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Symmetry in Geometric Mechanics and Mathematical Physics

Guest Editors:

Prof. Dr. Manuel de León
Campus Cantoblanco Consejo Superior de Investigaciones Científicas C/Nicolás Cabrera, Instituto de Ciencias Matematicas, 13–15, 28049 Madrid, Spain

Prof. Dr. Narciso Román-Roy
Department of Mathematics, Campus Nord, Universitat Politècnica de Catalunya, Ed. C3, 08034 Barcelona, Spain

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Message from the Guest Editors

Symmetries are present in natural phenomena, especially in physics. Since the celebrated Noether's Theorem that associates with 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, is 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.

The aim of this Special Issue is to address different aspects of the importance of symmetries in all these areas through the inclusion of quality articles by renowned authors.

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Editor-in-Chief

Prof. Dr. Sergei D. Odintsov
1. Institució Catalana de Recerca i Estudis Avançats (ICREA), Passeig Luis Companys, 23, 08010 Barcelona, Spain
2. Institute of Space Sciences (ICE-CSIC), C. Can Magrans s/n, 08193 Barcelona, Spain

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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Symmetry Editorial Office
MDPI, St. Alban-Anlage 66
4052 Basel, Switzerland

Tel: +41 61 683 77 34
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mdpi.com/journal/symmetry
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