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Dissertation Award in Nuclear Physics Talk: The Hunt for Astrophysical Neutrinos

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Astrophysical neutrinos are excellent probes of neutrino properties, the solar core, and high-energy cosmic accelerators. But their detection suffers from high backgrounds and from uncertainties in how we reconstruct and interpret events. For example, solar neutrino signals in Super-Kamiokande are overwhelmed by beta-decay backgrounds initiated by cosmic-ray muons. Meanwhile, the detection of high-energy astrophysical neutrinos in IceCube opened new ground for studying cosmic accelerators, but IceCube cannot effectively distinguish $\nu\tau$ from νe, as both generate similar-looking events. Using understanding of the common shower physics underlying both problems, I will show new methods to reject spallation backgrounds in Super-Kamiokande, applicable to their solar neutrino analysis, and to improve the measurement of flavors of astrophysical neutrinos in IceCube.