Techniques in Biophotonic Imaging

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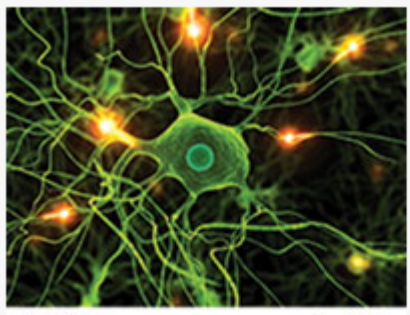

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ASI APPLIED SCIENTIFIC INSTRUMENTATION

Free Webinar

Dr. Kimani C. Toussaint Jr.
Photonics Research of Bio/Nano Environments (PROBE) lab group, University of Illinois

QUANTITATIVE IMAGING OF COLLAGEN FIBERS USING SECOND-HARMONIC GENERATION

Advances in nonlinear microscopy, e.g., multiphoton fluorescence microscopy and second-harmonic generation (SHG) microscopy, have permitted both noninvasive and high-resolution imaging of biological specimens. In recent years, there has been increasing effort to use these techniques to perform quantitative inspection of specimens under study. In his talk, Dr. Toussaint will focus on two particular techniques that the PROBE group is researching: Fourier transform-second-harmonic generation (FT-SHG) and polarization-second-harmonic generation (P-SHG). Information pertaining to collagen fiber structural organization is obtained using FT-SHG, which combines SHG with spatial harmonic analysis, while P-SHG carries information that is sensitive to molecular-level changes to collagen fibers, by exploiting the intrinsic coherence in the SHG process to determine the polarization-dependent normalized tensor components of the 2nd-order scattering coefficient. Potential biomedical applications will be discussed.

Dr. Melissa Skala
Optical Imaging Laboratory, Vanderbilt University School of Engineering

PHOTOTHERMAL OPTICAL COHERENCE TOMOGRAPHY OF NANOPARTICLE CONTRAST AGENTS

OCT is an important biomedical imaging modality, filling the spatial niche between ultrasound and microscopy, but it suffers from an inherent lack of molecular contrast. Dr. Skala's group has shown that photothermal detection of highly absorptive nanoparticles can be achieved by incorporating an amplitude-modulated laser into the sample arm of a standard OCT system. This talk will cover the principles of photothermal OCT, its characterization, and in vitro and in vivo molecular imaging applications using gold nanorod contrast agents.

Dr. Ofer Levi
Institute of Biomaterials and Biomedical Engineering, University of Toronto

MULTIMODAL OPTICAL NEURAL IMAGING WITH VCSEL LIGHT SOURCES

Dr. Levi presents the development of a multi-modality optical neural imaging system, to image blood flow velocity and oxygenation in a rat brain, using a fast CCD camera and miniature VCSEL illumination. His group combined two techniques of laser speckle contrast imaging (LCSI) and intrinsic optical signal imaging (IOSI) simultaneously, using these compact laser sources, to monitor induced cortical ischemia in a full field format with high temporal acquisition rates. Simultaneous imaging is based on fast coherence reduction techniques applied to vertical cavity surface-emitting lasers (VCSELs) operating at 680, 795 and 850 nm. His group has demonstrated the use of this system in tracking ischemia and with adding a fluorescence modality, in evaluating the disruption of a blood-brain barrier and tracking seizure activity in the brain. Finally, he will present his group's initial design and system analysis for a low-cost CMOS-based portable imaging system as a minimally invasive method for long-term neurological studies in un-anesthetized animals. This system will provide a better understanding of the progression and treatment efficacy of various neurological disorders in freely behaving animals.

Title: *Techniques in Biophotonic Imaging*
Date: Thursday, March 21, 2013
Time: 1:00 PM - 2:00 PM EDT

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System Requirements
PC-based attendees
Required: Windows® 7, Vista, XP or 2003 Server

Mac®-based attendees
Required: Mac OS® X 10.6 or newer

Mobile attendees
Required: iPhone®, iPad®, Android™ phone or Android tablet

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