

A symmetry connecting the shell, collective and cluster models

J. Cseh¹,

¹Institute for Nuclear Research, POB 51, 4001 Debrecen, Hungary

Abstract

The fundamental models of nuclear structure are based on different pictures: shell, collective (liquid drop), and cluster (molecule). In 1958 a simple symmetry (SU(3)) was found [1–3] which connects these models for the case of a single-shell problem. As for the more general situation is concerned, many illuminating contribution came from different approaches later on.

In this contribution I plan to present another simple symmetry, the multiconfigurational dynamical symmetry (MUSY), which turns out to be the common intersection of the three basic models for the multi-shell problem [4].

I wish to discuss briefly its algebraic background and some of its interesting physical features.

Further contributions show, how the connecting symmetry can be applied for the determination of the stable configurations (shape isomers) of the nucleus [5], and how the spectra of different energy windows and configurations can be described in a simple and unified way [6].

References

- [1] J. P. Elliott, Proc. R. Soc. A 245 (1958) 128; 562.
- [2] K. Wildermuth, Th. Kanellopoulos, Nucl. Phys. 7 (1958) 150.
- [3] B.F. Bayman, A. Bohr, Nucl. Phys. 9 (1958) 596.
- [4] J. Cseh, Phys. Rev. C 103 (2021) 064322.
- [5] J. Darai, contribution to this workshop.
- [6] G. Riczu, contribution to this workshop.