

Department of Physics and Astronomy Colloquium Series

Tuesday, November 25, 2025, 2:30pm in PSE 317

Speaker: Sanjana Curtis

Institution: Oregon State University

Title: Nucleosynthesis and Kilonovae from Compact Object Mergers

Abstract:

From the iodine in our bodies to the gold in our jewelry, heavy elements occupy myriad roles in human life. But how did these elements come to exist? This question lies at the heart of my talk, which will focus on two nucleosynthesis sites -- binary neutron star mergers and black hole-neutron star mergers -- and the 'kilonova' transients they produce. In 2017, the landmark detection of the kilonova AT2017gfo confirmed that neutron star mergers are a site of heavy element production. But important questions remain with respect to the details of nucleosynthesis in merger ejecta, the nature and diversity of kilonovae, and whether such mergers are the only source of heavy elements in the Universe. In this talk, I will present our latest end-to-end kilonova models based on general-relativistic magnetohydrodynamic simulations of merger remnants. We include essential neutrino physics that sets the electron fraction of the ejecta and, in turn, the heavy element abundances. I will show that detailed numerical modeling is necessary for linking kilonovae to their progenitors, interpreting past and future observations of these transients, and gaining insight into the origin of heavy elements.