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Symmetry and Quark Matter

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Message from the Guest Editor

This Special Issue will focus on symmetries in quark matter at specific energies and temperatures. Various theories and models have been examined and applied to atomic nuclei, color superconductivity, and extremely high-density matter in neutron stars.

Ever since the proposal that the Lie-group SU(3) is the symmetry group for the constituents of Hadrons, quarks have played an important role in elementary particle physics. Although they have never been detected as free particles, they are expected to be free with a large momentum transfer and at an extremely high temperature in the field-theoretical sense. At low energies, quarks are thought to be confined to hadrons with a size of around 1 femtometer = 10^{-15} m = 1 Fermi.

New trends in this field of symmetry and quark matter include the application of quark matter theories to fields of nuclear physics and astrophysics, specifically nuclear structures, neutron stars, quark stars, and magnetars. Here, condensed matter analysis of QCDs and quark matter phases such as color super conductivity have been important subjects of study in quark matter.

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Message from the Editor-in-Chief

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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