

PHYSICAL MATHEMATICS SEMINAR

PROGRAMMABLE BUCKLING: SHAPING THIN FILMS WITH INHOMOGENEOUS SWELLING

CHRISTIAN SANTANGELO
University of Massachusetts, Amherst

ABSTRACT:

From potato chips to leaves to embryos, inhomogeneous growth mechanisms have been implicated in the shaping of thin, elastic films in nature. The strain induced by this inhomogeneous growth leads to buckling into a variety of non-planar shapes. For sufficiently thin elastic films, these systems provide an experimental realization of a geometry problem known as isometric embedding. While any amount of swelling can be accommodated locally by buckling, geometry sometimes prohibits the existence of a global strain-free shape. I will discuss the basic experimental results and some theoretical ideas to predict the final film shape, highlighting several mysteries along the way. The theory will then be applied to the shapes of narrow ribbons whose edges have been swelled. I will discuss the connection between the growth pattern and ribbon shape. These results shed light on how, and under what conditions, ribbon topology conspires to prevent buckling to eliminate all the strain.

TUESDAY, NOVEMBER 3, 2009

2:30 PM

Building 2, Room 105

*Refreshments at 3:30 PM in Building 2, Room 290
(Math Department - Common Room)*



Massachusetts Institute of Technology

Department of Mathematics
Cambridge, MA 02139