



physics



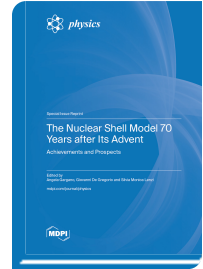
Special Issue Reprint

The Nuclear Shell Model 70 Years after Its Advent: Achievements and Prospects

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This reprint explores the fascinating world of nuclear physics, focusing on the shell model, which is one of the most important concepts for understanding atomic nuclei structure. Within this model, the complexity of the nuclear many-body system is drastically reduced by considering a limited number of nucleons moving in a reduced model space and interacting via effective forces that account for the missing degrees of freedom. Since its birth about 70 years ago, this model has been successfully applied to investigating the rich structure of atomic nuclei, with important implications in astrophysics and physics beyond the standard model. In recent years, experimental tools allow the exploration of regions of the nuclide chart towards the drip lines; this has led to the discovery of new and unexpected phenomena, whose interpretation has required large computation efforts and the development of more efficient codes and has also probed the reliability and robustness of the shell model in describing the behavior of nuclei far from the valley of stability. Substantial progress has also been achieved in deriving effective shell-model interactions from the force between free protons and neutrons, as well as in developing advanced techniques to include the effects of the continuum. This reprint provides an overview of the shell model's status and future developments. It illustrates its versatility and power in understanding the structure of nuclei, including processes related to other branches of physics.



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