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Neutron star mergers and multi-messenger astronomy

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With the discovery of binary black hole mergers by LIGO, the era of gravitational wave (GW) astronomy and multi-messenger astronomy including GWs has begun. As the advanced LIGO and Virgo detectors approach design sensitivity in the next few years, exciting discoveries are expected to be made, including neutron star mergers, which are among the most promising GW events for multi-messenger astronomy. In this talk, I will present recent results from general-relativistic magnetohydrodynamic simulations of the merger and long-term post-merger evolution, and discuss how multi-messenger observations of NS mergers may represent the key to understand and solve several long-standing problems in astrophysics; these include the origin and generation of GWs and accompanied electromagnetic transients across the electromagnetic spectrum including short gamma-ray bursts and kilonovae, the properties of nuclear matter at high densities, and the origin of the heavy elements in the universe.

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