Third Laureate Fundamental Research

Project Title: Thermodynamic nature of gravity Executive Organization: Shiraz University Researcher: Ahmad Sheykhi (Ph.D.)



Khwarizmi International Award

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Abstract:

In this project, we show that the thermodynamic laws of nature including Newtonian law of gravity and Einstein field equations of gravity, as well as its extensions in other theories such as braneworld scenarios, are not fundamental laws and can be obtained from various thermodynamic approaches. We have studied three approaches for extracting the laws of gravity from thermodynamics arguments: Using the first law of thermodynamics, applying the concept of entropic force, and considering the difference between the bulk and boundary degrees of freedom. Applying these three approaches, we show that the field equations of gravity for different gravitational systems, in particular for the whole universe can be derived from thermodynamic arguments. The results of this project which have been published in 25 decent ISI journals, imply that gravity is nothing but a manifestation of thermodynamic for the spacetime on large scales. Our results help to understand the nature of gravity as a fundamental law of nature which is governing the evolution, motions as well as the stability and of stars, galaxies and our Universe.

