model behaviour are clusterized around the magic numbers, while nuclei with large number of valence particles form the regions of collectivity on the Segré chart, placed in between these magic gaps. In practice, however, spherical states can be found in a region of deformed nuclei and vice versa. The seniority concept, for example, is well understood within the spherical shell model approach, but it is completely "orthogonal" to the deformed shell model picture. However, recent data on the anomalous $j-1$ states seems to support a gradual evolution between the spherical and deformed regimes, suggesting that some of the spherical shell model features survive in the mass regions of well developed collectivity.

This contribution is built on a systematics of low-lying intruder states from within isotopic and isotonic chains of nuclei with three neutron holes.

Acknowledgements
This study is supported by the Bulgarian National Science Fund under contract DFNI-E02/6.