

Katia Bertoldi's KEYNOTE seminar

"Multistable structures - from deployable structures to robots"

Multistable structures can reversibly change between multiple stable configurations when a sufficient energetic input is provided. While originally the field focused on understanding what governs the snapping, more recently it has been shown that these systems also provide a powerful platform to design a wide range of smart structures.

In this talk, I will first show that pressure-deployable origami structures characterized by two stable configurations provide opportunities for a new generation of large-scale inflatable structures that lock in place after deployment and provide a robust enclosure through their rigid faces. Then, I will demonstrate that the propagation of transition waves in a bistable one-dimensional linkage can be exploited as a robust mechanism to realize structures that can be quickly deployed. Finally, while in the first two examples multistability is harnessed to realize deployable architectures, I will demonstrate that bistable building blocks can also be exploited to design crawling and jumping robots. Unlike previously proposed robots that require complex input control of multiple actuators, a simple, slow input signal suffices to make our system move, as all features required for locomotion are embedded into the architecture of the building blocks.



Katia Bertoldi is the William and Ami Kuan Danoff Professor of Applied Mechanics at the Harvard John A. Paulson School of Engineering and Applied Sciences. She earned master degrees from Trento University (Italy) in 2002 and from Chalmers University of Technology (Sweden) in 2003, majoring in Structural Engineering Mechanics. Upon earning a Ph.D. degree in Mechanics of Materials and Structures from Trento University, in 2006, Katia joined as a PostDoc the group of Mary Boyce at MIT. In 2008 she moved to the University of Twente (the Netherlands) where she was an Assistant Professor in the faculty of Engineering Technology. In January 2010 Katia joined the School of Engineering and Applied Sciences at Harvard University and established a group studying the mechanics of materials and structures. She is the recipient of the NSF Career Award 2011 and of the ASME's 2014 Hughes Young Investigator Award. She serves as an Associate Editor for the journal *Extreme Mechanics Letters*. She published over 120 peer-reviewed papers and several patents. For a complete list of publication and research information: <https://bertoldi.seas.harvard.edu/>