

Franklin Wayne Outten

University of South Carolina
Department of Chemistry and Biochemistry
631 Sumter St.
Columbia, SC 29208
<https://faculty.sc.edu/fwayneoutten>
ORCID: 0000 – 0002 – 9095 – 0194

Phone: (803) 777 – 8151
Fax: (803) 777 – 9521
woutten@sc.edu

EDUCATION

College of William and Mary, Williamsburg, VA 1991 – 1995
B.S. in Biology with Honors, May 1995
Advisor: Dr. Margaret Saha

Northwestern University, Evanston, IL 1995 – 2001
Ph.D. in Biochemistry, June 2001
Advisor: Dr. Thomas V. O'Halloran

NICHD, National Institutes of Health, Bethesda, MD 2001 – 2005
Postdoctoral Fellow, Cell Biology and Metabolism Branch
Advisor: Dr. Gisela Storz

APPOINTMENTS

University of South Carolina, Columbia, SC 2005 – 2010
Assistant Professor, Department of Chemistry and Biochemistry

University of South Carolina, Columbia, SC 2011 – 2017
Associate Professor, Department of Chemistry and Biochemistry

University of South Carolina, Columbia, SC 2012 – 2015
College of Arts and Sciences Distinguished Professor

University of South Carolina, Columbia, SC 2018 – Present
Professor, Department of Chemistry and Biochemistry

University of South Carolina, Columbia, SC 2015 – Present
Guy F. Lipscomb, Sr. Professor of Biochemistry

AWARDS & HONORS

NIH Cellular and Molecular Basis of Disease, Traineeship 1998 – 2000
Pharmacology Research Associate (PRAT) Postdoctoral Fellowship 2002 – 2004
Cottrell Scholar Award, Research Corporation for Science Advancement 2008 – 2010
Ada B. Thomas Outstanding Faculty Advisor Award 2012
Breakthrough Rising Star at the University of South Carolina 2012

Peer – reviewed Primary Research publications (chronological order)

Bold, underlined font indicates corresponding or co – corresponding author

– – – – – From Graduate or Post – doctoral work – – – – –

1. Outten, C. E., **Outten, F. W.**, O’Halloran, T. V. (1999) DNA distortion mechanism for transcriptional activation by ZntR, a Zn(II) – responsive MerR homologue in *E. coli*. *J. Biol. Chem.*, 274 (53), 37517 – 37524.
2. Munson, G. P., Lam, D., **Outten, F. W.**, O’Halloran, T. V. (2000) Identification of a copper responsive two – component system on the chromosome of *Escherichia coli* K12. *J. Bacteriol.*, 182 (20) 5864 – 5871.
3. **Outten, F. W.**, Outten, C. E., Hale, J., O’Halloran, T. V. (2000) Transcriptional activation of an *E. coli* copper efflux regulon by the chromosomal MerR homologue CueR. *J. Biol. Chem.*, 275 (40), 31024 – 31029.
4. **Outten, F. W.**, Huffman, D. L., Hale, J. A., O’Halloran, T. V. (2001) The independent *cue* and *cus* systems confer copper tolerance during aerobic and anaerobic growth in *Escherichia coli*. *J. Biol. Chem.*, 276 (33), 30670 – 30677.
5. **Outten, F. W.**, Wood, M. J., Munoz, F. M., Storz, G. (2003) The SufE protein and the SufBCD complex enhance SufS cysteine desulfurase activity as part of a sulfur transfer pathway for Fe – S cluster assembly in *E. coli*. *J. Biol. Chem.*, 278 (46), 45713 – 45719.
6. **Outten, F. W.**, Djaman, O., Storz, G. (2004) A *suf* operon requirement for Fe – S cluster assembly during iron starvation in *E. coli*. *Mol. Microbiol.*, 52 (3), 861 – 872.
7. Djaman, O., **Outten, F. W.**, Imlay, J. A. (2004) Repair of oxidized iron – sulfur clusters in *Escherichia coli*. *J. Biol. Chem.*, 279 (43), 44590 – 44599.
8. Wang, X., Mukhopadhyay, P., Wood, M. J., **Outten, F. W.**, Opdyke, J. A., Storz, G. (2006) Mutational analysis to define an activation region on the redox – sensitive transcriptional regulator OxyR. *J. Bacteriol.*, 188 (24): 8335 – 8342.

– – – – – At University of South Carolina – – – – –

9. Layer, G., Gaddam S. A., Ayala – Castro, C. N., Ollagnier de Choudens, S., Lascoux, D., Fontecave, M., **Outten, F. W.** (2007) SufE transfers sulfur from SufS to SufB for iron – sulfur cluster assembly. *J Biol Chem.* 282 (18): 13342 – 13350.
10. Mettert, E.L., **Outten, F.W.**, Wanta, B., and Kiley, P.J. (2008) The impact of O₂ on Fe – S cluster biogenesis requirements of *Escherichia coli* FNR. *J. Mol Biol.* 384 (4): 798 – 811.
11. Wu, Y. and **Outten, F.W.** (2009) IscR controls iron – dependent biofilm formation in *Escherichia coli* by regulating Type I fimbriae expression. *J. Bacteriol.* 191 (4): 1248 – 1257.
12. Wada, K., Sumi, N., Nagai, R., Iwasaki, K., Sato, T., Suzuki, K., Hasegawa, Y., Kitaoka, S., Minami, Y., **Outten, F.W.**, Takahashi, Y., and Fukuyama, K. (2009) Molecular dynamism of Fe – S cluster biosynthesis implicated by the structure of SufC₂ – SufD₂ complex. *J. Mol Biol.* 387 (1): 245 – 258.

13. Gupta, V., Sendra, M., Naik, S.G., Chahal, H.K., Huynh, B.H., **Outten, F.W.**, Fontecave, M., and Ollagnier de Choudens, S. (2009) Native *Escherichia coli* SufA, coexpressed with SufBCDSE, purifies as a [2Fe – 2S] protein and acts as an Fe – S transporter to Fe – S target enzymes. *J. Am. Chem. Soc.* 131 (17): 6149 – 6153.
14. Chahal, H.K., Dai, Y., Saini, A., Ayala – Castro, C., and **Outten, F.W.** (2009) The SufBCD Fe – S scaffold complex interacts with SufA for Fe – S cluster transfer. *Biochemistry.* 48 (44): 10644 – 10653.
15. Saini, A., Mapolelo, D.T., Chahal, H.K., Johnson, M.K., and **Outten, F.W.** (2010) SufD and SufC ATPase activity are required for iron acquisition during in vivo Fe – S cluster formation on SufB. *Biochemistry.* 49 (43): 9402 – 9412.
16. Wang, S., Wu, Y., and **Outten, F.W.** (2011) Fur and the novel regulator YqjI control transcription of the ferric reductase gene *yqjH* in *Escherichia coli*. *J Bacteriol.* 193 (2): 563 – 574.
17. Chahal, H.K. and **Outten F.W.** (2012) Separate Fe – S scaffold and carrier functions for SufB₂C₂ and SufA during in vitro maturation of [2Fe – 2S] Fdx. *J Inorg Biochem.* 116: 126 – 134.
18. Dai, Y. and **Outten, F.W.** (2012) The *E. coli* SufS – SufE sulfur transfer system is more resistant to oxidative stress than IscS – IscU. *FEBS Lett.* 586(22): 4016 – 4022.
19. Singh H., Dai, Y., **Outten, F.W.**, and Busenlehner, L.S. (2013) *Escherichia coli* SufE sulfur transfer protein modulates the SufS cysteine desulfurase through allosteric conformational dynamics. *J Biol Chem.* 288(51): 36189 – 36200.
20. Wang, S., Blahut, M., Wu, Y., Philipkosky, K.E., and **Outten, F.W.** (2014) Communication between binding sites is required for YqjI regulation of target promoters within the *yqjH* – *yqjI* intergenic region. *J Bacteriol.* 196(17): 3199 – 3207.
21. Dai, Y., Kim, D., Dong, G., Busenlehner, L.S., Frantom, P.A., **Outten, F.W.** (2015) SufE D74R substitution alters active site loop dynamics to further enhance SufE interaction with the SufS cysteine desulfurase. *Biochemistry.* 54(31): 4824 – 4833.
22. Hirabayashi, K., Yuda, E., Tanaka, N., Katayama, S., Iwasaki, K., Matsumoto, T., Kurisu, G., **Outten, F.W.**, Fukuyama, K., Takahashi, Y., Wada, K. (2015) Functional dynamics revealed by the structure of the SufBCD complex, a novel ATP – binding Cassette (ABC) protein that serves as a scaffold for Iron – Sulfur Cluster Biogenesis. *J Biol Chem.* 290(50): 29717 – 29731.
23. Hanna, D.A., Harvey R.M., Martinez – Guzman, O., Yuan, X., Chandrasekharan, B., Raju, G., **Outten, F.W.**, Hamza, I., Reddi, A.R. (2016) Heme dynamics and trafficking factors revealed by genetically encoded fluorescent heme sensors. *Proc Natl Acad Sci U S A.* 113(27): 7539 – 7544.
24. Blahut, M., Dzul, S., Wang S, Kandegedara, A., Grosseohme, N.E., Stemmler, T., **Outten, F.W.** (2018) Conserved cysteine residues are necessary for nickel – induced allosteric regulation of the metalloregulatory protein YqjI (NfeR) in *E. coli*. *J Inorg Biochem.* 184, 123 – 133. doi: 10.1016/j.jinorgbio.2018.04.016
25. Kim, D., Singh, H., Dai, Y., Dong, G., Busenlehner, L.S., **Outten, F.W.**, Frantom, P.A. (2018) Changes in protein dynamics in *Escherichia coli* SufS reveal a possible conserved regulatory

mechanism in Type II Cysteine Desulfurase systems. *Biochemistry*. 57(35): 5210 – 5217. doi: 10.1021/acs.biochem.7b01275.

26. Washington – Hughes, C.L., Ford, G.T., Jones, A.D., McRae, K., **Outten, F.W.** (2019) Nickel exposure reduces enterobactin production in *Escherichia coli*. *MicrobiologyOpen*. 8(4): e00691. doi: 10.1002/mbo3.691.
27. Montllor – Albalade C., Colin, A.E., Chandrasekharan, B., Bolaji, N., Andersen, J.L., **Outten, F.W.**, Reddi, A.R. (2019) Extra – mitochondrial Cu/Zn superoxide dismutase (Sod1) is dispensable for protection against oxidative stress but mediates peroxide signaling in *Saccharomyces cerevisiae*. *Redox Biol*. 21: 101064. doi: 10.1016/j.redox.2018.11.022.
28. Dunkle, J.A., Bruno, M., **Outten, F.W.**, Frantom, P.A. (2019) Structural evidence for dimer – interface driven regulation of the type II cysteine desulfurase, SufS. *Biochemistry*. 58(6): 687 – 696. doi: 10.1021/acs.biochem.8b01122.
29. Wofford, J.D., Bolaji, N., Dziuba, N., **Outten, F.W.**, Lindahl, P.A. (2019) Evidence that a respiratory shield in *Escherichia coli* protects a low – molecular – mass Fe(II) pool from O₂ – dependent oxidation. *J Biol Chem*. 294(1): 50 – 62. doi:10.1074/jbc.RA118.005233.
30. Blahut, M., Wise, C.E., Bruno, M.R., Dong, G., Makris, T.M., Frantom P.A., Dunkle, J.A., **Outten, F.W.** (2019) Direct observation of intermediates in the SufS cysteine desulfurase reaction reveals functional roles of conserved active – site residues. *J Biol Chem*. 294(33): 12444 – 12458. doi: 10.1074/jbc.RA119.009471.

Review articles / invited commentaries

1. **Outten, F.W.** Iron – sulfur clusters as oxygen – responsive molecular switches. (2007) *Nat Chem Biol*. 3(4): 206 – 207. *Invited Commentary*.
2. Ayala – Castro, C., Saini, A., and **Outten, F.W.** (2008) Fe – S cluster assembly pathways in bacteria. *Microbiol Mol Biol Rev*. 72(1): 110 – 125. *Invited Review Article*.
3. **Outten, F.W.** and Theil, E.C. (2009) Iron – based redox switches in biology. *Antioxid Redox Signal*. 11(5): 1029 – 1046. *Invited Review Article*.
4. **Outten, F.W.** and Munson, G.P. (2013) The lability and liability of endogenous copper pools. *J Bacteriol*. 95(20): 4553 – 4555. *Invited Commentary*.
5. Boyd, E.S., Thomas, K.M., Dai, Y., Boyd, J.M., and **Outten, F.W.** (2014) Interplay between oxygen and Fe – S cluster biogenesis: insights from the Suf pathway. *Biochemistry*. 53(37): 5834 – 5847. *Invited Review Article*.
6. **Outten, F.W.** (2015) Recent advances in the Suf Fe – S cluster biogenesis pathway: Beyond the Proteobacteria. *Biochim Biophys Acta*. 1853(6): 1464 – 1469. *Invited Review Article*.

Book chapters

1. **Outten, F.W.** and Twining, B.S. Metal Homeostasis: An Overview in Wiley Encyclopedia of Chemical Biology. Published online only. *Book Chapter*.

2. Chahal, H.K., Boyd, J., and **Outten F.W.** (2012) Fe – S cluster biogenesis in Archaea and Bacteria. In V. Culotta and R. A. Scott (Eds.), *Encyclopedia of Inorganic and Bioinorganic Chemistry: Metals in Cells*, West Sussex, UK: John Wiley and Sons, Ltd.
3. **Outten, F.W.** (2014) A stress – responsive Fe – S cluster biogenesis system in bacteria – the *suf* operon of Gammaproteobacteria. In T. Rouault (Ed.), *Iron – Sulfur Clusters in Chemistry and Biology*, Berlin, Boston: De Gruyter.
4. Dong, G., Witcher, S., **Outten, F.W.**, and Pilon – Smits, M. (2016) The Suf system in Archaea, Bacteria, and eukaryotic organelles. In M. K. Johnson and R. A. Scott (Eds.), *Encyclopedia of Inorganic and Bioinorganic Chemistry: Metalloprotein Site Assembly*, West Sussex, UK: John Wiley and Sons, Ltd.

EXTRAMURAL RESEARCH SUPPORT

Ongoing Research Support

*dollar amounts listed on collaborative grants are for F. Wayne Outten’s share of total only

"Conformational dynamics and allosteric regulation during stress – responsive metallocofactor assembly"

2020 – 2024, \$477,400

National Institutes of Health, NIGMS (renewal of R01 GM112919)

Co – PIs: **F. Wayne Outten** / Patrick Frantom (University of Alabama)

The goal of this study is to characterize the protein – protein interactions that coordinate Fe – S cluster assembly by the bacterial Suf system.

"GEAR CRP: Building stimuli – responsive ferritin protein nanocages for biomaterial applications"

2019 – 2020, \$35,000

SC EPSCoR/IDeA, GEAR Collaborative Research Program (CRP)

Co – PIs: **F. Wayne Outten** / Nicholas Grosseohme (Winthrop University)

The goal of this study is to design and test pH – responsive ferritin nanocages that can be used for drug delivery and other biomaterial applications.

Completed Research Support (reverse chronological)

*dollar amounts on collaborative grants are for F. Wayne Outten’s share of total only

“Conformational dynamics and allosteric regulation during stress – responsive metallocofactor assembly”

2015 – 2019, \$486,000

National Institutes of Health, NIGMS (R01 GM112919)

Co – PIs: **F. Wayne Outten** / Patrick Frantom (University of Alabama)

The goal of this study is to characterize the protein – protein interactions that coordinate Fe – S cluster assembly by the bacterial Suf system.

Research Supplement to Promote Diversity in Health – Related Research

2015 – 2018, \$96,423

National Institutes of Health, NIGMS (GM112919 – S1)

Co – PIs: **F. Wayne Outten** / Patrick Frantom (University of Alabama)

The goal of this project is to develop the research career and improve participation for an individual from a group with low representation in the biomedical sciences. The minority graduate student will

work to characterize the protein – protein interactions that coordinate Fe – S cluster assembly by the bacterial Suf system.

R13, Conference Grant for *7th International Conference on Iron – Sulfur Cluster Biogenesis and Regulation*

2013 – 2014, \$4,000

National Institutes of Health, NIGMS (GM106685)

PI: **F. Wayne Outten** / Caryn E. Outten

“Minority Undergraduate Research on Nickel Toxicity Mechanisms”

2012, \$7,120

SC EPSCoR/IDeA

National Science Foundation

PI: **F. Wayne Outten**

“REU: Characterization of a Novel Nickel Metalloregulatory Protein, YqjI”

2012 – 2015, \$21,000

NSF, Biological Sciences, Molecular and Cellular Biosystems (supplement to MCB1022288)

PI: **F. Wayne Outten**

“Characterization of a novel nickel metalloregulatory protein, YqjI”

2010 – 2015, \$645,000

NSF, Biological Sciences, Molecular and Cellular Biosystems (MCB1022288)

PI: **F. Wayne Outten**

The goal of this study is to characterize the regulatory mechanisms of the YqjI transcription factor in *E. coli*.

Administrative Supplement to R01 GM81706

2009 – 2010, \$30,000

National Institutes of Health, NIGMS

PI: **F. Wayne Outten**

“Determining the role of the microbiome in the APCmin mouse model of colon cancer”

2008 – 2011, \$150,000

NIH/NCRR, COBRE: Center for Colon Cancer Research

Co – PIs: **F. Wayne Outten** / Sean Norman

The goal of this project was to determine if the microbial flora of the large intestine influences the development of colon cancer in the APCmin mouse model of colon cancer

“Characterization of a novel Fe – S scaffold system used by pathogenic bacteria under oxidative stress and iron starvation.”

2008 – 2010, \$100,000

Cottrell Scholar Award, Research Corporation for Science Advancement.

PI: **F. Wayne Outten**

The goal of this study is to determine the identity of Fe – S scaffold protein(s) in the Suf pathway for Fe – S cluster assembly in *E. coli*.

“Characterization of the Suf Fe – S Cluster Biosynthesis Pathway Under Stress”

2007 – 2012, \$1,080,382

National Institutes of Health, NIGMS (R01 GM81706)

PI: **F. Wayne Outten**

The goal of this study was to elucidate the biochemical mechanisms of the bacterial Suf system for Fe – S cluster assembly.

INTRAMURAL RESEARCH SUPPORT

"ASPIRE I: Characterization of protein interactions during iron – sulfur cluster trafficking under stress in bacteria."

2019 – 2020, \$15,000

USC Research Foundation

PI: **F. Wayne Outten**

"Magellan Mini – grant: Iron – Sulfur Cluster Biosynthesis"

2016 – 2017, \$1,000

USC Office of Undergraduate Research

Co – PI: **F. Wayne Outten**

"Magellan Apprentice for Capstone Scholars: Iron – Sulfur Cluster Biosynthesis"

2016 – 2017, \$1,000

USC Office of Undergraduate Research

Co – PI: **F. Wayne Outten**

"Magellan Scholar: MGS Identification of Critical Regulatory Elements Controlling Gene Regulation in *E. coli*"

2014 – 2015, \$3,000

USC Office of Undergraduate Research

Co – PI: **F. Wayne Outten**

"ASPIRE I: Characterization of an essential iron cofactor biosynthesis pathway from *Mycobacterium tuberculosis*

2013, \$15,000

USC Research Foundation

PI: **F. Wayne Outten**

"ASPIRE III: Acquisition of Applied Photophysics Stopped Flow Spectrometer"

2013, \$45,000

USC Research Foundation

Co – PI: **F. Wayne Outten**

"ASPIRE III: Acquisition of Instrumentation for Quantitative Biomolecular Imaging"

2013, \$97,252

USC Research Foundation

Co – PI: **F. Wayne Outten**

TEACHING/MENTORING SUPPORT

ASBMB Student Chapters Outreach Grant Program

2016 – 2017, \$500

American Society for Biochemistry and Molecular Biology (ASBMB)

Teaching Innovation Grant in Flipped Course Development

2015, \$7,500

USC Center for Teaching Excellence

Scientific Advocate Network (SAN) proposal "Dr. William Walden: Minority Research Symposium Keynote Speaker"
2010, \$888
SC EPSCoR/IDeA
National Science Foundation

INVITED ORAL PRESENTATIONS AT PROFESSIONAL MEETINGS

----- Invited oral presentations as a graduate student or post – doctoral fellow -----

1. Wind River Conference on Prokaryotic Biology – Estes Park, CO
“Copper – responsive loci on the *E. coli* chromosome.” June 2, 1999
2. Fe – S Proteins: Biogenesis, Structure, Function, Pathogenesis, and Evolution – Philipps –
Universitat, Marburg, Germany
“The *suf*, *isc*, and *csdAygdk* operons of *E. coli*: Differential regulation and function?” September 12,
2002
3. Steenbock Symposium on Fe – S Proteins: Biogenesis, Structure and Function – University of
Wisconsin – Madison, WI
“Iron Homeostasis under stress: Fe – S cluster biosynthesis and the *suf* pathway of *E. coli*.” May 22,
2005

----- Invited oral presentations as a Professor at University of South Carolina -----

4. American Society of Microbiology General Meeting – Philadelphia, PA
“At the Intersection of Oxygen and Iron Metabolism: The Suf Pathway for Fe – S Cluster Biogenesis”
in a Colloquium entitled Iron – Sulfur Proteins: At the Center of Life and Death May 18, 2009
5. Research Corporation for Science Advancement Annual Meeting – Tucson, AZ
“An undergraduate research opportunity (URO) to increase minority participation in STEM graduate
programs” July 10, 2009
6. Cell Biology of Metals Gordon Conference – Newport, RI
“The Suf pathway: Fe – S cluster biosynthesis at the convergence of iron starvation and oxidative
stress” August 10, 2009
7. Fifth International Conference on Iron – Sulfur Cluster Biogenesis and Regulation – Athens, GA
“Fe – S cluster metabolism regulates biofilm formation through the IscR metalloregulatory protein in
E. coli” September 2, 2009
8. Protein Cofactors, Radicals, and Quinones Gordon Research Conference – Ventura, CA
“The Suf proteins and Fe – S cluster assembly pathways in bacteria” January 28, 2010
9. Iron – Sulfur Enzymes Gordon Research Conference – New London, NH
“Exploring the *in vivo* mechanisms of Suf Fe – S cluster assembly in *E. coli*” June 7, 2010
10. American Chemical Society Goodman Award Symposium – Boston, MA

“In vivo and in vitro characterization of Fe – S cluster assembly by the stress – responsive Suf pathway” August 23, 2010

11. Sixth International Conference on Iron – Sulfur Protein Biogenesis – Cambridge, UK
“The SufBCD complex: A cellular forge for Fe-S cluster assembly” August 23, 2011
12. Metals in Biology Gordon Research Conference – Ventura, CA
“The co – evolution of oxygen metabolism and Fe – S cluster biogenesis: Insights from the Suf pathway” January, 24, 2013
13. FASEB Conference on Trace Elements in Biology and Medicine – Steamboat Springs, CO
“Iron mobilization for stress – responsive Fe – S cluster biogenesis by the Suf pathway” June 3, 2014
14. Cell Biology of Metals Gordon Conference – Mount Snow, VT
“Taking a dip in the labile iron pool: How does Suf acquire iron under stress?” July 29, 2015
15. International Chemical Congress of the Pacific Basin Societies (PacifiChem) – Honolulu, HI. “Iron mobilization for metallocofactor biogenesis: Not all iron pools are equal” December 19, 2015
16. 251st National Meeting of the American Chemical Society (ACS) – San Diego, CA
“Siderophore – mediated iron acquisition during nickel stress is controlled by the metalloregulatory protein YqjI in *E. coli*” March 15, 2016
17. Southeast Regional Meeting of the American Chemical Society (SERMACS) – Columbia, SC.
“Defining the cellular iron pools used for stress – resistant metallocofactor biogenesis” October 25, 2016
18. 39th Steenbock Symposium, University of Wisconsin – Madison, Iron – Sulfur Proteins—Biogenesis, Regulation and Function, Madison, WI. “Exploring Interactions Between the Suf Fe – S Cluster Biogenesis Pathway, Fe – S Cluster Trafficking Networks, and Iron Homeostasis in *E. coli*” May 30, 2018
19. Iron – Sulfur for Life: Cooperative function of Iron – Sulfur Centers in Assembly, Biosynthesis, Catalysis and Disease, Potsdam, Germany. “Direct observation of SufS reaction intermediates reveals the functional role of conserved active site residues.” July 6, 2019
20. 19th International Conference on Biological Inorganic Chemistry (ICBIC – 19), Interlaken, Switzerland. “Direct observation of SufS reaction intermediates reveals the functional role of conserved active site residues.” August 13, 2019

*In addition, undergraduates, graduate students, and post – doctoral fellows from my lab have **42 Contributed Presentations** (posters and oral presentations) since 2005. Authors, titles, and meetings are available upon request.

INVITED SEMINARS

– – – – – Invited seminars as a graduate student or post – doctoral fellow – – – – –

1. Lambda Lunch Bacterial Genetics Seminar Series, National Cancer Institute, Bethesda, MD
“Biosynthesis of Fe – S Clusters Under Stress: Characterization of the Suf System”
January 22, 2003

2. Virginia Tech, Department of Biochemistry, Blacksburg, VA
 “Biosynthesis of Fe – S clusters under stress: Characterization of the *suf* system”
 December 8, 2003
 3. DuPont Research Station, Wilmington, DE
 “Specialized systems for iron and copper homeostasis in response to oxygen availability in *Escherichia coli*”
 November, 2004
 4. Old Dominion University, Department of Chemistry, Norfolk, VA
 “Iron homeostasis under stress: Fe – S cluster assembly and the *suf* pathway in *E. coli*”
 December 10, 2004
- – – – – Invited seminars as an Assistant/Associate/Full Professor – – – – –
5. Armstrong Atlantic University, Department of Chemistry and Physics, Savannah, GA
 “Heavy metal lifestyles: Disruption of cellular iron metabolism by environmental stress”
 February 20, 2006
 6. Georgia Southern University, Department of Chemistry, Statesboro, GA
 “Heavy metal lifestyles: Disruption of cellular iron metabolism by environmental stress”
 February 21, 2006
 7. Francis Marion University, Department of Biology, Florence, SC
 “Transition Metals in Biology: Strategies for Maintaining Iron Homeostasis Under Stress”
 November 8, 2007
 8. University of Georgia, Department of Chemistry, Athens, GA
 “Unraveling the mechanism of Suf Fe – S cluster assembly during oxidative stress and iron starvation”
 March 24, 2008
 9. Clemson University, Department of Biological Sciences, Clemson, SC
 “Biosynthesis of a critical iron cofactor: In vivo Fe – S cluster assembly”
 April 18, 2008
 10. DuPont Research Station, Wilmington, DE
 “Fe – S cluster assembly in bacteria: Overlapping and divergent roles for the *Isc* and *Suf* pathways”
 September 26, 2008
 11. Claflin University, Department of Chemistry, Orangeburg, SC
 “The Role of Iron Metalloenzymes in Biology: From Inorganic Chemistry to Cell Biology”
 February 20, 2009
 12. Wake Forest University, Department of Chemistry, Winston – Salem, NC
 “Circling the wagons: Studies of iron – sulfur cluster biosynthesis by the stress – responsive *Suf* pathway”
 March 4, 2009
 13. University of South Carolina, Department of Chemistry and Biochemistry, Columbia, SC

“Metalloprotein Biosynthesis: Characterization of the Suf pathway for Iron – Sulfur Cluster Assembly”
May 21, 2009

14. University of South Carolina, Department of Chemistry and Biochemistry, Columbia, SC
“Rust Never Sleeps: Genetic and Biochemical Characterization of Iron Homeostasis and Fe – S Cluster Metabolism in *E. coli*”
September 29, 2009
15. University of Georgia, Department of Microbiology, Athens, GA
“Fe – S cluster metabolism regulates biofilm formation through the IscR metalloregulatory protein in *E. coli*”
October 1, 2009
16. Wayne State School of Medicine, Department of Biochemistry and Molecular Biology, Detroit, MI
“Fe – S clusters at the crossroads of iron and oxygen: Fe – S cluster biosynthesis by the Suf pathway”
March 23, 2010
17. Michigan State University, Department of Biochemistry and Molecular Biology, East Lansing, MI
“Fe – S clusters at the crossroads of iron and oxygen: Fe – S cluster biosynthesis by the Suf pathway”
March 24, 2010
18. Western Michigan University, Department of Chemistry, Kalamazoo, MI
“Fe – S clusters at the crossroads of iron and oxygen: Fe – S cluster biosynthesis by the Suf pathway”
March 26, 2010
19. Lambda Lunch Bacterial Genetics Seminar Series, National Cancer Institute, Bethesda, MD
“Cross – talk between iron metabolism and biofilm formation in *E. coli*”
April 8, 2010
20. University of Maryland School of Pharmacy, Department of Pharmaceutical Sciences, Baltimore, MD
“Fe – S cluster assembly by the Suf pathway: In vivo and in vitro characterization of a stress – responsive metal cofactor biosynthetic pathway”
April 9, 2010
21. University of Minnesota, Department of Chemistry, Minneapolis, MN
“The Suf Fe – S cluster assembly pathway: In vivo and in vitro characterization of a multi – protein factory for metal cofactor biosynthesis.”
March 3, 2011
22. Claflin University, Department of Chemistry, Orangeburg, SC
“Metal coordination acts as a molecular switch to control gene expression via metallo – regulatory proteins”
April 13, 2011
23. North Dakota State University, Department of Chemistry and Biochemistry, Fargo, ND
“The SufBCD complex: A cellular forge for Fe – S cluster assembly”
April 21, 2011
24. Montana State University, Department of Chemistry and Biochemistry, Bozeman, MT
“The Suf pathway: An ancient system for Fe – S cluster biosynthesis with a modern role under stress”

September 30, 2011

25. Claflin University, Department of Chemistry, Orangeburg, SC
“Unraveling the DNA – Protein interactions that control gene expression”
April 19, 2012
26. Claflin University, Department of Chemistry, Orangeburg, SC
“Molecular mechanisms of metal toxicity and cellular metal homeostasis”
March 1, 2013
27. University of Toronto, Department of Chemistry, Toronto, Canada
“At the intersection of iron, sulfur, and oxygen metabolism: Metallocofactor biogenesis by the Suf pathway”
December 9, 2014
28. University of Colorado – Boulder, The Molecular, Cellular, and Developmental Biology (MCDB) Department, Boulder, CO
“At the intersection of iron, sulfur, and oxygen metabolism: Metallocofactor biogenesis by the Suf pathway”
December 11, 2014
29. University of Tennessee, Department of Microbiology, Knoxville, TN
“Metal homeostasis under stress: insights from the Suf metallocofactor biogenesis pathway”
March 9, 2015
30. College of William & Mary, Department of Biology, Williamsburg, VA
“Mars rising: From cofactor biogenesis to pathogenesis, the critical role of Iron in biology”
April 10, 2015
31. Winthrop University, Department of Department of Chemistry, Physics and Geology, Rock Hill, SC
“Iron in biology: Mechanistic studies of Fe – S cluster biogenesis”
July 21, 2016
32. University of South Carolina, Department of Chemistry and Biochemistry, Columbia, SC.
“Unraveling the molecular tangle of iron cofactor biogenesis through biochemistry and genetics”
January 27, 2017
33. Duke University, Departments of Chemistry & Pharmacology and Cancer Biology, Durham, NC.
“How to maintain essential metallocofactors under stress: Lessons from the Suf pathway for Fe – S cluster biogenesis”
October 26, 2017.
34. Texas A&M University, Department of Chemistry, College Station, TX.
“How to maintain essential metallocofactors under stress: Lessons from the Suf pathway for Fe – S cluster biogenesis”
November 3, 2017.
35. James Madison University, Department of Chemistry and Biochemistry, Harrisonburg, VA.
" Using targeted mutagenesis to trap reaction intermediates along the Suf pathway for Fe – S cluster biogenesis"
January 25, 2019

36. Georgia Tech, Department of Chemistry and Biochemistry, Atlanta, GA.
“At the intersection of iron homeostasis and Fe – S cluster biogenesis: Lessons from the Suf pathway in *E. coli*”
March 12, 2020

PROFESSIONAL ACTIVITIES

Professional Society Memberships

American Society for Biochemistry and Molecular Biology (ASBMB)	2013 – Present
American Chemical Society (ACS)	2016 – Present
American Association for the Advancement of Science (AAAS)	2016 – Present

Professional Society Activities

Founder and Faculty Advisor for the USC Undergraduate Affiliate Network (UAN) student chapter of the ASBMB	2012 – 2015
Interim Secretary for the American Chemical Society Division of Biological Chemistry	2019
Secretary for the American Chemical Society Division of Biological Chemistry	2020 – 2023

Editorial Boards

Editorial Board, <i>Biometals</i>	2016 – Present
Editorial Board, <i>Journal of Inorganic Biochemistry</i>	2016 – Present

Conference Organizer/Discussion Leader/Poster Judge

Member of Organizing Committee for the International Conference on Iron – Sulfur Cluster Biogenesis and Regulation	2009 – Present
Discussion Leader, Session on Metal Transport, BioMetals 2010 – Tucson, AZ	2010
Discussion Leader for Gordon Research Conference on Iron – Sulfur Enzymes – South Hadley, MA (Mount Holyoke College)	2011
Co – host, Southeast Regional Fe – S Biogenesis Symposium (SERFS) – Columbia, SC (University of South Carolina)	2011
Co – Host (with C. E. Outten) of the Seventh International Conference on Iron – Sulfur Cluster Biogenesis and Regulation – Columbia, SC (University of South Carolina)	2013
Discussion Leader for the Eighth International Conference on Iron – Sulfur Cluster Biogenesis and Regulation– Bergamo, Italy	2015
Discussion Leader for the Southeast Regional ACS	

(SERMACS) conference – Columbia, SC 2016

Grant Reviews / Panels

Review Panel member for Pharmacology Research Associate (PRAT)
Postdoctoral Fellowship program at NIGMS, NIH in Bethesda, MD 2009, 2011

Review Panel member for site visit to review Dr. Tracey Rouault, Head,
Section on Human Iron Metabolism in the Program in Molecular Medicine
(PMM) at the NICHD, NIH in Bethesda, MD 2010

Review Panel member on National Science Foundation (NSF)
Panel on Mechanistic Molecular Biophysics – Arlington, VA 2013

Review Panel member for an Internet Assisted Review panel
for the National Institutes of Health (NIH) 2013

Review Panel member for National Science Foundation
(NSF) Virtual Panel on Molecular and Cellular Biosciences 2015

Review Panel member for the Macromolecular Structure and
Function A (MSFA) Study Section Biological Chemistry and
Macromolecular Biophysics Integrated Review Group NIGMS, NIH 2017

Ad hoc reviewer for the following funding agencies:

National Institutes of Health
National Science Foundation
Wellcome Trust
Human Frontier Science Program
Research Corporation for Science Advancement
Louisiana Board of Regents Research Competitiveness Program
North Carolina Biotechnology Center
Israel Science Foundation
Medical Research Council (MRC) – UK
Deutsche Forschungsgemeinschaft (DFG) – Germany
Agence Nationale de la Recherche (ANR) – France

Journal Referee for the following publications:

<i>ACS Chemical Biology</i>	<i>Frontiers in Microbiology</i>
<i>ACS Infectious Diseases</i>	<i>Genetics</i>
<i>Antioxidants and Redox Signaling</i>	<i>Journal of the American Chemical Society</i>
<i>Archaea</i>	<i>Journal of Applied Microbiology</i>
<i>Biochemistry</i>	<i>Journal of Biological Chemistry</i>
<i>Biomaterials</i>	<i>Journal of Biological Inorganic Chemistry</i>
<i>BMC Biotechnology</i>	<i>Journal of Inorganic Biochemistry</i>
<i>Coordination Chemistry Reviews</i>	<i>Journal of Proteome Research</i>
<i>Chemical Reviews</i>	<i>MBio</i>
<i>Dalton Transactions</i>	<i>Metallomics</i>
<i>FEBS Letters</i>	<i>Molecular Systems Biology</i>

Microbiology
Microbiology Open
Molecular Microbiology
Nature Communications
Nature Chemical Biology
Nature Reviews – Microbiology

Nucleic Acids Research
PLoS Genetics
PLoS One
PLoS Pathogens
PNAS
Science

TEACHING EXPERIENCE

Lecture Courses

Biol 545/Chem 555	Principles of Biochemistry
Chem D651	Medical Biochemistry (at University of South Carolina School of Medicine)
Chem 701	Biochemistry Division Seminar
Chem 759	Special Topics in Biochemistry

Research Courses

Chem 496	Undergraduate Research
Chem 497	Undergraduate Research
Chem 498	Undergraduate Research
Chem 790	Introduction to Research
Chem 791	Introduction to Research
Chem 798	Research in Chemistry I
Chem 799	Thesis Preparation
Chem 898	Research in Chemistry II
Chem 899	Dissertation Preparation

Total Post – doctoral fellows mentored:	3
Total Ph.D. graduate students mentored (graduated):	16 (12)
Total M.S. graduate students mentored (graduated):	3 (3)
Total B.S. undergraduate research students mentored:	23

SERVICE EXPERIENCE

College and/or University – wide Committees and Service

Taught “Introduction to Biochemistry” lecture for STEM 101 for SC STEP (Science, Technology, Engineering, and Mathematics Talent Expansion Program)	2008 – 2009
Integrated Biomedical Science Program Admissions Committee	2012 – 2015
Ada B. Thomas Advisor Award Committee	2012
Ada B. Thomas Advisor Award Committee (Chair)	2013 – 2015
Faculty Senate (Chemistry Department Representative)	2013 – 2015 2018 – 2020
Faculty mentor for two Carolina Scholar undergraduates	2015 – Present

Panelist on the “Research: Next Steps to Success” panel for summer research students in the SCAMP Program, Chemical Engineering REU, Physics REU, the CCCR Minority Summer Research Program, and SC Advancing Diversity in Aging Research Program	2016
Chemistry/Biochemistry Representative at the Admitted Student Day session for the College of Arts & Sciences: Science, Math, and Statistics	2017
COVE (Communicating Our Value Effectively) Committee	2017
Panelist for a "Conversations About Teaching" panel sponsored by the USC College of Arts and Sciences Incubator for Teaching Innovation	2018
University Committee on Tenure and Promotion (UCTP)	2018 – 2021
Departmental Committees	
Served on 18 Dissertation Committees (Chair of 2)	2005 – Present
Graduate Recruiting Committee	2006 – 2008
Departmental Website Committee	2006 – 2010
Graduate Admissions Committee	2008 – 2012
Ad Hoc Committee on Departmental Budget Revisions	2010
Executive Committee (Biochemistry Division Representative)	2010 – Present
Biochemistry and Molecular Biology (BMB) Curriculum Committee (Chair)	2012 – Present
Chemistry Curriculum Committee	2015 – Present
Associate Chair, Department of Chemistry and Biochemistry	2017 – Present
Ad Hoc Committee for ASBMB Accreditation of the Biochemistry and Molecular Biology (BMB) Major	2018
Chair, Department Committee on Tenure and Promotion	2019 – 2020
Exam Administrator for annual ASBMB Certification Exams (for BMB seniors)	2019 – Present
Community Service and Outreach	
Science Fair Judge, Hammond High School	2007
Organized and participated in the summer Undergraduate Research Opportunity for local minority students at Historically Black Colleges and Universities (via Cottrell Scholar award)	2010

Hosted local minority students from Historically Black Colleges and Universities (via NSF grant) for summer research	2011 – 2013
Participated as a Judge in the ASBMB High School science fair held in the Capstone Center at USC	2013 – 2014
Assistant Scoutmaster and Instructor for Chemistry Merit Badge course for Troop 8, Indian Waters Council, Boy Scouts of America	2016 – Present
Instructor and demonstrator, special classes on Genetic Engineering for 7th grade science classes at Hand Middle School, Columbia, SC	2018
Research Mentor, SPRI Program, SC Governor’s School for Science and Mathematics	2018

MILITARY EXPERIENCE

Assignments (with highest rank in that position):

Headquarters Battery (HHB), 29 th Infantry Division Artillery, Sandston, VA Virginia Army National Guard Intelligence Analyst (96B), E4, Specialist	1989 – 1993
Headquarters Battery (HHB), 29 th Infantry Division Artillery Virginia Army National Guard Simultaneous Membership Program (SMP) Cadet (E5)	1993 – 1995
Revolutionary Guard Battalion ROTC, College of William and Mary, Williamsburg, VA Simultaneous Membership Program (SMP) Cadet	1993 – 1995
Company B, 863 rd Engineer Battalion, Combat Heavy, Ft. Sheridan, IL United States Army Reserve Platoon Leader, O2, 1LT	1995 – 1999
Headquarter Support Company (HSC), 863 rd Engineer Battalion, Combat Heavy, Darien, IL United States Army Reserve Executive Officer, O2, 1LT	1999 – 2001
416 th Engineer Command, Facility Engineer Center – Northeast, Ft. Meade, MD United States Army Reserve Facility Engineer, O2, 1LT	2001 – 2002
416 th Engineer Command, Facility Engineer Center – Northeast, Ft. Meade, MD United States Army Reserve S1, O3, CPT	2002 – 2003
Honorable Discharge	2003

Military Education:

Basic Training, Ft. Jackson, SC	1989
Advanced Individual Training (AIT), U.S. Army Intelligence School, Ft. Huachuca, AZ	1990
Air Assault School, Ft. Belvoir, VA	1991
Airborne School, Ft. Benning, GA	1993
Engineer Officer Basic Course, Ft. Leonard Wood, MO	1996
Engineer Officer Advanced Course, Ft. Leonard Wood, MO	2002

Military Honors and Awards:

Distinguished Graduate, Intelligence Analyst Course (96B)	1990
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Army Service Ribbon	1990
National Defense Service Medal	1991
Army Achievement Medal	1991, 1994, 1999
Army Reserve Components Achievement Medal	1993, 1998, 2001
Army Commendation Medal	1993
Army ROTC Superior Cadet Decoration	1993
Guaranteed Reserve Forces Duty Scholarship (ROTC)	1993 – 1995
Distinguished Military Graduate, College of William and Mary ROTC	1995
Commandant's Award, Engineer Officer Basic Course	1996
Reserve Component Officer Award, Engineer Officer Basic Course	1996
Army Reserve Components Overseas Training Ribbon*	1999
Humanitarian Service Medal*	1999

*For deployment to Guatemala for hurricane relief efforts as part of Operation New Horizons II, U.S. Southern Command