Colloquium

Tracking the Evolution of the Nuclear Shell Structure

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Room 118 Nieuwland Science Hall

Refreshments @ 3:30 in 202 NSH

Atomic nuclei are the carrier of almost all visible mass in the universe. Nuclei also provide the fuel powering stars and nuclear reactions produce all naturally occurring chemical elements. Despite this fundamental role of nuclei in the universe, their structure and dynamics cannot yet be satisfactorily described on the basis of the fundamental strong interaction.

One of the major successes in the description of the properties of atomic nuclei was the introduction of the nuclear shell model. For certain numbers of protons or neutrons, the so-called magic numbers, discontinuities occur, for example in the nucleon separation energies. In analogy to the successful atomic shell model, these magic numbers were interpreted as closed shell configurations, similar to the noble gases.

In exotic nuclei however, far away from the stable isotopes, several experimental as well as theoretical investigations found evidence that the shell structure of atomic nuclei can change locally. In order to understand the underlying causes for the migration of nuclear shells, sensitive experimental methods are of paramount importance to investigate rare isotopes far from stability.

In this talk I will present results on recent experimental investigations tracking the evolution of nuclear shell structure in exotic nuclei. I will also present future perspectives on using stable and in-flight radioactive beams available at Notre Dame to close the gap between the well studied stable and very exotic nuclei.