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Neutrino Oscillations and Supernova Nucleosynthesis

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A good fraction of the heavier nuclei were formed in the rapid neutron capture (r-process) nucleosynthesis scenario. Although an astrophysical site of the r-process is not yet identified, one expects such sites to be associated with explosive phenomena since a large number of interactions are required to take place during a rather short time interval. Candidate sites include core-collapse supernovae and neutron-star mergers. The dynamics of these sites very much depend on neutrinos. In particular, the sheer number of neutrinos produced give rise to collective neutrino oscillations. Collective oscillations of neutrinos represent emergent nonlinear flavor evolution phenomena instigated by neutrino-neutrino interactions in astrophysical environments with sufficiently high neutrino densities. In this talk the connection between neutrino collective oscillations, the dynamics of core-collapse supernovae, and the origin of chemical elements, especially those produced by the r-process nucleosynthesis, will be discussed.

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