

Jonathan D. Caranto

Department of Chemistry, University of Central Florida
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Education

2013 Ph.D, Chemistry, University of Texas at San Antonio

Dissertation: "The nitric oxide reductase mechanism of flavo-diiron proteins"

2003 B.S., Chemistry, Illinois Institute of Technology

2003 B.S., Molecular Biochemistry and Biophysics, Illinois Institute of Technology

Appointments

Assistant Professor of Biochemistry, University of Central Florida

Department of Chemistry, 2017–present

Research Interests

Physiological role of nitric oxide in bacteria

Metalloenzymology of NO-dependent transformations

Natural product biosynthesis

Physiological role of microbial natural products

Research Experience

Postdoctoral Research Associate, Kyle Lancaster, Cornell University

Department of Chemistry, 2013–2017

Enzymology of nitrification: revision of hydroxylamine oxidoreductase and cytochrome P460 activities

Graduate Research Assistant, Donald Kurtz, University of Texas at San Antonio

Department of Chemistry, 2006–2013

Mechanisms of non-heme iron enzymes involved in oxidative and nitrosative stress protection

Research Assistant, Mark Brodl, Trinity University

Department of Biology, 2005–2006

Heat shock response in barley and effects on mRNA stability and endoplasmic reticulum membrane fluidity

Research Assistant, Jonathan King, Trinity University

Department of Biology, 2003–2005

Regulation of matrix metalloproteinases in response to inflammatory signals in kidney cells

Undergraduate Research Assistant, Nick Menhart, Illinois Institute of Technology

Department of BCPS, Spring 2003

Spectroscopic study of multi-domain proteins

Undergraduate Research Assistant, Ken Stagliano, Illinois Institute of Technology

Department of BCPS, 2000–2002

Synthesis of a trimeric quinone analog of a potent HIV inhibitor

Research Student, Nancy Mills, Trinity University

Department of Chemistry, Summers of 1999 and 2000

Synthesis of organic compounds for the study of antiaromaticity

Teaching Experience

Graduate Teaching Assistant, University of Texas at San Antonio, 2006

Taught general chemistry and Allied Health organic chemistry lab sections for two semesters

Substitute Teacher, St. Mary's Hall, San Antonio, 2003–2006

Substitute teacher for middle school and high school mathematics, chemistry and biology. Also, taught middle school biology in the Fall of 2005

Private Tutor, 2003–2012

One-on-one private tutoring of middle school and high school students in math and science.

Awards and Fellowships

- 2015** NextProf Science workshop at University of Michigan (Biophysics)
- 2015** Postdoc Spotlight Cornell University ([Link to article](#))
- 2014–2016** Understanding Interventions Conference travel award
- 2013** Judith A. Walmsley Award for Research in Chemistry
- 2013** Summer Graduation Incentive Scholarship
- 2012** UTSA College of Sciences Doctoral Student Fellowship Award
- 2011** UTSA Department of Chemistry Graduate Research Assistant Award
- 2011** UTSA COS Research Conference Best Poster Award in Medicinal Chemistry and Biochemistry
- 2008–2013** Ph.D MBRS-RISE Doctoral Fellowship
- 2007** Welch Summer Research Fellowship
- 2007** Welch Summer Research Seminar, Outstanding Presentation Award
- 2006** Welch Summer Research Fellowship

Publications (Co-first authors underlined where appropriate)

17. Dong, M.; Kathiresan, V.; Fenwich, M.K.; Torelli, A.T.; Zhang, Y.; Caranto, J.D.; Dzikovski, B.; Lancaster, K.M.; Freed, J.H.; Ealick, S.E.; Hoffmann, B.M.; Lin, H. Organometallic and radical intermediates reveal the reaction mechanism for the diphthamide biosynthetic radical SAM enzyme. **2017**. *Submitted to Science*.
16. Vilbert, A.C.; Caranto, J.D.; Lancaster, K.M. The Lysine Cross-Link to Heme P460 Obviates NO-Dependent Histidine-Dissociation from *Nitrosomonas europaea* Cytochrome P460 {FeNO}⁷. *Chem. Sci.* **2018**, *Advance Article*.
15. Weitz, A.C; Giri, N.; Caranto, J.D.; Kurtz, D.M., Jr.; Bominaar, E.L.; Hendrich, M.P. Spectroscopy and DFT calculations of a flavo-diiron enzyme implicate new diiron site structures, *J. Am. Chem. Soc.* **2017**, *139*, 12009–12019.
14. Caranto, J.D.; Lancaster, K.M. Nitric oxide is an obligate bacterial nitrification intermediate produced by hydroxylamine oxidoreductase, *Proc. Natl. Acad. Sci. U.S.A.* **2017**, *114*, 8217–8222.

Research highlighted:

- Chemical and Engineering News – Kemsley, J. Nitric oxide gets a new role. *Chem Eng. News* **2017** 95 (34), 10.
- Albany Times Union
- The American Agriculturist
- The Cornell Chronicle

13. Caranto, J.D.; Vilbert, A.C.; Lancaster, K.M. *Nitrosomonas europaea* cytochrome P460 is a direct link between nitrification and nitrous oxide emission, *Proc. Natl. Acad. Sci. U.S.A.* **2016**, *113*, 14704–14709.

Research highlighted:

- PNAS commentary – White, C.J.; Lehnert, N. *Proc. Natl. Acad. Sci. U.S.A.* **2016**, *113*, 14474–14476.
- The Cornell Chronicle

12. Frederick, R.E.; Caranto, J.D.; Masitas, C.A.; Gebhardt, L.L.; MacGowan, C.E.; Limberger, R.J.; Kurtz, D.M., Jr. Dioxygen and nitric oxide scavenging by *Treponema denticola* flavo-diiron protein: A mechanistic paradigm for catalysis, *J. Biol. Inorg. Chem.* **2015**, *20*, 603–613.
11. Caranto, J.D.; Weitz, A.; Giri, N.; Hendrich, M.P.; Kurtz, D.M., Jr. A diferrous-dinitrosyl intermediate in the N₂O-generating pathway of a deflavinated flavo-diiron protein, *Biochemistry* **2014**, *53*, 5631–5637.
10. Caranto, J.D.; Weitz, A.; Hendrich, M.P.; Kurtz, D.M., Jr. The nitric oxide reductase mechanism of flavo-diiron protein: Identification of active-site intermediates and products, *J. Am. Chem. Soc.* **2014**, *136*, 7981–7992.
9. Meininger, D.J.; Caranto, J.D.; Arman, H.D.; Tonzetich, Z.J. Studies of Iron(III) Porphyrinates Containing Silanethiolate Ligands, *Inorg. Chem.* **2013**, *52*, 12468–12476.
8. Kurtz, D.M., Jr.; Boice, E.; Caranto, J.D.; Frederick, R.E.; Masitas, C.A.; Miner, K.D. Iron: Non-heme protein with diiron-carboxylate active sites. In *Encyclopedia of Inorganic and Bioinorganic Chemistry*, Scott, R.A., Ed.; Wiley: New York, 2013.
7. Fang, H.; Caranto, J.D.; Mendoza, R.; Taylor A.B.; Hart, P.J.; Kurtz, D.M., Jr. Histidine ligand variants of a flavo-diiron protein: effects on structure and activities, *J. Biol. Inorg. Chem.* **2012**, *17*, 1231–1239.
 - **Selected as cover art for JBIC 2013 issues.**
6. Caranto, J.D.; Gebhardt, L.L.; MacGowan, C.E.; Limberger, R.J.; Kurtz, D.M., Jr. *Treponema denticola* superoxide reductase: In vivo role, in vitro reactivities and a novel [Fe(Cys)₄] site, *Biochemistry* **2012**, *51*, 5601–5610.
5. Hayashi, T.; Caranto, J.D.; Matsumara, H.; Kurtz, D.M., Jr.; Moënné-Loccoz, P. Vibrational analysis of mononitrosyl complexes in hemerythrin and flavodiiron proteins: relevance to detoxifying NO reductase, *J. Am. Chem. Soc.* **2012**, *134*, 6878–6884.
4. Felhofer, J.L.; Caranto J.D.; Garcia C.D. Adsorption kinetics of catalase to thin-films of carbon nanotubes, *Langmuir* **2010**, *26*, 17178–17183.
3. Hayashi, T.; Caranto, J.D.; Wampler, D.A.; Kurtz, D.M., Jr.; Moënné-Loccoz, P. Insights into the nitric oxide reductase mechanism of flavo-diiron proteins from flavin-free enzyme, *Biochemistry* **2010**, *49*, 7040–7049.
2. Hillmann, F.; Riebe O.; Fischer R.; Mot A.; Caranto J.D.; Kurtz D.M., Jr.; Bahl, H. Reductive dioxygen scavenging by flavo-diiron proteins of *Clostridium acetobutylicum*, *FEBS Lett.* **2009**, *583*, 241–245.
1. Leone, A.K.; Chun, J.A.; Koehler, C.L.; Caranto, J.D.; King, J.K. Effect of proinflammatory cytokines tumor necrosis factor- α and interferon- γ on epithelial barrier function and matrix metalloproteinase-9 in Madin-Darby canine kidney cells, *Cell. Physiol. Biochem.* **2007**, *19*, 99–112.

Oral Presentations

6. Caranto, J.D.; Lancaster, K.M. Revision of hydroxylamine oxidoreductase activities and bacterial ammonia oxidation pathways. 254th ACS National Meeting, Washington D.C., Aug. 20-24, 2017.
Presentation highlighted in Chemical and Engineering News: Kemsley, J. Nitric oxide gets a new role. *Chem Eng. News* **2017** 95 (34), 10.
5. Caranto, J.D.; Lancaster, K.M. Revision of metalloenzyme activities reveals potential agricultural sources of atmospheric pollutants. Chemistry and Chemical Biology Grad and Postdoc Seminar, Ithaca, NY, Feb 24, 2017.
4. Caranto, J.D.; Lancaster, K.M. Rapid-mixing techniques for elucidating reaction mechanisms. Advanced Spectroscopy and Theoretical Modeling of Bioinorganic Systems Workshop and Seminar, Copenhagen, Denmark, Jun 16–19, 2014.
3. Caranto, J.D.; Hayashi, T.; Hirotohi, M.; Moenne-Loccoz, P.; Kurtz, D.M., Jr. Characterization of the nitric oxide reductase mechanism of flavo-diiron proteins. 2nd Penn State Bioinorganic Workshop, State College, PA, May 31–Jun 9, 2012.
2. Caranto, J.D.; Hayashi, T.; Gupta, R.; Hendrich, M.; Moenne-Loccoz, P.; Kurtz, D.M., Jr. Characterization of the nitric oxide reductase mechanism of flavo-diiron proteins. 67th American Chemical Society Southwest Regional Meeting, Austin, TX, Nov 9–12, 2011.
1. Kurtz D.M., Jr.; Caranto, J.D.; Hayashi, T.; Moenne-Loccoz, P. Probing the mechanism of a non-heme diiron nitric oxide reductase. 66th American Chemical Society Southwest Regional Meeting, New Orleans, LA, Nov 30–Dec 4, 2010.

Poster Presentations

12. Smith, M.; Caranto, J.D.; Lancaster, K.M. Recombinant expression, mutagenesis, and spectroscopic characterization of archaeal ammonia monooxygenase. 252nd ACS National Meeting and Exposition, Philadelphia, PA, Aug 21–26, 2016.
11. Caranto, J.D.; Smith M.A.; Vilbert A.; Lancaster, K.M. Taming reactive nitrogen: Towards the enzyme mechanisms of biological nitrification. Georgian Bay International Conference on Bioinorganic Chemistry, Parry Sound, Ontario, Canada, May 19–22, 2015.
10. Caranto, J.D.; Smith M.A.; Vilbert A.; Lancaster, K.M. Preliminary characterization of the putative active subunit of an archaeal ammonia monooxygenase. Advanced Spectroscopy and Theoretical Modeling of Bioinorganic Systems Workshop and Seminar, Copenhagen, Denmark, Jun 16–19, 2014.
9. Caranto, J.D.; Smith M.A.; Vilbert A.; Lancaster, K.M. Preliminary characterization of the putative active subunit of an archaeal ammonia monooxygenase. 33rd Summer Symposium in Molecular Biology: Frontiers in Metallobiochemistry, University Park, PA, Jun 5–7, 2014.
8. Caranto, J.D.; Gupta, R.; Hayashi T.; Wampler D.A.; Moenne-Loccoz P.; Hendrich, M.P.; Kurtz D.M., Jr. Characterization of the nitric oxide reductase mechanism of flavo-diiron proteins. College of Science Research Conference/SACNAS Regional Conference, San Antonio, TX, Oct 5, 2012.

7. Caranto, J.D.; Hayashi T.; Wampler D.A.; Moenne-Loccoz P.; Kurtz D.M., Jr. Poster: Characterization of the nitric oxide reductase mechanism of flavo-diiron proteins. College of Science Research Conference/SACNAS Regional Conference, San Antonio, TX, Sep 30, 2011.
6. Caranto, J.D.; Hayashi T.; Wampler D.A.; Moenne-Loccoz P.; Kurtz D.M., Jr. Characterization of the nitric oxide reductase mechanism of flavo-diiron proteins. 15th International Conference for Bioinorganic Chemistry, Vancouver, Canada, Aug 7–12, 2011.
5. Caranto, J.D.; Hayashi T.; Wampler D.A.; Moenne-Loccoz P.; Kurtz D.M., Jr. Nitric oxide derived intermediates of *Thermotoga maritima* flavo-diiron protein. 29th Summer Symposium in Molecular Biology: Frontiers in Metallobiochemistry, University Park, PA, Jun 1–5, 2010.
4. Caranto, J.D.; Hayashi T.; Wampler D.A.; Moenne-Loccoz P.; Kurtz D.M., Jr. Nitric oxide derived intermediates of *Thermotoga maritima* flavo-diiron protein. College of Science Research Conference/SACNAS Regional Conference, San Antonio, TX, May 28, 2010.
3. Caranto, J.D.; Wampler D.A.; Kurtz D.M., Jr. Journey to the center of a protein: Removal of flavin from flavo-diiron protein to study nitric oxide-diiron adduct formation. College of Science Research Conference/SACNAS Regional Conference, San Antonio, TX, Aug 7, 2009.
2. Caranto, J.D.; Ramirez, G.; Wampler, D.A.; Hayashi, T.; Moenne-Loccoz, P.; Kurtz D.M., Jr. Flavo-diiron Proteins: O₂ or NO reductases? Gordon Graduate Research Seminar: Bioinorganic Chemistry, Valencia, CA, Jan 29–Feb 1, 2009.
1. Huang, V.W.; Caranto, J.D.; Kurtz, D.M., Jr. Kinetic investigation of the mechanism of superoxide reductase from *Desulfovibrio vulgaris*. American Chemical Society Southwestern Regional Meeting, Houston, TX, 2006.

Service and Outreach

2015 Facilitator of discussion on imposter syndrome for Cornell University Graduate Student Orientation

2015 Sciencenter, Ithaca, NY—Designed a hands-on demonstration for children ages 4–10 about how light can be converted to energy using light bulbs, a multimeter and a “solar-powered puppy.”

2014–present Research mentor for the Cornell University Office of Academic Diversity Initiatives (OADI) Research Scholars Program

2014 Sciencenter, Ithaca, NY—Presented an interactive presentation on the nitrogen cycle to children 10 or under. Designed and constructed shadow box puzzles for this presentation and illustrated that enzymes control the biochemistry of organisms by making a piñata representative of the ammonia-oxidizing archaeon *Nitrosopumilus maritimus*.

2014–present Developed experiments and a lecture that focused on the nitrogen cycle for a high school science class.

2013 Judge for Exxon/Mobil regional science fair

2012 and 2010 Panelist for MBRS-RISE graduate student panel for undergraduate researchers

2010 Judge for Stinson middle school science fair

2010 Witte Museum “Its not magic its chemistry!” chemistry demo presenter

2009–2013 Marc/MBRS-RISE Selection Committee

2007 Judge for Exxon/Mobil regional science fair

Professional Development

2016 An Introduction to Evidence-Based Undergraduate STEM Teaching (Certificate)

2016 Understanding Interventions Conference, Philadelphia, PA

2015 An Introduction to Evidence-Based Undergraduate STEM Teaching (Non-certificate)

2015 Understanding Interventions Conference, San Diego, CA

2015 Cornell University postdoc leadership development program

2015 CIRTl workshop: Building mentoring skills for an academic career

2014 Understanding Interventions Conference, Baltimore, MD

2012–present Academy for Future Science Faculty

2012 2nd Penn State Bioinorganic Workshop, May 31–June 10

2012 Intermedia Communications Training, April 26–27

2010 Frontiers in metallochemistry: Pre-symposium training program, June 1–2

2009 Dawn of the new enzymology kinetics workshop, June 28–July 2

Students Mentored

Rachael Coleman (2017), Sean Majer (2016–2017), Rich Walroth (2015–2017), Ashley Vincent (2015–2017), Meghan Smith (2013–2017), Avery Vilbert (2013–2017), Hayley Knox (2013–2015), Kait Schrote (2013–2015), Rosalinda Mendoza (2009–2011), Christina Deakins (2010), Anthony Arredondo (2009), Gerardo Ramirez (2008–2009), Augustin Mot (2008).

Professional Organizations

American Chemical Society

Society of Biological Inorganic Chemistry