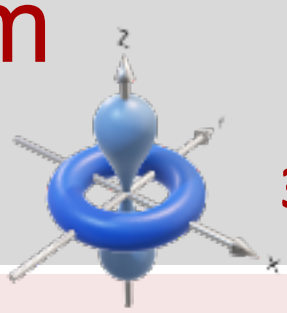
Department of Physics Colloquium

October 23, 2023 **3:00 PM**



From Quarks to Nuclei: Computing the Standard Model

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Our understanding of the structure of matter, encapsulated in the Standard Model of particle physics, is that protons, neutrons, and nuclei emerge dynamically from the interactions of underlying quark and gluon degrees of freedom. I will describe how first-principles theory calculations have given us new insights into this structure, including recent predictions of the contributions of gluons to the pressure distribution in the proton, which have been followed by first experimental measurements. I will also discuss studies of light nuclei which provide insights relevant to dark matter direct-detection experiments and other intensity-frontier searches for new physics. Finally, I will explain how provably exact machine learning algorithms are launching a computational revolution in this field.

This colloquium will be held in-person, in SERC 116