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Symmetry Applied in Theoretical and Mathematical Physics

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Message from the Guest Editors

Dear Colleagues,

Symmetries are present in natural phenomena, especially in physics. Since the celebrated Noether's Theorem that associates to each symmetry a conserved quantity, the study of symmetries and their implications in the equations of mechanics and mathematical physics has been a constantly growing topic. Since the pioneering work of Evariste Galois, the concept of symmetry has been closely linked to that of the group, and in our field, which requires differentiability, to that of the Lie group. One of the major achievements is the so-called Marsden–Weinstein Theorem of symplectic reduction, which allows us to reduce the dynamical system to another phase space with less dimension. The use of Lie groups and their infinitesimal approximations, Lie algebras, are essential. The moment map becomes a bridge connecting dynamical systems to more manageable algebraic versions. Furthermore, the gauge theories or the construction of the standard model itself are based on the properties of Lie groups. Symmetries are also extremely useful in the fields of engineering (robotics, for example) and in the study of control systems and economics.

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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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