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

Mechanical Engineering Seminar

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Lecture Title: Soft Multifunctional Composites: From Bio-inspired Armor to Artificial Muscles

Friday, December 7, 2012 at 2PM, Room 173 Light Engineering Building

Abstract

Nature actively uses soft materials to create the most effective "soft machines." An example of such a soft machine is an octopus, which can squeeze its whole body through an extremely narrow space while preserving a large variety of functionalities. Usually, these soft multifunctional materials are composites that are characterized by different microstructures and phase properties depending on the required functionalities. In this talk, I will specifically focus on the role of microstructures in the overall performance of soft media. We will explore the properties of different materials. Examples include fiber composites that are widely present in biological tissues (e.g., collagen), flexible armor inspired by scale-tissue protective systems of fishes, and electroactive polymer composites also known as "artificial muscles." We will consider how large deformations and elastic instabilities can be used to trigger dramatic pattern transformations and control the large variety of functionalities. Analytical, numerical and experimental results will illustrate the ideas. The talk is based on joint work with Kaushik Bhattacharya (Caltech), Mary C. Boyce (M.I.T.), Katia Bertoldi (Harvard) and Gal deBotton (BGU).

Biography

Stephan Rudykh is a postdoctoral scholar at Mary Boyce's research group at M.I.T. He received his Ph.D. from Ben-Gurion University (Israel), where he worked with Gal deBotton. Stephan Rudykh was a visiting graduate student at Katia Betroldi's Group at Harvard University in 2011. He was a visiting graduate student at Caltech in 2009, where he worked with Kaushik Bhattacharya. He gained his B.Sc. and M.Sc. from Saint-Petersburg State Polytechnical University.

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