

Physics Colloquium

*Monday, May 1, 2017 / 428 Pupin Hall / 4:15 PM
wine and cheese following the colloquium*

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"High energy QCD at the dawn of the EIC era"



We will describe progress and open questions in our understanding of the theory of strong interactions, quantum chromodynamics (QCD), in high energy collisions. The discussion will center around two topics. One is the theoretical observation that the proton and nuclear wave functions probed in high energy collisions should exhibit a novel phenomenon of gluon saturation, where the new effect of gluon mergers balances the more conventional gluon splittings. This saturation regime is characterized by very strong gluon fields and intricate non-linear effects. Another theme of the talk will be the mystery of the proton spin. Theoretically, adding all the spins and orbital angular momenta of the quarks and gluons in the proton should give us $1/2$, the spin of the proton. At the same time, adding the experimentally measured spin components of the proton carried by the quarks and gluons comes up short, giving us a number in the 0.3-0.4 range. This discrepancy is known as the "spin crisis". We will discuss one possibility of where the missing spin may be hiding. We will also outline how the Electron-Ion Collider (EIC) proposed to be built in the US either at Brookhaven National Laboratory or at Jefferson Laboratory, may resolve the spin crisis and discover the gluon saturation regime.