# Gravity-like theories give insight into the strong force

7 June 2010, by Kandice Carter

A new computation of the constant that describes the strength of the force between the quarks in a proton may help theorists tackle one of the most challenging problems of physics: analytically solving the theory of QCD and determining its coupling strength at large distances.

Quantum Chromodynamics is the theory of the strong force, describing how quarks combine to make the protons and neutrons in the nucleus of the atom. While the strong force strength is known to be weak at small separation between quarks, its value and behavior at large distances is uncertain and hotly debated.

To tackle that problem, three scientists, including one based at DOE's Jefferson Lab, computed the constant that describes the strength of the force between the quarks in a proton. They computed the constant using a novel approach: the Maldacena conjecture, a method that connects QCD-like theories in physical space to gravity-like theories in a mathematical five-dimensional space.

The calculation showed that the Maldacena conjecture provides an analytical way to solve QCD. Their analysis also clarifies why different earlier calculations have yielded different values for the constant, thus giving new insights into how to consistently define strong force coupling, as well as providing new non-trivial tests of QCD.

A paper describing the result was published on May 28 in the journal Physical Review D.

Provided by Jefferson Lab