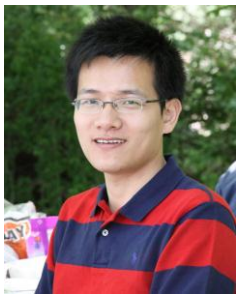
The Department of Mechanical Engineering/College of Engineering and Applied Sciences
Stony Brook University

Mechanical Engineering Seminar



Jie Yin, Ph.D
Department of Mechanical Engineering & Institute for Soldier Nanotechnologies
Massachusetts Institute of Technology

Lecture Title: Mechanical Self-Assembly: Mechanics and Applications

Friday, December 14, 2012 at 2PM, Room 173 Light Engineering Building

Abstract

Self-assembly is becoming increasingly important as a bottom-up route for achieving numerous highly ordered patterns and structures and controlling multifunction at small scales. This talk will discuss a novel category of self-assembly driven by mechanical instability in soft composite materials. Historically, instability has been considered as a mechanism for structural failure. In this talk, I will demonstrate how we harness instability for diverse applications of mechanical self-assembly in biological morphogenesis, micro-fabrication, patterning, energy harvesting, and environmental sustainability etc. Based on self-assembled buckling mechanisms, how mechanics shapes the morphologies of various natural and biological systems, including fruits, vegetables, cells, and tissues, etc., is first discussed. A theoretical framework of stress-driven spontaneous buckling of a model spheroidal bilayer composite system is then established to correlate the surface morphologies of various fruits with their geometries and material properties. Furthermore, I will illustrate that mechanical self-assembly has enormous potential in micro-fabrication to induce micro-patterning on non-planar surfaces for making gear-like microstructures, and creating deterministic ordered surface micro-topologies in polymers through sequential wrinkling. Finally, future researches on novel applications of mechanical self-assembled structures are envisioned in energy harvesting and environmental sustainability etc.

Biography

Dr. Jie Yin received his B.E from Wuhan University of Technology in 2003 and M.S. in Solid Mechanics from Tsinghua University in 2007. In 2010, he completed his Ph.D. in Engineering Mechanics at Columbia University under the guidance of Prof. Xi Chen. During his graduate research, Dr. Yin studied instability of soft composite materials and its novel applications in mechanical self-assembly for micro-fabrication and to understand biological morphogenesis. After graduation, he joined Prof. Mary Boyce's group at MIT. Dr. Yin is currently a Postdoctoral Associate in the Department of Mechanical Engineering and Institute for Soldier Nanotechnologies at MIT, where he is studying mechanics of colloidal nanoparticles for high energy absorption, patterning of polymer surface, and tunable frictional behavior of stimuli-responsive polymers, etc. Dr. Yin has published over 20 journal papers. He has received several awards including the Founder Prize from American Academy of Mechanics, and NSF Fellowship for Summer Institute on Nano Mechanics and Materials etc. Dr. Yin's research interests are in mechanics of soft materials for multifunctional applications in energy and environment.

Directions: Please refer to website: http://www.sunysb.edu or call 631-632-8300 for more information.
Check http://me.eng.sunysb.edu for any changes to location or time.

Stony Brook University