CHEMICAL ENGINEERING
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# CHEMICAL ENGINEERING
## 290 SEMINAR SERIES PRESENTS

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## *Geometrically programmed deformation of polymer plates and shells*

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Thin elastic plates and shells subjected to compressive stress can undergo a wide variety of geometry-dependent mechanical shape instabilities. Our group seeks to take advantage of these phenomena, in combination with new approaches in materials chemistry to develop systems with tailored and reconfigurable 3D shapes and properties. In particular, we have studied the use of photo-crosslinkable polymer films to prepare polymer sheets and multilayers containing stimuli-responsive hydrogel elements. This approach provides access to both smoothly curved plates with programmed Gaussian curvature, and sharply folded films suitable for reversibly self-folding micro-scale origami. The folding of curved surfaces is largely unexplored, but our initial investigations have revealed simple geometric principles for designing bistable structures connected by rapid snap-buckling transitions.

**Ryan Hayward** is a Professor of Polymer Science and Engineering at the University of Massachusetts Amherst. He received degrees in Chemical Engineering from Princeton University (B.S.E, 1999) and the University of California, Santa Barbara (Ph.D., 2004), and was a post-doctoral fellow in Engineering and Applied Sciences at Harvard University from 2004-2005. His group's research covers a variety of topics in polymers and soft materials, with a focus on thin films and interfaces. Recent areas of interest include swelling-induced deformation of constrained and micro-patterned stimuli-responsive gels, and solution state self-assembly of polymer and particle-based nano-structures. Ryan has received several awards, including the Presidential Early Career Award for Scientists and Engineers (PECASE), the 2013 Journal of Polymer Science Innovation Award, and the 2014 John H. Dillon Medal of the American Physical Society. He serves as Associate Editor for the journal ACS Macro Letters.

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