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Black hole thermodynamics probes the equivalence principle

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The equivalence principle imposes stringent constraints on both kinematics and dynamics of the spacetime. In my talk, I discuss how these constraints manifest in the context of black hole thermodynamics. I introduce a thought experiment involving a small black hole which uncovers violations of the strong equivalence principle. I then explore its outcomes in several gravitational theories of interest. In particular, I show that all Lanczos-Lovelock theories except general relativity violate the strong equivalence principle. I also comment on the application of the thought experiment in the context of semiclassical gravity and AdS/CFT correspondence.

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