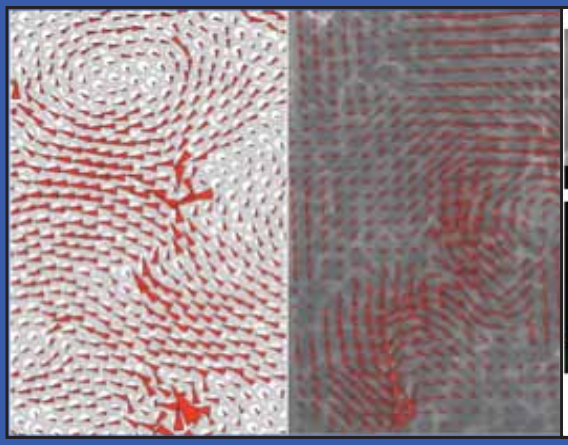
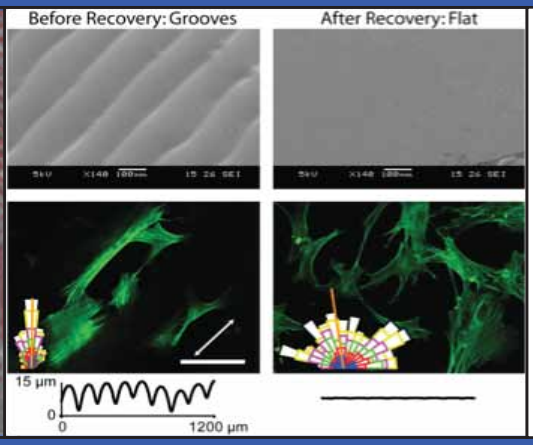
How do cells move in response to mechanical changes in their environment and interactions with other cells?

Many critical biomechanical events—from early embryonic development to tumor formation—involve biomechanical stimuli changing in complex, non-repeating patterns over periods of minutes, hours, or days. In this project, students will use recently developed shape changing and stiffness changing cell culture substrates to mimic and study biomechanical stimuli experienced by cells during tissue development, disease, and repair. They will be part of a team that cultures cells on shape memory polymer (SMP) substrates, develops image analysis tools to quantify the motility and shapes of cells, applies methods from statistical physics to describe motion and emergent behavior, and generates theoretical and computational models to understand observed behavior and make new predictions. Our long term goal is to improve our ability to control cell behavior during tissue repair/regeneration and increase our fundamental understanding of developmental biology, disease pathogenesis, and wound healing.





We have **positions available** for graduate students who are interested in performing any combination of the following on our interdisciplinary, collaborative team:

- theoretical calculations
- simulations
- experiments

Prof. Jay Henderson (henderson.syr.edu)
Department of Biomedical and Chemical Engineering and Syracuse Biomaterials Institute (SBI)

Prof. Lisa Manning (www.phy.syr.edu/~mmanning)
Department of Physics and SBI

Prof. Cristina Marchetti (www.phy.syr.edu/Marchetti_files/)
Department of Physics and SBI

Tools and techniques

- biological cell culture
- polymer synthesis
- image analysis and cell tracking
- simulations and "active matter" modeling
- analytical calculations for diffusion rates and phase transitions

Soft Interfaces IGERT @ Syracuse University