



# Department of Physics Colloquium

January 23, 2023



3:00 PM

## Evidence for a QCD accelerator in relativistic heavy-ion collisions

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Quantum Chromodynamics (QCD) is the theory of the strong interactions between hadrons. Two remarkable aspects of QCD are that its fundamental particles (quarks and antiquarks) are confined in hadrons, and the quanta of QCD fields (gluons) carry QCD charge (color). This color charge results in string-like QCD fields. High-energy colliders such as the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC) collide protons at high energies to probe their internal structures. High-energy collisions can give quarks or gluons large momenta relative to the hadron that confines them. These scattered partons appear in detectors as QCD jets, normally detected at large angles relative to the colliding ions. These colliders also collide heavy nuclei to probe a quark-gluon plasma, allowing study of early universe conditions. This talk will describe the detection of jets at small angles relative to the copper beam in collisions of Cu+Au ions. We observe forward jets at energies much larger than expected, confirming previously untested models that include string interactions effectively, resulting in a color-charge accelerator. Some models widely used in high-energy cosmic ray studies do not include such interactions.

**This colloquium will be held in-person, at SERC 116 unless announced otherwise.**