Abstract

For over 40 years we have understood protons as bound states of quarks and gluons interacting through the strong force, described by Quantum Chromodynamics (QCD). At large energy scales, perturbative QCD successfully describes the strong interaction, yet our understanding of the dynamics that form a physical proton from quarks and gluons is, at best, poor. Both experiment and theory fail to explain basic properties including the proton spin, mass, or the flavor composition of the antiquark sea. Contrary to naive assumptions, a remarkable asymmetry between the anti-down d and anti-up u quarks has been observed. This asymmetry cannot be generated through perturbative QCD and demonstrates that at any energy scale, there is a fundamental anti-quark component in the proton. The Drell-Yan reaction is uniquely sensitive to antiquark distributions of the interacting hadrons because the reaction requires an anti-quark in one of the initial state hadrons. With the kinematics of the SeaQuest spectrometer, it is particularly sensitive to the anti-quarks of the target nuclei. The E906/SeaQuest collaboration has measured the ratio of deuterium to hydrogen Drell-Yan cross sections. From these data, we have extracted the ratio of d^-/u^-\bar d/\bar u, as a function of the fraction of the proton's momentum that is carried by the interacting quark, x_{Bj}. These data extend the range of previous measurements to larger x_{Bj}. I will also highlight other continuing analyses future Drell-Yan measurements at Fermilab.