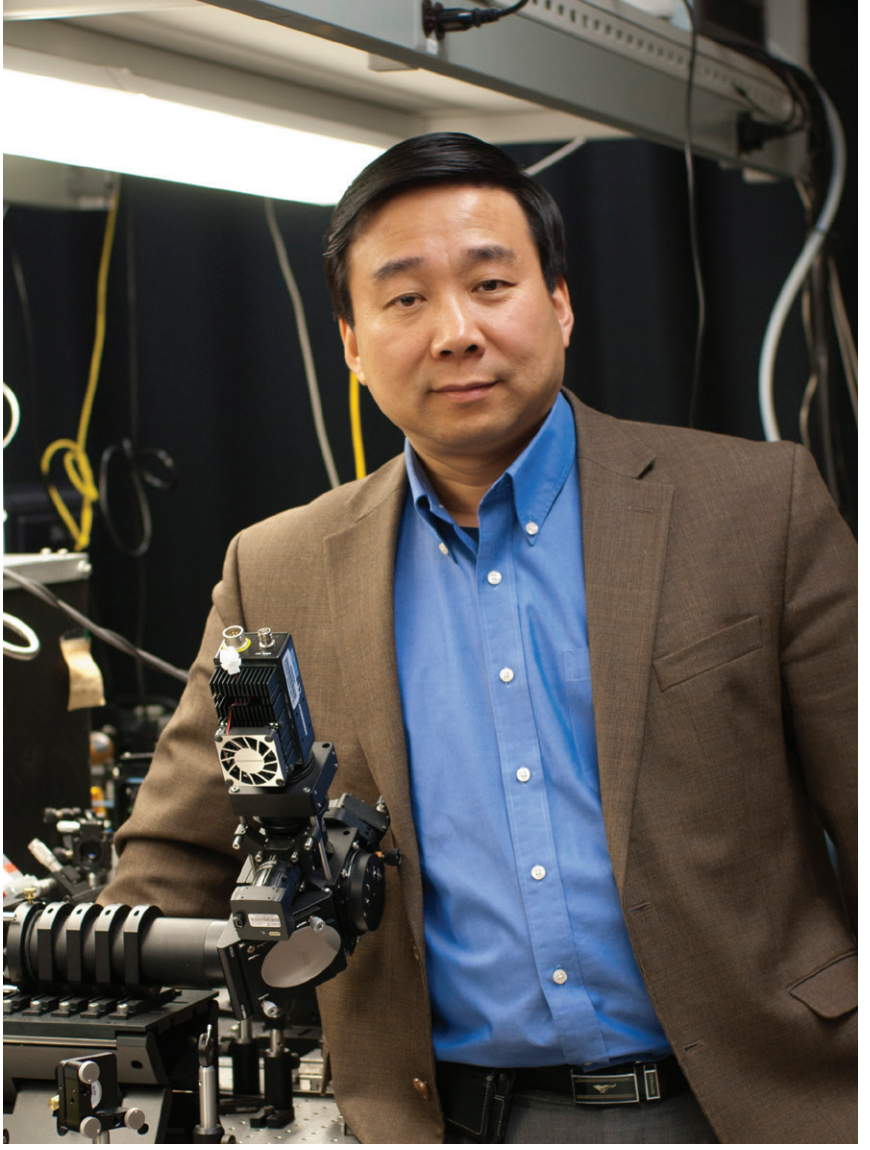
CONVERSATIONS

Looking Inward with Optics

OSA Fellow **Xingde Li**, one of the BIOMED 2014 plenary speakers, talks with OPN about label-free imaging of tissue histology.

Li is a professor of biomedical engineering and of electrical and computer engineering at Johns Hopkins University. His plenary talk will describe nonlinear endomicroscopy technology and its use in label-free imaging of tissue histology in real time while inside the body.



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What inspired you to pursue a multidisciplinary Ph.D. in physics and biomedical optics?

Inspirational mentors and colleagues greatly influenced my career pursuits—but there was also an element of luck. The shutdown of some nuclear research facilities during my graduate studies at UPenn triggered my move away from nuclear physics. At that time, one of my favorite professors, Ralph Amado, chatted with me about alternative career prospects and shed some light on the emerging field of biomedical optics. He also introduced me to two pioneers in the field: Arjun Yodh and the late Britton Chance, with whom I got the opportunity to work with while completing my Ph.D. I was also very fortunate to have my postdoc training in James Fujimoto's group at MIT.

What are you looking forward to at the BIOMED meeting?

I have been part of this conference since 1996 and always enjoy learning about new developments and meeting new people. BIOMED is the perfect size for this: big enough to cover a wide selection of topics in the field, but small enough to meet and talk to almost any fellow attendee. In addition to the cozy scientific atmosphere, the warm weather in Miami is not a bad addition to the conference.

What are some of the topics you will cover in your plenary talk?

There are so many exciting new developments in biomedical optics! I am honored and humbled to talk about new developments in label-free nonlinear endomicroscopy imaging from my lab. This technology miniaturizes a benchtop scanning multiphoton microscope down to a flexible, 2-mm diameter endomicroscope. Our work has involved new fiber optics capabilities, micro optics, MEMS technology, physics, as well as many engineering challenges.

How will this technology affect public health in the near term? Long term?

Near term, the device's small size will enable it to be integrated with existing medical instruments for guided biopsy and early disease detection. For the long term, the technology could allow for direct visualization of tissue histology in real time while inside the body at a resolution of standard histopathology, but without the need for tissue removal or staining. I see a potential use as a stand-alone technology or modality in a clinical setting.

CONVERSATIONS

Determining **Tissue Health** with Light

OSA Fellow and Board Member and BIOMED 2014 plenary speaker **Adam Wax** talks with OPN about his work on assessing tissue health based on coherent detection of multiply scattered light.

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Wax is the Theodore Kennedy Professor of Biomedical Engineering at Duke University, as well as the founder and chairman of Oncoscope, Inc., a company launched in 2006 to commercialize technologies developed in his lab. He received his Ph.D. in physics from Duke in 1999 and completed his postdoctoral training at the Massachusetts Institute of Technology.

Why did you pursue a career in biomedical optics?

As a physics major, I enjoyed studying fundamental phenomena. However, as I began to contemplate career paths, I started to feel that I wanted to see my work have an immediate, tangible impact on the world around me.

As a biomedical engineer, I'm able to develop new technologies and translate them to the clinic, enabled by the great collaborative atmosphere we have at Duke between the engineering school and the medical center.

Right now, my research is focused on optical spectroscopy for early cancer detection, novel microscopy and interferometry techniques. By studying intact, living cells, we have the opportunity to observe cellular structure, organization and dynamics in a way that is not possible with traditional methods.

What will be the focus of your plenary talk?

My BIOMED talk, "Label-free nonlinear endomicroscopy imaging of tissue histology *in vivo*," will focus on our work to address a gap in biomedical optical imaging technology.

While we have excellent techniques for visualizing things at microscopic length scales and for sensing at larger length scales with diffuse optics, there isn't really a technology that can do millimeter scale imaging with centimeter depth penetration.

However, this length scale is of interest for solving many clinical problems. My laboratory works to addresses this gap by using forward-scattered light and coherence gating. I will present results on tissue characterization with this approach and demonstrate applicability to the clinical problem of assessing burn wound progression.

How will *in situ* biomedical imaging affect public health in the near and distant future?

I believe that existing biomedical optical imaging technologies will become less expensive and more portable; and they will become more accessible to a greater part of the population, at the point of care and in low-resource settings. Long term, we may have such imaging technologies available in our homes, enabling disease to be detected at the earliest stages.

What are you looking forward to at the BIOMED meeting?

The BIOMED meeting is among my favorites—I've attended every one since 1996. I think the size and location of the meeting make it easy to catch up with colleagues both at the conference and in more informal settings. The Miami weather also makes this a fun conference to attend, and since my parents moved there a few years ago, the conference has been a great excuse for me to visit them, too. OPN

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