

KMI Colloquium

“Probing Nucleons and Nuclei through Electron-Ion Collisions: The Gluonic Structure of Matter”

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Abstract:

Understanding how the mass, spin, and structure of nucleons and nuclei emerge from their fundamental constituents—quarks and gluons—remains one of the central challenges in nuclear physics.

The Electron-Ion Collider (EIC), now under construction at Brookhaven National Laboratory, is designed to probe the gluon-dominated regime of Quantum Chromodynamics (QCD) and provide a three-dimensional picture of quarks and gluons inside protons and nuclei.

Realizing the full physics potential of the EIC requires not only the construction of a next-generation collider, but also major advances in detector technology, precision timing, and streaming data acquisition, supported by AI-driven data processing and high-performance computing for real-time analysis.

In this colloquium, I will introduce how we aim to explore nucleons and nuclei from the partonic perspective, discuss the physics of gluon dynamics and correlations, and highlight the emerging experimental and technological innovations driving this new frontier.

