

# Amy C. Rosenzweig

## EDUCATION

Amherst College, B. A. in Chemistry, *Summa Cum Laude*, 1988  
Massachusetts Institute of Technology, Ph. D. in Inorganic Chemistry, 1994

## PROFESSIONAL APPOINTMENTS

Weinberg Family Distinguished Professor of Life Sciences, Northwestern University, 2012-present  
Professor, Departments of Molecular Biosciences and of Chemistry, Northwestern University, 2005-present  
Irving M. Klotz Research Professor, Northwestern University, 2004-2006  
Associate Professor, Departments of Biochemistry, Molecular Biology, and Cell Biology and of Chemistry, Northwestern University, 2002-2005  
Assistant Professor, Departments of Biochemistry, Molecular Biology, and Cell Biology and of Chemistry, Northwestern University, 1997-2002  
Harvard Medical School and Dana Farber Cancer Institute, NIH Postdoctoral Fellowship, 1994-1997

## RESEARCH INTERESTS

Structural biology and bioinorganic chemistry, metal uptake and transport, oxygen activation by metalloenzymes, membrane proteins

## HONORS AND AWARDS

The Protein Society Hans Neurath Award, 2021  
American Chemical Society Alfred Bader Award in Bioinorganic or Bioorganic Chemistry, 2021  
Elected Member, National Academy of Sciences, 2017  
Elected Fellow, American Academy of Arts and Sciences, 2014  
Royal Society of Chemistry Joseph Chatt Award, 2014  
Ivano Bertini Award, 2014  
Fletcher Undergraduate Research Faculty Award, 2014  
Elected Fellow, American Association for the Advancement of Science, 2007  
American Chemical Society Nobel Laureate Signature Award for Graduate Education, 2006  
Honorary Degree, Doctor of Science, Amherst College, 2005  
MacArthur Fellow, 2003  
Camille Dreyfus Teacher Scholar Award, 2001  
David and Lucile Packard Fellow, 1999  
National Institutes of Health Postdoctoral Fellowship, 1994-1997  
General Electric Predoctoral Fellowship, 1988-1989  
Howard Waters Doughty Prize for best thesis in Chemistry, 1988  
White Prize for excellence in Chemistry, 1987

## PROFESSIONAL ACTIVITIES

### Societies

American Chemical Society  
Society of Biological Inorganic Chemistry  
American Association for the Advancement of Science  
American Society for Biochemistry and Molecular Biology

American Academy of Arts and Sciences  
National Academy of Sciences

### **Other Professional Activities**

National Academy of Sciences Award Selection Committee, 2021-present  
Searle Scholars Program Advisory Board, 2020-2025  
Member, National Advisory General Medical Sciences Council (NIGMS Council), NIH, 2020-2024  
Co-chair, 12<sup>th</sup> International Copper Meeting (Copper 2020 Sorrento), September 20-25, 2020  
Co-organizer, Metals in Biological Chemistry: C-H Bond Activation by Metalloenzymes and Models Symposium, Pacificchem 2020, December 15-20, 2020  
Editorial Board, *Proc. Natl. Acad. Sci. USA*, 2019-present  
American Chemical Society National Award Selection Committee, 2019-present  
Editorial Advisory Board of *Accounts of Chemical Research*, 2018-present  
Board of Reviewing Editors, *Science*, 2015-present  
Editorial Advisory Board of *Biochemistry*, 2017-2020  
Elected Member, ASBMB Nominating Committee, 2015-2018  
Scientific Advisory Board of the Cluster of Excellence "Unifying Concepts in Catalysis, UniCAT," Berlin, Germany, 2013-2017  
Elected Councilor, Society for Biological Inorganic Chemistry, 2013-2017  
Co-organizer, Dioxygen Activation Chemistry of Metalloenzymes and Models Symposium, Pacificchem 2015, December 15-20, 2015  
Co-editor, Catalysis and Regulation section of *Current Opinion in Structural Biology*, December 2015 issue  
Member, Stanford Synchrotron Radiation Light Source Structural Molecular Biology Advisory Committee (SMBAC), 2014-present  
Founding Member, Methanotroph Commons Website ([www.methanotroph.org](http://www.methanotroph.org))  
Chair, Metals in Biology Gordon Research Conference, 2013  
Vice Chair, Metals in Biology Gordon Research Conference, 2012  
Editorial Advisory Board of the *Journal of Inorganic Biochemistry*, 2010-2014  
Editorial Advisory Board of the *Journal of Biological Inorganic Chemistry*, 2009-2011  
Editorial Advisory Board of *Inorganic Chemistry*, 2009-2012  
Scientific Organizing Committee for the 8<sup>th</sup> International Copper Meeting, Alghero, Sardinia, September 30-October 5, 2012  
Co-organizer, Dioxygen Activation Chemistry and Catalytic Oxidation Reactions Symposium, Pacificchem 2010, December 15-20, 2010  
Co-editor, *Methods in Enzymology* volumes 494 and 495, *Methods in Methane Metabolism*, 2011  
Elected Chair, Bioinorganic Subdivision, American Chemical Society, 2009  
Scientific Organizing Committee for the 6<sup>th</sup> International Copper Meeting, Alghero, Sardinia, October 11-15, 2008  
Co-Editor, Bioinorganic Chemistry section of *Current Opinion in Chemical Biology*, April 2006 issue  
Elected Councilor, Division of Biological Chemistry, American Chemical Society, 2005-2008  
Editorial Advisory Board of the *Journal of Biological Inorganic Chemistry*, 2004-2006  
Scientific Organizing Committee for the 4<sup>th</sup> International Meeting on Copper Homeostasis and its Disorders: Molecular and Cellular Aspects, Ischia, Italy, October 22-28, 2004  
Co-organizer, Bader Award Symposium, 227<sup>th</sup> National Meeting of the American Chemical Society, Anaheim, CA, March 28 – April 1, 2004  
Elected member, Advanced Photon Source Users Organization Steering Committee (APSUO), 2000-2003  
Local chair, Midwest Enzyme Chemistry Conference, 2002  
Co-organizer, Biological Crystallography Workshop, 2001 APS Users Meeting

### **Peer-Review**

Member, DOE BES Enzyme Structure and Function Review Panel, March 2021

Ad hoc reviewer for R35 Special Emphasis Panel, November 2019  
Member, DOE BES Enzyme Structure and Function Review Panel, March 2018  
Member, Proposal Review Panel, Stanford Synchrotron Radiation Light Source, 2010-2015  
Ad hoc reviewer for MSFA Study Section, Center for Scientific Review, National Institutes of Health, February 2015  
Ad hoc reviewer for MBBP Study Section, Center for Scientific Review, National Institutes of Health, October 2013  
Member, NSF CLP Review Panel, March 2013  
Member, Special Emphasis Panel, Center for Scientific Review, National Institutes of Health, May 2012  
Ad hoc reviewer, Program Project Special Emphasis Panel, Center for Scientific Review, National Institutes of Health, November 2011  
Member, MFSA Study Section, Center for Scientific Review, National Institutes of Health, 2006-2010  
Ad hoc reviewer for Roadmap Initiative for Membrane Proteins, Center for Scientific Review, National Institutes of Health, June 2005  
Ad hoc reviewer for the Metallobiochemistry Study Section, Center for Scientific Review, National Institutes of Health, February 2004, October 2004, February 2006  
Ad hoc reviewer for the Nutritional Chemistry Study Section, Center for Scientific Review, National Institutes of Health, October 2003  
Grant proposal review for the National Science Foundation, Department of Energy, Department of Agriculture, American Chemical Society Petroleum Research Fund, Research Corporation, Biotechnology and Biological Sciences Research Council (BBSRC, UK), German Research Foundation (DFG), Marsden Fund (Royal Society of New Zealand), Alberta Heritage Foundation for Medical Research (Canada), Nebraska EPSCoR, Swedish Research Council  
Macromolecular crystallography proposal review panel (MC PRP) at the Advanced Photon Source, 2003-2005  
Manuscript review for *Science*, *Nature*, *Nat. Chem.*, *Nat. Chem. Biol.*, *Structure*, *Proc. Natl. Acad. Sci. USA*, *J. Am. Chem. Soc.*, *Biochemistry*, *Nat. Struct. Molec. Biol.*, *Cell*, *eLife*, *J. Biol. Inorg. Chem.*, *Inorg. Chem.*, *Structure*, *J. Mol. Biol.*, *J. Biol. Chem.*, *Acc. Chem. Res.*, *J. Bacteriol.*, *Metallomics*, *FEBS Lett.*, *FEMS Microbiol. Rev.*, *FEMS Microbiol. Lett.*, *Eur. J. Inorg. Chem.*, *Molecular Cell*, *EMBO J.*, *Environ. Microbiol.*, *PLoS ONE*, *Biochem. Biophys. Acta*, *Biochem. J.*, *J. Inorg. Biochem.*, *TIBS*, *Proteins*, *Nat. Prod. Rep.*, *Trends Microbiol.*, *Dalton Trans.*, *PloS One*, *Biochimie*, *Frontiers Microbiol.*, *Sci. Rep.*, *Essays Biochem.*, *Sci. Adv.*, *ChemBioChem*, *Microb. Biotechnol.*, *ACS Cent. Sci.*, *ACS Catal.*, *Mol. Catal.*

### **PUBLICATIONS (158 total)**

Hadley, R. C.; Zhitnitsky, D.; Livnat-Levanon, N.; Masrati, G.; Vigonsky, E.; Rose, J.; Ben-Tal, N.; Rosenzweig, A. C.; Lewinson, O. The copper-linked *Escherichia coli* AZY operon: Structure, metal binding, and a possible physiological role in copper delivery. *J. Biol. Chem.* **2022**, 298, 101445.

Park, Y. J.; Roberts, G. M.; Montaser, R.; Kenney, G. E.; Thomas, P. M.; Kelleher, N. L.; Rosenzweig, A. C. Characterization of a copper-chelating natural product from the methanotroph *Methylosinus* sp. LW3. *Biochemistry* **2021**, 60, 2845-2850.

Jodts, R. J.; Ross, M. O.; Koo, C. W.; Doan, P. E.; Rosenzweig, A. C.; Hoffman, B. M. Coordination of the copper centers in particulate methane monooxygenase: comparison between methanotrophs and characterization of the Cu<sub>c</sub> site by EPR and ENDOR spectroscopies. *J. Am. Chem. Soc.* **2021**, 143, 15358-15368.

Manesis, A. C.; Jodts, R. J.; Hoffman, B. M.; Rosenzweig, A. C. Copper binding by a unique family of metalloproteins is dependent on kynurenine formation. *Proc. Natl. Acad. Sci. USA* **2021**, 118, e2100680118.

- Cutsail, G. E., III; Ross, M. O.; Rosenzweig, A. C.; DeBeer, S. Towards a unified understanding of the copper sites in particulate methane monooxygenase: an X-ray absorption spectroscopic investigation. *Chem. Sci.* **2021**, *17*, 6194-6209.
- Koo, C. W.; Rosenzweig, A. C. Biochemistry of aerobic biological methane oxidation. *Chem Soc. Rev.* **2021**, *50*, 3424-3436.
- Koo, C. W.; Rosenzweig, A. C. Particulate methane monooxygenase and the PmoD protein. In *Encyclopedia of Inorganic and Bioinorganic Chemistry* (A. Messerschmidt, ed.), **2020**, DOI: 10.1002/9781119951438.eibc2740.
- Fisher, O. S.; Sendzik, M. R.; Ross, M. O.; Lawton, T. J.; Hoffman, B. M.; Rosenzweig, A. C. PCu<sub>A</sub>C domains from methane-oxidizing bacteria use a histidine brace to bind copper. *J. Biol. Chem.* **2019**, *294*, 16351-16363.
- Kenney, G. E.; Dassama, L. M. K.; Manesis, A. C.; Ross, M. O.; Chen, S.; Hoffman, B. M.; Rosenzweig, A. C. MbnH is a diheme MauG-like protein associated with microbial copper homeostasis. *J. Biol. Chem.* **2019**, *294*, 16141-16151.
- Ro, S. Y.; Schachner, L. F.; Koo, C. W.; Purohit, R.; Remis, J. P.; Kenney, G. E.; Liauw, B. W.; Thomas, P. M.; Patrie, S. M.; Kelleher, N. L.; Rosenzweig, A. C. Native top-down mass spectrometry provides insights into the copper centers of membrane-bound methane monooxygenase. *Nat. Commun.* **2019**, *10*, 2675.
- Ross, M. O.; MacMillan, F.; Wang, J.; Nisthal, A.; Lawton, T. J.; Olafson, B. D.; Mayo, S. L.; Rosenzweig, A. C.; Hoffman, B. M. Particulate methane monooxygenase contains only monocopper centers. *Science* **2019**, *364*, 566-570.
- Ross, M. O.; Fisher, O. S.; Morgada, M. N.; Krzyaniak, M. D.; Wasielewski, M. R.; Vila, A. J.; Hoffman, B. M.; Rosenzweig, A. C. Formation and electronic structure of an atypical Cu<sub>A</sub> site. *J. Am. Chem. Soc.* **2019**, *141*, 4678-4686.
- Fisher, O. S.; Kenney, G. E.; Ross, M. O.; Ro, S. Y.; Lemma, B. E.; Batelu, S.; Thomas, P. M.; Sosnowski, V. C.; DeHart, C. J.; Kelleher, N. L.; Stemmler, T. L.; Hoffman, B. M.; Rosenzweig, A. C. Characterization of a long overlooked copper protein from methane- and ammonia-oxidizing bacteria. *Nat. Commun.* **2018**, *9*, 4276.
- Deng, Y. W.; Ro, S. Y.; Rosenzweig, A. C. Structure and function of the lanthanide-dependent methanol dehydrogenase XoxF from the methanotroph *Methylomicrobium buryatense* 5GB1C. *J. Biol. Inorg. Chem.* **2018**, *7*, 1037.
- Ro, S. Y.; Ross, M. O.; Deng, Y. W.; Batelu, S.; Lawton, T. J.; Hurley, J. D.; Stemmler, T. L.; Hoffman, B. M.; Rosenzweig, A. C. From micelles to bicelles: effect of the membrane on particulate methane monooxygenase activity. *J. Biol. Chem.* **2018**, *293*, 10457-10465.
- Park, Y. J.; Kenney, G. E.; Schachner, L. F.; Kelleher, N. L.; Rosenzweig, A. C. Repurposed HisC aminotransferases complete the biosynthesis of some methanobactins. *Biochemistry* **2018**, *57*, 3515-3523.
- Kenney, G. E.; Dassama, L. M. K.; Pandelia, M.-E.; Gizzi, A. S.; Martinie, R. J.; Gao, P.; DeHart, C. J.; Schachner, L. F.; Skinner, O. S.; Ro, S. Y.; Zhu, X.; Sadek, M.; Thomas, P. M.; Almo, S. C.; Bollinger, J. M., Jr.; Krebs, C.; Kelleher, N. L.; Rosenzweig, A. C. The biosynthesis of methanobactin. *Science* **2018**, *359*, 1411-1416.

Ro, S. Y.; Rosenzweig, A. C. Recent advances in the genetic manipulation of *Methylosinus trichosporium* OB3b. *Methods Enzymol.* **2018**, *605*, 335-349.

Kenney, G. E.; Rosenzweig, A. C. Chalkophores. *Annu. Rev. Biochem.* **2018**, *87*, 645-676.

Purohit, R.; Ross, M. O.; Batelu, S.; Kusowski, A.; Stemmler, T. L.; Hoffman, B. M.; Rosenzweig, A. C. A Cu<sup>+</sup>-specific CopB transporter: revising P<sub>1B</sub>-type ATPase classification. *Proc. Natl. Acad. Sci. USA* **2018**, *115*, 2108-2113.

Kenney, G. E.; Rosenzweig, A. C. Methanobactins: maintaining copper homeostasis in methanotrophs and beyond. *J. Biol. Chem.* **2018**, *293*, 4606-4615.

Cao, L.; Caldararu, O.; Rosenzweig, A. C.; Ryde, U. Quantum refinement does not support dinuclear copper sites in the crystal structures of particulate methane monooxygenase. *Angew. Chem. Int. Ed.* **2018**, *57*, 162-166.

Rosenzweig, A. C. A biochemical sulfur delivery service. *Science* **2017**, *358*, 307-308

Ross, M. O.; Rosenzweig, A. C. A tale of two methane monooxygenases. *J. Biol. Inorg. Chem.* **2017**, *22*, 307-319.

Dassama, L. M. K.; Kenney; G. E.; Rosenzweig, A. C. Methanobactins: from genome to function. *Metallomics* **2017**, *9*, 7-20.

Smith, A. T.; Ross, M. O.; Hoffman, B. M.; Rosenzweig, A. C. Metal selectivity of a Cd-, Co-, and Zn-transporting P<sub>1B</sub>-type ATPase. *Biochemistry* **2016**, *56*, 85-95.

Dassama, L. M. K.; Kenney; G. E.; Ro, S. Y.; Zielazinski, E. L.; Rosenzweig, A. C. Methanobactin transport machinery. *Proc. Natl. Acad. Sci. USA* **2016**, *113*, 13027-13032.

Lawton, T. J.; Rosenzweig, A. C. Biocatalysts for methane conversion: big progress on breaking a small substrate. *Curr. Op. Chem. Biol.* **2016**, *35*, 142-149.

Trana, E. N.; Nocek, J. M.; Vander Woude, J.; Span, I.; Smith, S. M.; Rosenzweig, A. C.; Hoffman, B. M. Charge-disproportionation symmetry breaking creates a heterodimeric myoglobin complex with enhanced affinity and rapid intracomplex electron transfer. *J. Am. Chem. Soc.* **2016**, *138*, 12615-12628.

Kenney, G. E.; Goering, A. W.; Ross, M. O.; DeHart, C. J.; Thomas, P. M.; Hoffman, B. M.; Kelleher, N. L.; Rosenzweig, A. C. Characterization of methanobactin from *Methylosinus* sp. LW4. *J. Am. Chem. Soc.* **2016**, *138*, 11124-11127.

Lawton, T. L.; Rosenzweig, A. C.; Methane-oxidizing enzymes: an upstream problem in biological gas-to-liquids conversion. *J. Am. Chem. Soc.* **2016**, *138*, 9327-9340.

Blanchette, C. D.; Knipe, J. M., Stolaroff, J. K.; DeOtte, J. R.; Oakdale, J. S.; Maiti, A.; Lenhardt, J. M.; Sirajuddin, S.; Rosenzweig, A. C.; Baker, S. E. Printable enzyme-embedded materials for methane to methanol conversion. *Nat. Commun.* **2016**, *7*, 11900.

Lawton, T. J.; Rosenzweig, A. C. Methane – make it or break it. *Science* **2016**, *352*, 892-893.

Kenney, G. E.; Sadek, M.; Rosenzweig, A. C. Copper-responsive gene expression in the methanotroph *Methylosinus trichosporium* OB3b. *Metallomics* **2016**, *8*, 931-940.

Lawton, T. J.; Kenney, G. E.; Hurley, J. D.; Rosenzweig, A. C. The CopC family: structural and bioinformatic insights into a diverse group of periplasmic copper binding proteins. *Biochemistry* **2016**, *55*, 2278-2290.

Li, J.; Lawton, T. J.; KostECKI, J. S.; Nisthal, A.; Fang, J.; Mayo, S. L.; Rosenzweig, A. C.; Jewett, M. C. Cell-free protein synthesis enables high yielding synthesis of an active multicopper oxidase. *Biotechnol. J.* **2016**, *11*, 212-218.

Klinman, J. P.; Rosenzweig, A. C. Editorial overview: catalysis and regulation. *Curr. Op. Struct. Biol.* **2015**, *35*, IV-VI.

Kathman, S. G.; Span, I.; Smith, A. T.; Xu, Z.; Zhan, J.; Rosenzweig, A. C.; Statsyuk, A. V. A small molecule that switches a ubiquitin ligase from a processive to a distributive enzymatic mechanism. *J. Am. Chem. Soc.* **2015**, *137*, 12442-12445.

Boal, A. K.; Rosenzweig, A. C. Response from Boal and Rosenzweig to Crystallography and chemistry should always go together: a cautionary tale of protein complexes with cisplatin and carboplatin. *Acta Cryst.* **2015**, *D71*, 1984-1986.

Smith, A. T.; Barupala, D.; Stemmler, T. L.; Rosenzweig, A. C. A new metal binding domain involved in cadmium, cobalt, and zinc transport. *Nat. Chem. Biol.* **2015**, *11*, 678-684.

Sirajuddin, S.; Rosenzweig, A. C. Enzymatic oxidation of methane. *Biochemistry* **2015**, *54*, 2283-2294.

Rosenzweig, A. C. Breaking methane. *Nature* **2015**, *518*, 309-310.

Culpepper, M. A.; Rosenzweig, A. C. Structure and protein-protein interactions of methanol dehydrogenase from *Methylococcus capsulatus* (Bath). *Biochemistry* **2014**, *53*, 6211-6219.

Sirajuddin, S.; Rosenzweig, A. C. Protocols for structural and functional analysis of particulate methane monooxygenase from *Methylocystis* species strain Rockwell (ATCC 49242). *Hydrocarbon and Lipid Microbiology Protocols* (T. J. McGenity et al, eds.) **2014**, Berlin: Springer-Verlag, 10.1007/8623\_2014\_22.

Culpepper, M. A.; Cutsail, G. E., III; Gunderson, W. A.; Hoffman, B. M.; Rosenzweig, A. C. Identification of the valence and coordination environment of the particulate methane monooxygenase copper centers by advanced EPR characterization. *J. Am. Chem. Soc.* **2014**, *136*, 11767-11775.

Sirajuddin, S.; Barupala, D.; Helling, S.; Marcus, K.; Stemmler, T. L.; Rosenzweig, A. C. Effects of zinc on particulate methane monooxygenase activity and structure. *J. Biol. Chem.* **2014**, *289*, 21782-21794.

Silakov, A.; Grove, T. L.; Radle, M. I.; Bauerle, M. R.; Green, M. T.; Rosenzweig, A. C.; Boal, A. K.; Booker, S. J. Characterization of a cross-linked protein-nucleic acid substrate radical in the reaction catalyzed by RlmN. *J. Am. Chem. Soc.* **2014**, *136*, 8221-8228.

Smith, A. T.; Smith, K. P.; Rosenzweig, A. C. Diversity of the metal-transporting P<sub>1B</sub>-type ATPases. *J. Biol. Inorg. Chem.* **2014**, *6*, 947-960.

Austin, R. N.; Kenney, G. E.; Rosenzweig, A. C. Perspective: what is known, and not known, about the connections between alkane oxidation and metal uptake in alkanotrophs in the marine environment. *Metallomics* **2014**, *6*, 1121-1125.

Lawton, T. J.; Ham, J.; Sun, T.; Rosenzweig, A. C. Structural conservation of the B subunit in the ammonia monooxygenase/ particulate methane monooxygenase superfamily. *Proteins* **2014**, *82*, 2263-2267.

Chang, W.-C.; Guo, Y.; Wang, C.; Butch, S. E.; Rosenzweig, A. C.; Boal, A. K.; Krebs, C.; Bollinger, J. M., Jr. Mechanism of the C5 stereoinversion reaction in the biosynthesis of carbapenam antibiotics. *Science* **2014**, *343*, 1140-1144.

Makhlynets, O.; Boal, A. K.; DeLacy, V. R.; Kitten, T.; Rosenzweig, A. C.; Stubbe, J. *Streptococcus sanguinis* class Ib ribonucleotide reductase: high activity with both iron and manganese cofactors and structural insights. *Biochemistry* **2014**, *289*, 6259-6272.

Zielazinski, E. L.; González-Guerrero, M.; Subramanian, P.; Stemmler, T. L.; Argüello, J. M.; Rosenzweig, A. C. *Sinorhizobium meliloti* Nia is a P<sub>1B-5</sub>-ATPase expressed in the nodule during plant symbiosis and is involved in Ni and Fe transport. *Metallomics* **2013**, *5*, 1614-1623.

Dassama, L. M. K.; Krebs, C.; Bollinger, Jr., J. M.; Rosenzweig, A. C.; Boal, A. K. Structural basis for assembly of the Mn/Fe cofactor in the class Ic ribonucleotide reductase from *Chlamydia trachomatis*. *Biochemistry* **2013**, *52*, 6424-6436.

Lawton, T. J.; Bowen, K. E.; Sayavedra-Soto, L. A.; Arp, D. J.; Rosenzweig, A. C. Characterization of a nitrite reductase involved in nitrifier denitrification. *J. Biol. Chem.* **2013**, *288*, 25575-25583.

Rosenzweig, A. C. Put a ring on it. *Nat. Chem. Biol.* **2013**, *9*, 220-221.

Kenney, G. E.; Rosenzweig, A. C. Genome mining for methanobactins. *BMC Biol.* **2013**, *11*, 17.

Smith, S. M.; Rosenzweig, A. C. Particulate methane monooxygenase. In *Encyclopedia of Metalloproteins* (V.N. Uversky, R.H. Kretsinger, E.A. Permyakov, eds.), **2013**, Springer, Heidelberg, Germany, 1663-1669.

Boal, A. K.; Rosenzweig, A. C. A radical route for nitrogenase carbide insertion. *Science* **2012**, *337*, 1617-1618.

Zielazinski, E. L.; Cutsail, G. E., III; Hoffman, B. M.; Stemmler, T. L.; Rosenzweig, A. C. Characterization of a cobalt-specific P<sub>1B</sub>-ATPase, *Biochemistry*, **2012**, *51*, 7891-7900.

Rosenzweig, A. C.; Argüello, J. M. Toward a molecular understanding of metal transport by P<sub>1B</sub>-type ATPases. *Curr. Top. Membr.* **2012**, *69*, 113-136.

Culpepper, M. A.; Rosenzweig, A. C. Architecture and active site of particulate methane monooxygenase. *Crit. Rev. Biochem. Mol. Biol.* **2012**, *47*, 483-492.

Culpepper, M. A.; Cutsail, G. E., III; Hoffman, B. M.; Rosenzweig, A. C. Evidence for oxygen binding at the active site of particulate methane monooxygenase. *J. Am. Chem. Soc.* **2012**, *134*, 7640-7643.

Boal, A. K.; Cotruvo, J. A., Jr.; Stubbe, J.; Rosenzweig, A. C. The dimanganese(II) site of *Bacillus subtilis* class Ib ribonucleotide reductase. *Biochemistry* **2012**, *51*, 3861-3871.

Dassama, L. M. K.; Boal, A. K.; Krebs, C.; Rosenzweig, A. C.; Bollinger, J. M., Jr. Evidence that the  $\beta$  subunit of *Chlamydia trachomatis* ribonucleotide reductase is active with the manganese ion of its manganese(IV)/iron(III) cofactor in site 1. *J. Am. Chem. Soc.* **2012**, *134*, 2520-2523.

Kenney, G. E.; Rosenzweig, A. C. Chemistry and biology of the copper chelator methanobactin. *ACS Chem. Biol.* **2012**, *7*, 260-268.

Smith, S. M.; Rawat, S.; Telsler, J.; Hoffman, B. M.; Stemmler, T. L.; Rosenzweig, A. C. Crystal structure and characterization of particulate methane monooxygenase from *Methylocystis* species strain M. *Biochemistry* **2011**, *50*, 10231-10240.

Balasubramanian, R.; Kenney, G. E.; Rosenzweig, A. C. Dual pathways for copper uptake by methanotrophic bacteria. *J. Biol. Chem.* **2011**, *286*, 37313-37319.

Lawton, T. J.; Rosenzweig, A. C. Detection and characterization of a multicopper oxidase from *Nitrosomonas europaea*. *Methods Enzymol.* **2011**, *496*, 423-433.

Boal, A. K.; Grove, T. L.; McLaughlin, M. I.; Yennawar, N. H.; Booker, S. J.; Rosenzweig, A. C. Structural basis for methyl transfer by a radical SAM enzyme. *Science* **2011**, *332*, 1089-1092.

Rosenzweig, A. C. Particulate methane monooxygenase. In *Handbook of Metalloproteins Volumes 4 and 5* (A. Messerschmidt, ed.), **2011**, John Wiley & Sons, Chichester, UK, 615-622, originally published online September 2008.

Lawton, T. J.; Rosenzweig, A. C. Two-domain multicopper oxidase. In *Handbook of Metalloproteins Volumes 4 and 5* (A. Messerschmidt, ed.), **2011**, John Wiley & Sons, Chichester, UK, 591-599.

Smith, S. M.; Balasubramanian, R.; Rosenzweig, A. C. Metal reconstitution of particulate methane monooxygenase and heterologous expression of the pmoB subunit. *Methods Enzymol.* **2011**, *495*, 195-210.

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Balasubramanian, R.; Levinson, B. T.; Rosenzweig, A. C. Secretion of flavins by three species of methanotrophic bacteria. *Appl. Environ. Microbiol.* **2010**, *76*, 7356-7358.

Boal, A. K.; Cotruvo, J. A., Jr.; Stubbe, J.; Rosenzweig, A. C. Structural basis for activation of class Ib ribonucleotide reductase. *Science* **2010**, *329*, 1526-1530.

Traverso, M. E.; Subramanian, P.; Davydov, R.; Hoffman, B. M.; Stemmler, T. L.; Rosenzweig, A. C. Identification of a hemerythrin-like domain in a P<sub>1B</sub>-type transport ATPase. *Biochemistry* **2010**, *49*, 7060-7068.

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## **RECORD OF RESEARCH SUPPORT**

### **Current**

Amy C. Rosenzweig, PI  
Metalloenzymes and metal ion homeostasis  
NIH R35  
Direct costs: \$2,050,000  
Project dates: 4/1/21-3/31/26

Amy C. Rosenzweig, PI  
Missing links in biological methane and ammonia oxidation  
DOE DE-SC0016284  
Direct costs: \$389,427  
Project dates: 9/1/19-8/31/21

Amy C. Rosenzweig, PI  
Novel determinants of prokaryotic copper homeostasis  
NSF MCB-1938715  
Direct costs: \$508,696  
Project dates: 1/1/20-12/31/23

### **Past**

Amy C. Rosenzweig, PI  
Metalloenzymes and metal ion homeostasis  
NIH R35  
Direct costs: \$1,941,772  
Project dates: 4/1/16-3/31/21

Amy C. Rosenzweig, PI  
Missing links in biological methane and ammonia oxidation  
DOE DE-SC0016284  
Direct costs: \$389,427  
Project dates: 9/1/16-8/31/19

Amy C. Rosenzweig, PI  
Microbial methane utilization  
Intrexon Corporation  
Direct costs: \$107,408  
Project dates: 11/21/17-11/20/19

Barry Olafson, Protabit LLC, PI; Amy C. Rosenzweig Co-PI  
Development of a computational protein engineering platform and its application to methane activating enzymes  
NSF STTR Phase II  
Direct costs: \$97,088 (Rosenzweig subcontract only)  
Project dates: 9/1/15-8/31/17

Amy C. Rosenzweig, PI  
Structure and specificity in metal ion homeostasis  
NIH R01  
Direct costs: \$909,940  
Project dates: 4/1/12-3/31/16

Amy C. Rosenzweig, PI  
Particulate methane monooxygenase  
NIH R01  
Direct costs: \$800,000  
Project dates: 6/1/13-5/31/17

Amy C. Rosenzweig, PI  
NIH Administrative Supplement to Particulate Methane Monooxygenase  
Direct costs: \$139,317  
Project dates: 7/1/15-6/30/16

Amy C. Rosenzweig, PI  
Michael Jewett (Northwestern), Stephen Mayo (Caltech), Protabit, Co-PIs  
Engineering metalloenzymes for methane oxidation  
Advanced Research Projects Agency – Energy (ARPA-E)  
Direct costs (NU Rosenzweig only): \$668,969  
Project dates: 2/11/14-8/11/15

Protabit, PI  
Amy C. Rosenzweig, Co-PI  
Engineering a recombinant methane monooxygenase to convert methane to methanol for the production of fuels and chemicals  
NSF STTR  
Direct costs (NU Rosenzweig only): \$29,126  
Project dates: 1/1/14-12/31/14

Amy C. Rosenzweig, PI  
Methanobactin biosynthesis  
Institute for Sustainability and Energy at Northwestern (ISEN) Booster Award  
Direct costs: \$40,500  
Project dates: 1/1/14-12/31/14

Amy C. Rosenzweig, PI  
Diversity Supplement for 2R01GM074743-09, Particulate Methane Monooxygenase  
NIH  
Direct costs: \$108,669  
Project dates: 12/1/13-11/30/14

Amy C. Rosenzweig, PI  
Acquisition and internalization of copper by methanotrophs  
NSF  
Direct costs: \$408,616  
Project dates: 7/15/09-6/30/13

Amy C. Rosenzweig, PI  
Particulate Methane Monooxygenase  
NIH R01  
Direct costs: \$840,000  
Project dates: 6/1/09 – 5/31/13

Amy C. Rosenzweig, PI  
Molecular mechanisms of nitrogen metabolism by ammonia oxidizing bacteria  
USDA  
Direct costs: \$247,104  
Project dates: 11/1/09-10/31/12

Amy C. Rosenzweig, PI  
Structural Biology of Copper Homeostasis  
NIH R01  
Direct costs: \$816,000  
Project dates: 2/1/08 – 1/31/12

Amy C. Rosenzweig, PI  
Administrative Supplement to Particulate Methane Monooxygenase  
NIH  
Direct costs: \$51,000  
Project dates: 9/30/09-8/31/10

Amy C. Rosenzweig, PI  
Structural Biology of Copper Homeostasis  
NIH R01  
2/1/04-1/31/08, Total costs: \$1,050,192

Amy C. Rosenzweig, PI  
Particulate Methane Monooxygenase  
NIH R01 Grant  
5/1/04-4/30/08, Total costs: \$1,122,660

Amy C. Rosenzweig, PI  
Minority Supplement to Particulate Methane Monooxygenase  
NIH  
5/1/04-4/30/09, Total costs: \$195,969

Amy C. Rosenzweig, PI  
Metal Trafficking by Copper ATPases  
The Camille and Henry Dreyfus Foundation, Inc.  
6/1/01-5/31/06, Total costs: \$60,000

Andrzej Joachimiak, PI; Amy C. Rosenzweig, Co-PI  
The Midwest Center for Structural Genomics  
NIH  
9/30/00-8/31/05, Total costs: \$24,587,713

Amy C. Rosenzweig, PI  
Structural Basis for Biological Methane Oxidation  
The Lucile and David Packard Foundation  
11/1/99-10/31/04, Total costs: \$625,000

Amy C. Rosenzweig, PI  
Structural Biology of Copper Homeostasis  
NIH R01 Grant  
2/1/99-1/31/04, Total costs: \$1,162,517

Amy C. Rosenzweig, PI  
Structural Biology of Bacterial Copper Resistance  
NSF  
3/1/99-2/28/03, Total costs: \$420,000

Amy C. Rosenzweig, PI, Alfonso Mondragón, Ted Jardetzky, Wayne Anderson, Douglas Freymann,  
Brian Shoichet, Martin Watterson, Co-PIs  
Acquisition of Instrumentation for Macromolecular Crystallography  
National Science Foundation  
9/1/00-8/31/03, Total costs: \$411,000

Amy C. Rosenzweig, PI  
Structural Studies of SOD1 Copper Chaperone Proteins  
Amyotrophic Lateral Sclerosis Association  
2/1/99-1/31/02, Total costs: \$150,000

Amy C. Rosenzweig, PI  
Structural Studies of the Particulate Methane Monooxygenase Active Site  
American Chemical Society Petroleum Research Fund  
9/1/98-8/31/00, Total costs: \$20,000

Amy C. Rosenzweig, PI  
X-Ray Crystallographic Studies of Hah1, a Human Copper Trafficking Protein  
Just Cause/Robert H. Lurie Cancer Center Research Grant  
2/1/98-1/31/99, Total costs: \$20,000



**INVITED PRESENTATIONS****Conferences**

2022 Bollum Symposium on Metals in Biology in honor of John Lipscomb, Department of Biochemistry, Molecular Biology, and Biophysics, University of Minnesota, May 4, 2022

Molecular Basis for Microbial One-Carbon Metabolism Gordon Research Conference, Southbridge, MA, August 7-12, 2021

Plenary Lecture, 19<sup>th</sup> International Symposium on Relations between Homogeneous and Heterogeneous Catalysis (ISHHC19), Oslo, Norway, June 26-29, 2022

Metallocofactors Gordon Research Conference, Newport, RI, June 5-10, 2022

American Chemical Society William H. Nichols Distinguished Symposium honoring Alison Butler, White Plains, NY, April 8, 2022

Dioxygen Activation Chemistry of Metalloenzymes and Models Symposium, Pacifichem 2020, Honolulu, HI, December 16-21, 2021

Cell Biology of Metals Gordon Research Conference, West Dover, VT, August 1-6, 2021

Hans Neurath Award Lecture, virtual, Protein Society Meeting, July 9, 2021

Bader Award Lecture, American Chemical Society Spring 2021 Meeting, virtual, April 9, 2021

15<sup>th</sup> European Conference on Biological Inorganic Chemistry, EuroBIC-15, Reykjavik, Iceland, August 16-21, 2020 (canceled for COVID-19)

45<sup>th</sup> Lorne Conference on Protein Structure and Function, Cumberland, Lorne, Australia, February 9-13, 2020

Research and Education on Chemistry in the US: State of the Art and Future Perspectives, University of Málaga, Málaga, Spain, January 13-17, 2020

Keynote Lecture, 19<sup>th</sup> International Conference on Biological Inorganic Chemistry (ICBIC19), Interlaken, Switzerland, August 11-16, 2019

American Society for Microbiology (ASM Microbe) 2019, San Francisco, CA, Jun 20-24, 2019

Metals in Biology Gordon Research Conference, Ventura, CA, January 27-February 1, 2019

26<sup>th</sup> Enzyme Mechanisms Conference, New Orleans, LA, January 6-9, 2019

1987 Plenary Lecture, AsCA2018/Crystal 32, Auckland, New Zealand, December 2-5, 2018

Plenary Lecture, 11<sup>th</sup> International Copper Meeting, Sorrento, Italy, September 23-28, 2018

Plenary Lecture, 14<sup>th</sup> European Biological Inorganic Chemistry Conference EuroBIC-14, Birmingham, UK, August 26-30, 2018

Plenary Lecture, Frontiers in Metallobiochemistry Summer Symposium in Molecular Biology, The Pennsylvania State University, University Park, PA, June 5-8, 2018

Keynote Lecture, Copper Bioinorganic Chemistry Symposium (CuBICS 2018), Marseille, France, May 21-24, 2018

Symposium on Nitrogen Un-fixation: Mechanisms and Models in Nitrification and Denitrification American Chemistry Society Spring 2018 Meeting, New Orleans, LA, March 18-22, 2018

Bader Award Symposium in honor of Alison Butler, American Chemistry Society Spring 2018 Meeting, New Orleans, LA, March 18-22, 2018

Symposium on the Many Colors of Copper, American Chemical Society Fall 2017 Meeting, Washington, D. C., August 20-24, 2017

Keynote Lecture, 18<sup>th</sup> International Conference on Biological Inorganic Chemistry, Florianópolis, Brazil, July 31-August 4, 2017

Department of Energy Basic Research Needs Workshop on Catalysis Science to Transform Energy Technologies, Gaithersburg, MD, May 7-10, 2017

Metal Homeostasis Symposium, 2017 ASBMB Meeting, Chicago, IL, April 22-27, 2017

Symposium in honor of William B. Tolman, American Chemical Society Spring 2017 Meeting, San Francisco, CA, April 2-7, 2017

Symposium on C1 Catalysis, American Chemical Society Spring 2017 Meeting, San Francisco, CA, April 2-7, 2017

Latin American Meeting on Bioinorganic Chemistry, Queretaro, Mexico, October 18-22, 2016

Plenary Lecture, 10<sup>th</sup> International Copper Meeting, Sorrento, Italy, September 25-30, 2016

6<sup>th</sup> International Conference on Metals in Genetics, Chemical Biology and Therapeutics, ICMG-2016, Bangalore, India, February 17-20, 2016  
Dioxygen Activation Chemistry of Metalloenzymes and Models Symposium, Pacificchem 2015, Honolulu, HI, December 15-20, 2015  
UniCat 2015/CCSS Joint Scientific Meeting, Northwestern University, August 24-25, 2015  
Cell Biology of Metals Gordon Research Conference, West Dover, VT, July 26-31, 2015  
Metals in Biology in Wako Conference, Tokyo, Japan, June 16-18, 2015  
19<sup>th</sup> International Conference on Cytochrome P450, Tokyo, Japan, June 12-15, 2015  
5<sup>th</sup> Georgian Bay International Conference on Bioinorganic Chemistry (CanBIC-5), Parry Sound, Canada, May 19-23, 2015  
Frontiers in Membrane Protein Structural Dynamics Conference, Chicago, IL, April 29-May 1, 2015  
2015 Benjamin Franklin Medal Symposium in Honor of Stephen Lippard, Newark, DE, April 23, 2015  
Inorganic Reaction Mechanisms Gordon Research Conference, Galveston, TX, March 1-6, 2015  
9<sup>th</sup> International Copper Meeting, Vico Equense, Italy, October 5-10, 2014  
Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Waterville Valley, NH, July 13-18, 2014  
Iron-Sulfur Enzymes Gordon Research Conference, Easton, MA, June 15-20, 2014  
Plenary Lecture, Swedish Chemical Society Symposium, Lund, Sweden, May 22, 2014  
Baker Symposium, Department of Chemistry and Chemical Biology, Cornell University, May 3, 2014  
Priestley Award Symposium, 247<sup>th</sup> National Meeting of the American Chemical Society, Dallas, TX, March 16-20, 2014  
Panel, Survival Skills for Female Graduate Students and Junior Faculty, Northwestern University Women's Center, February 5, 2014  
Symposium in Honor of Professor David M. Dooley, Montana State University, Bozeman, MT, October 11-12, 2013  
Sixteenth International Conference in Bioinorganic Chemistry (ICBIC16), Grenoble, France, July 14-19, 2013  
C-H Activation Symposium, 245<sup>th</sup> National Meeting of the American Chemical Society, New Orleans, LA, April 7-11, 2013  
UniCat biocatalysis workshop, Free University of Berlin, Berlin, Germany, March 17-19, 2013  
Suddath Symposium, The Inorganic Face of Life: From Metalloproteins to Cells and Whole Organisms, Georgia Institute of Technology, Atlanta, GA, February 21-22, 2013  
ARPA-E Workshop: Bio-technologies for methane to liquids conversion, Washington, DC, December 5, 2012  
Plenary Lecture, International Symposium on Activation of Oxygen and Homogeneous Catalytic Oxidation, Jerusalem, Israel, September 2-7, 2012  
Molecular Basis of Microbial One-carbon Metabolism Gordon Research Conference, Lewiston, ME, August 5-10, 2012  
Protein Cofactors, Radicals, and Quinones Gordon Research Conference, South Hadley, MA, July 29-August 3, 2012  
Keynote Lecture, 16<sup>th</sup> Annual Conference of the Swedish Structural Biology Network (SBNet), Tällberg, Sweden, June 15-18, 2012  
Plenary Lecture, International Symposium on Relations between Homogeneous and Heterogeneous Catalysis, Berlin, Germany, September 11-16, 2011  
Structure, Mechanism and Regulation in Enzyme Catalysis Symposium, 2011 ASBMB Meeting, Washington, D. C., April 9-13, 2011  
Dioxygen Activation Chemistry of Metalloenzymes and Models Symposium, Pacificchem 2010, Honolulu, HI, December 15-20, 2010  
Plenary Lecture, UniCat biocatalysis workshop, Technical University of Berlin, Berlin, Germany, November 17-19, 2010  
7<sup>th</sup> International Copper Meeting, Alghero, Sardinia, October 16-20, 2010  
Goodman Award Symposium, American Chemical Society Fall 2010 Meeting, Boston, MA,

August 22-26, 2010  
Bioinorganic Chemistry Symposium, American Chemical Society Fall 2010 Meeting, Boston, MA, August 22-26, 2010  
Molecular Basis of Microbial One-carbon Metabolism Gordon Research Conference, Lewiston, ME, August 1-6, 2010  
FASEB Summer Research Conference on Trace Element Micronutrients: Basic and Applied Research, Snowmass, CO, June 13-18, 2010  
Frontiers in Metallobiochemistry Summer Symposium in Molecular Biology, The Pennsylvania State University, University Park, PA, June 2-5, 2010  
Metals in Biology Gordon Research Conference, Ventura, CA, January 30-February 5, 2010  
Fourteenth International Conference in Bioinorganic Chemistry (ICBIC14), Nagoya, Japan, July 25-30, 2009  
Panel, The Future of Science Education in the Liberal Arts, Amherst College, Amherst, MA, October 25, 2008  
6<sup>th</sup> International Copper Meeting, Alghero, Sardinia, October 11-15, 2008  
Biochemical Society Focused Meeting: Transition Metals in Biochemistry, University of East Anglia, UK, June 24-26, 2008  
Pre-ICBIC14 Special Symposium: Dioxygen Activation by Metalloenzymes and Models, Nagoya University, Nagoya, Japan, March 20-21, 2008  
Mini-Symposium on Metals in Biological Systems, Duquesne University, Pittsburgh, PA, December 7, 2007  
Plenary Lecture, Thirteenth International Conference in Bioinorganic Chemistry (ICBIC13), Vienna, Austria, July 15-20, 2007  
Molecular Basis of Microbial One-carbon Metabolism Gordon Research Conference, Oxford, UK, August 6-11, 2006  
Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference, Biddeford, ME, July 16-21, 2006  
Environmental Bioinorganic Chemistry Gordon Research Conference, Andover, NH, June 18-23, 2006  
Frontiers in Metallobiochemistry Summer Symposium in Molecular Biology, The Pennsylvania State University, University Park, PA, June 7-10, 2006  
Plenary Lecture, Advanced Photon Source Users Meeting, May 3, 2006  
Thursday night talk, Metals in Biology Gordon Research Conference, Ventura, CA, January 30-February 3, 2006  
Dioxygen Activation Chemistry of Metalloenzymes and Models Symposium, Pacificchem 2005, Honolulu, HI, December 15-20, 2005  
Keynote Speaker, Royal Society of Chemistry Dalton Discussion Meeting, Nottingham, UK, September 7-9, 2005  
Twelfth International Conference in Bioinorganic Chemistry (ICBIC12), Ann Arbor, MI, July 31-August 5, 2005  
Fourth International Meeting on Copper Homeostasis and its Disorders: Molecular and Cellular Aspects, Ischia, Italy, October 23-28, 2004  
Environmental Bioinorganic Chemistry Gordon Research Conference, Lewiston, ME, June 20-25, 2004  
Metals in Biology Symposium in Honor of Jenny P. Glusker, Fox Chase Cancer Institute, Philadelphia, PA, December 12, 2003  
International Symposium on Copper in Biology: From Novel Structures to New Cellular Functions, Konstanz, Germany, September 21-24, 2003  
Metalloenzyme Symposium, 226<sup>th</sup> National Meeting of the American Chemical Society, New York, NY, September 7-11, 2003  
The Impact of Genomics on Chemical Biology: a PRF Supported Summer School Program, Cornell University, Ithaca, NY, July 5-11, 2003  
Bioinorganic Chemistry Symposium, 58<sup>th</sup> Northwest Regional Section Meeting of the American Chemical Society, Bozeman, MT, June 12-14, 2003  
Washington College Women in Science-Sigma XI Symposium in Bioinorganic Chemistry, Chestertown, MD, April 8, 2003

Graduate Research Seminar in Metals in Biology, Ventura, CA, February 6-9, 2003  
Enzyme Mechanisms Conference XVIII, Galveston Island, TX, January 4-7, 2003  
Third International Meeting on Copper Homeostasis and its Disorders: Molecular and Cellular Aspects, Ischia, Italy, October 6-8, 2002  
Coordination Chemistry of Metal Metabolism Symposium, 224<sup>th</sup> National Meeting of the American Chemical Society, Boston, MA, August 18-22, 2002  
American Society for Microbiology, 102<sup>nd</sup> General Meeting, Salt Lake City, UT, May 19-23, 2002  
Midwest Metals Meeting, Chicago, IL, May 11-12, 2002  
Tenth International Conference in Bioinorganic Chemistry (ICBIC10), Florence, Italy, August 26-31, 2001  
ALS Association Workshop for Young Investigators, Philadelphia, PA, October 26-27, 2000  
Lippard 2000: Inorganic Chemistry at the Beginning of the New Millennium, Cambridge, MA, October 6-8, 2000  
Annual Meeting of the Packard Fellows, Monterey, CA, September 6-9, 2000  
Metals in Biology Gordon Research Conference, Ventura, CA, January 23-28, 2000  
Ninth International Conference in Bioinorganic Chemistry (ICBIC9), Minneapolis, MN, July 11-16, 1999  
Quinone and Redox Active Amino Acid Cofactors Gordon Research Conference, Meriden, NH, June 13-18, 1999  
Chemical Crystallographic Analysis Symposium, Massachusetts Institute of Technology, Cambridge, MA, January 9, 1999  
Biological Electron Transfer Symposium, Northeast Regional Section Meeting of the American Chemical Society, Rochester, NY, October 22-25, 1995  
Eighth International Symposium on Microbial Growth on C1 Compounds, San Diego, CA, August 27-September 1, 1995  
Metal Carboxylates and Synthetic Models Symposium, 209<sup>th</sup> National Meeting of the American Chemical Society, Anaheim, CA, April 2-5, 1995  
Alkane Functionalization in Natural and Unnatural Systems Symposium, 207<sup>th</sup> National Meeting of the American Chemical Society, San Diego, CA, March 13-18, 1994

### **Seminars**

Department of Chemistry, Dartmouth College, April 28, 2022  
Department of Chemistry, Yale University, April 25, 2022  
Department of Biochemistry and Molecular Biology, University of Georgia, February 25, 2022  
Hong Kong University Science Distinguished Lecture, March 1, 2021 (virtual)  
Department of Chemistry Colloquium, North Carolina State University, February 26, 2021 (virtual)  
Department of Chemistry, Pomona College, February 16, 2021 (virtual)  
R. Gaurth Hansen Lecturer, Department of Chemistry and Biochemistry, Utah State University, Logan, UT, December 2, 2020 (virtual)  
Chemistry-Biology Interface Training Program Seminar, University of Illinois, Urbana-Champaign, IL, February 27, 2020  
Department of Biochemistry and Molecular Biology, University of Chicago, Chicago, IL, December 11, 2019  
Class of 1960 Scholar Seminar, Biochemistry and Molecular Biology Program, Williams College, Williamstown, MA, September 20, 2019  
2019 Edgar Fahs Smith Lecturer, Department of Chemistry, University of Pennsylvania, Philadelphia, PA, March 21, 2019  
Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA, March 6, 2019  
Bioengineering Lecture Series, California Institute of Technology, Pasadena, CA, February 4, 2019  
Intrexon Corporation, South San Francisco, CA, September 17, 2018  
Department of Biological Chemistry, University of Michigan, Ann Arbor, MI, September 11, 2018  
Structural, Chemical, and Quantitative Biology Seminar, Departments of Chemistry and Molecular and Cell Biology, University of California, Berkeley, Berkeley, CA, April 9, 2018  
Department of Chemistry and Biochemistry, Swarthmore College, Swarthmore, PA, March 8, 2018

Department of Chemistry, Stanford University, Stanford, CA, March 2, 2018  
Department of Chemistry, San Jose State University, San Jose, CA, March 1, 2018  
Department of Chemistry, Colorado State University, Fort Collins, CO, February 20, 2018  
Advanced Photon Source Colloquium Series, Argonne National Laboratory, Argonne, IL, December 6, 2017  
Shanghai Institute of Materia Medica, Shanghai, China, October 21, 2017  
Department of Chemistry, Nanjing University, Nanjing, China, October 19, 2017  
Department of Chemical Biology, Peking University, Beijing, China, October 16, 2017  
Environmental and Molecular Mechanisms of Health and Disease Seminar, Departments of Pharmacology, Molecular Biosciences, and Neuroscience, University of Texas, Austin, September 14, 2017  
Department of Chemistry, Kalamazoo College, Kalamazoo, MI, February 16, 2017  
Department of Chemistry, Johns Hopkins University, Baltimore, MD, April 26, 2016  
ExxonMobil Research and Engineering, Clinton, NJ, March 7, 2016  
Indian Association for the Cultivation of Sciences, Kolkata, India, February 15, 2016  
Division of Biology Colloquium, Illinois Institute of Technology, April 27, 2015  
Royal Society of Chemistry Joseph Chatt Award Lecture and Inorganic Biochemistry Discussion Group, University of York, York, UK, April 9, 2015  
Royal Society of Chemistry Joseph Chatt Award Lecture, Kings College, London, UK, April 8, 2015  
Royal Society of Chemistry Joseph Chatt Award Lecture, University of East Anglia, Norwich, UK, April 7, 2015  
Science Salon & Humanities Hour, Lectures at Lunch for Staff, Northwestern University, February 26, 2015  
Molecular Discovery Seminar, National Cancer Institute, December 4, 2014  
Department of Structural Biology, University of Buffalo, and Hauptmann Woodward Institute, April 24, 2014  
Department of Chemistry and Biochemistry, University of Notre Dame, December 6, 2013  
Department of Chemistry, University of Akron, Akron, OH, October 22, 2013  
Department of Chemistry and Biochemistry, Worcester Polytechnic Institute, December 12, 2012  
Department of Chemistry, California Institute of Technology, April 23, 2012  
Department of Chemistry and Biochemistry, University of California, San Diego, April 20, 2012  
Department of Chemistry, University of California, Irvine, April 19, 2012  
Department of Pharmacology, Case Western Reserve University, Cleveland, OH, October 17, 2011  
Department of Chemistry, Duke University, Durham, NC, April 26, 2011  
Department of Biochemistry, Molecular Biology, and Biophysics, University of Minnesota, Minneapolis, MN, March 23, 2011  
Pollard Memorial Lecture, Department of Biochemistry and Molecular Biology, The Pennsylvania State University, University Park, PA, March 14, 2011  
UOP/Honeywell Invitational Lecturer, UOP LLC, Des Plaines, IL, February 17, 2011  
Vanderbilt Institute of Chemical Biology, Vanderbilt University, Nashville, TN, December 1, 2010  
Biomolecular Student Seminar, Department of Chemistry, Emory University, Atlanta, GA, April 26, 2010  
Biophysics Colloquium, Cornell University, Ithaca, NY, April 7, 2010  
Department of Chemistry and Biochemistry, University of South Carolina, Columbia, SC, October 2, 2009  
Department of Biochemistry, The University of Texas Health Science Center, San Antonio, TX, August 28, 2009  
Department of Chemistry, Texas A&M University, College Station, TX, May 14, 2009  
Department of Chemistry, Yale University, New Haven, CT, April 22, 2009  
Departments of Molecular and Cell Biology and of Chemistry, University of California, Berkeley, November 3, 2008  
Department of Chemistry, University of Illinois at Urbana-Champaign, Urbana, IL, September 30, 2008  
Molecular Biophysics Program, University of Colorado, Boulder, CO, April 23, 2008  
Department of Chemistry, University of Chicago, Chicago, IL, October 15, 2007  
Department of Chemistry, Massachusetts Institute of Technology, Cambridge, MA, June 6, 2007  
Department of Biochemistry and Molecular Biophysics, University of Arizona, Tucson, AZ, March 23, 2007  
Department of Chemistry, Oberlin College, Oberlin, OH, November 15, 2006  
Department of Biochemistry, University of Nebraska, Lincoln, NE, September 19, 2006  
Department of Molecular Sciences, University of Kansas, Lawrence, KS, April 24, 2006  
Membrane Protein Interest Groups (MPIG), National Institutes of Health, Bethesda, MD, April 12, 2006

Department of Chemistry and Biochemistry, Miami University of Ohio, Oxford, OH, December 1, 2005  
Department of Chemistry, SUNY Buffalo, Buffalo, NY, October 14, 2005  
Hauptmann-Woodward Medical Research Institute, Buffalo, NY, October 13, 2005  
Biosciences Division, Argonne National Laboratory, September 29, 2005  
Department of Chemistry, Williams College, Williamstown, MA, April 8, 2005  
Keynote Address, Northwestern University Center for Talent Development Award Ceremony, June 5, 2004  
Department of Chemistry, Inaugural Dow Lecturer, Amherst College, Amherst, MA, February 20, 2004  
Department of Biochemistry and Molecular Biology, Michigan State University, East Lansing, MI, October 23, 2003  
Center for Biochemical and Biophysical Studies, Northern Illinois University, DeKalb, IL, October 17, 2003  
Department of Biochemistry, Medical College of Wisconsin, Milwaukee, WI, May 21, 2003  
Departments of Biochemistry and Biology, Brandeis University, Waltham, MA, April 30, 2003  
Department of Chemistry, University of Notre Dame, South Bend, IN, March 27, 2003  
Department of Biological Sciences, Purdue University, West Lafayette, IN, September 18, 2002  
Department of Biochemistry and Molecular Biology, University of Chicago, Chicago, IL, April 24, 2002  
Department of Chemistry, University of Minnesota, Minneapolis, MN, March 11, 2002  
Department of Chemistry and Chemical Biology, Harvard University, Cambridge, MA, February 25, 2002  
Department of Chemistry, Stanford University, Stanford, CA, February 12, 2002  
Department of Chemistry, Massachusetts Institute of Technology, Cambridge MA, June 5, 2001  
Department of Chemistry, Indiana University, Bloomington, IN, April 27, 2001  
Department of Biochemistry and Molecular Biology, Wayne State University School of Medicine, Detroit, MI, April 24, 2001  
Protein Engineering Centre of Excellence, Department of Biochemistry and Structural Biology, University of Toronto, Toronto, Canada, March 15, 2001  
Department of Chemistry, University of Michigan, Ann Arbor, MI, March 9, 2001  
Department of Biochemistry and Molecular Biology, Mayo Clinic and Foundation, Rochester, MN, February 13, 2001  
Department of Biological Sciences, University of Illinois at Chicago, Chicago, IL, April 18, 2000  
Department of Chemistry and Biochemistry, Utah State University, Logan, UT, February 9, 2000  
Department of Biochemistry, University of Utah Health Sciences Center, Salt Lake City, UT, February 7, 2000  
Department of Biochemistry, University of Wisconsin, Madison, WI, December 13, 1999  
Department of Biochemistry and Molecular Biology, Finch University of Health Sciences/The Chicago Medical School, North Chicago, IL, December 2, 1999  
Department of Molecular Biology, The Scripps Research Institute, La Jolla, CA, November 4, 1999  
Department of Biological and Chemical Sciences, Illinois Institute of Technology, Chicago, IL, April 19, 1999  
Department of Chemistry, Loyola University, Chicago, IL, October 15, 1998  
Department of Chemistry, Amherst College, Amherst, MA, April 17, 1995  
Department of Chemistry, University of Rochester, Rochester, NY, April 7, 1995  
Department of Biology, Brookhaven National Laboratory, Upton, NY, March 16, 1995