Title: Revival of the Fittest: Exploding Core-Collapse Supernovae

Abstract

Fifty years have lapsed since the early simulations of Colgate and White identified neutrino heating as key to powering core-collapse supernovae (CCSNe). Yet, for over half a century, the mechanism for producing a robust CCSN explosion has endured as a scientific mystery. Outcome - explosion or dud - depends sensitively on the progenitor structure, the neutrino-matter microphysics, and macrophysical properties (e.g., rotation and velocity perturbations). I will present recently published results, using our multidimensional hydro/radiative transfer code FORNAX, of one of the first 3D simulations of a CCSN progenitor with detailed microphysics and state of the art neutrino transport. Our model explodes within 100 milliseconds, and is estimated to accumulate energy at a rate of 0.5 Bethe (10^{50} erg) over 2 seconds. The vigorous explosion highlights the crucial dependence on input physics and illustrates recent communal progress on understanding CCSNe.