

EMMI workshop: Neutron Matter in Astrophysics: From Neutron Stars to the r-Process



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Nucleosynthesis in O-Ne-Mg Supernovae

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The site of the r-process has been the most enduring mystery in nucleosynthesis theory since the publication of the seminal papers in this field. Of particular promise (in their times and for some even today) have been the many efforts suggesting Type II supernovae as the site with the relevant conditions arising either in or near the exploding core (initially championed by Burbidge et al.), or in the outer layers, with recent attention focused on aspects of neutrino interactions.

We will explore detailed nucleosynthesis in the shocked surface layers of an Oxygen-Neon-Magnesium core collapse supernova to determine if suitable conditions arise for r-process nucleosynthesis. We find no such conditions in an unmodified model, but do find overproduction of N=50 nuclei (previously seen in early neutron-rich neutrino winds) in amounts that, if ejected, would pose serious problems for galactic chemical evolution. A minor modification to the distribution of the neutron excess predicted by the model can alleviate this result, providing for production ^{64}Zn , which has been under-produced in previous surveys of galactic chemical evolution.

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