

# Center for Magnetic Resonance Research Institute for Engineering in Medicine Co-Sponsored Seminar

TUESDAY  
July 26<sup>th</sup>, 2016

## Deep Tissue Optical Neuroimaging



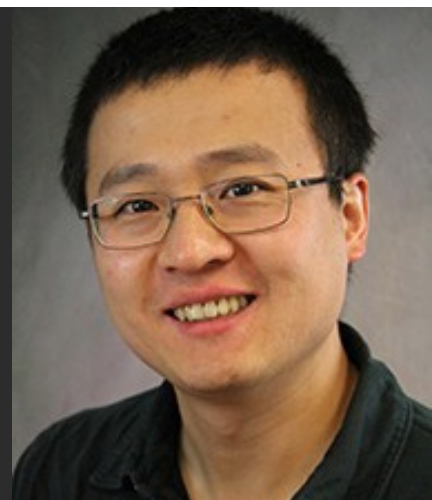
Institute for  
Engineering in Medicine

UNIVERSITY OF MINNESOTA

Driven to Discover<sup>SM</sup>

### Dr. Meng Cui

Assistant Professor, Electrical and Computer  
Engineering and Biology  
Purdue University



FREE event, no registration required.

Refreshments will be provided  
from 11:30 am

For additional information on  
Dr. Meng Cui's presentation  
please contact: [scot0353@umn.edu](mailto:scot0353@umn.edu)

12:00PM - 1:00PM

CMRR Seminar

Room

2-102

The Center for Magnetic Resonance Research (CMRR) and the Institute for Engineering in Medicine (IEM) are pleased to co-sponsor and announce a seminar by Dr. Meng Cui, "Deep Tissue Optical Neuroimaging."

Fluorescence microscopy has been widely used in biology for studying the cellular dynamics. In the field of neuroscience, with the advance of sensitive genetic calcium indicator and laser scanning two-photon microscopy, fluorescence based calcium imaging has become the major workhorse in many labs worldwide. The noninvasiveness and high spatiotemporal resolutions are greatly desired in a variety of applications. Despite its huge success, there are several limitations of optical fluorescence microscopy. A major drawback of optical measurement is the inherently limited penetration depth as compared to other modalities such as MRI. This has limited the calcium imaging to the superficial depth in mammalian brains. To date, most imaging studies are still performed for layer 2/3 neurons (up to ~400  $\mu\text{m}$ ). High resolution imaging of layer 5 or 6 neurons remains very challenging. For calcium imaging of neuron networks, the other major challenge is the throughput. Within a cubic millimeter volume, the number of neurons can approach ~ 1 million. Even at a modest 10 Hz volume rate, this requires an overall throughput of ten million neuron $\times$ Hz, which is approximately three orders of magnitude greater than what current state-of-the-art solutions can provide. In this seminar, our recent work along these directions, which utilize wavefront engineering to improve the depth and throughput of optical neuroimaging will be discussed.

Meng Cui received his B.S. in Physics from Nankai University in China in 2002 and his M.S. in Electrical Engineering in 2006 and a Ph.D. in Physics in 2008, both from the University of Michigan in Ann Arbor. Dr. Cui was a post doctorate scholar at the Department of Electrical Engineering at the California Institute of Technology and received the Rosen scholar award. He headed a lab at the Janelia Research Campus of Howard Hughes Medical Institute. Dr. Cui's research interest is in vivo optical bioimaging.

