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Recent results of reverse engineering nuclear masses from solar r-process abundances and the challenges faced in the presence of fissioning nuclei[1] NICOLE VASSH, University of Notre Dame — The astrophysical site(s) of the rapid neutron capture process (r-process) remains one of the most challenging open problems in all of physics. Conclusive statements are difficult to make due to a limited knowledge of nuclear physics far from stability. We describe recent developments in the method of "reverse engineering" nuclear properties using well established observational data for the rare earth elements. This new theoretical framework is intended to be used in combination with recent and future measurements to gain new insights into the astrophysical site of the r-process. To do so we perform this procedure for a variety of astrophysical environments in order to differentiate between the trends in the mass surface required to fit the rare earth solar data. We present results for the most recent reverse engineering mass predictions given the astrophysical trajectory of a hot, low entropy wind and compare to the mass data for neutron rich neodymium isotopes recently measured at the CPT at CARIBU. Since fission properties of nuclei far from stability are experimentally unknown, neutron rich environments present challenges to the reverse engineering approach. We describe these challenges and the impact of fission properties, such as fragment yield distributions and fission rates, on the r-process abundance pattern.

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Nicole Vassh
University of Notre Dame

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