Chris Xu, Cornell University, USA

Bio:

Chris Xu is Professor of Applied and Engineering Physics, Cornell University, and the Mong Family Foundation Director, Cornell Neurotech. Prior to Cornell, he was a member of technical staff at Bell Laboratories. He received his Ph.D. in Applied Physics from Cornell University. His current research areas are biomedical imaging and fiber optics. His research is supported by major grants from NIH, NSF, DARPA, and IARPA. Dr. Xu has chaired or served on numerous conference organization committees and NSF/NIH review panels. He has served as Associate Editor for Biomedical Optics Express, and is on the editorial boards of several journals. He has published more than 110 journal papers (including 7 invited review articles) and 8 book chapters. He has 30 patents granted or pending. He has won the NSF CAREER award, Bell Labs team research award, and the Tau Beta Pi and two other teaching awards from Cornell Engineering College. He is a fellow of the Optical Society of America, and a fellow of the National Academy of Inventors.

Presentation Title:

In vivo 3-photon Microscopy of the Mouse Brain

Abstract:

Over the last two decades, multiphoton microscopy has created a renaissance in the brain imaging community. It has changed how we visualize neurons by providing high-resolution, non-invasive imaging capability deep within intact brain tissue. Multiphoton imaging will likely play an essential role in understanding how the brain works at the level of neural circuits, which will provide a bridge between microscopic interactions at the neuronal level and the complex computations performed at larger scales. In this talk, the fundamental challenges of deep tissue, high-resolution optical imaging are discussed. New technologies for in vivo structural and functional imaging of mouse brain using long wavelength excitation and three-photon microscopy will be presented. We will discuss the requirements for imaging the dynamic neuronal activity at the cellular level over a large area and depth in awake and behaving animals, and identify the applications where 3-photon microscopy outperforms conventional 2-photon microscopy in both signal strength and image contrast. We will speculate on the possible future directions, including adaptive optics, to further improve the imaging depth and speed in biological tissues.