

Physics Division Seminar

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The RHIC Cold QCD Program: A Gaze into EIC Physics

Host: Whitney Armstrong

Monday, February 10, 2020 – 203, R150, 3:30 PM

A myriad of new techniques and technologies have made it possible to inaugurate the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory as the world's first high-energy polarized proton collider. RHIC delivers polarized proton-proton and proton-ion collisions at center-of-mass energies of up to 510 GeV. This unique environment provides opportunities to study the polarized quark and gluon spin structure of the proton and QCD dynamics at a high energy scale and is therefore complementary to existing semi-inclusive deep inelastic scattering (SIDIS) experiments. Recent data from RHIC have shown a non-zero contribution of the gluons ($\Delta g(x)$) to the proton spin. The results of parity violating single spin asymmetries in W-boson production from 2011-2013 have led to a substantial improvement in the understanding of the light sea quark polarizations in the nucleon. In recent years, transverse spin phenomena have gained attention as they offer the unique opportunity to expand our current one-dimensional picture of the nucleon by imaging the proton in both momentum and impact parameter space. RHIC measurements provide the essential data to elucidate the dynamical mechanisms that produce large asymmetries in transverse polarized pp, and the crucial test of the predicted process-dependence of TMDs. A summary of the achievements and future opportunities of the RHIC cold QCD program to study initial and final state effects for TMDs, GPDs and how these results will pave the way for a successful science program at an EIC will be presented.