

## Probing Cold QCD: Jefferson Lab $eA$ program today and its prospects at 20+ GeV and EIC

The Jefferson Lab  $eA$  program, initially carried out with a 5 GeV electron beam and the CLAS detector, is now continuing with beam energies up to 11 GeV using CLAS12. Looking ahead, there are plans to extend the program to higher energies following the CEBAF upgrade to beyond 20 GeV. The aim of  $eA$  program is to investigate the underlying mechanisms of medium-induced modifications to quark propagation and hadron formation using semi-inclusive deep-inelastic scattering. These effects, quantified through the measurements of hadronic multiplicity ratios and transverse momentum broadening, require multidimensional analyses on a broad kinematical range. In this talk, I will summarize key results from the Jefferson Lab  $eA$  program conducted with 5 GeV and 11 GeV beams, and discuss future prospects for extending these studies to the upgraded 20+ GeV CEBAF and the Electron-Ion Collider (EIC).