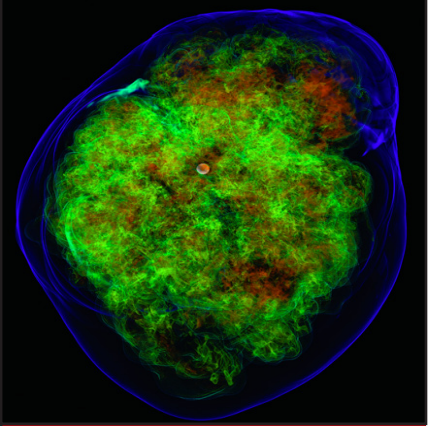


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Core-Collapse Supernova Explosions The Theoretical Challenge

Department of Physics Colloquium



Core-collapse supernovae have challenged theorists and computational science for half a century. Such explosions are the source of many of the heavy elements in the Universe and the birthplace of neutron stars and stellar-mass black holes. However, determining the mechanism of explosion remains the key goal of theory. Recently, using sophisticated numerical tools and platforms, theorists have been able to conduct multi-dimensional simulations with some physical fidelity that have provided insight into the phenomena that attend stellar death and explosion. The core of the emerging theoretical synthesis is the centrality of hydrodynamic instability and asphericity. In this talk, I review the state of the field and the contending explosion models. In the process, I will highlight the computational astrophysics that has been applied to date, and that may be necessary in the future to credibly unravel this mystery.