

UNIVERSITY OF NOTRE DAME
DEPARTMENT OF PHYSICS

NUCLEAR SEMINAR

Monday, March 5

Fission and the formation of the r-process rare-earth abundance peak in neutron star mergers

Dr. Nicole Vassh
University of Notre Dame

The recent observations of gravitational wave GW170817 and the electromagnetic counterpart from this neutron star merger suggest lanthanides were produced in this event. However many questions regarding heavy element production in mergers remain: can such events account for all the r-process lanthanide material observed in the galaxy? are precious metals such as gold produced in sufficient amounts? are actinides produced? where within the merger environment does nucleosynthesis occur and under what specific conditions? Such questions can only be answered with careful studies of the nuclear physics uncertainties affecting r-process calculations. Here I will discuss recent extended calculations of beta-delayed fission and their implications for r-process nucleosynthesis. The influence of fission fragment distributions will also be addressed with a particular emphasis on the unknown origin of the r-process rare-earth peak at $A \sim 164$. Since the rare-earth peak is formed as the r-process path begins to draw closer to stability, the rare-earth nuclei contributing to peak formation will soon be within reach of nuclear physics experiments such as the CPT at CARIBU and FRIB. I will present recent collaborative efforts between nuclear theory and experiment which compare the latest measurements to Markov Chain Monte Carlo predictions for the nuclear masses found to reproduce the observed rare-earth peak. Such studies could soon be in a position to make definitive statements regarding the formation of the rare-earth peak and thus the astrophysical site of the r process.

4 pm – 5 pm
Nuclear Science
Laboratory
124 Nieuwland
Science Hall

~~~~~

All interested  
persons are  
cordially invited  
to attend

~~~~~

Refreshments will be
served prior to the
seminar in room 124