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Flavour Problem and Family Symmetry beyond the Standard Model

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Message from the Guest Editors

The Standard Model (SM), in the currently available energy range, agrees very well with the experimental results. However, generally, it is not considered as a complete theory, because it does not provide answers to many pressing questions. The SM does not completely explain why its quarks and leptons sectors are so different; it does not explain the nature of neutrinos (Dirac or Majorana), their masses and parameters of the mixing matrix. All these parameters are determined experimentally. In general, there are three approaches to this matter. The first one derives from a theory that assumes a substructure for the fundamental fermions — the preons theory; the second is based on the grand unification theories; and the third, the family symmetries.

In the flavour symmetry approach, such additional symmetry between quark and lepton gauge doublets and Higgs doublets, triplets or singlets should be sought for. These will give fermion mass matrices from which the determined masses, mixing angles, and the CP symmetry breaking phases are in agreement with experimental data.

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Special Issue

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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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