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Petascale Core-Collapse Supernova Simulation[1]

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The advent of petascale computing brings with it the promise of substantial increases in physical fidelity for a host of scientific problems. However, the realities of computing on these resources are daunting, and the architectural features of petascale machines will require considerable innovation for effective use. Nevertheless, there exists a class of scientific problems whose ultimate answer *requires* the application of petascale (and beyond) computing. One example is ascertaining the core-collapse supernova mechanism and explaining the rich phenomenology associated with these events. These stellar explosions produce and disseminate a dominant fraction of the elements in the Universe; are prodigious sources of neutrinos, gravitational waves, and photons across the electromagnetic spectrum; and lead to the formation of neutron stars and black holes. I will describe our recent multidimensional supernova simulations performed on petascale platforms fielded by the DOE and NSF.

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