

Bethe Colloquium

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Probing heavy element nucleosynthesis through electromagnetic observations

Half of the elements heavier than iron are produced by a sequence of neutron captures, beta-decays and fission known as r-process. It requires an astrophysical site that ejects material with extreme neutron rich conditions. Once the r-process ends, the radioactive decay of the freshly synthesized material is able to power an electromagnetic transient with a typical intrinsic luminosity. Such kilonova was observed for the first time following the gravitational signal GW170817 originating from a merger of two neutron stars. This observation answered a long lasting question in nuclear astrophysics related to the astrophysical site of the r-process. In this talk I will summarize our current understanding of the r-process and the answers provided by recent observations. I will also illustrate the unique opportunities offered by kilonova observations to learn about the in-situ operation of the r-process and the properties of matter at extreme conditions. Achieving these objectives requires to address fundamental challenges in astrophysical modeling, the physics of neutron-rich nuclei and high density matter, and the atomic opacities of r-process elements required for radiative transfer models.

Lecture Hall I - Physikalisches Institut - Nussallee 12 - 53115 Bonn

Thursday, December 15, 2022, at 4:15 p.m.

Hybrid talk - for the Zoom link please contact theory@physik.uni-bonn.de

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