Challenges and prospects in low-energy nuclear theory[*]

Witold Nazarewicz[1,2]

[1]*Facility for Rare Isotope Beams, Michigan State University,*
East Lansing, Michigan 48824, USA and
[2]*Faculty of Physics, University of Warsaw, Warsaw, PL-02-093, Poland*

Understanding atomic nuclei is a quantum many-body problem of incredible richness and diversity and studies of nuclei address some of the great challenges that are common throughout modern science. While powerful nuclear facilities provide access to entirely new phenomena at different resolution scales, nuclear theory has completely transformed our view of the nucleus and nuclear matter in extreme conditions. In this talk, advances in low-energy nuclear theory will be reviewed in the context of the overarching scientific questions and opportunities provided by the extreme-scale computing, machine learning, and advanced statistical approaches. The nuclear-theory paradigm now shifts from models, each of which describes a subset of the properties of nuclei and nuclear matter, to a comprehensive theory that can produce predictions with well-quantified uncertainties.

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