# Keri L. Colabroy
**Curriculum Vitae**

Muhlenberg College
Department of Chemistry
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## Education

Doctorate of Philosophy in Chemistry, *Cornell University* 2005

Dissertation topic: Mechanistic studies on the formation of quinolinic acid, a precursor to the redox cofactor nicotinamide adenine dinucleotide. Advisor: Dr. Tadhg P. Begley

Bachelor of Science in Chemistry, *Messiah College* 2000
Summa Cum Laude

## Professional Experience

Professor of Chemistry, Muhlenberg College 2019-present

Associate Professor of Chemistry, Muhlenberg College 2011-2019

Assistant Professor of Chemistry, Muhlenberg College 2005-2011

## Peer-Reviewed Publications

(undergraduate co-authors in **bold-face** type)

**Alexander M. Goldberg†, Miranda K. Robinson†, Erykah S. Starr, Ryan N. Marasco, Alexa C. Alana, C. Skyler Cochrane, Kameron L. Klugh, David Strzeminski, Muxue Du**, Keri L. Colabroy,* Larryn W. Peterson* "L-DOPA dioxygenase activity on 6-substituted dopamine analogs" *Biochemistry* 60, no. 32 (2021): 2492-2507. † - contributed equally, * - corresponding author

Colabroy, K., Bell, J.K. *Lab eNotebooks*. Biochemistry Education: From Theory to Practice. 1337, 173–195, doi: 10.1021/bk-2019-1337.ch008 (2019).

Colabroy, Keri L., **Alyssa D. Horwitz, Victoria R. Basciano, Yizhi Fu, Kelly M. Travitz, Miranda K. Robinson, Brittany A. Shimanski,** and **Thomas W. Hoffmann**. "A New Way of Belonging: Active-Site Investigation of L-DOPA Dioxygenase, a VOC Family Enzyme from Lincomycin Biosynthesis." Biochemistry 58, no. 48 (December 3, 2019): 4794–98. https://doi.org/10.1021/acs.biochem.9b00456.

Wang, Yifan, Inchul Shin**, Yizhi Fu**, Keri L. Colabroy, and Aimin Liu. "Crystal Structures of L-DOPA Dioxygenase from Streptomyces Sclerotialus." Biochemistry, June 10, 2019. https://doi.org/10.1021/acs.biochem.9b00396.

Wang, Yifan, Ian Davis, Inchul Shin, Daniel J. Wherritt, Wendell P. Griffith, Kednerlin Dornevil, Keri L. Colabroy, and Aimin Liu. "Biocatalytic Carbon–Hydrogen and Carbon–Fluorine Bond Cleavage through Hydroxylation Promoted by a Histidyl-Ligated Heme Enzyme." *ACS Catalysis* 9, no. 6 (June 7, 2019): 4764–76. https://doi.org/10.1021/acscatal.9b00231.

Colabroy, K.L., **Mayer, K**. Benchtop Immobilized Metal Affinity Chromatography, Reconstitution and Assay of a Polyhistidine Tagged Metalloenzyme for the Undergraduate Laboratory. *Journal of Visualized. Exeriments.* (138), e58012, doi:10.3791/58012 (2018)

Colabroy, K.L. *Tearing down to build up*: Metalloenzymes in the biosynthesis lincomycin, hormaomycin and the pyrrolo[1,4]benzodiazepines, Biochimica et Biophysica Acta (BBA)-Proteins and Proteomics (2016) 1864 (6), 724-737

Young, S.C., Colabroy, K.L., and Baar, M.R. Comparable Educational Benefits in Half the Time: An Alternating Organic Chemistry Laboratory Sequence Targeting Prehealth Students. J. Chem. Educ., 2016, 93 (12), pp 2004–2011

Colabroy, K.L., **Smith, I.R., Vlahos, A.H.S**., **Markham, A.J., Jakubik, M.E**. Defining a kinetic mechanism for l-DOPA 2,3 dioxygenase, a single-domain type I extradiol dioxygenase from *Streptomyces lincolnensis* Biochimica et Biophysica Acta (BBA) - Proteins and Proteomics, 2014 Mar; 1844(3): 607-14.

Soriano, EV; Zhang, Y; Colabroy, KL; Sanders, JM; Settembre, EC; Dorrestein, PC; Begley, TP; Ealick, SE. Active-site models for complexes of quinolinate synthase with substrates and intermediates. Acta Crystallographica Section D Biological Crystallography(2013) 69(Pt 9):1685-96.

Connor, KL; Colabroy, K L; Gerratana, BA. Heme Peroxidase with a functional role as an L-Tyrosine Hydroxylase in the Biosynthesis of Anthramycin. *Biochemistry* 2011 Oct 18, 50(41):8926-36

Colabroy, KL. A Writing Intensive Methods-Based Laboratory Course for Undergraduates *Biochemistry and Molecular Biology Education*. 2011, 39 (3): 196-203

Colabroy KL, **Hackett WT**, **Markham AJ, Rosenberg J**, **Cohen DE, Jacobson A**. Biochemical characterization of L-DOPA 2,3-dioxygenase, a single-domain type I extradiol dioxygenase from lincomycin biosynthesis. *Arch Biochem Biophys*. 2008 Nov 15;479(2):131-8

Colabroy, KL and Begley, TP. Tryptophan catabolism: identification and characterization of a new degradative pathway. *Journal of Bacteriology* 2005 187(22):7866-9

Colabroy, KL; Zhai, H; Zhang, Y; Li,T; Ge,Y. Liu,A; Ealick, SE; McLafferty, FW and Begley, TP. The mechanism of inactivation of 3-hydroxyanthranilate-3,4-dioxygenase by 4-chloro-3-hydroxyanthranilate. *Biochemistry* 2005 44(21): 7623-31.

Zhang, Y; Colabroy, KL, Begley, TP and Ealick, SE. Structural studies on 3-hydroxyanthranilate-3,4-dioxygenase: the catalytic mechanism of a complex oxidation involved in NAD biosynthesis. *Biochemistry* 2005 44(21): 7632-43.

Colabroy, KL and Begley, TP. The pyridine ring of NAD is formed by a non-enzymatic pericyclic reaction. *JACS* 2005 127(3): 840-1.

Kurnasov,O; Goral,V; Colabroy, KL, Gerdes,S; Anantha,S; Osterman, A and Begley, TP. NAD Biosynthesis: identification of the tryptophan to quinolinate pathway in bacteria. *Chemistry and Biology.* 2003 Dec; 10(12):1195-204.

## Books

The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking, First Edition. Joseph J. Provost, Keri L. Colabroy, Brenda S. Kelly, and Mark A.Wallert. © 2016 John Wiley & Sons, Inc. Published 2016 by John Wiley & Sons, Inc. Companion website: www.wiley.com\go\provost\science_of_cooking.

## Funding and Awards

**Colabroy, K. L. Spira Honoree for Distinguished Teaching** for Recognition of contributions made in undergraduate research and scholarship. Muhlenberg College, $2,500 — 2019

**Colabroy, KL**, Peterson, L. **NSF-RUI**: *Kinetic Study and Mechanism of L-DOPA dioxygenase, a new type of VOC dioxygenase*, CHE 1708237, Recommended for an award through the Chemistry of Life Processes (CLP) program in the Chemistry (CHE) Division, May 2017, Program Officer, Dr. Max Funk. $294,000 — 2017

**Colabroy, KL.** *L-DOPA dioxygenase – effects of mutagenesis on pre-steady state kinetic mechanism.* Faculty Summer Research Grant, Muhlenberg College, $4000 — 2016

**Colabroy, KL.** *Pre-steady state kinetics on L-DOPA dioxygenase and alternative substrates*. Faculty Summer Research Grant, Muhlenberg College, $4000 — 2014

**Colabroy, KL.** *Global kinetic analysis of L-DOPA dioxygenase, a single-domain type 1 VOC dioxygenase.* Faculty Summer Research Grant, Muhlenberg College. $4000 — 2013

**Colabroy, KL**; Baar, MR; Young, SC; Dunham, S; Jones, C, Snyder, MR. *An LVAIC instructional video archive of research and teaching laboratory instrumentation for use in courses and undergraduate research*, Initiative for Online and Blended learning – **Teagle Foundation**. Planning grant - $5000, One year project - $8950 — 2014 -2016

**Colabroy, KL.** Christian R. and Mary F. **Lindback Foundation Award** for *Distinguished Teaching***,** $4,000 — 2012

**Colabroy, KL.** *Developing a rapid-kinetic assay for L-DOPA dioxygenase.* Faculty Summer Research Grant, Muhlenberg College, $3900 — 2011

**Colabroy, KL.** *Reconstitution of L-Tyrosine hydroxylase, an unusual hemoprotein,* Faculty Summer Research Grant, Muhlenberg College, $3900 — 2010

Wightman, B; **Colabroy, KL**; Hark, AT; Edwards, M; Kussmaul, C. Integration of Bioinformatics into a Biology Curriculum**, NSF-CCLI**, $ 85,910.00 — 2008 -2010

**Colabroy, KL**. *Lincomycin Biosynthesis – The enzymology of propylhygric acid assembly* Cottrell College Science Award Recipient, **Research Corporation,** $37,942 — 2007 -2010

**Colabroy, KL.** *Metal binding in L-DOPa dioxygenase and LmbF an aminotransferase of unknown function.* Faculty Summer Research Grant, Muhlenberg College, $3600 — 2007

**Colabroy, KL.** *L-DOPA dioxygenase: Site-directed mutagenesis and studies on alternative substrates.* Faculty Summer Research Grant, Muhlenberg College, $3600 — 2006

## Professional Presentations and Workshops

(undergraduate coauthors in **boldface** type)

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**Jones, Paige A., Nyjah M. Johnson, Kameron L. Klugh,** Larryn W. Peterson, and Keri L. Colabroy. "Extradiol cleavage of L-DOPA as strategy for natural product biosynthesis." FASEB Journal: Official Publication of the Federation of American Societies for Experimental Biology 36 (2022). Experimental Biology National Meeting 2022, Philadelphia, PA **https://doi.org/10.1096/fasebj.2022.36.S1.R3491** — 2022

**Klugh, Kameron L., Paige Jones, Riri Yoza**, Larryn W. Peterson, and Keri L. Colabroy. "L-DOPA dioxygenases from diverse natural product pathways." FASEB Journal: Official Publication of the Federation of American Societies for Experimental Biology 36 (2022). Experimental Biology National Meeting 2022, Philadelphia, PA **https://doi.org/10.1096/fasebj.2022.36.S1.R3515** — 2022

**Steiner, Jessica, Gisella Xhafkollari, David J. Strzeminski, Sebastian Leyes Porello,** Keri L. Colabroy, and Larryn W. Peterson. "Derivatives of 3, 4-dihydroxyhydrocinnamic acid at the 6-position as mechanistic probes of L-DOPA dioxygenase." *The FASEB Journal* 36 (2022). Experimental Biology National Meeting 2022, Philadelphia, PA **https://doi.org/10.1096/fasebj.2022.36.S1.R2554** — 2022

**Nyamkondiwa, Kudzai, Trevor Squires, Paige Jones,** Keri L. Colabroy, and Larryn W. Peterson. "Insight into L-DOPA dioxygenase mechanism with 6-substituted L-DOPA derivatives." *The FASEB Journal* 36 (2022). **https://doi.org/10.1096/fasebj.2022.36.S1.R3477** Experimental Biology National Meeting 2022, Philadelphia, PA — 2022

**David Strzeminski, Alexander M. Goldberg, Erykah S. Starr, Ryan Marasco, C. Skyler Cochrane**, Larryn W. Peterson, Keri L. Colabroy. 6-substituted derivatives of dopamine as substrates of L-DOPA dioxygenase: Understanding steric and electronic substituent effects. Fall 2021 ACS National Meeting, Atlanta, GA, BIOL, Sci-Mix, poster presentation. https://doi.org/10.1021/scimeetings.1c01136 — 2021

Larryn W. Peterson, **Erykah S. Starr, Ryan N. Marasco, Alexa C. Alana, Gisela Xhafkollari, C. Skyler Cochrane, Kameron L. Klugh, Miranda K. Robinson, Alexander M. Goldberg, Alyssa M. Roberts, Alyssa D. Horwitz, David Strzeminski, Muxue Du**, Keri L. Colabroy. Probing substrate space in dioxygenase catalysis: an investigation of 6-substituted dopamine derivatives as substrates of L-DOPA dioxygenase. Fall 2021 ACS National Meeting, Atlanta, GA, BIOL – Oral Presentation, Invited — 2021

Determining the pKa of dopamine and its derivatives using UV-vis spectroscopy Larryn Peterson **Erykah Starr Ryan Marasco Alexa Alana Gisela Xhafkollari Colleen Cochrane Kameron Klugh Miranda Robinson Alexander Goldberg Alyssa Roberts Alyssa Horwitz David Strzeminski Muxue Du** Keri Colabroy

American Chemical Society National Meeting, Spring 2021. https://doi.org/10.1021/scimeetings.1c00544

**Fu, Yizhi**; Wang, Yifan; Shin, Inchul; **Horwitz, Alyssa**; Liu, Aimin; Colabroy, Keri*; Investigating structure and function in VOC family dioxygenases: The structure of L-DOPA dioxygenase from Lincomycin Biosynthesis* Spring 2019 ACS National Meeting, Orlando, FL, March 31 - April 4, 2019, BIOL, poster presentation — 2019

Colabroy Keri, **Basciano Victoria, Shimanski Brittany, Travitz Kelly, Hoffmann Thomas, Mayer Katlyn.** *Evaluating the roles of active-site residues in catalysis and iron-binding in L-DOPA dioxygenase* Spring 2019 ACS National Meeting, Orlando, FL, March 31 - April 4, 2019, CHED, poster presentation — 2019

Colabroy, KL, **Yizhi Fu, Alyssa Roberts, Victoria Basciano, Katlyn Mayer, Melissa Edgar**. (Muhlenberg); Yifan Wang, Inchul Shin and Aimin Liu (UTSA) *Extradiol Dioxygenase Kinetics, Structure and Mechanism in the Vicinal-oxygen-chelate (VOC) superfamily – an investigation of L-DOPA dioxygenase.* Enzymes, Coenzymes and Metabolic Pathways Gordon Research Conference. *Discussion Leader.* — 2018

**Lucas JTM '18**, Perrotta KA '18, Ingersoll CM, Colabroy K, Teissere JA (2018) *A putative binding pocket mediating flavonoid modulation of the GABA(A) receptor.* Easton, PA: Lehigh Valley Society for Neuroscience Annual Meeting. — 2018

Colabroy, KL, **Ian R. Smith, Evan Gassaway, Alec Vlahos, Thomas Hoffmann, Tyler Florio**. (Muhlenberg); Liu, A and Dornevil, K (Georgia State University) *The Enzymology of Propylhygric Acid Assembly: Mass Spectrometry of the LmbX reaction and Kinetic study of L-DOPA dioxygenase.* Enzymes, Coenzymes and Metabolic Pathways Gordon Research Conference. *Invited poster presentation.* — 2017

Colabroy, KL**; Juliano, B; Fu, Y; Gassaway, E; Zimmerman, ZE.** *Progress toward the chemical characterization 3-vinyl-2,3-pyrroline-5-carboxylic acid (VPCA): A bacterial, natural-product synthon* (final paper number: BIOL 78) a poster presentation in the Current Topics in Biochemistry session at the 254th American Chemical Society National Meeting in Washington, DC, August 20-24, 2017. — 2017

Colabroy, KL, **Florio, T; Hoffmann; T; Sticco; M; Smith IR; Gassaway, E**. (Muhlenberg); Liu, A and Dornevil, K (Georgia State University) *The Enzymology of Propylhygric Acid Assembly: EPR studies on tyrosine hydroxylase and sequence similarity networks for LmbB1 – a VOC extradiol dioxygenase.* Enzymes, Coenzymes and Metabolic Pathways Gordon Research Conference. *Invited poster presentation* — 2015

*EFI-EST workshop*, Instructors: Dr. John Gerlt, Dr. Katie Whalen Enzymes, Waterville Valley, NH (Colabroy, KL – participant) — 2014

Colabroy, KL, **Smith, IR; Dunn, BR; Gassaway, E; Vlahos, AHS; Sholevar, R**. (Muhlenberg); Liu, A and Dornevil, K (Georgia State University) *The Enzymology of Propylhygric Acid Assembly- EPR studies on tyrosine hydroxylase, a homology model for LmbB1 – an extradiol dioxygenase, and evidence for activity of LmbX – a protein of unknown function*. Enzymes, Coenzymes and Metabolic Pathways Gordon Research Conference. *Invited poster presentation* 2014

**Smith, IR**; **Vlahos, AHS**; Colabroy, KL. *Defining a kinetic mechanism for L-DOPA 2,3-dioxygenase,* at the 247th National Spring Meeting of the American-Chemical-Society (ACS) in Dallas, TX. *Poster presenation.* 2014

*Teaching Presentations and Workshops*

*Colabroy, K. L.* Flipped-classroom and writing-intensive pedagogies enhance a course-based undergraduate research experience for the biochemistry laboratory. Spring 2019 ACS National Meeting, Orlando, FL, March 31 - April 4, 2019 CHED, *invited oral presentation* 2019

Colabroy KL and Provost, J. *Teaching a broad non-science major audience using the science of food and cooking, at* the 251st American Chemical Society National Meeting, Chemical Education Division, Integration of STEM and the Liberal Arts session – oral presentation. 2016

Chawne Kimber, Jennifer Rao, Diane Dimitroff, Lora Taub, Chris Ruebeck and Keri Colabroy, "LVAIC-Teagle: Hybrid Learning and the Residential Liberal Arts Experience" Bryn-Mawr Blended-Learning Conference, 75-minute panel discussion 2018

**Invited Professional Lectures**

*Invited Research Presentations*

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| **Symposium Co-Organizer** with Mary Konkle (Ball State University) at the American Chemistry Society Spring 2020 National Meeting in Philadelphia, PA: *Emerging Research by Investigators at Primarily Undergraduate Institutions*. The event was cancelled due to COVID-19 and rescheduled to 2021. | March 2020, August 2021 |
| **Colabroy, K. L**. *A look in Nature's toolbox: Cleaving aromatic rings with surgical precision using dioxygenase enzymes*. Invited Chemistry Seminar speaker at Bucknell University, Lewisburg, PA | February 2020 |
| **Colabroy, K. L**. *A look in Nature's toolbox: Cleaving aromatic rings with surgical precision using dioxygenase enzymes*. Invited Chemistry Seminar speaker at Juniata College, Huntington, PA | October 2018 |
| **Colabroy K.L**. and **Brock Juliano ('18).** *CMS Assisted Identification of Small-Molecule Bacterial Metabolites using ESI with direct injection* a lecture in the workshop entitled Mass Spectrometry for Chemists – Direct Analysis of TLC Plates, Solids, Liquids and Gases hosted by Advion, Inc. at the American Chemical Society Meeting in Washington, DC. | August 2017 |
| **Colabroy, KL**. *How to Make an Antibiotic: The enzymology of propylhygric acid assembly…with undergrads.* Texas A&M University, Special Symposium, College Station, TX | April 2015 |
| **Colabroy, KL**. *How to Build an Antibiotic: The Enzymology of Propylhygric Acid Biosynthesis,* Cedar Crest College, Department of Biological Sciences Seminar Series, Allentown, PA | March 2015 |
| **Colabroy, KL**. *The enzymology of propylhygric acid assembly*; Georgia State University, Department of Chemistry – Spring 2015 seminar series, Atlanta, GA | January 2015 |

*Invited Teaching Presentations*

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| **Colabroy, KL**. Beginning a Research Program in the Natural Sciences at a Predominantly Undergraduate Institution workshop by the Council for Undergraduate Research, Organizer, Presenter and Facilitator, Stetson University, Deland, FL | November 2019 |
| **Colabroy, KL**. *An LVAIC instructional video archive of research and teaching laboratory instrumentation for use in courses and undergraduate research*, Teagle Blended Learning Project, DeSales University, Center Valley, PA | February 2016 |
| **Colabroy, KL**. *Integrating Undergraduate Research into the Curriculum* and *Setting up your Research Laboratory*, at the Beginning a Research Program in the Natural Sciences at a Predominantly Undergraduate Institution workshop by the Council for Undergraduate Research, Presenter and Facilitator, Alexandria, VA | Nov 2016 |

**Colabroy, KL**. *Integrating Undergraduate Research into the* Curriculum, at the Beginning a Research Program in the Natural Sciences at a Predominantly Undergraduate Institution workshop by the Council for Undergraduate Research, Presenter and Facilitator, Denver, CO — Nov 2015

**Colabroy, KL.** *Integrating Enzymology into course-associated labs.* Establishing and Expanding Teaching-Research Networks, NSF-WIDER workshop. Birmingham, AL. — October 2013

## Professional Service

**Council for Undergraduate Research (CUR)** - *elected at-large by the national Chemistry membership of CUR to be a councilor in the Chemistry Division. Co-chair of the outreach committee.* — 2015-2018

**CUR Program Reviewer** – my CV is selected from among CUR councilors by institutions seeking an external review of their chemistry department. — 2016-present

**American Chemical Society –** *elected at-large by the national membership of the ACS DBC to be a councilor in the Division of Biological Chemistry*. — 2016-2019

**Coordinator of Student Research and Scholarship** – *Muhlenberg College.* — 2015-present