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# Probing Astro- and Particle Physics with Supernova and Solar Neutrinos at SURF

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Many mysteries still surround the neutrino. Despite being the most common massive particle in the universe, its basic properties, such as their mass, are still unknown, as they interact very rarely with matter. They are produced copiously during the life cycles of stars. Measuring neutrinos from the sun, pioneered by the Davis experiment at SURF, has confirmed the nuclear fusion processes responsible for providing the energy that sustains life on Earth. Further, these experiments found the first confirmed physics beyond the standard model – neutrino oscillations which gave the first indication of neutrino mass. Though neutrinos only interact very rarely with other constituents of matter, they fuel some of the most violent explosions in the universe: core-collapse supernovae. In the dying moments of the most massive stars, a change in the nuclear state of the star's core produces an enormous flux of neutrinos, blowing away the outer envelopes of stellar plasma while forming a neutron star or black hole. Though the light signal of supernovae has been studied for millennia, we can now explore the neutrino signals in large, underground particle detectors. These experiments directly observe the inner workings of the collapse, the formation of black holes and neutron stars, and many properties of neutrinos.Several experiments, including the DUNE and LZ experiments at SURF, are dedicated to understanding these stellar processes. In the talk, we will discuss the history and future of studying solar and supernova neutrinos, emphasizing the major efforts at SURF

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