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The role of neutrino-nucleus reactions in supernova nucleosynthesis

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Neutrinos play an important role for the supernova dynamics and the associated nucleosynthesis. During collapse, electron neutrinos, produced by electron capture on nuclei, dominate, while all neutrino families are being produced during the cooling phase of the protoneutron star.

Neutrinos are crucial for the explosive nucleosynthesis. At first, by interaction with free nucleons they determine the proton-to-neutron ratio of the ejected matter which is crucial for the subsequent nucleosynthesis. Modern supernova simulations indicate that the ejected matter is not sufficiently neutron rich to support an r-process which also produces the solar abundances in the third r-process peak.

Neutrino-induced spallation reactions on abundant nuclei in the outer stellar shells are responsible for the production of selected nuclides (neutrino nucleosynthesis). Recently the first study of neutrino nucleosynthesis has been presented which considers the time-dependence of the neutrino emission including the neutrino burst, the accretion phase and the cooling phase as well as changes in the spectral forms of the neutrinos.

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