Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

A rod theory for pleated elastic strips BASILE AUDOLY, Universtity Paris 6 and CNRS, MARCELO DIAS, Brown University — We consider the equilibrium shapes of a thin, annular strip cut out in a sheet of paper: when such a strip is folded along its circular centerline, it has been observed to buckle out-of-plane (Dias et al., PRL, 2012). We derive an equivalent Kirchhoff rod model for the folded strip. A nonlinear effective constitutive law capturing the underlying geometrical constraints is derived. In this rod model, the opening mode of the ridge appears as an internal degree of freedom. The buckling of the strip is shown to be equivalent to the buckling of a circular ring having two frozen curvatures. Another type of instability is pointed out, whereby the centerline remains planar but the ridge angle is modulated.

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Date submitted: 09 Nov 2012 Electronic form version 1.4