

# THE DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING SPEAKER SERIES

**PRESENTS**

## Internal excitation in whole animal fluorescence imaging for enhanced detection of tuberculosis



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**Monday, 9/17, 9:55 am**  
**Room W122, Engineering Building 2**

### **LECTURE ABSTRACT**

Tuberculosis afflicts one third of the population worldwide; more effective therapeutics are urgently needed. However, the slow growth rate of *Mycobacterium tuberculosis*, the causative agent of tuberculosis, hinders advancement in all areas of TB research. Fluorescent proteins have been widely utilized in real-time imaging of tuberculosis to track disease progression and evaluate therapeutic outcomes in live animals, but the sensitivity of this technique is limited by tissue absorption of fluorescence excitation light, which limits penetration particularly in the visible wavelengths. To circumvent the impact of tissue absorption of excitation light, we have applied a fiber bundle microendoscope to deliver fluorescence excitation light directly into the mouse lung. We have integrated this microendoscope into a whole animal imaging system to enable intravital excitation in the mouse lung combined with whole animal detection. Using the integrated intravital-excitation whole-animal imaging system, we have improved the detection threshold of tdTomato expressing *M. bovis* BCG strain during pulmonary infection to  $\sim 10^3$  colony forming units (CFU). This detection threshold represents a  $\sim 3$ -fold improvement compared to epi-illumination in a whole animal imaging system, which normally detects  $\sim 10^6$  CFU within the lungs of a mouse. We have developed a computer model of light transport in infected mouse lungs and three-dimensional tissue phantoms for validation.

### **SPEAKER BIOSKETCH**

Dr. Kristen Maitland is an Associate Professor of Biomedical Engineering and the Director of the Microscopy and Imaging Center at Texas A&M University. She has been awarded the NSF CAREER Award, TEES Select Young Faculty Award, William Keeler Memorial Award for outstanding contributions to the field of engineering, and Tenneco Meritorious Teaching Award. She is a Fellow of SPIE, the international society for optics and photonics, and a Senior Member of IEEE. Dr. Maitland's research focuses on the development of light-based technologies for detection, diagnosis, and treatment of disease. Dr. Maitland received her B.S. and M.S. degrees in Electrical Engineering from Cal Poly, San Luis Obispo, and Ph.D. degree in Biomedical Engineering from The University of Texas at Austin.

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