PROGRAM

3:30 p.m. – Reception, Clark Hall 105 Open Space
4:00 p.m. – Martin Kirk, Professor of Chemisty
Welcoming Remarks
4:05 p.m. – Jennifer Malat, Dean of College of Arts and Sciences
Presentation of Award and Honorarium
4:10 p.m. – Martin Kirk, Professor of Chemistry
Introduction of Professor Rosenzweig
4:15 p.m. – Professor Amy Rosenzweig
"Seeing Copper Enzymes In Their Native Membrane Environment"

Past Recipients:

- 2008 – Professor, Carlos Bustamante, University of California – Berkeley
- 2009 – Professor, Larry G. Sneddon, University of Pennsylvania
- 2010 – Professor, Tobin J. Marks, Northwestern University
- 2011 – Professor, Harry B. Gray, California Institute of Technology
- 2012 – Professor, Peter R. Ogilby, Aarhus University
- 2013 – Professor, Edward I. Solomon, Stanford University
- 2014 – Professor, Marcetta Darensbourg, Texas A&M University
- 2015 – Professor, Thomas J. Meyer, University of North Carolina
- 2016 – Professor, John F. Hartwig, University of California – Berkeley
- 2017 – Professor, Tom Mallouk, Pennsylvania State University
- 2018 – Professor, Cynthia J Burrows, University of Utah
- 2019 – Professor, Brian M Hoffman, Northwestern University
- 2022 – Professor, Dennis Dougherty, California Institute of Technology
- 2023 – Professor, Akif Tezcan, University of California – San Diego

Special thanks to the Office of the Vice President of Research for their support
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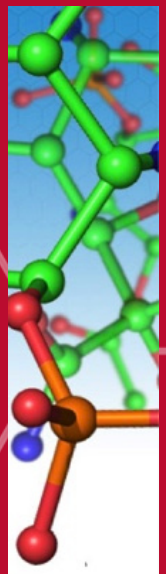
https://research.unm.edu/researchanddiscovery

15th Annual

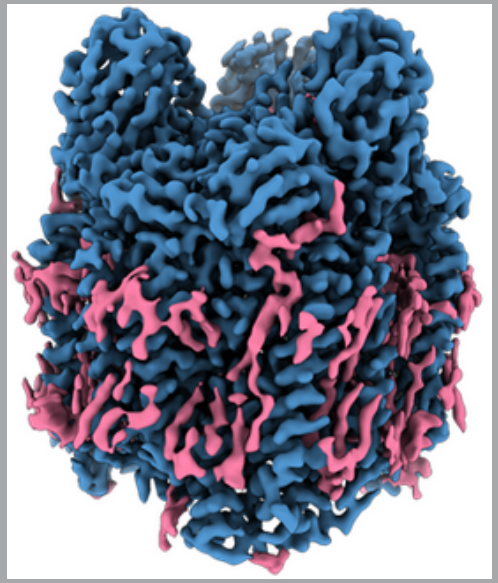
RILEY O. SCHAEFFER

Endowed Lectureship

2024



DEPARTMENT OF CHEMISTRY & CHEMICAL BIOLOGY



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

PROFESSOR RILEY O. SCHAEFFER

July 3, 1927 - April 15, 2018

This lectureship was established in 2008 in honor of Professor Riley Schaeffer through contributions from UNM faculty, past students of Professor Schaeffer at Indiana University and UNM, friends, and external colleagues. Professor Schaeffer began his academic career at Iowa State University in 1952 as an Assistant Professor and he became Associate Professor with tenure in 1956. In 1958 he was recruited to join the faculty at Indiana University where he became Professor in 1962. After a highly productive career at IU, including a stint as departmental Chair, 1967-1972, he accepted the position of Dean of the College of Arts and Sciences at the University of Wyoming in 1976. He was recruited from that position to UNM where he served as Department of Chemistry Chairperson from 1981-1987. He retired from UNM in 1992. Under his able leadership as Chair, Prof. Schaeffer guided the hiring and mentoring of a number of new faculty who have gone on to highly productive careers. Professor Schaeffer has also had a distinguished research record that includes critical discoveries in the synthesis, reactivity and structure analysis, via x-ray diffraction and NMR methods, of boron hydrides and carboranes. Professor Schaeffer received numerous honors, including a Guggenheim Fellowship; he is an AAAS Fellow and an Honorary Fellow of the Royal Society of Britain.

DEPARTMENT OF CHEMISTRY & CHEMICAL BIOLOGY

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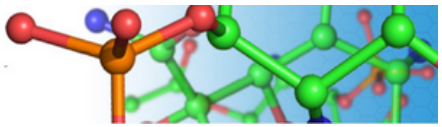

PROFESSOR AMY ROSENZWEIG

Northwestern University

Department of Chemistry | amyr@northwestern.edu

Amy C. Rosenzweig is the Weinberg Family Distinguished Professor of Life Sciences with Departments of Molecular Biosciences and Chemistry at Northwestern University. Her research group is focused on understanding metalloprotein function on the molecular level, using interdisciplinary approaches to attack problems at the forefront of bioinorganic chemistry. Rosenzweig's areas of interest include biological methane oxidation, oxygen activation by metalloenzymes, metal uptake and transport, and natural products biosynthesis. She is widely recognized as the world expert on particulate methane monooxygenase, an integral membrane metalloenzyme that converts methane, the most inert hydrocarbon, to methanol. This reaction has significant implications for catalysis, global warming, and bioremediation. Rosenzweig, a fellow of the American Academy of Arts and Sciences and a member of the National Academy of Sciences, received a B.A. in Chemistry from Amherst College and a Ph.D. in Inorganic Chemistry from Massachusetts Institute of Technology. Her accomplishments have been recognized by the American Chemical Society Alfred Bader Award in Bioinorganic or Bioorganic Chemistry, the Protein Society Hans Neurath Award, the Royal Society of Chemistry Joseph Chatt Award, the American Chemical Society Nobel Laureate Signature Award for Graduate Education, an Honorary Doctor of Science Degree from Amherst College, and a MacArthur Fellowship

SEEING COPPER ENZYMES IN THEIR NATIVE MEMBRANE ENVIRONMENT

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.