

Abstract Submitted
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Buckling Thin Disks and Ribbons with Non-Euclidean Metrics

CHRISTIAN SANTANGELO, UMass Amherst — I consider the problem of a thin membrane on which a metric has been prescribed, for example by lithographically controlling the local swelling properties of a polymer thin film. While any amount of swelling can be accommodated locally, geometry prohibits the existence of a global strain-free configuration. To study this geometrical frustration, I introduce a perturbative approach. I compute the optimal shape of an annular, thin ribbon as a function of its width. The topological constraint of closing the ribbon determines a relationship between the mean curvature and number of wrinkles that prevents a complete relaxation of the compression strain induced by swelling and buckles the ribbon out of the plane. These results are then applied to thin, buckled disks, where the expansion works surprisingly well. I identify a critical radius above which the disk in-plane strain cannot be relaxed completely.

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