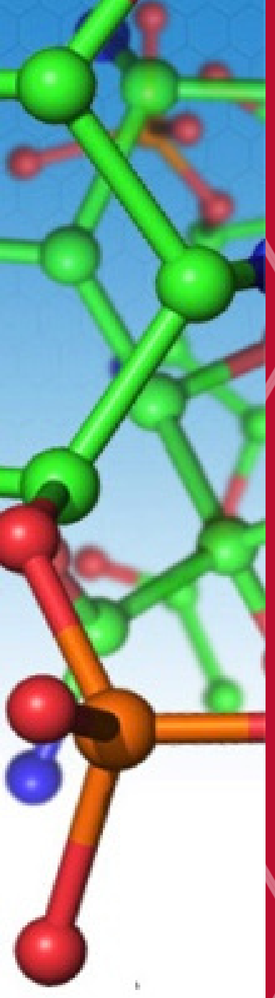

15th Annual

Riley O. Schaeffer

Endowed Lectureship

2024

Presented by:

Professor Amy Rosenzweig

Northwestern University

Seeing Copper Enzymes In Their Native Membrane Environment

Friday, November 15, 2024 4:00 PM

Clark Hall, Lecture Hall 101

Reception Clark Hall 105 Open Space 3:30 PM

Aerobic microbial processes are important sources and sinks for greenhouse gases with methane-oxidizing bacteria (methanotrophs) consuming methane and ammonia oxidizing bacteria (nitrifiers) releasing nitrous oxide. Methanotrophs and nitrifiers use copper-dependent membrane monooxygenases to carry out the first steps in their metabolisms: the conversions of methane to methanol by particulate methane monooxygenase (pMMO) and ammonia to hydroxylamine by ammonia monooxygenase (AMO). Due to loss of enzymatic activity upon detergent solubilization from their native intracytoplasmic membranes (ICMs), elucidating the structures and mechanisms of pMMO and AMO has posed significant challenges. Both enzymes consist of three subunits, including PmoB/AmoB, PmoA/AmoA, and PmoC/AmoC. Despite the availability of multiple crystal and cryoelectron microscopy (cryoEM) structures, the location and nature of the pMMO copper active site remain controversial. Attempts to study AMO have not been successful, leaving details of its molecular architecture and copper centers unknown. Using cryoEM single particle analysis, we have visualized both pMMO and AMO directly in their native ICMs at high resolution. These in situ structures reveal the arrangement of enzyme trimers in the membrane, details of the copper centers, bound lipids, and previously unobserved components. The ability to obtain molecular level insight within the native environment will enable further understanding of these and other environmentally-important membrane-bound cuproenzymes.

DEPARTMENT OF CHEMISTRY & CHEMICAL BIOLOGY

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