ANALYTICAL SEMINAR

Electrochemical Impedance Spectroscopy-Based Biosensor for Pathogen Detection

Bright Adu

Graduate Student
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Electrochemical Impedance Spectroscopy (EIS) has become a powerful tool for advancing biosensor technologies, enabling rapid and reliable detection of pathogens. Its label-free operation, high sensitivity, and compatibility with portable instrumentation make it a promising technique for healthcare, food safety, and environmental monitoring. This talk will review current EIS-based biosensor platforms, highlighting how nanomaterial-modified electrodes and biorecognition elements improve specificity and support point-of-care applications. Both Faradaic and non-Faradaic detection strategies will be discussed, with emphasis on how biological events at the electrode interface are transduced into measurable impedance changes. Case studies, including impedimetric immunosensors and phage-based pathogen detection systems, will be presented to illustrate the practical utility and versatility of EIS in real-world diagnostic scenarios.

Tuesday, December 9, 2025 | 3:30 pm | WTHR 172

PURDUE UNIVERSITY | James Tarpo Jr. and Margaret Tarpo Department of Chemistry

ANALYTICAL SEMINAR

Background-Free Biological Imaging: Exploring Novel Probe Designs for Afterglow-Based Imaging

Anthony Choi

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Fluorescence imaging is a popular analytical technique for its advantages and versatility, especially for biological spatial characterization. However, fluorescence spectroscopy techniques have their limitations, especially *in vivo*, due to autofluorescence and consequently low signal-to-background noise. In recent years, afterglow imaging has garnered attention for being a solution to these limitations by enabling high sensitivity, background-free visualization, even within living species. Implementing afterglow imaging does have its own unique challenges, one of which is designing an optimal probe for a specific problem. This seminar will explore recent probe designs for afterglow imaging, and how the probes were leveraged to answer biological questions.

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ANALYTICAL SEMINAR

Translating the “Unexpected Peptides”

Ahmed Soliman

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De novo peptide sequencing is essential for understanding complex biological systems when prior knowledge is unavailable, and has applications ranging from antibody sequencing to immunopeptidomics and metaproteomics. Responding to the ever-present challenge of irregular data in tandem mass spectra, this seminar introduces Casanovo, a transformer neural network that frames the problem of sequencing as language translation itself, predicting peaks in tandem mass spectra directly as amino acid sequences. Casanovo, trained on 30 million labeled spectra, achieves state-of-the-art results on cross-species benchmarks and enables fine-tuning on non-enzymatic peptides, offering an unparalleled approach for probing the invisible diversity of the dark proteome.

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