SEMINAR IN PHYSICS

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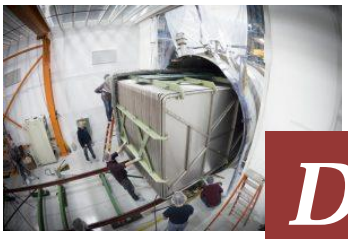

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Pioneering the Intensity Frontier with LArTPCs

The neutrino is a ubiquitous particle in our universe, originating from the Sun, the Earth's core and atmosphere, supernovae, the Big Bang, and man-made sources such as nuclear reactors and particle accelerators. Despite its omnipresence, it remains the least understood fundamental particle that we know about due to its weak interactions with other particles (and thus particle detectors). One surprising discovery in the last few decades is the experimental confirmation of neutrino oscillation, opening up many other questions in the field. What is the origin and ordering of neutrino mass, which enables these oscillations? Do neutrinos of the Standard Model mix with other undiscovered states (sterile neutrinos) as well? And are neutrinos at the heart of the matter-antimatter asymmetry of the universe?

One promising detector technology that can be used to answer many of these questions is the liquid argon time projection chamber (LArTPC). After a brief review of the open questions of neutrino oscillation physics, I will discuss how the LArTPC is utilized to extract meaningful physics results, and then highlight current and future LArTPC neutrino experiments, namely MicroBooNE (Micro Booster Neutrino Experiment), the SBN (Short-Baseline Neutrino) program, and DUNE (Deep Underground Neutrino Experiment).

Dr. Michael Mooney joined the Department of Physics at Colorado State University as an Assistant Professor this past fall. After graduating from the Massachusetts Institute of Technology with a bachelor's degree in physics and mathematics, Dr. Mooney received his Ph.D. in 2014 from Princeton University, where his research on the Compact Muon Solenoid experiment played a role in the discovery of the Higgs boson at the Large Hadron Collider of CERN in Geneva, Switzerland. Prior to joining the faculty at Colorado State University, he was a postdoctoral research associate at Brookhaven National Laboratory, where he worked on accelerator neutrino experiments including MicroBooNE and DUNE. He was awarded an Intensity Frontier Fellowship at Fermilab in 2016 for his work on these experiments. Dr. Mooney's work is focused on research and development of liquid argon time projection chambers, developing novel reconstruction techniques for neutrino experiments, and neutrino oscillation measurements.