

Developing optical imaging technologies to identify disease biomarkers

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Abstract

My lab seeks to develop optical imaging technologies to fill the gaps in both clinical diagnoses and fundamental investigations. The current focus are (1) to develop optical coherence tomography (OCT) technologies that can extract physiological and pathological information beyond high-quality anatomical imaging. To this end, we developed visible-light OCT or vis-OCT to quantify retinal oxygen metabolic signatures in diabetic retinopathy and macular degeneration. We are also examining optical signatures of earliest pathological alterations in glaucoma and geography atrophy; (2) to push super-resolution microscopy into new depth. We combined patterned illumination with two-photon microscopy to achieve this goal; (3) to add molecular specificity to photon localization microscopy through stochastic spectroscopic analysis. This newly developed technology demonstrated a spatial resolution of 4 nm and a potential to image biomolecules without fluorescent labeling. In this talk, I will brief our work in this three areas with applications from genome imaging at 10 nm scale to clinical ophthalmology.

Biography



Hao F. Zhang is an Associate Professor of Biomedical Engineering at Northwestern University. He received his Bachelor and Master degrees from Shanghai Jiao Tong University (Shanghai, China) in 1997 and 2000, respectively, and his Ph.D. degree from Texas A&M University (College Station, Texas) in 2006. From 2006 to 2007, he was a post-doctoral fellow at Washington University in St. Louis. He reported the first demonstration of photoacoustic microscopy in *Nature Biotechnology* (2006) and *Nature Protocols* (2007). In 2010, he received the NSF CAREER award and NIH Director's Challenge Award. He currently serves as an associate editor for *Biomedical Optics Express*, *Current Eye Research*, and *Scientific Reports*. His research interests include optical coherence tomography, super-resolution imaging, single molecule imaging, and vision science. For more information, please visit <http://foil.northwestern.edu>.