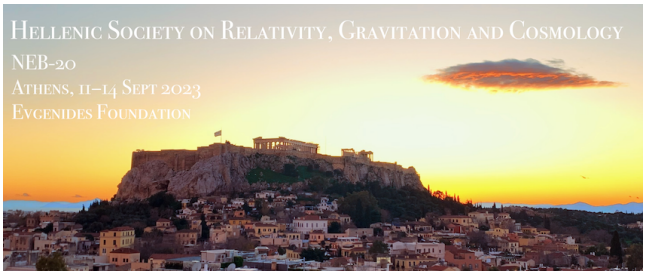

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Non-Noetherian conformal scalar fields

Wednesday, 13 September 2023 12:00 (30 minutes)

Recently, an extension of the standard four-dimensional scalar conformal action, yielding a secondorder field equation that remains conformally invariant, was proposed. In spite of this, the corresponding action is not invariant under conformal transformations and this motivates us to define the notion of non-Noetherian conformal scalar field. In this article, we go further by determining the most general action in four dimensions that gives rise to a non-Noetherian conformal scalar field satisfying a second-order equation. This task is achieved by using the solution to the inverse problem of the calculus of variations. Surprisingly enough, the standard equation is shown to be extended by a non-Noetherian conformal piece involving a nonminimal coupling with a very particular combination of squared curvature terms, which is none other than the one defining the so-called Critical Gravity. We also prove that the most general second-order Euler-Lagrange equation for a conformal scalar field involves additional Noetherian conformal nonminimal couplings defined by an arbitrary function of the Weyl tensor. The recently proposed non-Noetherian conformal extension is recovered as a particular example of this function.

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