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Gravitational theories in the context of non-Riemannian geometries on the edge of Ockham's razor

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The Newtonian theory of gravity can be reformulated in the language of differential geometry as a non- relativistic theory in curved spacetime, where the source of the curvature is associated with the standard Newtonian gravitational potential. This is known as the Newton-Cartan (NC) theory, and although at a dynamic level it is absolutely equivalent to the standard Newtonian theory, the interpretation of geometric objects and the very structure of Newtonian spacetime is different. A determining factor of this reformulation is that it allows a parallel comparison, and in the same geometric language, of the postulates necessary to construct NC theory and Einstein's theory of General Relativity (GR). It is concluded that the GR theory is simpler than the NC theory since it requires fewer postulates for its construction. Based on these conclusions and adhering to the principle of Ockham's razor, it is reasonable to think that GR is the best option that nature has had to describe gravity. However, it has been shown that, at the dynamical level, GR is indistinguishable from its teleparallel and symmetric teleparallel versions in the context of non-Riemannian geometries. Therefore, in this work the question arises: which gravitational theory would be preferred by Nature based on its simplicity and the number of postulates required for its construction?

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