



PHYSICS AND ASTRONOMY COLLOQUIUM

Dr. Sean Couch

Michigan State University

“Frontiers in Massive Stellar Death”

Abstract

Core-collapse supernovae are the luminous explosions that herald the death of massive stars. While core-collapse supernovae are observed on a daily basis in nature, the details of the mechanism that reverses stellar collapse and drives these explosions remain unclear. While the most recent high-fidelity simulations show promise at explaining the explosion mechanism, there remains tension between theory and observation. I will discuss the recent developments in the study of the supernova mechanism that could lead to a predictive theory of massive stellar death. In particular, I will describe our efforts to develop more realistic initial conditions for supernova simulations with fully 3D massive stellar evolution calculations. Such realistic 3D initial conditions turn out to be favorable for successful explosions, in large part because they result in stronger turbulence behind the stalled supernova shock. I will also discuss the important role turbulence is playing in the supernova mechanism and what might be required for accurately modeling the turbulence in our simulations. I will also mention recent work aimed at explaining the origin of pre-supernova outbursts from massive stars in the months and years prior to core collapse and explosion.

Wednesday, March 8, 2017

3:00 p.m.

Elliott Building

Room 167