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The two faces of mimetic Horndeski gravity: disformal transformations and Lagrange multiplier

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(arXiv:1506.08575).

We show that very general scalar-tensor theories of gravity (including, e.g., Horndeski models) are generically invariant under disformal transformations. However there is a special subset, when the transformation is not invertible, that yields new equations of motion which are a generalization of the so-called “mimetic” dark matter theory recently introduced by Chamseddine and Mukhanov. These conclusions hold true irrespective of whether the scalar field in the action of the assumed scalar-tensor theory of gravity is the same or different than the scalar field involved in the transformation. The new equations of motion for our general mimetic theory can also be derived from an action containing an additional Lagrange multiplier field. The general mimetic scalar-tensor theory has the same number of derivatives in the equations of motion as the original scalar-tensor theory. As an application we show that the simplest mimetic scalar-tensor model is able to mimic the cosmological background of a FLRW model with a barotropic perfect fluid with any constant equation of state.

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