EML WEBINAR

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MECHANICS OF ROBOTIC MATTER

Architectured materials have blurred the boundaries between structures and materials. They can be engineered to present specific mechanical, thermal and optical properties by selecting their constitutive materials and the geometry of their distribution. In parallel, an ever growing number of active materials, like liquid crystal elastomers (LCEs), gels and shape memory polymers are being developed to deform in the presence of external stimuli, like temperature changes, light, pH, humidity and electric or magnetic fields. Incorporating active materials in selected regions of architectured materials allows engineering local deformations and/or stresses, which affect the global material response to different external stimuli. For example, architectured sheets that include responsive materials can be programmed to self-morph into relatively complex three-dimensional shapes, to deploy and even to self-propel, when exposed to different environments. Rapidly evolving 3D manufacturing methods allow the fabrication of materials with such functionalities, herein referred to as “robotic matter". In this talk, I will discuss recent examples of robotic matter and I will show methods to design a time-dependent control of the developing shapes.

Chiara Daraio is a Professor of Mechanical Engineering and Applied Physics at Caltech. Her work is focused on developing new materials with advanced mechanical and sensing properties, for application in robotics, medical devices, and vibration absorption. She received her undergraduate degree, in Mechanical Engineering, from the Universita’ Politecnica delle Marche, Italy (2001) and her M.S. (2003) and Ph.D. degrees (2006), in Materials Science and Engineering, from the University of California, San Diego. She joined the California Institute of Technology (Caltech) in fall of 2006 and was promoted full professor in 2010. From January 2013 to August 2016, she joined the department of Mechanical and Process Engineering at ETH Zürich, with a chair in Mechanics and Materials. She received a Presidential Early Career Award (PECASE) from President Obama, was elected as a Sloan Research Fellow, and received a US Office of Naval Research Young Investigator Award. She is also a winner of the National Science Foundation CAREER award. She was selected by Popular Science magazine among the “Brilliant 10." For a complete list of her publications and research information see www.daraio.caltech.edu.

Discussion Leader: **Professor Teng Li**, University of Maryland

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