

Special
APPLIED MATH COLLOQUIUM

**The cost of crushing: curvature-driven
wrinkling of thin elastic shells**

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ABSTRACT:

How much energy does it take to stamp a thin elastic shell flat? Motivated by recent experiments on wrinkling patterns formed by thin floating shells, we develop a rigorous method (via Gamma-convergence) for evaluating the cost of crushing to leading order in the shell's thickness and other small parameters. The observed patterns involve regions of well-defined wrinkling alongside totally disordered regions where no single direction of wrinkling is preferred. Our goal is to explain the appearance of such "wrinkling domains". Our analysis proves that energetically optimal patterns maximize their projected planar area subject to a shortness constraint. This purely geometric variational problem turns out to be explicitly solvable in many cases of interest, and a strikingly simple scheme for predicting wrinkle patterns results. We demonstrate our methods with concrete examples and offer comparisons with simulation and experiment.

This talk will be mathematically self-contained, not assuming prior background in elasticity or calculus of variations.

THURSDAY, FEBRUARY 14, 2019

4:15 PM – 5:15 PM

Building 2, Room 131