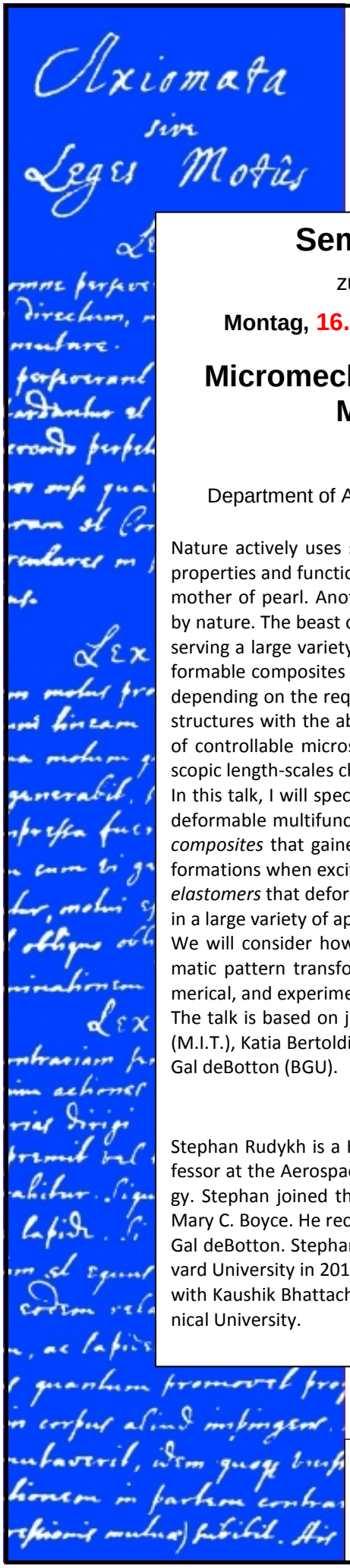

Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Montag, 16.03.2015, 14:00 Uhr, Paul-Gordan-Str. 3, Raum 0.029

Micromechanics of Soft Dielectric Elastomers and Magnetorheological Elastomers

Stephan Rudykh

Department of Aerospace Engineering, Technion - Israel Institute of Technology

Nature actively uses sophisticated designs of microstructures to achieve astonishing material properties and functionalities. Thus, the microstructures give rise to the incredible toughness of mother of pearl. Another example is an octopus, an amazingly effective soft machine created by nature. The beast can squeeze its whole body through an extremely narrow space while preserving a large variety of functionalities. The nature created soft machine comprises highly deformable composites that are characterized by different microstructures and phase properties, depending on the required functionalities. Moreover, combinations of the sophisticated microstructures with the ability to sustain extremely large deformations give rise to the opportunity of controllable microstructure transformations. These cascade transformations on the microscopic length-scales change dramatically the macroscopic properties of the materials.

In this talk, I will specifically focus on the role of microstructures in the overall performance of deformable multifunctional composites. We will explore the behavior of *electroactive polymer composites* that gained the name "*artificial muscles*". These materials can undergo large deformations when excited by an external electric field. Next, we will turn to *magnetorheological elastomers* that deforms and modify their stiffness in external magnetic field. They can be used in a large variety of application such as sensor, actuators and noise and vibration dampers.

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 Professors Kaushik Bhattacharya (Caltech), Mary C. Boyce (M.I.T.), Katia Bertoldi (Harvard), Pedro Ponte-Castañeda (UPenn), Nicholas X. Fang (M.I.T.), and Gal deBotton (BGU).

Stephan Rudykh is a Horev Fellow and Leaders in Science and Technology Chair Assistant Professor at the Aerospace Engineering Department of the Technion – Israel Institute of Technology. Stephan joined the Technion after a postdoctoral training at MIT, where he worked with Mary C. Boyce. He received his Ph.D. from Ben-Gurion University (Israel), where he worked with Gal deBotton. Stephan Rudykh was a visiting graduate student in 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.

Prof. Dr.-Ing. P. Steinmann
Prof. Dr.-Ing. K. Willner
Lehrstuhl für Technische Mechanik
Egerlandstraße 5, 91058 Erlangen

Prof. Dr.-Ing. S. Leyendecker
Lehrstuhl für Technische Dynamik
Haberstraße 1, 91058 Erlangen