

Special Talk

UCLA

Monday, April 13th @ 11am
Schwinger Lounge

“Axial vector form factors and the scalar charge of nucleons from lattice QCD”

Rajan Gutpa (Los Alamos)

Abstract: This talk will motivate the need for large scale simulations of lattice Quantum Chromodynamics (lattice QCD) to calculate two phenomenologically interesting properties of nucleons: (i) the axial vector form factors needed for the analysis of neutrino oscillation experiments (in fact, we will ultimately need quantum computing), and (ii) the scalar charge—important to direct detection of dark matter experiments and in the pion-nucleon sigma term, an important parameter in nuclear physics. Today, with growing computing power and novel algorithms, lattice QCD is providing increasingly precise results at multiple values of the pion mass close to the physical one and on increasingly fine large volume lattices needed to control the chiral, continuum and finite volume (CCFV) extrapolation needed to match to experiments. A major additional systematic in these calculations is the contributions of excited states, especially multiparticle states such as the $N\pi$ and $N\pi\pi$ with the quantum number of the nucleons. A brief discussion of this systematic and methods pioneered by the Los Alamos team to understand and remove them will be given. The talk will conclude with a summary of the current state of the calculations and prospects for improvements.