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An overview of the physics goals of the Electron-Ion Collider

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Owing to the color confinement, phenomena of strong interaction physics could be described either in terms of fundamental quarks and gluons of Quantum Chromodynamics (QCD) or as mesons and baryons and the nuclear force between them, depending on the momentum/distance scales at which the phenomena are probed, while mesons and baryons themselves are confined dynamic systems of quarks and gluons. Understanding fully the relationship between this dual representation of strong interaction physics requires us to explore the inner structure of nucleons and nuclei and its emergence from QCD dynamics. In this talk, I will review the physics goals of the EIC, currently under the construction at Brookhaven National Laboratory. I will demonstrate that both theory and experimental technology have now reached to a point where we can explore the inner structure of nucleons and nuclei at sub-femtometer distance scales and their underline dynamics with controllable precision, allowing us to search for answers to the most compelling and fundamental emergent phenomena of the strong interaction physics, as well as the quantum nature of these phenomena. I will also discuss the challenges and opportunities presented by the EIC.

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