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Weak Neutrino Magnetism and the r-Process in the Neutrino-Heated Supernova Bubble[1] GRANT MATHEWS, University of Notre Dame, JAMES WILSON, LLNL, KAORI OTSUKI, University of Chicago — The neutrino-energized high-entropy bubble above the proto neutron star in a core- collapse supernova remains as one of the most promising sites for r-process nucleosynthesis. However previous studies with this model have encountered the complication that neutrino interactions with material in the expanding bubble limit the production of heavy nuclei by decreasing the ratio of available neutrons to seed nuclei. In this talk we briefly summarize some recent improvements in Livermore supernova model neutrino transport and numerics. Among the important new physics we show that effects of weak magnetism are significant. Above the proto-neutron star, it leads to a high electron anti-neutrino energy at very late times ($t \approx 20$ s post bounce). This means an increased rate of capture on nucleons compared to electron neutrinos. This then shifts the equilibrium electron fraction Y_e to lower values ultimately meaning that more neutrons are available for the r-process. Also, very high entropy per baryon ($s/k \sim 600$) appears within the bubble at late times. This makes for efficient neutron production and favorable r-process nucleosynthesis.

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