Analytical Chemistry Seminar

Tuesday, April 16, 2024
3:30 p.m. ~ WTHR 320

"Mass Photometry: Fundamentals and Applications"

Myles Quinn Edwards
Graduate Student, Purdue Univesity

Bio:

Myles Quinn Edwards is a second-year graduate student in the Cooks research group at Purdue University, focusing on the applications of aqueous microdroplets for chemical evolution and prebiotic chemistry. He received his undergraduate and master's degrees from DePaul University in 2015 and 2018, respectively, where he was awarded the C and K Joanitis Scholarship and the Blumberg Endowed Scholarship for his master's studies. His master's thesis investigated infrared optical constants for squalane, squalene, and various mixtures from the Mie inversion of aerosol extinction spectra. He worked as a scientific consultant for the Law offices of Todd Friedman, P.C. before joining Purdue in the fall of 2022.

Abstract:

Only five years since its inception, mass photometry seems to have emerged as a powerful tool for the analysis of biomolecules. This technique allows for the determination of mass distributions of proteins and nucleic acids, evaluation of membrane protein complexes, and provides insight into the binding affinity of macromolecular machines and biological assemblies. Moreover, the advent of mass photometry enables the mass distribution of complex biological systems in solution, which has been challenging for conventional measurement techniques. This talk describes mass photometry technology and takes a focused look at this new technique for the analysis of molecular assemblies while showcasing the relatively short time frame for providing mass measurements. In particular, the method is accurate at assessing the masses of individual ribosomal particles in solution and makes a useful complement to the techniques of mass spectrometry. The ability of this technique to measure the mass directly in solution, in contrast to other strategies in analytical chemistry, makes this a useful tool in the study of biology's complex macromolecules.

PURDUE UNIVERSITY | Department of Chemistry

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"MINFLUX - Tracking Single Molecules with Minimal Photon Fluxes"

Raquel Konzen
Graduate Student, Purdue Univesity

Bio:

Raquel Konzen got her bachelor's degree in chemistry in 2016 from Universidade Tecnológica Federal do Paraná (Brazil), and her master's in environmental science and technology in 2018 from the same university. She worked in a multinational company before joining Purdue, where she was responsible for developing/ validating chromatographic methods for quantification of sweeteners in the final products. Raquel joined Dr. Julia Laskin's lab in Fall 2022, where she is currently focusing on implementing optical techniques for in-situ measurement of soft-landed ions.

Abstract:

MINFLUX (minimum photon fluxes) is a localization technique in super-resolution microscopy that promises to revolutionize the field. The practical resolution acquired with super-resolution techniques such as STED are in the order of 20 nm. MINFLUX, however, was able to resolve fluorophores in labeled DNA origamis only 6 nm apart and achieve true 1-nm localization precision. It was employed to track the stepping motion of the motor protein kinesin inside living cells, attaining nanometer spatial and millisecond temporal resolution in 2D and 3D. Localization of fluorophores is usually done by finding the center of their diffraction pattern on a camera, with precision increasing with number of photons emitted. In MINFLUX, however, localization is established with a local excitation minimum by employing a donut-shaped excitation laser. When the molecule is perfectly centered, no emission occurs. Slight deviations from the center make the emitter fluoresce, which can be used to fine tune its position and establish it's location with high precision.