Opto-Analytical Sensing, Imaging and Stimulation (OASIS)

Wei-Chuan Shih
Associate Professor
Departments of Electrical & Computer Engineering,
Biomedical Engineering, and Chemistry
University of Houston

Light matter interaction can provide rich constitutional information in tissue, cells, and molecules. Our laboratory at University of Houston has developed several opto-analytical sensing, imaging and stimulation (OASIS) technologies with core innovations in material, device, and instrumentation. In this talk, I will discuss label-free Raman spectroscopy and hyperspectral Raman imaging for non-invasive chemical measurements in cell, tissue, animal, and human. Next, I will present our work in developing a unique class of plasmonic nanomaterial, nanoporous gold disks (NPGD), featuring ~100 nm particle size with 3-dimensionally distributed and interconnected porous network of ~10 nm pore size. I will provide an overview on various aspects of this novel functional material such as fabrication, characterization, modeling, and applications. Specifically, I will discuss several advanced techniques with strong translational potential in the biomedical and environmental fields. I will then discuss our strategies for implementing these techniques on a novel multi-modal neural probe platform designed for stimulation and sensing in the deep brain region. I will close by showcasing our highly publicized DotLens Smartphone/Tablet Microscopy and its value in formal and informal K-12 STEM education, citizen science, as well as practical and research applications.

Bio: Wei-Chuan Shih received his B.S. and M.S. from National Taiwan University and National Chiao Tung University, respectively. He earned his Ph.D. from MIT Spectroscopy Laboratory/NIH Laser Biomedical Research Center under laser physicist Michael S. Feld, developing novel optical spectroscopy techniques for non-invasive chemical/biomedical sensing and disease diagnosis. He also worked extensively on Nano/microfabrication and N/MEMS. Prior to joining the University of Houston, he was a Schlumberger research fellow, developing optical analysis of hydrocarbon fluids and optical offshore oil spill monitoring. Dr. Shih is an Associate Professor of Electrical & Computer Engineering, Biomedical Engineering, and Chemistry at the University of Houston. He was a MIT Martin Fellow of Sustainability, and received NSF CAREER Award in Biophotonics (2012), inaugural NASA Early CAREER Faculty Award in Environmental Sensing (2012), UH Award for Excellence in Research and Scholarship (2013), and UH Cullen College of Engineering Faculty Research Excellence Award (2015). His recent PhD graduate was the winner of the Best Dissertation Award by the Cullen College of Engineering. He has published more than 60 articles in books, journals and conference proceedings, including ~40 peer-reviewed journal papers. He has more than 10 patents, one of which has been licensed. His recent invention, DotLens® Smartphone Microscopy, has been featured on CNBC, HoustonPBS, UH Moment and numerous other media outlets. Besides NSF and NASA, his research is also supported by NIH, DOI, and GoMRI, with a cumulative sum ~$3M.

Website: http://www2.egr.uh.edu/~wshih/