



## CHEMISTRY SEMINAR

### *Nanosensors for Imaging the Chemistry of the Body*



**Heather Clark, Ph.D**

**ARIZONA STATE UNIVERSITY**

**WEDNESDAY**

**October 29th, 2025 @4:00**

**219 BRL**

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Advancing the field of chemical imaging in living systems, my group works at the intersection of chemistry, biology, and bioengineering to develop nanoscale probes for in vivo biological measurements. Our goal is to enable real-time, deep-tissue chemical imaging within the brain, central nervous system, and body. To achieve this, we design nanoscale contrast agents that integrate with advanced imaging modalities such as fluorescence, diffuse in vivo flow cytometry, photoacoustics, and MRI.

A key challenge in biological imaging is achieving high spatial and temporal resolution with molecular specificity. Our research addresses this by engineering highly selective and sensitive nano contrast agents capable of detecting critical biomarkers, such as neurotransmitters in real time. In this talk, I will discuss projects that focus on imaging acetylcholine, a key neurotransmitter involved in cognitive function and neuromuscular signaling. The first project employs a fluorescent nanosensor to maximize measurement sensitivity and spatial resolution, providing real-time visualization of acetylcholine dynamics in living systems. Secondly, we have converted the nano contrast agent to be compatible with MRI, to obtain deeper imaging. We aim to push the boundaries of real-time molecular imaging, opening new avenues for monitoring disease progression and response to therapeutics.

Heather A. Clark is the Senior Associate Dean for Engineering Integration in the School of Medicine and Advanced Medical Engineering and the Director and Olin Endowed Professor in the School of Biological and Health Systems Engineering at Arizona State University. She earned her Ph.D. in Analytical Chemistry from the University of Michigan, where she pioneered optical PEBBLE nanosensors for single-cell chemical analysis, followed by an NIH NRSA fellowship at the University of Connecticut Health Center advancing cellular imaging. She began her career at Draper Laboratory before moving to Northeastern University as Associate Professor, Vice Chair, and Graduate Program Director, and later launching the Institute for Chemical Imaging of Living Systems, where she established a state-of-the-art core imaging facility.

Clark's research in nanosensors and molecular imaging has earned recognition including induction into AIMBE, the DARPA Young Faculty Award, and membership in the Rho Chi Honor Society, and her work has been featured by CNN, The Wall Street Journal, and WIRED. She is an Associate Editor for ACS Sensors, an advisor for organizations such as BioMedX and the Max Planck Institute for Biological Cybernetics, and co-chaired the NIH SPARC Steering Committee, advancing national bioelectronic medicine initiatives.



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