

Back to fundamental QCD - a tale of quarks and gluons!

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Collider experiments have proven themselves immensely useful in studying the behavior of fundamental particles such as quarks and gluons. The last few years in particular have seen a push towards an exploration of QCD, the theory of strong interactions, that has hitherto been inaccessible. Innovative experimental techniques allow access to the multi-scale evolution of quarks and gluons via jets. In the context of heavy ion collisions, jets have been advertised for the past two decades as a useful tool for quark-gluon plasma (QGP) tomography. This quest has had its fair share of roadblocks but I share the community's roadmap to the next-generation of measurements, at both RHIC and LHC, with untapped potential to extract QGP's properties. Lastly, I highlight the projected impact of the upcoming Electron Ion Collider both in terms of physics and developing a competent and excited scientific workforce for the discovery machine. We will discuss how these novel techniques and experimental precision lead to us having the ability for the first time to image both the perturbative and non-perturbative QCD regime, resulting in unprecedented access into color confinement.

Dr. Raghav (Rithya) Kunnawalkam Elayavalli is an assistant Professor of Physics in the department of Physics and Astronomy at Vanderbilt University since fall of 2022. Currently she is a Ruff Fant Dean's faculty fellow from 2024-2026. She works primarily in the field of high energy nuclear physics since her masters at Stony Brook University back in 2011. Her masters thesis was in the setup of a simulation package for the future Electron Ion Collider called EICROOT where she studied the interaction of lepton-flavor violating processes. After her PhD at Rutgers University (2013-2017) with focus on measurements of QCD jets in varying collision systems at the CMS experiment at CERN, she moved her research back to RHIC science with postdoc positions at Wayne State University (2017-2022) and Yale/BNL (2020-2022) with the STAR collaboration. At Vanderbilt University, her main focus is on the new sPHENIX experiment at RHIC and the CMS experiment at LHC along with EIC physics heading into the future. She was recently awarded the DOE Early Career award for 2023 focused on measurements of the space-time evolution of quarks and gluons at RHIC. She is also an NSF funded co-PI of the JETSCAPE collaboration which includes both theorists and experimentalists focused on creating advanced analysis and statistical toolkits to extract fundamental properties of the QGP. She also runs a successful high school summer workshop aimed at the EIC physics that is publicly accessible and she encourages everyone to try the program towards the goal of making scientific research accessible to everyone including historically underrepresented peoples in sciences.