



## Symmetries in Black Holes, Dark Matter and Dark Energy

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### Message from the Guest Editor

Dear Colleagues,

There has recently been a renewed interest in black holes, dark matter and dark energy. This is due to the confirmation of gravitational waves in 2015 from the inspiraling and collision of two black holes, and more recently, the detection of a black hole shadow, published in 2019. Since then, several more verifications have been made. From the theoretical point of view, there are many symmetries relating to black holes, such as black hole symmetry, ladder symmetries, hidden symmetries, gauge symmetries, love symmetries and the symmetry in black hole jets. The cosmic censorship hypothesis also remains an unresolved issue.

In 1998, two teams observing distant supernovae found that they were further than expected, leading to the prediction of the acceleration of the universe at later stages, rather than deceleration, as was previously believed. The most widely accepted explanation for this acceleration is the existence of exotic matter with negative pressure, dubbed dark energy. Dark energy is interpreted as the leftover of mostly cancelled vacuum energy due to spontaneous mirror symmetry breaking. Carroll symmetries, which arise from Poincare symmetry...





# symmetry



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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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