Emerging Collectivity in Nuclei, Shape Coexistence, and Proton-Neutron Interactions

R. F. Casten,
Wright Nuclear Structure Laboratory, Yale University, New Haven, CT

The growth of collectivity and phase transitional behavior in nuclei is one of the central questions facing nuclear structure studies today and in the future, especially with the advent of new generation facilities for the study of exotic nuclei. Several new developments relating to these issues will be discussed. An extensive series of (p,t) experiments to locate 0^+ states in a broad range of nuclei has disclosed a new signature for critical point nuclei arising from the modified shape of the potential in the phase transition region. A new set of empirical proton-neutron interactions, extracted from double differences of atomic masses, shows several interesting features, including striking bifurcations near closed shells, a generic relation to shell filling, and an empirical correlation to the different growth rates of collectivity in particle-particle and particle-hole regions. Finally, a new interpretation of the light Pt isotopes without the need for intruder states is linked to the concept of single and multiple Hilbert spaces in the description of spherical-deformed transition regions. These topics will be linked to the role of valence p-n interactions in nuclei.

Work supported by the U.S. DOE under Grant Number DE-FG02-9!ER-40609.