Abstract Submitted
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Graphene Statistical Mechanics[1] MARK BOWICK, Syracuse University, ANDREJ KOSMRLJ, DAVID NELSON, Harvard University, RASTKO SKNEPNEK, University of Dundee — Graphene provides an ideal system to test the statistical mechanics of thermally fluctuating elastic membranes. The high Young's modulus of graphene means that thermal fluctuations over even small length scales significantly stiffen the renormalized bending rigidity. We study the effect of thermal fluctuations on graphene ribbons of width W and length L, pinned at one end, via coarse-grained Molecular Dynamics simulations and compare with analytic predictions of the scaling of width-averaged root-mean-squared height fluctuations as a function of distance along the ribbon. Scaling collapse as a function of W and L also allows us to extract the scaling exponent eta governing the long-wavelength stiffening of the bending rigidity. A full understanding of the geometry-dependent mechanical properties of graphene, including arrays of cuts, may allow the design of a variety of modular elements with desired mechanical properties starting from pure graphene alone.

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Mark Bowick
Syracuse University

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