Holographic Symmetry-Breaking Phases in AdS$_3$/CFT$_2$

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In this note we study the symmetry-breaking phases of 3D gravity coupled to matter. In particular, we consider black holes with scalar hair as a model of symmetry-breaking phases of a strongly coupled 1+1 dimensional CFT. In the case of a discrete symmetry, we show that these theories admit metastable phases of broken symmetry and study the thermodynamics of these phases. We also demonstrate that the 3D Einstein-Maxwell theory shows continuous symmetry breaking at low temperature. The apparent contradiction with the Coleman-Mermin-Wagner theorem is discussed.

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