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# Black holes at a crossroads during the late stages of evaporation in quadratic gravity

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By studying quantum fields on classical curved spacetimes, Gibbons and Hawking managed to derive the thermodynamical properties of black holes, while making at the same time the first robust prediction of a semiclassical theory of gravity. Nevertheless, they quickly realized that black hole evaporation leads to sudden bursts of energy and loss of information. It can be argued that these phenomena happen in the final stages of evaporation, where the semiclassical approximation needs to be refined with the inclusion of quantum corrections also for the gravitational part of the theory. A natural way to describe gravity at high energies is to add quadratic curvature terms to the Einstein-Hilbert action, *i.e.* quadratic gravity. At the cosmological level it is known that its classical solutions can give rise to a model of inflation that matches observations strikingly well, while in an astrophysical context, at small masses, it allows for the possibility of non-Schwarzschild black holes. These solutions have very peculiar properties, due to the presence of a massive spin-2 particle which corresponds to a ghost at quantum level. The branch of non-Schwarzschild solutions crosses the one of Schwarzschild ones at a specific mass which could be between the one of an asteroid and the Planck mass, depending from the value of a slightly constrained free parameter. Nonetheless, we expect standard formation processes to create standard black holes, which could reach such small masses only at the late stages of their evaporation. Through the analysis of their dynamical stability, of their thermodynamical properties and the nature of their singularity, we investigate what could happen to a black hole who has reached this crossing point. While this investigation might not solve the problem of the endpoint of evaporation, it can shed a light on the directions it might take during its last moments.

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