

# GW170817: astrophysical results and implications for cosmic nucleosynthesis

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## Abstract

The recent detection of the binary neutron star merger GW170817 by advanced LIGO and Virgo and its fireworks of electromagnetic counterparts across the entire electromagnetic spectrum marked the beginning of multi-messenger astronomy and astrophysics with gravitational waves. In this talk, I will discuss what the electromagnetic counterparts of GW170817 (the kilonova in particular) reveal about the merger process and what to expect for future mergers. Combining first-principle simulations with the multimessenger observations, I will elaborate on the implications for our understanding of the synthesis of heavy rapid neutron capture (r-process) elements in compact object mergers. I will discuss challenges for neutron star mergers to explain the galactic r-process and show how combining multimessenger observations of compact object mergers with observations of other potential sources of r-process elements and prime targets of transient astronomy, such as GRB supernovae, will allow us to address and solve long-standing questions about the origin of the heavy elements in the Universe.