RESEARCH OVERVIEW

Professor Kimberly Foster’s research focuses on the understanding and utilization of nonlinear dynamics in micro and nanosystems. Her current research interests span applications from chemical detection, RF oscillators, to biomedical applications. Her bioengineering work falls into two distinct categories. The first focuses on the development of tools and techniques to understand the link between force and function in cells. Micromechanical machines are small-scale mechanical devices that can be made with very high precision. For example, her lab has developed a device called the uHammer (“micro”-hammer) that can apply controlled, repeatable forces to individual cells. Currently her lab members are using this technology to study the effects of force on neural stem cells. Tools developed for this project will have broad applications beyond neural stem cell research and help researchers gain insight on how forces affect other cells and tissue types. We hope that this work could transform our understanding of how cells process and respond to force-based signals. These signals are essential in development and wound healing in healthy tissues, and are misregulated in diseases such as cancer.

The second focus is the development of bio-inspired adhesives for applications ranging from sports equipment to micro-robotics. Nature has given us excellent adhesives ranging from the fast repeatable adhesion of the gecko to the permanent and strong adhesion of mussel feet. By understanding the mechanics behind nature-based adhesives, Kimberly’s lab is interested in developing synthetic adhesives that utilize similar principles for specialized applications.

Group Website: engineering.ucsb.edu/~tmems/
Selected Publications


5. C McIntosh, S Sherman, MT Napoli, K Turner, B Bamieh, S Pennathur, “Olive oil density characterization through microfluidic detection using acoustic signatures (MIDAS),” Analytical Methods, 8 (42), 7673-7677


