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Neutrino Interferometry at DUNE

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The fact that neutrinos have mass and oscillate means that we can learn a great deal about them by studying what are effectively interference patterns that arise after neutrinos propagate over hundreds of kilometers. These patterns may tell us the reason that our universe is dominated by matter and not simply light, and they can also tell us if neutrinos acquired their mass in the same way that other charged particles have acquired theirs. The DUNE experiment will measure these interference patterns over a broad range of neutrino energies after the neutrinos have propagated 1300km, to a laboratory located 765km south of Regina. In addition, DUNE will use a detector technology that provides exquisite detail about the interactions that make up the interference pattern. In order to measure these patterns, however, we need to not only build enormous detectors and create intense neutrino beams, we also have to understand in fine detail what happens inside the nucleus when a neutrino interacts there.

This talk will present the current state of neutrino oscillation measurements and how the field is preparing for the next big jump in our understanding of neutrinos and the role they play in the universe.

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