Abstract for an Invited Paper
for the HAW05 Meeting of
The American Physical Society

Neutrino processes in the Big-Bang and Supernovae

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Recent data of CMB anisotropies have suggested cosmological parameters which may manifest accelerating universal expansion. However, inferred baryonic density does not agree at 1σ C.L. with that determined from the Big-Bang nucleosynthesis (BBN) which satisfies all light element (D, $^{3,4}He$, and ^{7}Li) abundance constraints. BBN is a unique cosmological process to test not only the cosmological theory but also the fundamental theory of particles and nuclei. We firstly discuss recent progress in particle and nuclear physics which may resolve partly the cosmological discrepancy of Ω_b. We emphasize an important consequence of newly measured weak coupling constant in terms of neutron life. Secondly, we discuss astrophysical aspect of the supernova (SN) neutrino-processes which contribute to the production of ^{7}Li and ^{11}Li. SN neutrino thus plays an essential role in constraining chemical evolutin of the light elements. We discuss that the neutrino-processes help understand the origin of the Spite-plateau of ^{7}Li observed in metal-deficient halo stars, which makes the biggest uncertainties in the determination of Ω_b from the BBN. Thirdly, we propose a theoretical model of disappearing cold dark matter model of SUSY particles in brane world cosmology, and discuss how the BBN constraints allow this model, satisfying many other observational constraints from CMB anisotropies, Type Ia supernova magnitude-redshift relation, galaxy M/L ratios, and galaxy gas-fractions. We finally discuss other possible improvements in nuclear reaction rates which have common significance both in BBN and SN r-process where the neutrino processes again play the important role.