

Gradients Smart Materials (GradSmarts)

FACULTY MENTORS

James H. Henderson

Patrick T. Mather

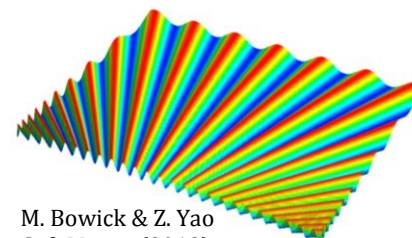
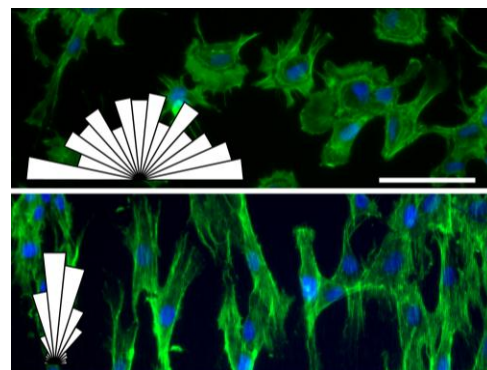
Mark Bowick

■ Biomedical and Chemical Engineering

■ Syracuse Biomaterials Institute ■ Physics

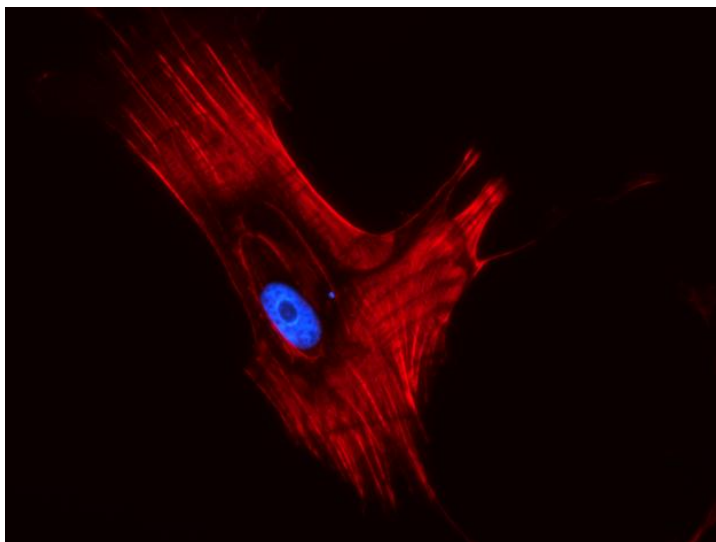
Study shape-memory cell culture materials that combine topographic gradients with biochemical gradients.

- It is known that properties of the material substrate, such as surface topography, can direct cell behaviors.
- One form of topography that drives droplet or cell motion is a gradient-wrinkle surface (see lower right).
- The combined effects of topography and biochemical signals are poorly understood.
- The labs of the faculty mentors have recently developed the first shape memory polymer substrates that can be programmed to change shape with attached and viable cells.
- The trainee will prepare shape memory polymers that exhibit controlled and switchable topography and gradients of cell-signaling molecules, while modeling the phenomena to guide the work.
- By culturing differentiated (e.g., cartilage cells) or progenitor (e.g., stem cells) cells on such unique materials, the trainee will reveal the combined effects of topography and biochemical gradients on cell behaviors important to tissue development and tissue engineering.
- Outcomes are anticipated to have positive and broad impact in the areas of biomaterials science, cell mechanobiology, tissue engineering, and medical device design.



M. Bowick & Z. Yao
Soft Matter (2012)

We seek ambitious graduate students with interests in biomaterials and biomechanics and interfacial physics



Methodology and expertise to be gained:

- Cell and tissue culture
- Interfacial physics theory
- Cell and molecular biology
- Polymer Science
- Live cell imaging
- Shape memory polymer science
- Experimental techniques
- Computational modeling

The trainee will be well prepared to pursue:

- Research in an academic, industrial, or governmental setting
- Research across multiple fields of engineering, physics, and biology
- Intellectual property development and translation

~ More information is available at henderson.syr.edu, mather.syr.edu, and www.phy.syr.edu/~bowick/ ~