Caryn E. Outten, Ph.D.

Guy F. Lipscomb, Sr. Professor of Chemistry
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Faculty Page | Research Group | @CarynOutten

PROFESSIONAL APPOINTMENTS

2018–present	**Professor of Chemistry and Biochemistry** University of South Carolina, Columbia, SC
2013–present	**Guy F. Lipscomb, Sr. Chair in Chemistry** University of South Carolina, Columbia, SC
2012–2013	**College of Arts and Sciences Distinguished Professor** University of South Carolina, Columbia, SC
2012–2017	**Associate Professor of Chemistry and Biochemistry** University of South Carolina, Columbia, SC
2005–2012[1]	**Assistant Professor of Chemistry and Biochemistry** University of South Carolina, Columbia, SC

EDUCATION AND TRAINING

2001–2005	**Postdoctoral Fellow** Environmental Health Sciences, Johns Hopkins University, Baltimore, MD
1996, 2001	**M.S., Ph.D. in Inorganic Chemistry** Northwestern University, Evanston, IL
1995	**B.S. in Biology and Chemistry with Highest Honors** College of William and Mary, Williamsburg, VA

HONORS AND AWARDS

2023	**South Carolina Chemist of the Year,** South Carolina Section of the American Chemical Society
2022	**Russell Research Award for Science, Mathematics, and Engineering**, USC Office of the Provost
2016, 2022	**Maximizing Investigators' Research Award (MIRA)**, National Institutes of Health/National Institute of General Medical Sciences (NIH/NIGMS)
2020	**Distinguished Research Leadership Award**, SC Governor's School for Science and Mathematics
2019	**Elected Fellow**, American Association for the Advancement of Science (AAAS)
2019	**Michael J. Mungo Undergraduate Teaching Award**, USC Office of the Provost
2016	**Garnet Apple Award for Teaching Innovation**, USC Office of the Provost
2013	**SC Governor's Young Scientist Award for Excellence in Scientific Research**, SC Governor's Office and SC Academy of Science
2011	***Breakthrough* Rising Star Award**, USC Office of the VP for Research

[1]Received a 1-year tenure clock extension for maternity leave in 2007

2009 **Presidential Early Career Award for Scientists and Engineers (PECASE)**, White House Office of Science and Technology Policy

2005–2008 **K22 Transition to Independent Positions Award**, NIH

PUBLICATIONS (in reverse chronological order)

*C. Outten as corresponding or co-corresponding author
C. Outten postdoc/graduate/undergraduate student authors are underlined

*45. Eap D, Ugro M, Sherrier TW, Albetel AN, Lindahl PA, Riggs-Gelasco PJ, **Outten CE**. (2025) *Aspergillus fumigatus* metallothionein CmtA binds and receives a [2Fe-2S] cluster from monothiol glutaredoxin GrxD. (2025) *J Amer Chem Soc, Accepted*

*44. McGee CC, Bandyopadhyay T, McCracken CN, Talib E, Patterson CE, **Outten CE**. (2025) Cysteine import via the high affinity glutathione transporter Hgt1 rescues glutathione auxotrophy in yeast. *J Biol Chem 301*(2), 108131.

*43. Hati D, Brault A, Gupta M, Fletcher K, Jacques JF, Labbé S, **Outten CE** (2023) *Schizosaccharomyces pombe* Grx4 and Fra2 control activity of the iron repressor Fep1 by facilitating [2Fe-2S] cluster removal. *J Biol Chem 299*(12), 105419.

*42. Bandyopadhyay T, **Outten CE** (2022) The role of thiols in iron-sulfur biogenesis. In *Redox Chemistry and Biology of Thiols.* B Alvarez, G Salinas, M Trujillo, M Comini, Eds.; Elsevier, San Diego, p. 487-506.

*41. Talib E, **Outten CE** (2021) Iron-sulfur cluster biogenesis, trafficking, and signaling: roles for CGFS glutaredoxins and BolA proteins. *Biochim Biophys Acta Mol Cell Res 1868*(1), 118847.

*40. Gupta M, **Outten CE** (2020) Iron-sulfur cluster signaling: the common thread in fungal iron regulation. *Curr Opin Chem Biol, 55*, 189-201.

*39. Li H, **Outten CE** (2019) The conserved CDC motif in the yeast iron regulator Aft2 mediates iron–sulfur cluster exchange and protein–protein interactions with Grx3 and Bol2. *J Biol Inorg Chem 24*(6), 809-815.

*38. Albetel AN, **Outten CE** (2018) Characterization of glutaredoxin Fe-S cluster binding interactions using circular dichroism spectroscopy. In *Meth Enzymol*, S David, Ed.; Vol. 599, p. 327-53.

37. Ponsero AJ, Igbaria A, Darch MA, Miled S, **Outten CE,** Winther JR, Palais G, D'Autréaux B, Delaunay-Moisan A, Toledano MB (2017) Endoplasmic reticulum transport of glutathione by Sec61 is regulated by Ero1 and Bip. *Molecular Cell 67*(6), 962-73.

*36. **Outten CE** (2017) Checks and balances for the iron bank. *J Biol Chem 292*(38), 15990-1.

*35. **Outten CE** (2017) The role of Fe-S clusters in yeast iron regulation. In *Iron-Sulfur Clusters in Chemistry and Biology*, 2nd ed., T. Rouault, Ed. Boston/Berlin Walter de Guyter GmbH, p. 161-85.

*34. Dlouhy AC, Beaudoin J, Labbé S, **Outten CE** (2017) *Schizosaccharomyces pombe* Grx4 regulates the transcriptional repressor Php4 via [2Fe-2S] cluster binding, *Metallomics 9*(8), 1096-105.

*33. Dlouhy AC, Li H, Albetel AN, Zhang B, Mapolelo DT, Randeniya S, Holland A, Johnson MK, **Outten CE** (2016) The *Escherichia coli* BolA protein IbaG forms a histidine-ligated [2Fe-2S] bridged complex with Grx4. *Biochemistry 55*(49), 6869-79.

32. Scian M, Guttman M, Bouldin SD, **Outten CE**, Atkins WM (2016) The myeloablative drug busulfan converts cysteine to dehydroalanine and lanthionine in redoxins. *Biochemistry 55*(33), 4720-30.

*31. [1]Ozer HK, [1]Dlouhy AC, Thornton JD, Hu J, Liu Y, Barycki JJ, Balk J, **Outten, CE** (2015) Cytosolic Fe-S cluster protein maturation and iron regulation are independent of the mitochondrial Erv1/Mia40 import system. *J Biol Chem. 290*(46), 27829-40. [1]Co-first authors

*30. [1]Poor CB, [1]Wegner SV, [1]Li H, Dlouhy AC, Schuermann JP, Sanishvili R, Hinshaw JR, Riggs-Gelasco PJ, [2]**Outten CE,** [2]He C (2014) Molecular mechanism and structure of the *S. cerevisiae* iron regulator Aft2. *Proc Natl Acad Sci USA 111*(11), 4043-8. [1]Co-first authors, [2]Co-corresponding authors

*29. **Outten CE**, Albetel AN (2013) Iron sensing and regulation in *Saccharomyces cerevisiae*: Ironing out the mechanistic details. *Curr Opin Microbiol 16*(6), 662-8.

28. Toledano MB, Delaunay-Moisan A, **Outten CE,** Igbaria A (2013) Functions and cellular compartmentation of the thioredoxin and glutathione pathways in yeast. *Antioxid Redox Signal 18*(13), 1699-711.

*27. **Outten CE** (2014) The role of Fe-S clusters in yeast iron regulation. In *Iron-Sulfur Clusters in Chemistry and Biology*, T Rouault, Ed. Verlag Walter de Guyter GmbH, Berlin, Germany; p. 411-36.

26. Mapolelo DT, Zhang B, Randeniya S, Albetel AN, Li H, Couturier J, **Outten CE,** Rouhier N, Johnson MK (2013) Monothiol glutaredoxins and A-type proteins: partners in Fe-S cluster trafficking. *Dalton Trans 42*(9), 3107-15.

*25. Dlouhy AC, **Outten CE** (2013) The iron metallome in eukaryotic organisms. In *Metallomics and the Cell*, L Banci, Guest Ed.; Vol. 12 of "Metal Ions in Life Sciences," A Sigel, H Sigel, and RKO Sigel, Series Eds.; Springer Science and Business Media B.V.: Dordhecht, Netherlands; Vol. 12, p. 241-78.

*24. [1]Bouldin SD, [1]Darch MA, Hart PJ, **Outten CE** (2012) Redox properties of the disulfide bond of human Cu,Zn superoxide dismutase and the effects of human glutaredoxin 1. *Biochem J 446*(1), 59-67. [1]Co-first authors

23. Dardalhon M, Kumar C, Iraqui I, Vernis L, Kienda G, Banach-Latapy A, He T, Chanet R, Faye G, **Outten CE**, Huang ME (2012) Redox-sensitive YFP sensors monitor dynamic nuclear and cytosolic glutathione redox changes. *Free Rad Biol Med 52*(11-12), 2254-65.

*22. Li H, **Outten CE** (2012) Monothiol glutaredoxins and BolA-like proteins: [2Fe-2S] binding partners in iron regulation. *Biochemistry 51*(22), 4377-89.

*21. Li H, Mapolelo DT, Randeniya S, Johnson MK, **Outten CE** (2012) Human glutaredoxin 3 forms [2Fe-2S]-bridged complexes with human BolA2. *Biochemistry 51*(8), 1687-96.

*20. Frey PA, **Outten CE** (2011) Forging ahead: new mechanistic insights into iron biochemistry. *Curr Opin Chem Biol 15*(2), 257-9.

*19. Li H, Mapolelo DT, Dingra NN, Keller G, Winge DR, Johnson MK, **Outten CE** (2011) Histidine 103 in Fra2 is an iron-sulfur cluster ligand in the [2Fe-2S] Fra2-Grx3 complex and is required for in vivo iron signaling in yeast. *J Biol Chem 286*(1), 867-76.

*18. Li H, Mapolelo DT, Dingra NN, Naik SG, Lees NS, Hoffman BM, Riggs-Gelasco PJ, Huynh BH, Johnson MK, **Outten CE** (2009) The yeast iron regulatory proteins Grx3/4 and Fra2 form heterodimeric complexes containing a [2Fe-2S] cluster with cysteinyl and histidyl ligation. *Biochemistry 48*(40), 9569-81.

17. Leitch JM, Jenson LT, Bouldin SD, **Outten CE,** Hart PJ, Culotta VC (2009) Activation of Cu,Zn-superoxide dismutase in the absence of oxygen and the copper chaperone CCS. *J Biol Chem 284*(33), 21863-71.

*16. Hu J, Dong L, **Outten CE** (2008) The redox environment in the mitochondrial intermembrane space is maintained separately from the cytosol and matrix. *J Biol Chem 283*(43), 29126-34. ***Highlighted in *Chem. Res. Toxicol.* (Dec. 2008)***

*15. Gibson LM, Dingra NN, **Outten CE**, Lebioda L (2008) Structure of the thioredoxin-like domain of yeast glutaredoxin 3. *Acta Crystallogr D Biol Crystallogr 64*(Pt 9), 927-32.

14. Kumanovics A, Chen O, Li L, Bagely D, Adkins E, Lin H, Dingra NN, **Outten CE**, Keller G, Winge D, Ward D, Kaplan J (2008) Identification of *FRA1* and *FRA2* as genes involved in regulating the yeast iron regulon in response to decreased mitochondrial iron-sulfur cluster synthesis. *J Biol Chem 283*(16), 10276-86.

---------- Publications from Graduate and Postdoctoral Work ----------

13. Carroll MC, **Outten CE**, Proescher JB, Rosenfeld L, Watson WH, Whitson LJ, Hart PJ, Jensen LT, Culotta VC (2006) The effects of glutaredoxin and copper activation pathways on the disulfide and stability of Cu/Zn superoxide dismutase. *J Biol Chem 281*(39), 28648-56.

12. **Outten CE**, Falk RL, Culotta VC (2005) Cellular factors required for protection from hyperoxia toxicity in *Saccharomyces cerevisiae*. *Biochem J 388*(Pt 1), 93-101.

11. **Outten CE**, Culotta VC (2004) Alternative start sites in the *Saccharomyces cerevisiae GLR1* gene are responsible for mitochondrial and cytosolic isoforms of glutathione reductase. *J Biol Chem 279*(9), 7785-91.

10. **Outten CE**, Culotta VC (2003) A novel NADH kinase is the mitochondrial source of NADPH in *Saccharomyces cerevisiae*. *EMBO J 22*(9), 2015-24.

9. Changela A, Chen K, Xue Y, Holschen J, **Outten CE**, O'Halloran TV, Mondragon A (2003) Molecular basis of metal-ion selectivity and zeptomolar sensitivity by CueR. *Science 301*(5638), 1383-7.

8. Banci L, Bertini I, Ciofi-Baffoni S, Finney LA, **Outten CE**, O'Halloran TV (2002) A new zinc-protein coordination site in intracellular metal trafficking: solution structure of the Apo and Zn(II) forms of ZntA(46-118). *J Mol Biol 323*(5), 883-97.

7. **Outten CE**, O'Halloran TV (2001) Femtomolar sensitivity of metalloregulatory proteins controlling zinc homeostasis. *Science 292*(5526), 2488-92.

6. **Outten CE**, Tobin DA, Penner-Hahn JE, O'Halloran TV (2001) Characterization of the metal receptor sites in *Escherichia coli* Zur, an ultrasensitive zinc(II) metalloregulatory protein. *Biochemistry 40*(35), 10417-23.

5. Hitomi Y, **Outten CE**, O'Halloran TV (2001) Extreme zinc-binding thermodynamics of the metal sensor/regulator protein, ZntR. *J Am Chem Soc 123*(35), 8614-5.

4. Outten FW, **Outten CE**, O'Halloran TV (2000) Metalloregulatory systems at the interface between bacterial metal homeostasis and resistance. In *Bacterial Stress Responses*, G Storz and R Hengge-Aronis, Eds.; ASM Press. Washington, D.C.; p. 145-160.

3. Outten FW, **Outten CE**, Hale J, O'Halloran TV (2000) Transcriptional activation of an *Escherichia coli* copper efflux regulon by the chromosomal MerR homologue, CueR. *J Biol Chem 275*(40), 31024-9.

2. **Outten CE**, Outten FW, O'Halloran TV (1999) DNA distortion mechanism for transcriptional activation by ZntR, a Zn(II)-responsive MerR homologue in *Escherichia coli*. *J Biol Chem 274*(53), 37517-24.

1. Althaus EW, **Outten CE**, Olson KE, Cao H, O'Halloran TV (1999) The ferric uptake regulation (Fur) protein is a zinc metalloprotein. *Biochemistry 38*(20), 6559-69.

EXTRAMURAL RESEARCH SUPPORT

2022–2027 National Institute of General Medical Sciences (NIGMS/NIH), MIRA Research Grant, R35 GM118164-06: *Mechanisms of Fungal Iron Regulation and Thiol Redox Metabolism*, Role: PI. **$2,043,523**

2016–2022 National Institute of General Medical Sciences (NIGMS/NIH), MIRA Research Grant, R35 GM118164-01: *Mechanisms of Iron and Thiol Redox Regulation in Yeast*, Role: PI. **$2,133,845**

2015–2024 SC Governor's School for Science and Mathematics, SPRI program, research supplies for 22 high school researchers. Role: Mentor. **$11,000** total

2010–2016 National Institute of General Medical Sciences (NIGMS/NIH) Research Grant, R01 GM086619: *Glutathione and Redox Control in the Mitochondrial Intermembrane Space*, Role: PI. **$1,488,778**

2012–2016 National Institute of General Medical Sciences (NIGMS/NIH) Research Grant, R01 GM100069: *Mechanistic Studies of Iron Regulation in Yeast*, Role: PI. **$983,915**

2005–2008 National Institute of Environmental Health Sciences (NIEHS/NIH) Transition to Independent Positions Award, K22 ES013780: *Mitochondrial Anti-Oxidant Factors and Redox Status,* Role: PI. **$314,900**

2002–2004 National Institute of General Medical Sciences (NIGMS/NIH) Postdoctoral Fellowship, F32 GM066594: *Genetic Determinants of Hyperoxia Stress*, Role: PI. **$84,740**

PROFESSIONAL ACTIVITIES

Professional Society Memberships:

2015–present American Association for the Advancement of Science (AAAS)

2014–present American Society for Biochemistry and Molecular Biology (ASBMB)

2014–present South Carolina Academy of Science

2009–present American Chemical Society (ACS)

2009–present Society of Biological Inorganic Chemistry (SBIC)

Professional Society Committees:

2016–2022 *Membership Committee,* American Society for Biochemistry and Molecular Biology (ASBMB)

Editorial Boards/Editorships:

2025-present *Editorial Advisory Board,* Metallomics

2024-present *Co-Editor,* Special Issue on "Iron-Sulfur Cluster Biogenesis and Regulation Across Biology," *Metallomics*

2014–2024 *Editorial Board,* Journal of Biological Chemistry

2020–2023 *Editorial Board,* Journal of Inorganic Biochemistry

2018 *Guest Editor*, Proceedings of the National Academy of Sciences

2013–2017 *Editorial Advisory Board,* Journal of Biological Inorganic Chemistry

2011 *Co-Editor,* Bioinorganic Chemistry Section, Current Opinion in Chemical Biology

Conference Organizer/Discussion Leader:

June 2026 *Discussion Leader,* FASEB Science Research Conference on Trace Elements in Biology and Medicine, Nashville, TN

Aug 2025	*Discussion Leader*, Cell Biology of Metals Gordon Research Conference, Portland, ME
July 2025	*Session Chair*, 21th International Conference on Biological Inorganic Chemistry (ICBIC21), Long Beach, CA: July 28-August 1, 2025
Jan 2025	*Co-Organizer,* Women in Science Power Hour, Metals in Biology Gordon Research Conference, Ventura, CA
June 2024	*Discussion Leader,* 11th International Conference on Iron-Sulfur Cluster Proteins: Function, Biogenesis, and Regulation, Winston-Salem, NC
Jan 2023	*Discussion Leader,* Metals in Biology Gordon Research Conference, Ventura, CA
June 2022	*Discussion Leader,* FASEB Science Research Conference on Trace Elements in Biology and Medicine, Asheville, NC
Dec 2021	*Symposium Co-Chair,* International Chemical Conference of Pacific Basin Societies (PACIFICHEM) 2021, Honolulu, Hawaii
Oct 2021	*Conference Co-Chair*, Cell Biology of Metals Gordon Research Conference, Mt. Snow, VT
Feb 2021	*Discussion Leader,* ASBMB Webinar on Family and Work Interactions
July 2019	*Co-Organizer*, Women in Science Power Hour, Cell Biology of Metals Gordon Research Conference, Castelldefels, Spain
July 2019	*Conference Co-Vice Chair*, Cell Biology of Metals Gordon Research Conference, Castelldefels, Spain
July 2017	*Discussion Leader,* Women in Science Power Hour, Cell Biology of Metals Gordon Research Conference, Mt. Snow, VT
Jan 2017	*Conference Chair*, 49th Annual Southeastern Undergraduate Research Conference (SURC), Columbia, SC
June 2015	*Discussion Leader,* 8th International Conference on Iron-Sulfur Cluster Biogenesis and Regulation, Bergamo, Italy
June 2014	*Conference Co-Chair*, FASEB Science Research Conference on Trace Elements in Biology and Medicine, Steamboat Springs, CO
Jan 2014	*Discussion Leader*, Metals in Biology Gordon Research Conference, Ventura, CA
May 2013	*Conference Co-Chair*, 7th International Conference on Iron-Sulfur Cluster Biogenesis and Regulation, Columbia, SC
Dec 2011	*Symposium Co-Organizer*, Southeast Regional Fe-S Symposium, Columbia, SC
Aug 2009	*Discussion Leader*, Cell Biology of Metals Gordon Research Conference, Newport, RI
July 2007	*Discussion Leader*, Cell Biology of Metals Gordon Research Conference, Newport, RI

Grant Reviews/Panels:

2021-2025	*Study Section Standing Member*, National Institutes of Health, Macromolecular Structure and Function A (MSFA)
2016, ’19, ‘20	*Review Panel Member*, German Research Foundation (DFG), Priority Program

2016, ’18, ’19	*Review Panel Member*, National Institutes of Health, New PI/ESI MIRA
2010, ‘13, ’14, ‘18	*Ad Hoc Reviewer*, French National Research Agency (ANR)
2017	*Ad Hoc Reviewer*, Stanford Synchrotron Radiation Lightsource (SSRL)
2017	*Ad Hoc Reviewer*, National Science Foundation, Chemistry of Life Processes
2015	*Review Panel Member,* National Institutes of Health, ZRG1 BCMB-U
2015	*Ad Hoc Reviewer*, National Institutes of Health, Superfund Research Program
2014	*Ad Hoc Reviewer*, Biotechnology and Biological Sciences Research Council, UK
2014	*Ad Hoc Reviewer*, National Science Foundation, Molecular and Cellular Biosciences
2011, ’14	*Review Panel Member,* National Science Foundation, Chemistry of Life Processes
2013	*Review Panel Member,* National Institutes of Health, ZRG1 BCMB-S Special Emphasis Panel
2013	*Ad Hoc Reviewer*, USC School of Medicine Research Development Fund
2012	*Ad Hoc Reviewer*, Portuguese Foundation for Science and Technology
2010	*Ad Hoc Reviewer*, U.S.-Israel Binational Science Foundation
2009	*Ad Hoc Reviewer*, South Carolina Clinical and Translational Research Institute Pilot Projects Program

Ad Hoc Journal Reviews:

Antioxidants and Redox Signaling
Biochemical Journal
Biochemistry
Biochimica et Biophysica Acta – Molecular Cell Research
Biochimie
Bioinformatics
Biological Chemistry
Biophysical Journal
BMC Biochemistry
Chemical Reviews
Current Opinion in Chemical Biology
eLife
Enzyme and Microbial Technology
Eukaryotic Cell
European Biophysics Journal
FEBS Journal
Human Molecular Genetics
Journal of Biological Chemistry
Journal of Biological Inorganic Chemistry
Journal of Inorganic Biochemistry
Journal of Molecular Biology
Journal of the American Chemical Society
mBio
Metallomics
Microbial Cell
Molecular Microbiology
Molecular and Cellular Biology
Nature Chemical Biology
Nature Communications
Nucleic Acids Research
PLoS One
Proceedings of the National Academy of Sciences
Yeast