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Minimal resonances in annular non-Euclidean strips BRYAN CHEN, Department of Physics and Astronomy, University of Pennsylvania, CHRISTIAN SANTANGELO, Department of Physics, University of Massachusetts, Amherst — Differential growth processes play a prominent role in shaping leaves and biological tissues. Using both analytical and numerical calculations, we consider the shapes of closed, elastic strips which have been subjected to an inhomogeneous pattern of swelling. The stretching and bending energies of a closed strip are frustrated by compatibility constraints between the curvatures and metric of the strip. To analyze this frustration, we study the class of "conical" closed strips with a prescribed metric tensor on their center line. The resulting strip shapes can be classified according to their number of wrinkles and the prescribed pattern of swelling. We use this class of strips as a variational ansatz to obtain the minimal energy shapes of closed strips and find excellent agreement with the results of a numerical bead-spring model. We derive and test a surprising resonance condition for strips with minimal bending energy along the strip center line to exist.

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