**Computational Challenges of Modeling X-ray Bursts and Type Ia Supernovae**

Stellar explosions come in a wide variety, powered by either by gravitational collapse or thermonuclear energy release. These are truly multiphysics problems---modeling them requires the coordinated input of gravity solvers, reaction networks, transport, and hydrodynamics together with microphysics recipes to describe the physics of matter under extreme conditions. Furthermore, these models involve following a wide range of spatial and temporal scales, which puts tough demands on simulation codes. As a result, a variety of methods have been developed to model the different phases of these explosions.

In this talk I will give a introduction to the algorithmic and computational challenges involved in modeling stellar explosions and then discuss the specific techniques and codes we've been developing, Maestro and Castro. Applications to a variety of Type Ia progenitor models and aspects of X-ray bursts will be shown.