

On the Fate of Alternative Gravitation and Extra-Dimensional Theories

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Abstract

The object of this (exceedingly) brief note is to point out that the recent discovery of gravitational waves may further constrain brane-worlds models and alternative theories of gravitation.

“Sic transit gloria mundi”

There are several mainstream theories that are likely to be impacted by the recent discovery of gravitational waves. At least for the time being, the physics community has been focused on detection results and the future of gravitational wave astronomy while keeping silent on the implications of the LIGO discovery for high-energy theory. In our view, the main models to be further constrained (or re-evaluated) in the short-term are:

- 1) The original Kaluza-Klein model and its derivatives [1-3],
- 2) The Randall-Sundrum scenario of warped extra-dimensions [4],
- 3) The ADD model of large extra-dimensions [5],
- 4) Some alternatives theories of classical gravitation [6-7].

We also believe that other models will be critically re-examined in the long-term, for instance the AdS/CFT correspondence [8] and dimensional reduction in the far ultraviolet regime of field theory [9]. On the topic of spacetime dimensions, it is

plausible to infer that the maximal deviation from three-dimensionality of space is limited to $\varepsilon_{\max} = O(-10^{-5})$ [10], a finding consistent with the body of ideas advanced in [11]. The existence of ε_{\max} severely constrains multi-fractional spacetimes developed in the context of Quantum Gravity, countering the claims of [12-14].

References:

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