Special Issue

Exploring Symmetries in the High-Energy Universe: Cosmic Rays, Solar Particles, and Astroparticle Physics

Message from the Guest Editors

Cosmic rays, high-energy particles originating from astrophysical sources, are key messengers in the field of astroparticle physics, offering critical insights into the most energetic processes in the universe and the fundamental nature of matter and forces. The propagation of cosmic rays through interstellar and intergalactic space, their interaction with magnetic fields and heliospheric and terrestrial structures, and their eventual detection on Earth or in near-Earth space are central challenges in understanding their origin, composition, and energy spectra. Currently, astroparticle physics has entered a new era driven by advances in detector technology, data analysis methods, and multi-messenger observations. Ground-based observatories and space missions have provided unprecedented data across wide energy ranges, revealing anomalies and spectral features that challenge existing theoretical models. At the same time, the development of high-resolution simulations and the application of machine learning techniques are transforming our ability to interpret large and complex datasets using an integrated approach that combines solar physics, cosmic ray research...

Guest Editors

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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.

Editor-in-Chief

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