

**Megan L. Matthews**

Assistant Professor  
 University of Pennsylvania  
 Department of Chemistry  
 231 South 34<sup>th</sup> Street  
 Philadelphia, PA 19104-6323  
 Office: 215-746-4738  
 Email: megamatt@sas.upenn.edu  
 Webpage: <https://web.sas.upenn.edu/matthewsgroup/>

**Curriculum Vitae****Education**

Doctor of Philosophy	The Pennsylvania State University, Chemistry, 2011
Bachelor of Arts	Miami University, Chemistry, 2005

**Research Experience**

July 2017	<b>University of Pennsylvania</b> Assistant Professor of Chemistry Chemical proteomics technologies to discover functional protein modifications and novel drug targets
August 2011 - June 2017	<b>The Scripps Research Institute</b> Merck Fellow of the Helen Hay Whitney Foundation Postdoctoral research associate <i>Prof. Benjamin F. Cravatt</i> Chemoproteomic profiling and discovery of protein electrophiles
August 2005 - August 2011	<b>The Pennsylvania State University</b> Graduate student <i>Prof. J. Martin Bollinger, Jr. and Carsten Krebs</i> Protein control of dioxygen activation, substrate hydrogen abstraction, and ligand-radical transfer outcome in the aliphatic halogenase, SyrB2
May 2005 - August 2005	<b>Novartis Institutes for Biomedical Research</b> Summer research intern <i>Dr. Denis M. Daigle</i>
August 2001 - May 2005	<b>Miami University</b> Undergraduate research assistant <i>Prof. Michael W. Crowder</i> Mechanistic studies on VanX, the D-D peptidase required for high-level vancomycin resistance in bacteria

**Research Fellowships and Awards**

<b>Scripps Research Institute</b>	2012–5	Helen Hay Whitney Foundation Postdoctoral Fellowship
<b>Penn State University</b>	2010	Alumni Association Dissertation Award
	2010	Finalist for 2010 Reaxys Prize
	2009	Braucher Scholarship
	2009	Society of Biological Inorganic Chemistry (SBIC) Travel Grant to attend the 14 <sup>th</sup> International Conference on Biological Inorganic Chemistry (ICBIC) in Nagoya, Japan

	2009	Chemistry Department Travel Award
<b>Miami University</b>	2004–5	Dean's Scholarship (supporting undergraduate research)
	2004–5	Doctoral-Undergraduate Opportunity for Scholarship (supporting undergraduate research)
	2004	Miami University's nominee for Iota Sigma Pi Award for Excellence in Chemistry
	2003–5	Beckman Research Scholarship

## Publications

### *The University of Pennsylvania*

21. **Matthews ML**, Lin Z, Zierden M. "Installation, function and inhibition of Nature's electrophilome." *Review in preparation*.

### *The Scripps Research Institute*

20. **Matthews ML**<sup>§</sup>, Olucha J<sup>§</sup>, Cong H, Mu X, Fu GC & Cravatt BF. "Crystallographic characterization of protein phosphatase methylesterase-1 with an aza- $\beta$ -lactam inhibitor." (<sup>§</sup>*co-first authors*). *In preparation*.
19. Kornahrens, A, Cognetta, A Brody D, **Matthews ML**, Cravatt BF & Boger D. "Design of benzoxathiazin-3-one 1,1-dioxides as a new class of irreversible serine hydrolase inhibitors: discovery of a uniquely selective PNPLA4 inhibitor." *J. Am. Chem. Soc.* **2017**, 139 (20),7052–7061.
18. **Matthews ML**<sup>‡</sup>, He L, Olson EJ, Horning BD, Correia BE, Yates JR, III, Dawson PE & Cravatt BF<sup>‡</sup>. "Chemoproteomic profiling and discovery of protein electrophiles in human cells." (<sup>‡</sup>*co-corresponding authors*). *Nat. Chem.* **2017**, 9, 234–243.
17. Horning BD, Suci RM, Ghadiri D, Ulanovskaya O, **Matthews ML**, Lum KM, Backus KM, Brown SJ, Rosen H & Cravatt BF. "Chemical proteomic profiling of human methyltransferases." *J. Am. Chem. Soc.* **2016**, 138, 13335–13343.
16. Rajagopalan S, Wang C, Yu K, Kuzin AP, Richter F, Lew S, Miklos AE, **Matthews ML**, Seetharaman J, Su M, Hunt JF, Cravatt BF & Baker D. "Design of activated serine-containing catalytic triads with atomic-level accuracy." *Nat. Chem. Biol.* **2014**, 10, 386-391.
15. Chang JW, Niphakis MJ, Lum KM, Cognetta AB, Wang C, **Matthews ML**, Niessen S, Buczynski MW, Parsons LH & Cravatt BF. "Highly selective inhibitors of monoacylglycerol lipase bearing a reactive group that is bioisosteric with endocannabinoid substrates." *Chem. Biol.* **2012**, 19, 579-588.

### *The Pennsylvania State University*

14. Martinie RJ, Pollock CJ, **Matthews ML**, Bollinger JM Jr, Krebs C & Silakov A. Vanadyl as a stable structural mimic of reactive ferryl intermediates in mononuclear non-heme-iron enzymes. *Inorg. Chem.* **2017**. *Accepted. Selected for cover image*.
13. Srnc M, Wong SD, **Matthews ML**, Krebs C, Bollinger JM, Jr. & Solomon EI. "Electronic structure of the ferryl intermediate in the  $\alpha$ -ketoglutarate dependent non-heme iron halogenase SyrB2: Contributions to H-atom abstraction reactivity." *J. Am. Chem. Soc.* **2016**, 138, 5110-5122.
12. **Matthews ML**<sup>‡</sup>, Chang WC, Layne AP, Miles LA, Krebs C & Bollinger JM, Jr. <sup>‡</sup> "Direct nitration and azidation of aliphatic carbons by an iron-dependent halogenase." *Nat. Chem. Biol.* **2014**, 10, 209-215. (<sup>‡</sup>*co-corresponding authors*). Highlighted in: *Chem. Eng. News* **2014**, 92, 8. "Enzyme makes tough-to-construct C–N bonds." and *Nat. Chem. Biol. News and Views* **2014**, 10, 171-172. "C-H activation: New recipes for biocatalysis."
11. Wong SD, Srnc M, **Matthews ML**, Liu LV, Kwak Y, Park K, Bell CB, Alp EE, Zhao JY, Yoda Y, Kitao S, Seto M, Krebs C, Bollinger JM, Jr. & Solomon EI. "Elucidation of the Fe(IV)=O intermediate in the catalytic cycle of the halogenase SyrB2." *Nature* **2013**, 499, 320-323.
10. Krebs C, Dassama LMK, **Matthews ML**, Jiang W, Price JC, Korboukh V, Li N & Bollinger JM, Jr. "Novel approaches for the accumulation of oxygenated intermediates to multi-millimolar concentrations." *Coord. Chem. Rev.* **2013**, 257, 234-243.
9. Hollenhorst MA, Bumpus SB, **Matthews ML**, Bollinger JM, Jr. Kelleher NL & Walsh CT. "The nonribosomal peptide synthetase enzyme DdaD tethers N( $\beta$ )-fumaramoyl-L-2,3-diaminopropionate for Fe(II)/ $\alpha$ -ketoglutarate-dependent epoxidation by DdaC during dapdiamide antibiotic biosynthesis." *J. Am. Chem. Soc.* **2010**, 132, 15773-15781.

8. Bollinger JM, Jr. & **Matthews ML**. "Remote enzyme microsurgery." *Science* **2010**, 327, 1337-1338.
7. **Matthews ML**, Neumann CS, Miles LA, Grove TL, Booker SJ, Krebs C, Walsh CT & Bollinger JM, Jr. "Substrate positioning controls the partition between halogenation and hydroxylation in the aliphatic halogenase, SyrB2." *Proc. Natl. Acad. Sci. USA* **2009**, 106, 17723-17728.
6. **Matthews ML**, Krest CM, Barr EW, Vaillancourt FH, Walsh CT, Green MT, Krebs C & Bollinger JM, Jr. "Substrate-triggered formation and remarkable stability of the C–H bond-cleaving chloroferryl intermediate in the aliphatic halogenase, SyrB2." *Biochemistry* **2009**, 48, 4331-4343.
5. Bollinger JM, Jr., Diao Y, **Matthews ML**, Xing G & Krebs C. "Myo-inositol oxygenase: a radical new pathway for O<sub>2</sub> and C-H activation at a nonheme diiron cluster." *Dalton Trans.* **2009**, 905-914.
4. Krebs C, **Matthews ML**, Jiang W & Bollinger JM, Jr. "AurF from *Streptomyces thioluteus* and a possible new family of manganese/iron oxygenases." *Biochemistry* **2007**, 46, 10413-10418.
3. Fujimori DG, Barr EW, **Matthews ML**, Koch GM, Yonce JR, Walsh CT, Bollinger JM, Jr., Krebs C & Riggs-Gelasco PJ. "Spectroscopic evidence for a high-spin Br-Fe(IV)-oxo intermediate in the  $\alpha$ -ketoglutarate-dependent halogenase CytC3 from *Streptomyces*." *J. Am. Chem. Soc.* **2007**, 129, 13408-13409.

#### Miami University

2. **Matthews ML**, Periyannan G, Hajdin C, Sidgel TK, Bennett B & Crowder MW. "Probing the reaction mechanism of the D-ala-D-ala dipeptidase, VanX, by using stopped-flow kinetic and rapid-freeze quench EPR studies on the Co(II)-substituted enzyme." *J. Am. Chem. Soc.* **2006**, 128, 13050-13051.
1. Breece RM, Costello A, Bennett B, Sigdel TK, **Matthews ML**, Tierney DL & Crowder MW. "A five-coordinate metal center in Co(II)-substituted VanX." *J. Biol. Chem.* **2005**, 280, 11074-11081.

#### Books

##### *The Pennsylvania State University*

Bollinger JM Jr., Chang WC, **Matthews ML**, Martinie RJ, Boal AK & Krebs C. Chapter entitled "Mechanisms of 2-oxoglutarate-dependent oxygenases: the hydroxylation paradigm and beyond" in *2-Oxoglutarate-Dependent Oxygenases (RSC Metallobiology)*. Royal Society of Chemistry, eds. Hausinger RP, Schofield CJ & Garner CD, ISBN 1849739501 (**2015**).

#### Patents

##### *The Scripps Research Institute*

Cravatt BF, Zuhl AM, Bachovchin DA, **Matthews ML**, Fu GC, Mohr JT, Berlin JM. "Aza- $\beta$ -lactam compounds and methods of using." WO 2013152272 A1 (**2013**).

#### Employment and Teaching Experience

##### *The Scripps Research Institute*

- 2015-6 Mentored Erika J. Olson (graduate student): resulted in one co-authored publication.
- 2012-4 Mentored Anna Owensby (graduate student)

##### *The Pennsylvania State University*

- 2007-11 Mentored Linde A. Miles (undergraduate student): resulted in two co-authored publications.
- 2010-1 Mentored Andrew Layne (graduate student)
- 2005-6 Teaching assistant
  - (i) General Chemistry Recitation; (ii) General Chemistry Laboratory; and (iii) Organic Chemistry Laboratory
- 2005 Novartis Institutes for Biomedical Research, Cambridge, MA: summer research internship under Denis M. Daigle

#### Posters, Presentations and Invited Talks

##### *University of Pennsylvania*

31. **Invited Talk:** International Symposium on Chemical Communication (ISCC), Tokyo, Japan, Jan. 9, 2019.
30. **Invited Talk:** University of Tennessee Health Science Center (UTHSC), Department of Pharmaceutical Science, Jan. 16, 2018, Memphis, TN.
29. **Invited Seminar:** Graduate Students Engaging with Mentor Scientists (GEMS) Seminar, Department of Chemistry, University of Pennsylvania, Philadelphia, PA, Dec. 5, 2017.

28. **Presentation:** Penn Welcome Symposium for Becton Dickinson, Penn Center for Innovation, Philadelphia, PA, October 11, 2017.
27. **Presentation:** ASBMB Mentoring Workshop for Early Career Scientists, Washington, D.C., June, 2017.

#### *The Scripps Research Institute*

26. **Presentation:** Vanderbilt University, Department of Chemistry and Biology, Feb. 2017, Nashville, TN.
25. **Presentation:** Yale University, Chemical Biology Institute and Department of Chemistry, Feb. 2017, New Haven, CT.
24. **Presentation:** University of Utah, Department of Biochemistry, Feb. 2017, Salt Lake City, UT.
23. **Presentation:** University of Michigan, Department of Medicinal Chemistry, College of Pharmacy, Feb. 2017, Ann Arbor, MI.
22. **Presentation:** University of Texas at Austin, Molecular Biosciences, Jan. 2017, Austin, TX.
21. **Presentation:** Indiana University, Department of Chemistry, Jan. 2017, Bloomington, IN.
20. **Presentation:** University of Wisconsin-Madison, Department of Chemistry, Jan. 2017, Madison, WI.
19. **Presentation:** University of Illinois Urbana-Champaign, Department of Chemistry, Jan. 2017, Champaign, IL.
18. **Presentation:** Penn State University, Department of Chemistry, Dec. 2016, State College, PA.
17. **Presentation:** University of Pennsylvania, Department of Chemistry, Dec. 2016, Philadelphia, PA.
16. **Presentation:** University North Carolina, Department of Chemistry, Dec. 2016, Chapel Hill, NC.
15. **Presentation:** University of Utah, Department of Chemistry, Nov. 2016, Salt Lake City, UT.
14. **Poster:** Gordon Research Conference: Enzymes, Coenzymes, and Metabolic Pathways, July, 2016, Waterville Valley, NH. **Recipient of the 2016 ECMP Poster Award:** sponsored by ACS Biological Chemistry
13. **Presentation:** The 57<sup>th</sup> Helen Hay Whitney Foundation Annual Meeting, Nov., 2014, Dedham, MA.

#### *The Pennsylvania State University*

12. **Poster:** 23<sup>rd</sup> Enzyme Mechanisms Conference, Jan., 2013, Coronado, CA.
11. **Invited speaker\*:** Society for Industrial Microbiology & Biotechnology Annual Meeting, Aug., 2012, Washington, D.C. (*\*only graduate student talk*)
10. **Invited speaker\*:** Pacificchem, Inorganic Division: Dioxygen Activation Chemistry and Catalytic Oxidation Reactions, Dec., 2010, Honolulu, HI. (*\*only graduate student talk*)
9. **Invited speaker:** Gordon Research Conference, Graduate Research Seminar in Bioinorganic Chemistry, Feb., 2010, Ventura, CA.
8. **Poster:** Gordon Research Conference, Metals in Biology, Jan., 2010, Ventura, CA.
7. **Presentation:** Biochemistry and Molecular Biology Graduate Seminar Series, Penn State University, Nov., 2009, University Park, PA.
6. **Presentation:** Lion Lecture, Penn State University, Sept., 2009, University Park, PA.
5. **Poster:** 14<sup>th</sup> International Conference on Biological Inorganic Chemistry (ICBIC-14), July, 2009, Nagoya, Japan.
4. **Poster:** Gordon Research Conference: Graduate Research Seminar in Bioinorganic Chemistry, Jan., 2008, Ventura, CA.
3. **Poster:** Gordon Research Conference: Proteins, Cofactors, Radicals and Quinones, Jan., 2008, Ventura, CA.
2. **Poster:** Gordon Research Conference: Enzymes, Coenzymes, and Metabolic Pathways, July, 2007, Biddeford, ME.
1. **Poster:** 25<sup>th</sup> Summer Symposium in Molecular Biology, June, 2006, Penn State University, University Park, PA.

#### **Professional Activity**

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American Chemical Society (ACS)  
 American Society for Biochemistry and Molecular Biology (ASBMB)

#### **Funding**

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