Notre Dame Science
Department of Physics

THE RARE EARTH PEAK: AN OVERLOOKED R-PROCESS DIAGNOSTIC

Matthew Mumpower
North Carolina State University

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The r-process is thought to be responsible for approximately half of the neutron-rich elements above iron. While many studies of r-process environments have focused on early time behavior, e.g. conditions for sufficient neutron-to-seed ratio, less effort has been made studying late-time (low neutron-to-seed ratio) r-process dynamics. I first cover the formation and evolution of the rare earth 'peak' (A~160) which occurs during freeze-out as matter decays back to stability. Neutron capture rates and separation energies in the region are especially important for peak formation. I show that the rare earth peak is sensitive to nuclear physics input, thermodynamic evolution and the interplay between the two. I will discuss the types of astrophysical conditions that produce abundance patterns that best match observational data. The success of this method in constraining the conditions is dependent on underlying uncertainties in the nuclear physics input. Lastly, I identify and discuss neutron capture rates of nuclei which are critical to the final structure of the rare earth abundances. These nuclei lie within 10-15 neutrons from stability and potentially could be measured at future radioactive ion beam facilities.

Nuclear Seminar

All interested persons are cordially invited to attend.