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**QCD and RHIC Spin Physics**

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Understanding the nucleon structure is of fundamental importance to science. The exploration of the internal structure of the nucleon in terms of quarks and gluons (partons), the degrees of freedom of Quantum Chromodynamics (QCD), has been and still is at the frontier of high energy nuclear physics research. Concurrent advances in the experimental use of high energy scattering processes and theoretical breakthroughs in understanding "asymptotic freedom" and developing the perturbation theory of strong interactions have provided a way of mapping out the internal landscape of protons and neutrons. In this talk, we will present how RHIC spin program has made significant contributions in understanding the proton structure, particularly the spin structure of the proton. We will discuss the tremendous theoretical progress in recent years towards understanding both the longitudinal and transverse spin phenomena observed at RHIC experiments. We start with the original goals of RHIC spin program, briefly report what we have learned so far on the proton spin structure. We then review the most recent developments on theoretical formalism, particularly on those so-called transverse-momentum-dependent factorization. We emphasize how spin has become a useful tool to study QCD factorization and evolution, and to probe the three-dimensional motion of the partons inside the proton. We end our talk with a brief outlook on the future opportunities and challenges.