Thursday, October 24, 2019
4:25PM in LL. 316
Refreshments at 4:00PM

Berndt Mueller
Professor of Physics, Duke University
Associate Laboratory Director for Nuclear and Particle Physics at BNL

THE UNBEARABLE BURDEN OF BEING LIGHT:
Emergence of ordinary matter from quarks and gluons

In our everyday world, quarks and gluons, forever hide inside protons and neutrons. While their fundamental properties are encoded in the theory of quantum chromodynamics (QCD), many phenomenological aspects of QCD dynamics remain poorly understood. When gluons are massless and the quarks carry only a small fraction of the mass of a nucleon, how do nucleons acquire their large mass? How does nuclear matter emerge from the hot quark-gluon plasma that permeated the universe shortly after the Big Bang? What are the limits of ordinary nuclear matter at high density, e.g. in the interior of neutron stars or neutron star mergers? My talk will explain where our investigation of these questions stands, aided by experiments at the Relativistic Heavy Ion Collider and elsewhere, and how future facilities, such as an Electron-Ion Collider can help us finding the answers.

Berndt Mueller holds a joint appointment as Professor of Physics at Duke University and Associate Laboratory Director for Nuclear and Particle Physics at Brookhaven National Laboratory (BNL). He received his Ph.D. in Theoretical Physics from the Goethe Universität in Frankfurt (Germany) in 1973. After post-doctoral appointments at Wright Nuclear Structure Lab of Yale University and the University of Washington, he returned to Frankfurt in 1976 as an Associate Professor. In 1990 he moved to Duke University in Durham, NC, where he is J.B. Duke Professor of Physics. He served as Department Chair (1997–99) and as Divisional Dean for the Natural Sciences in the College of Arts & Sciences of Duke University (1999–2004). He served as Director of Duke’s Center for Theoretical and Mathematical Sciences (2008–2012) and Chair of the Division of Nuclear Physics of the American Physical Society (2013–2014). Since 2013 he is Associate Laboratory Director for Nuclear and Particle Physics at BNL.

Mueller’s research currently focuses on quantum chromodynamics, in particular, the structure and properties of hot QCD matter and the phenomenology of relativistic heavy ion collisions. He has previously worked on the structure of the vacuum state in strong fields and on the quasi-molecular theory of atomic collisions. He is an author or co-author of 6 textbooks and over 280 refereed publications with more than 15,000 citations. Mueller is a Fellow of the American Physical Society and the American Association for the Advancement of Science. He is a recipient of the Röntgen Prize (1976), the Senior U.S. Scientist Award of the A. v. Humboldt Foundation (1998) and the Jesse Beams Award of the Southeastern Section of the APS (2007).

Mueller has served as a Divisional Associate Editor of Physical Review Letters (1992–1994) and was a member of NSAC (1993–1995). In 2003 he chaired the NSAC Subcommittee on Nuclear Theory. He was a member and chair of the National Advisory Committee of the INT (1995–98), member and chair of the APS Publications Oversight Committee (2010–2013), member of the Board of Directors of ORAU (2012–2015), and served on the Physics Policy Committee of the APS (2016–2018).