

Stress focusing in cones

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The elementary defects on an unstretchable thin sheet (paper say) are described by cones, characterized metrically by the excess angle at the apex.

I will summarize a variational framework to explore the equilibrium states of these defects when they are free to bend. This involves constraints on the metric in the bulk as well as on free boundaries. For the purpose of illustration, I will show how this framework can be applied to determine both the geometry as well as the stress distribution within the cone. A circular ice-cream cone with a deficit angle is trivial geometrically but the stress within it is not. A cone exhibiting a surplus displays an infinite number of states but only one that is stable. When the apex is cut out, I will argue that the resulting annulus relaxes into a non-conical flat geometry whose rulings converge to an edge of regression exhibiting cusps.