ASTROPHYSICS SEMINAR SERIES

Tuesday, October 1 12:30 pm - Rm 184 NSH

Sarah Dietz, Graduate Student, Department of Physics

Neutrinos from Pre-supernova Stars

We present a study of the metallicity gradient in the outer halo component of the Milky Way's dual halo system, using metallicities from SDSS DR15 and several other datasets along with high-precision astrometry from Gaia DR2. It has previously been recognized that the outer halo has one of the most metal-poor stellar populations in our Galaxy (peaking around [Fe/H] = -2.2). In this work, we further explore this unique stellar population by examining variations in its metallicity as a function of kinematic and orbital parameters. Previous predictions have suggested that less massive, more metal-poor dwarf galaxy satellites do not sink very deeply into the potential well of our Galaxy during mergers, rather they remain on the outskirts and form the outermost regions of the halo. On this basis, we look for trends in metallicity in a variety of data samples to better understand the assembly history of the Milky Way. Our work aims to aid future efforts to expand the observational catalogue of [Fe/H] < -2 stars, which serve as important "fossils" of the first generation of stars.

Erika Holmbeck, Graduate Student, Department of Physics

Actinide-Rich vs. Actinide-Poor: The Stellar Actinide Boost and its r-Process Implications

The rapid-neutron-capture ("r") process is responsible for synthesizing many of the heavy elements observed in both the solar system and Galactic metal-poor halo stars. The astrophysical site of the r-process, however, remains a mystery. We are conducting an observational survey to increase the number of known r-process-enhanced stars from 25 to 100 to better characterize and understand the r-process. As a direct result of this survey, we have identified the most actinide-enhanced r-II star to date. To explain this enhancement, we investigate actinide production in the dynamical ejecta of a neutron star merger. Our study suggests that while the dynamical ejecta of a neutron star merger is a likely production site for the formation of actinides, a significant contribution is required from another site or sites. Incorporating actinide signatures of metal-poor, r-process enhanced stars into theoretical studies of r-process production can offer crucial constraints on the origin of heavy elements. I will present and discuss recent results on characterizing neutron star merger sites through actinide production by the r-process.

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