University of Miami, Physics Department Colloquium

Date: Wednesday, Sep 28, 2022
Time: 4:00 pm – 5:00 pm
Location: Wilder Auditorium – Rm 112, Knight Physics Building

Nucleons and Nuclei under the Microscope

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Abstract

Nucleons (protons and neutrons) make up the nuclei of all elements and provide the vast majority of mass in the visible universe. The study of their substructure, which started over 60 years ago with electron scattering from a hydrogen nucleus at the Stanford Linear Accelerator, has shown that they have an extended size and are composed of quarks and gluons, bound by the strong force. Although we know roughly since 50 years that quantum chromodynamics (QCD) is the fundamental quantum field theory that underlies the strong interaction, how exactly nucleons and nuclei emerge as the effective low energy degrees of freedom is still an unsolved problem. I will give a general introduction to the strong force and QCD and will discuss how experiments performed at US accelerator facilities (such as Jefferson Lab and the future electron-ion collider) help in improving our understanding of the strong nuclear force and attempt at performing a 3D tomography of nucleons and nuclei. Theoretical reaction frameworks are needed to interpret the data from these facilities and I will discuss some examples from my own work that have been used to do that.