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The R-Processes and their Astrophysical Sites

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The r-process occurs in neutron star mergers. This has been confirmed by the observation of the decay of neutron rich radioactive nuclei as a kilonova light curve after the neutron star merger detected with gravitational waves GW170817. We study the nucleosynthesis and kilonova light curves from different ejecta of neutron star mergers discussing the astrophysical and nuclear physics uncertainties. Moreover, core-collapse supernovae driven by neutrinos can produce elements up to silver. The astrophysical and nuclear physics uncertainties of this weak r-process will be discussed. In order to have a successful r-process and to produce the heaviest elements in core-collapse supernovae, magnetic fields are necessary. We will report about the impact of rotation and magnetic fields based on recent simulations including detailed neutrino transport

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