PHYSICS AND ASTRONOMY SEMINAR

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“Unitarity, Ensemble Averages, and the Gravitational Path Integral”

Abstract

It was long believed that resolving the black hole information paradox would require input from the microscopic details of quantum gravity---something beyond the reach of semiclassical effective field theory. In that light, one of the most surprising recent discoveries has been that key features of the unitary evaporation of black holes can already be seen within effective field theory. The necessary new ingredients are 'euclidean wormholes': surprising contributions to the gravitational path integral that can connect different universes together. If that's not troubling enough, these euclidean wormholes are best understood when the gravitational theory is not a single microscopic theory, but an ensemble of many different theories. To put this story on firmer ground, I will explain how these ideas all arise in the description of a single, unitary, microscopic theory and discuss lessons for understanding the gravitational path integral.

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