60th Friend E. Clark Lecture Series

sponsored by

Phi Lambda Upsilon Honorary Chemistry Society and
C. Eugene Bennett Department of Chemistry

Vicki Wysocki, Ph. D

Ohio Eminent Scholar of Macromolecular Structure and Function
Department of Chemistry and Biochemistry
Director, Campus Chemical Instrument Center
The Ohio State University

John Fenn made molecular elephants fly and changed biomedical research

Where: Clark 312
When: Monday, March 4th at 3:30pm – 4:30pm

Native mass spectrometry: A structural biology tool

Where: Clark 112
When: Tuesday, March 5th at 3:30pm – 4:30pm

Graduate students, please join us for pizza with Dr. Wysocki

Where: CLC
When: Monday, March 4th at 12pm to 1:15pm

John Fenn made molecular elephants fly and changed biomedical research

Where: Clark 312
When: Monday, March 4th at 3:30pm – 4:30pm

Vicki Wysocki, Ph. D

Ohio Eminent Scholar of Macromolecular Structure and Function
Department of Chemistry and Biochemistry
Director, Campus Chemical Instrument Center
The Ohio State University

Until the late 1980's, mass spectrometry was a useful measurement tool for measuring relatively small molecules. With the invention of electrospray ionization, mass spectrometry became a tool that can measure non-volatile, thermally unstable molecules and the use of mass spectrometry as a characterization tool changed dramatically. Today, mass spectrometry is a $6 billion industry, is used for many applications, and new developments continue. This talk will illustrate several types of research that have been made possible because of improvements in ionization and in mass spectrometry instrument development. Examples will be selected from multiple fields of research including proteomics, metabolomics/gut microbiome, and native mass spectrometry of large protein complexes, including gene therapy platforms.

Native mass spectrometry: A structural biology tool

Where: Clark 112

When: Tuesday, March 5th at 3:30pm – 4:30pm

Vicki Wysocki, Ph. D

Ohio Eminent Scholar of Macromolecular Structure and Function
Department of Chemistry and Biochemistry
Director, Campus Chemical Instrument Center
The Ohio State University

Characterization of the overall topology and inter-subunit contacts of protein complexes, and their assembly/ disassembly and unfolding pathways, is critical because protein complexes regulate key biological processes, including processes important in understanding and controlling disease. Tools to address structural biology problems continue to improve. Native mass spectrometry (nMS) and associated technologies such as ion mobility and variable temperature electrospray ionization are becoming increasingly important components of the structural biology toolbox. When the native mass spectrometry approach is used early or mid-course in a structural characterization project, it can provide answers quickly for small amounts of sample, even when heterogeneity is present. Integration of sample preparation/purification with effective dissociation methods (e.g., surface-induced dissociation, SID), ion mobility, and computational approaches provide an MS workflow that is enabling in biochemical, synthetic biology, and systems biology approaches. Native MS can determine whether a complex of interest exists in a single or multiple oligomeric states, and surface induced dissociation can provide characterization of topology/inter-subunit connectivity and other structural features. Examples will illustrate the coupling of SID to electron capture charge reduction and charge detection mass spectrometry for the characterization of protein and nucleoprotein complexes, including glycoproteins and adeno-associated virus capsids.

References

[1] Snyder, Harvey, Wysocki, V. H., Chemical Reviews, 2022, 122, 8, 7442–7487.
[2] Karch, Snyder, Harvey, Wysocki Annu. Rev. Biophys. 2022. 51, 157–79.