High Precision Design and Manufacture of Microfluidic Biomedical Devices

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Abstract: Adaptation of silicon microfabrication and MEMS technology has enabled researchers to create networks of microfluidic channels on enclosed chips, allowing observation of cells and manipulation of fluidic samples possible in increasingly smaller volumes. By using this platform, researchers hope to create miniaturized, portable versions of many biological, chemical, and medical tests currently performed in wet labs. While individual components have been demonstrated, repeatability and system integration have yet to be addressed; new components and manufacturing techniques—such as polymer-based fluidic channels and surface patterning of proteins—expand the range of microfluidic devices that can be created, but also add a significant source of manufacturing and assembly error.

This seminar will discuss the use of precision machine design techniques to create high precision integrated microfluidic systems. Specifically, a method of creating microprinted arrays of viable proteins for use in microfluidics will be presented. This novel technique can produce multiple protein patterns with alignment accuracy more than an order of magnitude better than previous technology. In addition, this design provides a tool for integrating soft-polymer microfluidic channels into traditional silicon-based platforms with very high accuracy. The combination of these two procedures can significantly improve the repeatability of integrated microfluidic devices, a vital step in incorporation of these devices into biological, pharmaceutical, and medical settings. A discussion of future work will also be presented, including applications of this technology towards specific medical diagnostic systems and biomimetic ex-vivo cell study.

Bio: Christine Trinkle is a National Science Foundation Fellow and doctoral candidate at the University of California, Berkeley. She received her BS and MS degrees in Mechanical Engineering from the University of Kentucky in 2001 and 2003 with an emphasis on precision machine design. Her research focuses on the application of microfluidics and precision design techniques to create molecular biology analysis technology, with a particular focus on development of portable medical diagnostic devices and biomimetic microenvironments for cellular study.

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Time: 3:30pm to 4:30pm (refreshments 3:00pm)
Place: 323 CRMS
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