UNIVERSITY OF NOTRE DAME
DEPARTMENT OF PHYSICS

NUCLEAR SEMINAR

Monday, March 27

Powering the bright glow of neutron stars with exotic nuclei

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Nuclei with equal numbers of protons and neutrons, $N=Z$, play a key role in our understanding of astrophysics, weak-interaction physics, and nuclear structure. For masses beyond calcium these nuclei are unstable and not naturally found on earth. However, they are created in extreme astrophysical environments. For instance, properties of the isotopes 69Br and 73Rb are critical for characterizing the reaction pathway through 68Se ($N=Z=34$) and 72Kr ($N=Z=36$), so-called waiting-point nuclei in the astrophysical rapid proton capture (*rp)* process. These nuclei significantly influence stellar environments and events such as type I x-ray bursts — bright periodic flashes of x-rays emitted by accreting neutron stars. Probing these neutron-deficient systems in the laboratory is extremely challenging: nuclei with $N=Z$ lie progressively further away from stability with increasing mass (for example 69Br has 10 neutrons less than the nearest stable bromine isotope). Rare-isotope beams and associated techniques are a necessary and powerful tool for accessing such nuclei in the laboratory. In this talk, I will discuss recent experiments utilizing beams at both the NSCL and GANIL facilities, focused on measuring the properties of 69Br and 73Rb as well as other very neutron-deficient nuclei in this mass region. To further explore the limits of stability along the proton drip line at NSCL, e.g., between Kr and Zr, requires the development of new rare- isotope beams. I will discuss some new initiatives, the associated physics, and future possibilities that will exist at next-generation laboratories such as FRIB.

4 pm – 5 pm

Nuclear Science Laboratory

124 Nieuwland Science Hall

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All interested persons are cordially invited to attend

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Refreshments will be served prior to the seminar in room 124