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Conical surfaces and singularities in highly constrained elastic membranes[1] PAULA MELLADO, SHENGFENG CHENG, ANDRES CONCHA — An elastic membrane that is forced to reside in a container of a slightly smaller size will deform and, upon further volume reduction, will eventually crumple. Previous studies have focused on the onset of the crumpled state by analyzing the mechanical response and stability of a developable conical surface (d-cones) that can be described by a single-valued function, while others have simulated the highly packed regime, neglecting the importance of connectivity of the membrane. Here we present a study in which experiments, numerical simulation and analytic work are used to show that the emergence of new regions of high stretching is a generic outcome when a self- avoiding membrane is subject to a severe geometrical constraint. Consequently, an anomalous mechanical response, characterized by a series of peaks in the force-deformation curve, appears as the membrane is squeezed. Our findings emphasize the role of self-avoidance, connectivity and friction as the key factors defining the morphology and response of a d- cone from its formation to its final fate.

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