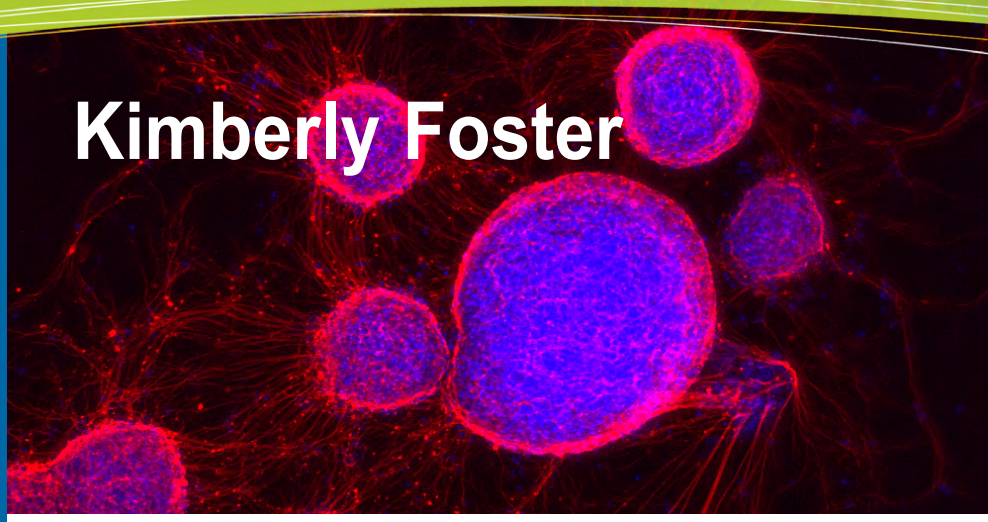
FACULTY OF
THE CENTER FOR
BIOENGINEERING

CBEPeople



Kimberly Foster

Professor,
Mechanical
Engineering

CBE
Associate Director

Co-Chair
UCSB Brain Initiative

CONTACT

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EDUCATION

Michigan Technological University
B.S. 1994 Mechanical Engineering

Cornell University
Ph.D. 1999 Theoretical & Applied Mechanics

HONORS AND AWARDS

2001 NSF Career Award

2005 UCSB Academic Senate Distinguished Teaching Award

2013 UCSB Academic Senate Distinguished Graduate Mentor Award

2010 Program Chair, Americas Workshop on Solid State Sensors and Actuators (elected)

2010-2021 Board of Directors, Transducer Research Foundation

2008-2013 Former Chair of Mechanical Engineering, UCSB

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

1. KR Qalandar, BS Strachan, B Gibson, M Sharma, A Ma, SW Shaw, KL Turner, "Frequency division using a micromechanical resonance cascade," Applied Physics Letters, Volume 105 Issue 24 Pages 244103-07 (2014)
2. Saurabh Das, Nicholas Cadirov, Sathya Chary, Yair Kaufman, Jack Hogan, Kimberly L Turner, Jacob N Israelachvili, "Stick–slip friction of gecko-mimetic flaps on smooth and rough surfaces," JOurnal of the Royal Society, Interface,Vol 12, Issue 104, p 20141346 (2014)
3. Ellen L Holthoff, Lily Li, Tobias Hiller, Kimberly L Turner, "A molecularly imprinted polymer (MIP)-coated microbeam MEMS sensor for chemical detection," in proceedings of the SPIE Defense+ Security International Society for Optics and Photonics, (2015)
4. T Hiller, LL Li, EL Holthoff, B Bamieh, KL Turner, "System Identification, Design, and Implementation of Amplitude Feedback Control on a Nonlinear Parametric MEM Resonator for Trace Nerve Agent Sensing," in Journal of MEMS, 24 (5), 1275-1284 (2015)
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
6. M Bacca, JA Booth, KL Turner, RM McMeeking, "Load sharing in bioinspired fibrillar adhesives with backing layer interactions and interfacial misalignment," Journal of the Mechanics and Physics of Solids 96, 428-444.
7. H Goktas, K Turner, M Zaghloul, "Enhancement in CMOS-MEMS resonator for high sensitive temperature sensing," IEEE Sensors Journal
8. LL Li, PM Polunin, S Dou, O Shoshani, B Scott Strachan, JS Jensen, K. L. Turner, "Tailoring the nonlinear response of MEMS resonators using shape optimization", in Applied Physics Letters 110 (8), 081902
9. N Cadirov, JA Booth, KL Turner, JN Israelachvili, "Influence of Humidity on Grip and Release Adhesion Mechanisms for Gecko-Inspired Microfibrillar Surfaces," ACS Applied Materials & Interfaces 9 (16), 14497-14505. (2017)
10. Brian Gibson, Kamala Qalandar, Cristian Cassella, Gianluca Piazza, Kimberly L Foster, "A Study on the Effects of Release Area on the Quality Factor of Contour-Mode Resonators by Laser Doppler Vibrometry, IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, V. 64 Issue 5, Pages 898-904 (2017)