Preface by the Guest Editors

The *Turkish Journal of Physics* is honouring the 100th anniversary of Einstein's general theory of relativity with a special issue focusing on this remarkable geometric theory of gravitation. Due to the fact that the Newtonian theory of gravitation is not successful enough to describe the influence of massive objects on the structure of space, Albert Einstein obtained his field equations governing the space-time metric guided by physical principles, such as the principle of equivalence, far ahead of his time. With the very audacious underlying idea that gravity is an expression of the curvature of space-time arising from the mass and energy distribution content, he was the first to work out some predictions of his theory as well. For example, the prediction that light follows a geodesic curve was later verified by observing the deflection of starlight by the sun in 1919 during the solar eclipse expedition to Príncipe Island led by British physicist AS Eddington. This particular confirmation of the theory caused sensational headlines in newspapers, making Einstein a household name and helping to establish his celebrity status as a scientist. His name became synonymous with the word genius. Yet another far-reaching prediction of the theory turns out to be on the existence of gravitational waves, which were first considered, and studied exhaustively, by Einstein himself in November 1916 merely a year after the publication of the theory. As a consequence of momentous advances in observational techniques and numerical relativity, the LIGO Scientific Collaboration on 11 February 2016 announced the landmark observation of gravitational waves produced by a binary black hole merger, confirming the remarkable theory in its centennial.

In this commemorative special issue, readers will find research articles related to different aspects of the general theory of relativity. One of the articles considers the evolution of primordial stars in terms of their stability and composition. Another article examines inflationary models incorporating a variety of potentials in which the inflaton is a standard model singlet scalar field. In another article, the particle trajectories are studied in a linear dilaton black hole space-time. There is also a review article that considers the family of metrics corresponding to plane-fronted gravitational waves with parallel propagation within the context of various modified gravitational models described within Newman–Penrose formalism. The cosmological constant problem is considered in an article arguing that it evolves from an extremely small value initially. One of the articles in this issue deals with the bosonic sectors of supergravity theories in ten and eleven dimensions corresponding to the low energy limits of string theories and M-theory. By preserving different fractions of supersymmetry, some examples of supergravity backgrounds are provided. The properties of neutron stars are considered in another article in terms of general relativity. The outcomes are compared with Newtonian gravity and emphasise the indispensability of general relativity in understanding the mechanism of neutron stars. The issue is completed by an article that considers the extension of an electrically charged Majumdar–Papapetrou black hole to the dyonic case possessing both electric and magnetic charges. The properties of the solution are described by providing detailed analysis of geodesics. Hopefully this special issue will help us to inspire the younger generation of physicists in Turkey to explore this wonderful achievement of human intellect.

Guest Editors

Özay Gürtuğ, Professor,
Department of Physics, Eastern Mediterranean University, North Cyprus

Teoman Turgut, Professor,
Department of Physics, Boğaziçi University, Turkey

Ahmet Baykal, Professor,
Department of Physics, Niğde University, Turkey