NUCLEAR SEMINAR SERIES

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Monday, November 18

4:00 pm - Rm 184 NSH

R-process observables and what we can learn from them

The rapid neutron capture process (r-process) is a nucleosynthesis process responsible for the production of about half of the heavy elements in the universe. The decays of the radioactive r-process nuclei result in a characteristic light curve (termed kilo- or macronova), which has recently been observed for the first time in the aftermath of the neutron star merger GW170817. Apart from this direct observation, spectral abundance analyses of extremely metal-poor stars can give us further insight into the properties of the r-process site(s), since they possibly carry the fingerprint of only one r-process event.

While GW170817 has confirmed neutron star mergers (NSMs) as an r-process site, it is currently unclear if this scenario can account for all the enrichment of heavy r-process nuclei in the galaxy, especially at low metallicities. Theoretical models show that the heaviest r-process nuclei can possibly be produced also in other astrophysical scenarios, such as magneto-rotationally driven supernovae (MR SNe) or disks forming around collapsars. Distinguishing these scenarios by means of their nucleosynthetic signatures proves extremely challenging, since the properties of the neutron-rich nuclei involved are unknown, in addition to the uncertainties in the hydrodynamical conditions of the ejecta.

In this talk I will discuss signatures in r-process compositions aris- ing from different hydrodynamical conditions, and assess their robust- ness against the nuclear uncertainties.

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