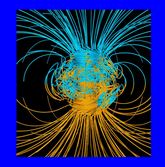
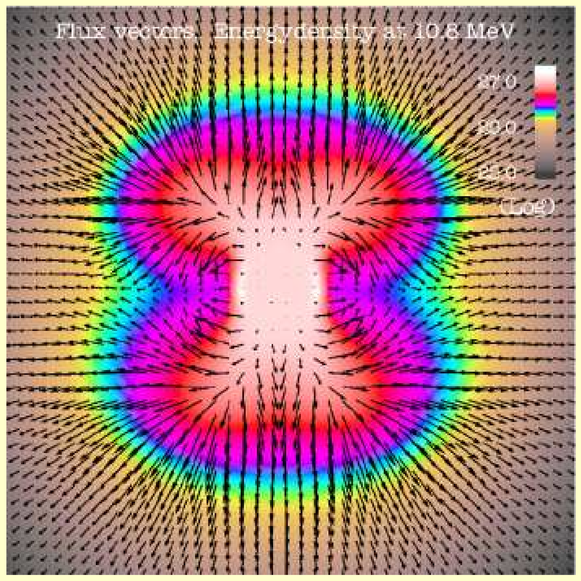
Supernova Science Center (SNSC)

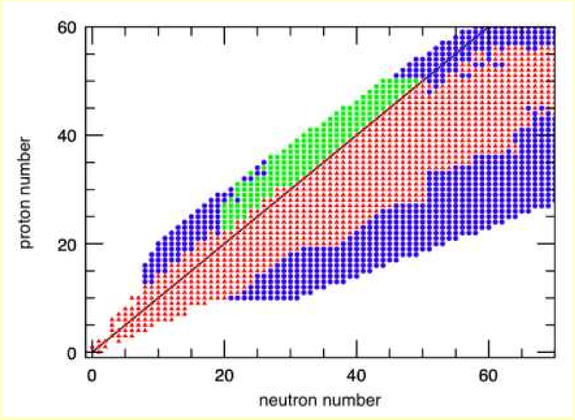
Stan Woosley (UCSC), Adam Burrows (U. Arizona), Chris Fryer (LANL), Robert Hoffman (LLNL) (plus 25 researchers)



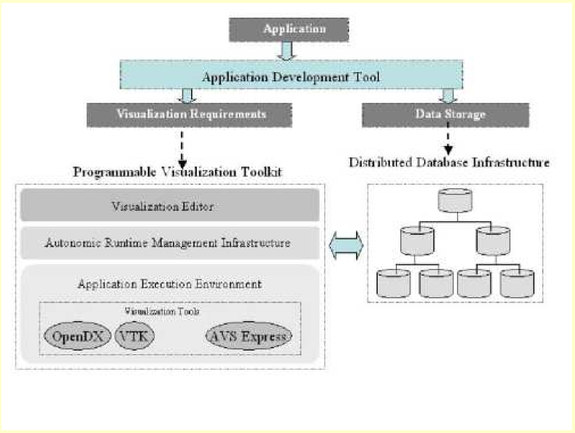
2D Boltzmann Rad/Hydro



Nuclear Reaction Library



Programmable Visualization Toolkit

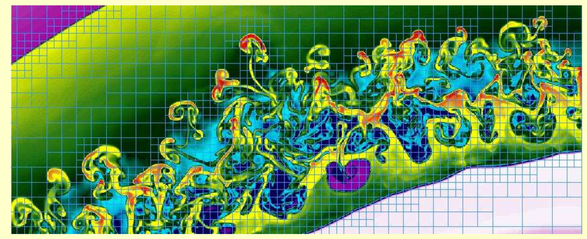


3D SPH Core-Collapse Explosion

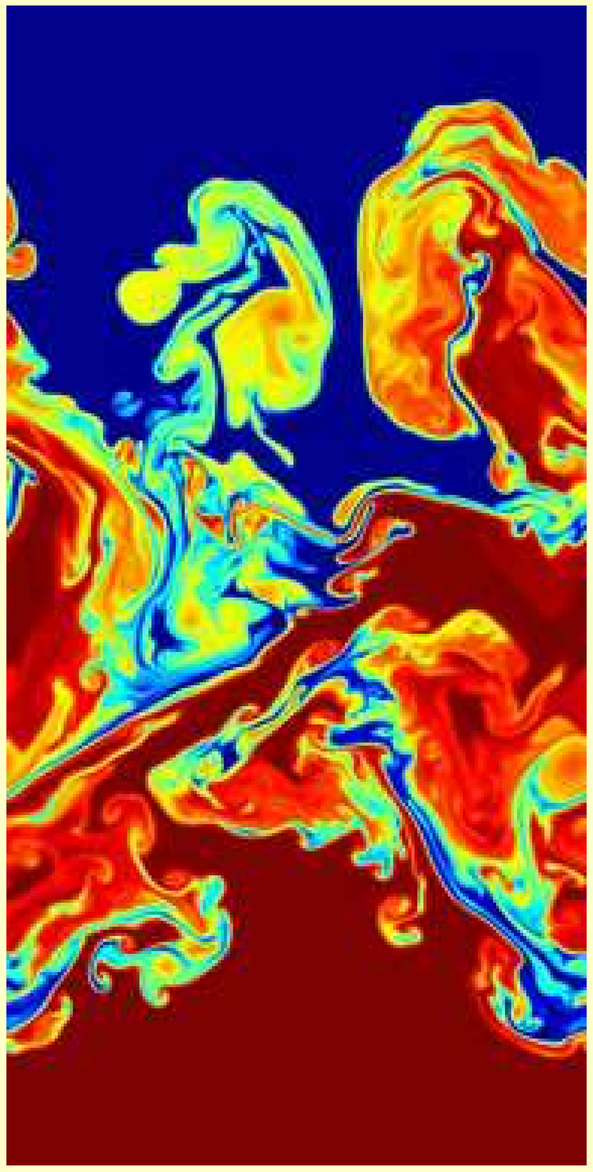
Major Accomplishments:

- The first full 3D simulation of a core-collapse supernova including neutrino energy transport (diffusion)
- The first 2D simulation of core collapse in a massive star and the immediate post-bounce evolution with full multi-group, multi-angle neutrino transport
- The first 3D simulations of relativistic jet propagation and break out in the collapsar model for gamma-ray bursts
- The first 3D simulation of convection leading to ignition of Type Ia supernova
- The first fully resolved 3D study of combined Rayleigh-Taylor instability coupled to nuclear burning in a Type Ia supernova (microzoned piece of star)
- 3D Monte-Carlo calculations of gamma-ray transport in Type Ia and Type II supernovae
- The first (albeit 1D) studies of repeating Type I X-ray flashes on accreting neutron stars with large nuclear reaction networks (1600 species) coupled to convection and radiative diffusion
- Assembly of the world's most comprehensive and current library of nuclear reaction rate information for studies of nucleosynthesis and energy generation in stars, supernovae, and X-ray bursts
- Cutting edge calculations of the gravitational wave signatures of core-collapse supernovae
- Runtime and Execution Infrastructure: Extensions of CORBA, DEVS-DOC (Arizona ACIMS)

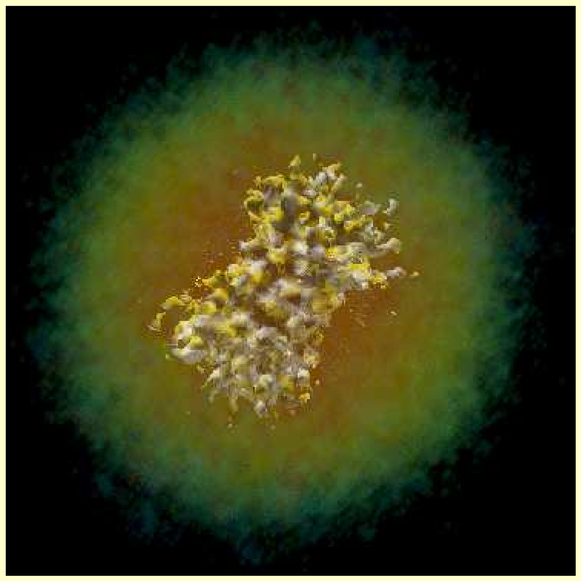
Rayleigh-Taylor Mixing in a Type II Supernova



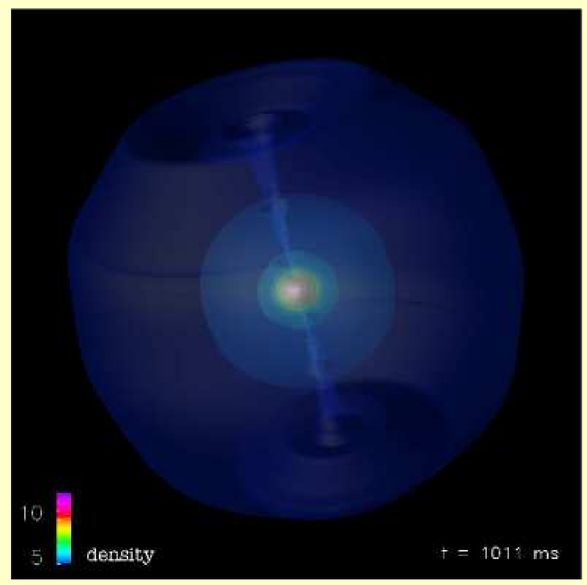
2D Rayleigh-Taylor Flame



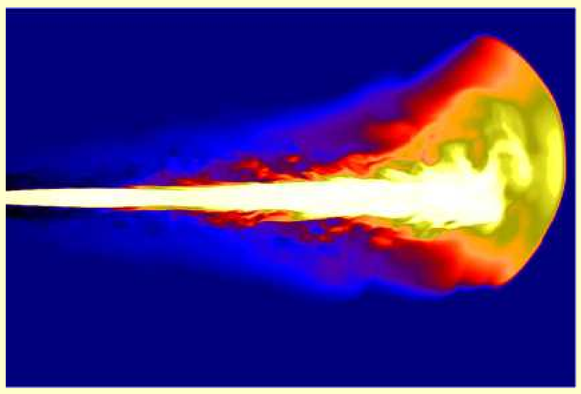
Radioactive Debris Field



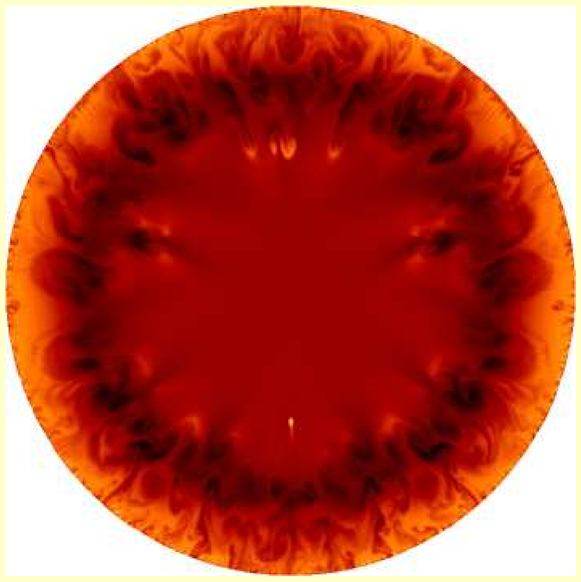
Rotating Core Collapse



Relativistic GRB Jet



Solar Convective Overshoot



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U.S. DEPARTMENT OF ENERGY

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