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# Department of Chemistry

## Etter Lecture

9:45 a.m. Thursday, March 10 • 331 Smith Hall

Professor

### Joanna Aizenberg

School of Engineering and Applied Science  
Harvard University

#### *Actuated spiny surfaces à la echinoderms: En route for adaptive materials*

Research interests:

biomineralization, biomimetics, self-assembly, crystal engineering, surface chemistry, nanofabrication, biomaterials, biomechanics and biooptics

Website: <http://www.seas.harvard.edu/directory/jaiz>



#### Abstract

The ability of organisms to respond to various stimuli provides an inspiration for a modern engineering and science that seek to develop a new generation of materials with dynamic, adaptive properties. I will describe the synthesis, fabrication and characterization of new hybrid nano/micro-structures that mimic the echinoderm skin. We demonstrate that these spiny surfaces can be reversibly actuated and assembled into a variety of previously unseen structures with uniform, periodic or chiral nano/micro-patterns. The application of these structures in the context of new materials with reversible optical and wetting properties, as a multifunctional platform for controlling cell differentiation and function, and as an efficient particle-trapping and adhesive system will be discussed.

Selected references:

1. "Reversible Switching of Hydrogel-Actuated Nanostructures into Complex Micropatterns", A. Sidorenko, T. Krupenkin, A. Taylor, P. Fratzi, J. Aizenberg, *Science* **2007**, 315, 487-490.
2. "Controlled Switching of the Wetting Behavior of Biomimetic Surfaces with Hydrogel-Supported Nanostructures", A. Sidorenko, T. Krupenkin, J. Aizenberg, invited paper, *J. Mater. Chem.* **2008**, 18, 3841-3846.
3. "Fabrication of Bio-Inspired Actuated Nanostructures with Arbitrary Geometry and Stiffness", B. Pokroy, A. K. Epstein, M. C. M. Gulda Persson, J. Aizenberg, *Adv. Mater.* **2009**, 21, 463-469.
4. "Self-Organization of a Mesoscale Bristle into Ordered, Hierarchical, Helical Assemblies", B. Pokroy, S. H. Kang, L. Mahadevan, J. Aizenberg, *Science*, **2009**, 323, 237-240.
5. "Microbristle in gels: Toward all-polymer reconfigurable hybrid surfaces", P. Kim, L. D. Zarzar, X. Zhao, A. Sidorenko, J. Aizenberg, *Soft Matter* **2010**, 6, 750-755.

#### Margaret C. Etter Memorial Lecture in Materials Chemistry

Margaret "Peggy" Cairns Etter was born on September 12, 1943. She died on June 10, 1992, from cancer. In 1974, she received her doctorate in chemistry from the University of Minnesota under the direction of Jack Gougoutas. She taught organic chemistry at Augsburg College in 1975-76, and worked at the 3M Company from 1976 to 1983. She returned to the University of Minnesota as a postdoctoral fellow with Robert Bryant in 1984 and, within a year, had secured an independent academic appointment. Peggy rose rapidly through the ranks and in 1990 was promoted to full professor. Peggy's outstanding characteristics as a scientist were her infectious enthusiasm, uncompromising scientific standards, and creativity. Her research group made major contributions in the applications of solid-state nuclear magnetic resonance spectroscopy, the design and properties of organic non-linear optical materials, and most significantly, in the understanding and utilization of hydrogen-bonding interactions in crystals. This was reflected in nearly 80 research papers and in several landmark review articles in prestigious journals. Outside recognition in the form of fellowships from the Sloan and Bush Foundations and an Iota Sigma Pi Award for Excellence in Chemistry represent incomplete reflections of the impact of this work. One of her extramural "side projects" was to found a company called "Rochelle Crystal Corporation," for which Peggy was named St. Paul Businessperson of the Year in 1986.

Host: Regents Professor Lawrence Que Jr.  
Refreshments will be served prior to the seminar.