# ANALYTICAL SEMINAR

## Scanning Electrochemical Microscopy for Label-Free Forensic Analysis of Latent and Blood Fingermarks


**Bridger Johnston**
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Time since deposition (TSD) of forensic evidence, particularly latent and blood fingermarks, is a critical parameter for crime scene reconstruction, aiding in the differentiation of relevant evidence from background contamination. Despite its importance, a widely accepted method for determining TSD of fingermarks has yet to be established. Scanning Electrochemical Microscopy (SECM) is a versatile technique that investigates the electrochemical activity of surfaces with high spatial resolution, high sensitivity, and imaging capabilities. This technique has gained interest for its potential to provide both spatial and temporal information in forensic contexts. Recently, SECM has been utilized to analyze the electrochemical response of endogenous biomarkers present in blood and sebaceous secretions to quantify fingermark TSD. Employing lateral scan SECM assays achieves fast, label-free, and quantitative determination of fingermark age, as well as distinction of overlapping fingermarks.


*Tuesday, October, 15 2024* | *3:30pm* | *WTHR 172*

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

# ANALYTICAL SEMINAR

## Small Angle X-ray Scattering (SAXS) for Nanoparticle Research


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Recent advancements in X-ray sources and detectors have enhanced the role of small-angle X-ray scattering (SAXS) in nanoparticle research. Unlike transmission electron microscopy (TEM), which is constrained by limited analysis areas and potential sample bias, SAXS offers a nondestructive approach that yields structural data averaged over macroscopic volumes. This capability is particularly beneficial for studying colloidal systems in their native environments, as SAXS's tunable flux and energy allow for detailed characterization under realistic conditions. This research seminar will explore how even a benchtop SAXS setup can yield statistically meaningful data for investigating the shape purity of gold nanoparticles synthesized using seed-mediated synthesis, free from the biases associated with advanced electron microscopy techniques.


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## Microfluidic Electrokinetics for Separation of Live and Dead Cells


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Cell viability analyses are essential in fields such as drug development, clinical diagnostics, and bioanalytical assessments. With advancements in microfabrication, cell manipulation in microfluidic devices has become possible through the differentiation of properties including size, fluorescence, and so on. Electrokinetics (EK) is a major branch of microfluidics and has emerged as a particularly powerful tool for separating live and dead cells, offering rapid, label-free, and portable assessments. Insulator-based EK (iEK) devices employing DC potentials have been shown to effectively separate live and dead *E. coli* cells. The mechanism of discrimination has been studied by comparing dielectrophoretic effects and a combination of linear and nonlinear electrophoresis phenomena.


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