Contributed Talk

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Title: Duality-invariant extensions of Einstein-Maxwell theory

Abstract: We investigate higher-derivative extensions of Einstein-Maxwell theory that are invariant under electromagnetic duality rotations, allowing for non-minimal couplings between gravity and the gauge field. Working in a derivative expansion of the action, we characterize the Lagrangians giving rise to duality-invariant theories up to the eight-derivative level, providing the complete list of operators that one needs to include in the action. We also characterize the set of duality-invariant theories whose action is quadratic in the Maxwell field strength but which are non-minimally coupled to the curvature. Then we explore the effect of field redefinitions and we show that, to six derivatives, the most general duality-preserving theory can be mapped to Maxwell theory minimally coupled to a higher-derivative gravity containing only four non-topological higher-order operators. We conjecture that this is a general phenomenon at all orders, i.e, that any duality-invariant extension of Einstein-Maxwell theory is perturbatively equivalent to a higher-derivative gravity minimally coupled to Maxwell theory. Finally, we study charged black hole solutions in the six-derivative theory and we investigate additional constraints on the couplings motivated by the weak gravity conjecture. The talk would be mainly based on arXiv:2104.07674.