Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Spontaneous formation of singularities in twisted ribbons JULIEN CHOPIN, ESPCI, ARSHAD KUDROLLI, Clark University — We present experimental results on the spontaneous formation of a triangular tessellation of a thin elastic ribbon which is twisted with a prescribed longitudinal tension. We find that triangular patterns arise out of a period doubling of a primary longitudinal instability as the twist is increased in contrast with theoretical development assuming infinitely thin, inextensible sheet. 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. We discuss quantitatively the structures of singularities (d-cones and ridges) as a function of nondimensional parameters characterizing the twist, the tension, and the geometry of the ribbon. Because the observed singularities occur away from walls and boundaries, the twisted ribbon configuration provides a unique opportunity to address the spontaneous formation of localized structures with great experimental flexibility.

Arshad Kudrolli
Clark University

Date submitted: 14 Nov 2014 Electronic form version 1.4