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Quasi-Palatini Gravity and Scalar-Tensor Theories

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The Palatini formulation of gravity has been successfully used to motivate several observationally viable models of inflationary expansion. While the Palatini and metric formulations are equivalent in minimally coupled gravity, non-minimal scalar models are phenomenologically distinct depending on which formulation is used. At the same time, the recent hybrid approach to metric and Palatini gravity, featuring both the metric and Palatini scalar curvature, has been a productive avenue for model building. However, in practice, the distinction between metric and Palatini appears as a choice applied to an already existing model, rather than the introduction of a novel coupling function. This raises the interesting question of whether a continuous deformation between the metric and Palatini formulations is possible. To this end, we delineate between theories with distinct physical content and different formulations of the same theory, and we introduce the "quasi-Palatini" formulation. We demonstrate how this novel formulation can be used to modify already existing models without introducing new degrees of freedom. We study established models such as the Higgs model of inflation, F(R) gravity, and higher-order modified gravity, and we determine the relative presence of the Palatini variation by making contact with observations without parameter fine-tuning. We discuss how this approach may be further incorporated into the geometric trinity of gravity and metric-affine theories in general.

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