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**Multidimensional neutrino-transport simulations of the core-collapse supernova central engine** EVAN O'CONNOR, North Carolina State University, SEAN COUCH, Michigan State University — Core-collapse supernovae (CCSNe) mark the explosive death of a massive star. The explosion itself is triggered by the collapse of the iron core that forms near the end of a massive star's life. The core collapses to nuclear densities where the stiff nuclear equation of state halts the collapse and leads to the formation of the supernova shock. In many cases, this shock will eventually propagate throughout the entire star and produces a bright optical display. However, the path from shock formation to explosion has proven difficult to recreate in simulations. Soon after the shock forms, its outward propagation is stagnated and must be revived in order for the CCSNe to be successful. The leading theory for the mechanism that reenergizes the shock is the deposition of energy by neutrinos. In 1D simulations this mechanism fails. However, there is growing evidence that in 2D and 3D, hydrodynamic instabilities can assist the neutrino heating in reviving the shock. In this talk, I will present new multi-D neutrino-radiation-hydrodynamic simulations of CCSNe performed with the FLASH hydrodynamics package. I will discuss the efficacy of neutrino heating in our simulations and show the impact of the multi-D hydrodynamic instabilities.

Evan O'Connor
North Carolina State University

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