Soft Living Active and Adaptive Matter

CCBM NSF-CREST CENTER FOR CELLULAR AND BIOMOLECULAR MACHINES

New prospects in shape morphing sheets: unexplored pathways, 4D printing, and autonomous actuation

Ido Levin
University of Washington

Abstract:

Living organisms have mastered the dynamic control of stresses within sheets to induce shape transformation and locomotion. For instance, the spatiotemporal pattern of action potential in a heart yields a dynamical stress field leading to shape changes and biological function. Such structures inspired the development of theoretical tools and responsive materials alike. Yet, present attempts to mimic their rich dynamics and phenomenology in autonomous synthetic matter are still very limited. In this talk, I will present several complementing innovations toward this goal: novel shaping mechanisms that were overlooked by previous research, new fabrication techniques for programmable matter via 4D printing of gel structures, and most prominently, the first autonomous shape morphing membranes. The dynamical control over the geometry of the material is a prevalent theme in all of these achievements. In particular, the latter system demonstrates localized deformations, induced by a pattern-forming chemical reaction, that prescribe the patterns of curvature, leading to global shape evolution. Together, these developments present a route for modeling and producing fully autonomous soft membranes mimicking some of the locomotive capabilities of living organisms.

Date:
06/06/2022

Time:
9:00 AM-10:15 AM (PT)
12:00 PM-1:15 PM (ET)

About the speaker:

Dr. Ido Levin is a postdoctoral fellow at the University of Washington. His research focuses on shape-morphing structures, particularly on the interplay between their geometry, shape, and mechanical properties. He is currently working with Prof. Sarah Keller on conformational changes in biological membranes induced by liquid-liquid phase separation.

Dr. Levin earned his Ph.D. from the Hebrew University working with Prof. Eran Sharon. He combined experiments and theoretical models to uncover various shaping mechanisms of soft tissues and replicate them in synthetic model systems. Dr. Levin was awarded a graduate fellowship by the Azrieli Foundation and postdoctoral fellowships by the Fulbright program and by the Washington Research Foundation.

For more information, contact: Kinjal Dasbiswas, Madhuvanthi Athani
kdasbiswas@ucmerced.edu, mathani1@jh.edu
Sign up at physics.ucmerced.edu/slaam/ to be included in the mailing list to receive a Zoom link.

UNIVERSITY OF CALIFORNIA MERCED PHYSICS