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SEMINAR SERIES

Wednesday, May 15, 2024
Seminar Presentation: 11:00am – 12:00pm
SME Room 248

"Ultra-sensitive, selective, and label-free optical sensing for fundamental science, environmental monitoring, and translational medicine"

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Abstract: Microtoroid optical resonators, when combined with frequency locking, balanced detection, and data processing techniques, are capable of label-free single molecule detection at zeptomolar concentrations in under 30 seconds. We have developed such a system called FLOWER (frequency locked optical whispering evanescent resonator). We discuss the principles of FLOWER, including noise analysis, and how, at such low concentrations, we can achieve sensing times on the order of seconds. In addition, we discuss our ongoing work on using FLOWER for fundamental studies on taste, and a variety of applications including drug screening, medical diagnostics for ovarian cancer, and chemical threat sensing. We validate our technology against existing approaches and perform detection in complex biological fluids. Finally, we discuss our next generation sensing platforms, including how we combine FLOWER with frequency comb technology to enable simultaneous detection and absorption spectroscopy, our work on high sensitivity photothermal spectroscopy, and our work towards a robust, portable, translatable device.

Biosketch: Judith Su is an Associate Professor in Biomedical Engineering and an Associate Professor in Optical Sciences at the University of Arizona. Judith received her B.S. and M.S. from MIT in Mechanical Engineering and her Ph.D. from Caltech in Biochemistry & Molecular Biophysics. Her lab focuses on building next generation optical sensing platforms and, with these sensors, collaborating with top researchers to solve the most significant and pressing problems in science, medicine, and issues confronting society. She is a recipient of an NSF CAREER award, an NIH R35 Outstanding Investigator Award, an American Society of Laser Surgery and Medicine Young Investigator Award, the Journal of Physics Photonics 2023 Early Career Award, and is one of the 2024 Photonics100 which recognizes the industry's most innovative people. She was a Siegman International School on Lasers Lecturer and a Scialog: Chemical Machinery of the Cell Fellow. She was on the Board of Scientific Counselors for the National Institute for Occupational Safety and Health (NIOSH). She gave a keynote talk at SPIE Photonics West 2022 and was the general co-chair for Optica's 2023 Advanced Photonics Congress, Integrated Photonics Research (IPR) Conference in Busan, Korea. She is serving again as IPR's co-general chair in 2024 in Quebec City, Canada.