MECHANICAL ENGINEERING SEMINAR

Sunday, May 14th, 2023 at 14:00, D. Dan and Betty Kahn Building, Room 217

Principles of wrinkle patterns in thin solids under confinement

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Hosted by: Assoc. Prof. Amir Gat

Confining thin solid objects, such as rods, sheets and shells in a volume smaller than their lateral dimensions generates in them stress. Relaxation of this stress often gives rise to complex patterns – smooth wrinkles, cusped crumples, deep folds, and so on. This general description spans a broad range of pattern formation phenomena, from tissue-shaping instabilities in animal epithelia and plant leaves to shapes of mylar balloons and encapsulation of liquid volumes by solid-like surfactants. In this talk I will describe a few unifying principles that encompass the mechanical-geometrical routes through which confinement gives rise to elastic instabilities and pattern formation in thin sheets and shells. I will emphasize an important distinction between two theoretical approaches: a classic, "near threshold" analysis, which assumes proximity to an unstable compressed state, and "far from threshold" analysis, whose basis is a compression-free state of an infinitely-bendable object.

Prof. Davidovitch is a theoretical physicist in the condensed matter physics group in the Physics Department at the University of Massachusetts, Amherst. His research interests are primarily in the physics of soft matter, and in non-equilibrium physics. In particular, Prof. Davidovitch studies mechanisms for pattern formation in elastic membranes (e.g. wrinkling and crumpling), fluids (e.g. capillary waves and shear banding), and solids (e.g. sputtering-induced nanopatterning).

Seminars Coordinator: Assoc. Prof. Matthew Suss.