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Nuclear Physics Input to Models of the Supernova Phenomenon
JIRINA RIKOVSKA STONE[1], Oxford University, ANTHONY MEZZACAPPA, Physics Division Oak Ridge National Laboratory — The density and temperature dependence of the energy per particle of a system (the Equation of State (EOS)) is a fundamental ingredient of all models of nuclear matter and stars. As nucleons and leptons form the main components of all stars, the best possible description of the strong and weak interactions amongst these particles is essential for a correct understanding of birth, life and death of stars. To date, no model predicts the explosion of a core collapse supernova. The problem may lie with the EOS currently used. We give examples of EOS's, based on different models of nuclear interactions, suitable for models of core-collapse supernovae and examine the sensitivity of calculated radial positions of shock waves, mass fractions in the supernova core, pressure and temperature profiles and some other features to the choice of the equation of state. Two new EOSs, one based on a fully selfconsistent Hartree-Fock model, shedding new light on the phase transition between homogeneous and inhomogeneous nuclear matter and the other, based on the quark model, describing high density homogeneous matter with strange baryons, will be discussed.

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