

NEUTRINO INTERACTIONS WITH NUCLEI AND NUCLEAR MATTER

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Microscopic calculations of nuclear and neutron matter are necessary to understand the nuclear equation of state which is probed in heavy-ion experiments and to predict the equation of state used in calculations of neutron stars. Calculations made in 1981 are still frequently used in neutron star calculations. The most complete calculations to date have also been performed using the Fermi hypernetted chain (FHNC) method. VMC and GFMC have been used to compute the ground state of liquid ^3He and ^4He by imposing periodic boundary conditions, but there have been no corresponding calculations for nuclear matter because of the complications introduced by the strong dependence of the force on spin and isospin. In collaboration with J. Carlson (LANL), S. Pieper and R. Wiringa (ANL), we propose to calculate neutron matter using GFMC techniques. We will compare the ground-state properties of neutron matter with the FHNC methods using the Argonne- V_{18} nucleon-nucleon potential supplemented by a 3-body interaction. A very interesting question for astrophysics concerns the effects of neutrino pressure on the nuclear matter, which we will also investigate in the GFMC framework.