Advances in High Energy Physics

Special Issue on

Theoretical and Observational Aspects of Black Holes, Gravitational Waves, and Space-Time Singularities

CALL FOR PAPERS

Some of the fascinating predictions of Einstein's Theory of Relativity are black holes, gravitational waves, and space-time singularities. Despite the fact that theoretical calculations predicted their existence, lack of experimental evidence led some to view these phenomena with scepticism.

Many sources of astronomical evidence pointed out the existence of black holes, and additional evidence showed that gravitational waves exist as well. Finally, 100 years after Einstein's theory was put forward, gravitational waves were directly observed by LIGO detectors. Not only were these ripples in the fabric of space-time observed, scientists confirmed that they were generated by the inspiraling of two black holes. For a long time, it has been known that the gravitational collapse of sufficiently massive objects is a mechanism for the formation of black holes, as well as the production of space-time singularities. On the other hand, it is also known theoretically that nonlinear interactions of gravitational waves themselves may produce space-time singularities as a result of mutual focussing. A thorough analysis of Einstein's equations has revealed that space-time singularities are intrinsic features of both nonlinear gravitational waves and black holes. Finally, understanding singularities at both the classical and the quantum level is extremely important as far as the cosmic censorship hypothesis is concerned, an unproven but generally accepted feature of Einstein's theory. Therefore, these three seemingly unrelated predictions of black holes, gravitational waves, and space-time singularities are in fact interrelated, and this interrelation ranges over both the classical and quantum scales.

As some of the most fascinating topics in relativity, these phenomena have attracted the attention of a considerable number of researchers, and even though there is already a rich literature of theoretical studies, there remain unresolved issues. Space-time singularities, for instance, are awaiting a consistent theory of quantum gravity to elucidate their existence and nature. With the direct discovery of gravitational waves, theoretical and observational studies about the nature and sources of gravitational waves have gained momentum. Astonishing advancements in technology promise a new astronomical research window, a gravitational-wave window, for uncovering a great deal of new information about the universe.

In this special issue, we invite front-line researchers and authors to submit original research and review papers from different viewpoints on the exploration of the classical and quantum nature of black holes, gravitational waves, and space-time singularities in light of the recent theoretical and observational advances.

Potential topics include but are not limited to the following:

- Black hole solutions in modified theories of gravity
- Black hole thermodynamics
- Wormholes
- Particle dynamics in black hole spacetimes
- Dynamical black holes
- Gravitational waves and their nonlinear interactions
- Analysis of gravitational waves
- Analysis of space-time singularities

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/ahep/toahs/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

Lead Guest Editor
Ozay Gurtug, Eastern Mediterranean University, Famagusta, Turkey
ozay.gurtug@emu.edu.tr

Guest Editors
Deborah Konkowski, United States Naval Academy, Annapolis, USA
dak@usna.edu

M. Sharif, University of the Punjab, Lahore, Pakistan
msharif.math@pu.edu.pk

Submission Deadline
Friday, 2 February 2018

Publication Date
June 2018