

# Tyler P. Barnum

Ph.D. Candidate in Microbiology at the University of California, Berkeley

John D. Coates Environmental Microbiology Laboratory

Department of Plant & Microbial Biology

barnum@berkeley.edu

- Education** **Ph.D. University of California, Berkeley** Expected conferral: 2019  
Microbiology  
G.P.A. 4.0
- B.A. Johns Hopkins University** 2013  
Biology (Honors) and Earth & Planetary Sciences  
G.P.A. 3.96
- Penn High School, Mishawaka, IN 2010  
Rank 1 / 701
- Research** **Graduate Student Researcher at University of California, Berkeley** 2015 Feb. - Present  
Graduate Group in Microbiology  
Advisor: John Coates, Professor, Dept. of Plant and Microbial Biology  
Thesis Committee: Jill Banfield and Kara Nelson  
Project: Studying genes, genomes, and interactions in the microbial reduction of chlorine oxyanions
- Assembly and analysis of genomes from metagenomes
  - Analysis of microbial communities using 16S rRNA gene amplicon sequence variants
  - Isolation of new strains from the microbial communities
  - Culturing of aerobic, anaerobic, phototrophic, halophilic, or thermophilic bacteria
  - Ion chromatography
  - qPCR and other common molecular DNA methods
  - Deletion, insertion, and complementation of genes
  - Identification of gene function and transfer using comparative genomics
- Rotation Student at University of California, Berkeley** 2014 Sep. - 2015 Feb.
- PI: Michiko Taga, Associate Professor, Dept. of Plant and Microbial Biology  
Project: Studying corrinoid vitamin-sharing in interspecies cocultures of human gut microbiota  
Techniques: Culturing of fastidious organisms, HPLC analysis, and tetrapyrrole extraction
- PI: Jill Banfield, Professor, Dept. of Environmental Science, Policy, and Management  
Project: Comparative genomics of uncultivated Chloroflexi in key metabolic processes  
Techniques: Gene prediction and annotation and phylogenetic tree-building and analysis
- Research Assistant at Johns Hopkins University** 2014 Apr. - 2014 Aug.  
PI: Dorry Segev, Professor, Department of Surgery  
Project: Epidemiological studies of kidney donors and recipients  
Techniques: Administration of physical and mental diagnostic tests, blood fractionation
- Research Assistant at Johns Hopkins University** 2012 May - 2013 Dec.  
PI: Jocelyne DiRuggiero, Assoc. Research Professor, Department of Biology  
Project: Analysis of hyper-arid soil microbial communities  
Techniques: <sup>14</sup>C tracer studies, DNA extraction and PCR, soil geochemistry measurements

**Student Intern** at University of Maryland CES 2013 May - 2013 Aug.  
PI: Frank Robb, Professor, Institute for Marine and Environmental Technology  
Project: Expression of diphtheria toxin constructs in Escherichia coli  
Techniques: Molecular biology techniques (restriction, ligation, cloning, gel purification)

**Summer Research Assistant** at University of Notre Dame 2011 May - 2011 Aug.  
PI: Jessica Hellmann, Professor, Department of Biological Sciences  
Project: Population study on effect of climate on endangered Karner Blue butterflies  
Techniques: insect husbandry, phenological records

**Programming** **Python**, intermediate  
**Unix**, intermediate  
**R**, familiar  
**GitHub**: <https://github.com/tylerbarnum>

**Publications** **Barnum T.P.**, Coates J.D. Comparative genomics identification of genes involved in reactive chlorine stress production and response. *In preparation.*

**Barnum T.P.**, Cheng Y., Hill K.A., Lucas L.N., Carlson H.K., Coates J.D. Exploitation of a complete respiratory pathway by a partial respiratory pathway in chlorine oxyanion reduction. *In preparation.*

**Barnum, T.P.**, Figueroa, I., Carlstrom, C., Lucas, L., Engelbrekston, A., & Coates, J.D. (2018). Genome-resolved metagenomics identifies genetic mobility, metabolic interactions, and unexpected diversity in perchlorate-reducing communities. ISME J 12, 1568–1581. [Open-access version.](#)

Figueroa, I.A., **Barnum, T.P.**, Somasekhar, P.Y., Carlström, C.I., Engelbrekston, A.L., and Coates, J.D. (2017). Metagenomics-guided analysis of microbial chemolithoautotrophic phosphite oxidation yields evidence of a seventh natural CO<sub>2</sub> fixation pathway. Proc Natl Acad Sci 201715549. doi: [10.1073/pnas.1715549114](https://doi.org/10.1073/pnas.1715549114)

Youngblut, M. D., Wang, O., **Barnum, T. P.**, & Coates, J. D. (2016). (Per)chlorate in Biology on Earth and Beyond. Annual Review of Microbiology, 70(1), 435–459. [Open-access version.](#)

**Barnum, T.P.**, and Coates, J.D. (2016). Enrichment and Isolation of Chloroxyanion-respiring Hydrocarbon Oxidizers. Hydrocarbon and Lipid Microbiology Protocols, 1–29.

Crits-Christoph, A., Robinson, C. K., **Barnum, T.**, Fricke, W. F., Davila, A. F., Jedynek, B., McKay, C.P., Diruggiero, J. (2013). Colonization patterns of soil microbial communities in the Atacama Desert. Microbiome, 1(1), 28.

**Presentations & Outreach** "How to Use Assembly Graphs with Metagenomic Datasets" **Online tutorial.** <https://tylerbarnum.com>. 2018 February 26

"Exploring an unexpected microbial interaction between respiratory metabolisms" **Presentation.** Department Student/Post-Doc Seminar. 2018 November 12.

"Closing the chlorine cycle: microbial interactions in the reduction of chlorine oxyanions" **Presentation.** Department Retreat. 2017 September 8.

"Perchlorate reduction in estuary sediment communities: Genes, genomes, and interactions" **Presentation.** Department Student/Post-Doc Seminar. 2016 October 31.

“A new understanding of Cl oxyanion reduction from community studies” Poster. European Federation of Biotechnology Section on Microbial Physiology. 2018 March 12.

“Community genomes from perchlorate-reducing sediment enrichments support the role of interspecies interactions in chlorine oxyanion metabolism” Poster. Meeting of the International Society for Microbial Ecology (ISME). 2016 August 25.

“Characterizing the Upper Thermal Tolerance of the Endangered Karner Blue Butterfly” Poster. University of Notre Dame Undergraduate Research Summer Symposium. 2011 August.

**Teaching** Guest Lecturer on “Metagenomics,” Microbial Diversity (PMB116). Fall 2015, 2017.

**Graduate Student Instructor**, Soil Microbial Ecology (ESPM131). Spring 2017.

**Graduate Student Instructor**, Microbial Diversity (PMB116). Fall 2015.

**Mentorship** Peer Adviser, [Peer Adviser Working Group](#), Dept. of Plant & Microbial Biology. 2015-16, 17-18.

Research Mentor, [NIH Bridges to Baccalaureate Program](#). Summer 2017.

**Service** Teacher, monthly science lesson to 4th grade students. [Bay Area Scientists in School](#). 2014-19.

Co-Chair, [Microbiology Student Symposim](#). 2018-19.

Co-Chair, Department Graduate Student Group. 2017-18.

**Graduate Student Admissions Representative**, Dept. of Plant & Microbial Biology. 2016-17.

**Chair, Graduate Assembly workgroup on Housing and Basics Needs Security**. 2015-18.

Graduate Assembly Delegate, External Affairs Committee. 2015-17.

Co-author, “Basic Needs Services at UC Berkeley: Gaps and Responsibility.” Student Advocate’s Office internal report. 2016 Nov.

Co-author, “Housing Insecurity at UC Berkeley: A Preliminary Survey.” Centers for Educational Equity and Excellence internal report. 2016 Sep.

Co-author, [“The GA’s Housing Guide: Best Practices for Finding Housing”](#) Online guide. Mar. 2016.

**Honors** 2018 Dr. E. Ralph de Ong Award

**2016 National Science Foundation Graduate Research Fellowship**

**2014 William V. Power Top-Off Award**

*Awarded to “the most competitive prospective students” at UC Berkeley*

2014 Phi Beta Kappa Society - Alpha Chapter of Maryland Membership

2014 Earth & Planetary Sciences Undergraduate Majors Award

*Awarded to “a graduating senior for outstanding academic excellence, leadership, and service”*

**2013 Bloomberg Scholarship**

*A highly competitive scholarship awarded to students needing tuition support*

2011-2013 Crane-Huntington Scholarship

*Awarded to one biology or chemistry student to encourage a science career other than medicine*

2013 National Honor Society for the Earth Sciences (Sigma Gamma Epsilon) Membership

2012 National Honor Society for Biology (Beta Beta Beta) Membership

2010 Man of the Year and Valedictorian, Penn High School, Mishawaka, IN

**References** **Ph.D. advisor:** John Coates, Ph.D.

Professor, Dept. of Plant & Microbial Biology, University of California, Berkeley  
jdcoates@berkeley.edu  
510-643-8455

**Undergraduate advisor:** Jocelyne DiRuggiero, Ph.D.

Associate Research Professor, Microbial Ecology, Johns Hopkins University  
jdiuggiero@jhu.edu  
410-516-8498

**Former coworker:** Maggie Stoeva, Ph.D.

Scientist, Whole Biome  
mstoe101@gmail.com

*Note: Maggie and I shared the same Ph.D. advisor from May 2015 to December 2018.*

**Former employee:** Kaisle Hill, B.A.

Research associate, Zymergen  
kaisle\_hill@berkeley.edu

*Note: I employed Kaisle as an undergraduate researcher from May 2017 to December 2018.*