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Degenerating Microstate Geometries and the Emergence of the Horizon

Large classes of supergravity solutions that appears to be coherent microstates of the D1-D5-P black hole have been found by the Microstate Geometries program. These solutions have a smooth cap at the bottom of a long but finite throat, replacing the black hole's horizon lying at the bottom of an infinitely-long throat.

Because of gravitational blueshift, a small amount of energy as seen from the asymptotics will become large at the bottom of their throat; this energy could perturb the smooth structure replacing the horizon, and force the solution to move in moduli space. One possible outcome is that the solution approaches a locus in the boundary of the moduli space where its smooth microstructure degenerates into a horizon.

In this talk, I will bring to light new degrees of freedom that prevent that prevent the horizon to form in the limit where a class of microstate geometries – the superstrata – seem to degenerate into black holes. These correspond, in a dual frame, to local brane density modes along the common D1-D5 circle. The degenerate solutions, carrying these modes, behave locally as two-charge solutions with vanishing horizon area, and asymptotically as microstates of the three-charge black hole. Interestingly, if one chooses to average over these density modes, a horizon emerges.

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