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Degenerate Microstate Solutions: At Moduli Space's End

Large classes of supergravity solutions that appear 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 gong-show presentation, I will tell how our work [2202.08844] brings to light new degrees of freedom that prevent the horizon to form in the limit where a class of microstate geometries – the so-called 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 microstate solutions, carrying these modes, behave locally as two-charge solutions and have vanishing horizon area; while asymptotically, they have the same charges as the three-charge F1-NS5-P black hole.

Based on [arXiv:2202.08844] with Iosif Bena, Nejc Ceplak, Shaun Hampton, Dimitrios Toulikas and Nick Warner.

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