TEP Seminar

UCLA

Tuesday, December 13th @ 4pm
Schwinger Lounge

"Black hole microstate counting from the gravitational path integral"

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Abstract: Reproducing the integer count of black hole micro-states from the gravitational path integral is an important problem in quantum gravity. In this paper, we show that, by using supersymmetric localization, the gravitational path integral for 1/16-BPS black holes in supergravity reproduces the index obtained in the string theory construction of such black holes, including all non-perturbatively suppressed geometries. A more refined argument then shows that not only the black hole index but also the total number of black hole microstates within an energy window above extremality that is polynomially suppressed in the charges also matches this string theory index. To achieve such a match, we compute the one-loop determinant arising in the localization calculation for all N=2 supergravity supermultiplets in the N=8 gravity supermultiplet. Furthermore, we carefully account for the contribution of boundary zero-modes, which can be seen as arising from the zero-temperature limit of the N=4 super-Schwarzian, and show that performing the exact path integral over such modes provides a critical contribution needed for the match to be achieved.