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Symmetry in Gravity Theories and Cosmology

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Message from the Guest Editors

The late-time cosmic speed-up phenomenon, as witnessed in recent observations, has triggered the development of new ideas and concepts. Einstein's general relativity (GR) theory is able to explain such a phenomenon through the incorporation of additional dynamical degrees of freedom. However, geometrically modified theories of gravity can handle this issue without the need for any dark energy candidates. On the other hand, theoretical shortcomings and tensions between different cosmological observations have raised questions about GR, at least at the large energy scale. Additionally, questions about the symmetrical expansion of the universe have arisen. In this context, symmetry plays an important role in addressing many issues arising in the fields of cosmology and astrophysics. Usually, for a dynamical system, different symmetries, such Noether symmetry and the non-local conservation laws, help to simplify the system of equations, allowing physical systems to be studied in an analytic manner.

This Special Issue aims to present the role played by symmetries and conservation laws in addressing issues in gravitation and cosmology concerning recent research challenges.

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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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