Contribution ID: **37** Type: **Oral Presentation**

The Emerging Theory of Three-Dimensional Core-Collapse Supernova Explosions

Using our code Fornax we have simulated the collapse and explosion of the cores of many massive-star models in three spatial dimensions. This is the most comprehensive set of realistic 3D core-collapse supernova (CCSN) simulations yet performed and has provided very important insights into the mechanism and character of this 50-year-old astrophysical puzzle. I will present detailed results from this suite of runs and the novel conclusions derived from our new capacity to simulate many 3D, as opposed to 2D and 1D, full physics models every year. Emerging are insights into the criteria for explosion, the systematics of explosion energy and residual neutron-star mass with progenitor, the characteristics of proto-neutron star convection, neutrino and gravitational-wave emissions and signatures, the morphology of CCSN explosions, and supernova nucleosynthesis. This new capability, enabled by this new algorithm and modern HPC assets, is poised to transform our understanding of this central astrophysical phenomenon.

Length of presentation requested

Oral presentation: 25 min + 5 min questions (Review-type talk)

Please select between one and three keywords related to your abstract

Astronomy

2nd keyword (optional)

Stellar explosions and mergers - theory

3rd keyword (optional)

Nuclear physics - theory

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