Special Issue

Perturbative and Nonperturbative Aspects of Quantum Chromodynamics (QCD)

Message from the Guest Editors

Quantum Chromodynamics (QCD) remains a mystery, although it has been thought to underlie the strong interactions associated with low energy for almost 50 years. The features of QCD theory are strongly dependent on the energy scale (regime). In higher-energy regimes, QCD exhibits strong coupling, and this regime is known as the non-perturbative regime of QCD. In this regime, the perturbative method cannot be applied and broken down. Non-perturbative QCD is characterized by confinement and spontaneously chiral symmetry breaking (SCSB). The latter is believed to be a process that provides particles with mass generation, with particle physicists suggesting that most particle mass in the universe is caused by this spontaneous breaking, in addition to the current mass of the particle that is provided by the Higgs mechanism. Another feature of QCD, QCD confinement, is a challenging non-perturbative aspect of QCD. This confinement maintains the isolation of the quarks and gluons inside the particle hadron, so that they cannot see beyond the hadron particle...

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Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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