Polymer Program

INSTITUTE OF MATERIALS SCIENCE

Seminar: 11:10 am Friday, November 17

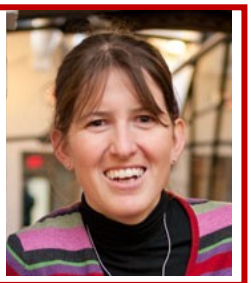
Science 1: Room 1002

Host: Xueju Sophie Wang

Katia Bertoldi

Materials Science & Mechanical Engineering

Harvard University



Nonlinear Inflatable Matter: From Soft Robots to Reconfigurable Structures

Inflation of compliant structures leads to dramatic shape changes: a property that is exploited in a wide range of applications, such as soft robots, deployable structures and medical devices. On the one hand, fluid-driven actuators capable of complex motion can power highly adaptive and inherently safe soft robots. On the other hand, inflation can be used to transform seemingly flat shapes into shelters, field hospitals, and space modules.

Here, we embrace instabilities of inflatable structures as a paradigm to further expand the functionality of inflatable systems. In the first part of this seminar, I exploit snapping instabilities in spherical shells to decouple the input signal from the output deformation in soft actuators–a functionality that can be utilized to design a soft machine capable of jumping. Further, I show that buckling instabilities can be harnessed to generate complex motion out of uniform cylindrical shells. In the second part of the seminar, I focus on quasi-inextensible structures and show that the crumples introduced upon inflation provide opportunities for the design of reconfigurable structures. Together, these projects highlight the potential of instabilities in expanding the functionality of inflatable structures.

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