

Abstract Submitted
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Loops, Wrinkles and Scrolls in Twisted Ribbons JULIEN CHOPIN, ARSHAD KUDROLLI, Clark University — We explore experimentally the stable and metastable configurations of an elastic ribbon under mixed twist and tension. A ribbon is a slender and thin elastic material with an extremely narrow cross section which exhibits features of rods and plates: it can coil and form loops but wrinkles and stress localization can also be seen yielding a surprisingly rich variety of shapes. Using the twist angle and the tension as control parameters, the various configurations obtained can be rationalized in a phase diagram. Using x-ray tomography, we are able to reconstruct the 3D shape of the ribbon which can then be precisely characterized by measuring locally the mean and Gaussian curvature. Guided by our experimental data, we will present a simple model for the bifurcations observed. Finally, implications for the fabrication of structured rods and yarns with novel mechanical and transport properties will be discussed.

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