ELECTRICAL & COMPUTER ENGINEERING BIO-SEMINAR Fall 2017

When: **Friday 13:50 – 14:50**
Where: **ETB 1035**

Speaker: **Prof. Brian E. Applegate**

Associate Professor
Department of Biomedical Engineering
College of Engineering
Texas A&M University

Title: **Probing mechanical processing in the ear using Volumetric Optical Coherence Tomography and Vibrometry**

Date: **11-03-2017**

Abstract: Many of the diagnoses for hearing loss and vertigo or disequilibrium are based on a process of elimination, rather than physical evidence of a particular pathology. This is especially true for diseases of the inner ear, which can lead to misdiagnosis and improper treatment. Similarly, our understanding of both healthy and pathological conditions of the inner ear is in many ways lacking. Such an understanding is a key component in the development of effective therapies. Our ability to fill this knowledge gap and provide better diagnoses would be strongly enhanced if there were a way to directly interrogate the soft tissues of the inner ear. We have been working on a functional extension of Optical Coherence Tomography (OCT) that enables functional vibratory measurements in the cochlea, the part of the inner ear largely responsible for the mechanical processing of sound in hearing. The techniques and algorithms we have developed have been incorporated into a stereo-microscope based system that enables morphological and vibratory imaging with picometer sensitivity in animal models. Working with collaborators in otolaryngology we have made detailed 3-D measurements of the murine cochlear soft tissues under tonal stimulation. Recent results include the first in vivo measurements of a sound evoked wave traveling up the organ of Corti and documentation of phase variations in the organ of Corti that could have implications for our basic understanding of mammalian hearing. We have also started to work to translate this technology to the clinic in order to enable similar interrogation of the human cochlear soft tissues for diagnosis.

Biography: Dr. Applegate received his B.S. in chemistry from Wright State University and his M.S. and Ph.D. in chemistry from The Ohio State University. After completing a postdoctoral fellowship in the Department of Chemistry at the University of North Carolina at Chapel Hill, working on water cluster growth in superfluid helium, he joined the Biophotonics group at Duke University directed by Prof. Joe Izatt. While at Duke, he won a National Institutes of Health NRSA postdoctoral fellowship award to support work in developing molecular imaging technologies. Upon completing his fellowship he joined the Department of Biomedical Engineering at Texas A&M University. He is currently an Associate Professor with research interests in technology development for optical and molecular imaging and optical diagnosis/monitoring of atherosclerosis and diseases of the ear. Research in his lab has been supported by grants from the Department of Defense CDMRP, National Institutes of Health, and the National Science Foundation, including an NSF CAREER award. He is a fellow of the Optical Society of American and serves as an Associate Editor for Optics Letters and IEEE Transactions on Medical Imaging.