



BIOENGINEERING

UNIVERSITY of WASHINGTON

A Department of the College of Engineering & School of Medicine

## BIOEN 509 – DEPARTMENTAL SEMINAR SERIES

Thursday, April. 15<sup>th</sup> 2010, 12:30-1:20 PM

Foege Bioengineering Building N130A

# Creating optical microscopes on a semiconductor chip: the implementation and application of optofluidic microscopy (ofm)

*Dr. Xiquan Cui*

*Department of Electrical Engineering, California Institute of Technology*

Abstract: Optical microscopy has been widely used in the bioscience and biomedical research since its invention. At the same time, the variety and complexity of biological imaging problems also create space for innovations of optical microscopy. In this talk, I will present our work on the implementation and application of high resolution ( $\sim 1 \mu\text{m}$ ), lensless, and fully on-chip microscopes based on the optofluidic microscopy (OFM) method. The OFM prototype is as small as a dime, and yet can render images of comparable quality to those of a bulky standard optical microscope. We have applied the OFM devices to perform automated phenotype characterization of different *Caenorhabditis elegans* mutant strains, and to image waterborne parasites *Giardia lamblia*. OFM has great potential in revolutionizing the way we use microscopes. For example, the availability of tens or even hundreds of the OFM devices on a single chip can allow massively paralleled imaging of cells or microorganisms. The compactness and low cost of the OFM devices can also enable portable and even disposable biomedical diagnostic tools.

*Dr. Cui is a postdoctoral scholar in the Biophotonics Lab at the California Institute of Technology. His expertise is in Biomedical Optics and Micro/Nano Technologies, and has over 21 peer-reviewed publications and 11 patents. His current research interest is to create novel, compact, and low cost biomedical imaging devices. Dr. Cui received his B.E. and M.S. in Optical and Electrical Engineering at the Zhejiang University, China, in 2000 and 2003. After his graduation, he came to the Portland State University for his training in Physics, and received his M.S. in 2005. During his research in Portland, he invented a new type of near field microscope, which can measure both optical and acoustic properties of a sample with nanometer resolution. He also discovered the phononic dissipation mechanism for the probe-sample interaction in the shear force scanning probe microscopes. In 2005, Dr. Cui joined the California Institute of Technology to pursue his Ph.D. career. He developed many innovative tools for biological imaging, including the first optofluidic microscope device on a single chip. He received his Ph.D. in Electrical Engineering at the California Institute of Technology in 2009.*



For more information please visit <http://courses.washington.edu/bioetalk>