

# Curriculum Vitae

**Benjamin M. Swarts, Ph.D.**

**Assistant Professor**

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## Education and Appointments

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Assistant Professor, Dept. of Chemistry and Biochemistry Central Michigan University	2013–
Postdoctoral Fellow, University of California, Berkeley, California	2010–2013
Ph.D., Chemistry, Wayne State University, Detroit, Michigan	2010
B.A., Chemistry, College of Wooster, Wooster, Ohio	2004

## Fellowships, Awards, and Research Recognition

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• NSF CAREER Award (CMU)	2017-2022
• CMU College of Science & Engineering Outstanding Researcher Award (CMU)	2017
• International Carbohydrate Organization Young Researcher Award (CMU)	2016
• CMU Provost's Award for Outstanding Research and Creative Activity (CMU)	2016
• Research Corporation Cottrell College Scholar Award (CMU)	2014–2017
• American Cancer Society Postdoctoral Fellowship (UC Berkeley)	2011–2013
• NIH Ruth L. Kirschstein Postdoctoral Fellowship (UC Berkeley), awarded but declined	
• Center for Emerging and Neglected Diseases (CEND) Frameworks for Global Health Postdoctoral Fellowship (UC Berkeley)	2010–2011
• James C. French Graduate Scholarship in Organic Chemistry (Wayne State)	2009
• Graduate School Citation for Excellence in Teaching (Wayne State)	2009
• Departmental Citation for Excellence in Teaching (Wayne State)	2008
• CASE Chemistry Scholar (Case Western Reserve University)	2004–2005
• American Chemical Society Senior Award (Wooster Section)	2004
• Sisodia-Williams Prize in Biochemistry (College of Wooster)	2004
• Lewis L. LaShell Memorial Scholarship in Chemistry (College of Wooster)	2004
• Robert E. Wilson Award in Chemistry (College of Wooster)	2004
• Dow Chemical Company Foundation Scholarship (College of Wooster)	2000–2004

## Publications

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### *Peer-Reviewed Publications from CMU (Bolded Author = From Swarts Lab at CMU)*

15. **J. M. Groenevelt, L. M. Meints, A. I. Stothard, A. W. Poston, T. J. Fiolek**, D. Finochetti, V. Mulholland, P. J. Woodruff, and **B. M. Swarts\***. Concise Chemoenzymatic Synthesis of Trehalosamine, an Aminoglycoside Antibiotic and Precursor to Mycobacterial Imaging Probes, **manuscript in preparation**.

14. **T. J. Fiolek, H. W. Kavunja, N. Banahene, N. J. Holmes, A. K. Rylski, and B. M. Swarts\***. An Expanded Set of Trehalose Monomycolate-Based Reporters for Probing Mycoloylation in Mycobacteria, **manuscript in preparation**.
13. C. Baranowski, A. A. Pohane, A. Heredia-García, E. Melzer, **T. J. Fiolek, S. R. Rundell, H. C. Lim, J. M. Hayashi, M. McMillan, J. Wagner, T. G. Bernhardt, E. J. Rubin, Y. S. Morita, E. H. Rego, B. M. Swarts,** and M. S. Siegrist\*. Spatiotemporal Visualization of Cell Envelope Metabolism in Mycobacteria, **submitted**.
12. **J. M. Wolber, B. L. Urbanek, L. M. Meints, B. F. Piligian, I. C. Lopez-Casillas, K. M. Zochowski, P. J. Woodruff, and B. M. Swarts\***. The Trehalose-Specific Transporter LpqY-SugABC is Required for Antimicrobial and Anti-Biofilm Activity of Trehalose Analogues in *Mycobacterium smegmatis*, **submitted**.
11. P.-H. Chen, T. J. Smith, J. Wu, P. F. Siesser, F. Khan, **M. Hogue**, E. Soderblom, F. Tang, J. R. Marks, M. B. Major, **B. M. Swarts**, M. Boyce,\* and J.-T. Chi\*. Glycosylation of KEAP1 links nutrient sensing to redox stress signaling, *EMBO J.* **2017**, DOI: 10.15252/embj.201696113.
10. **L. M. Meints, A. W. Poston, B. F. Piligian, C. D. Olson, K. S. Badger, P. J. Woodruff, and B. M. Swarts\***. Rapid One-Step Enzymatic Synthesis and All-Aqueous Purification of Trehalose Analogues, *J. Vis. Exp.*, **2017**, DOI: 10.3791/54485.
9. **M. K. O'Neill,† B. F. Piligian,† C. D. Olson, P. J. Woodruff, and B. M. Swarts\***. Tailoring Trehalose for Biomedical and Biotechnological Applications. *Pure Appl. Chem.*, **2017**, DOI: 10.1515/pac-2016-1025. †Equal contribution.
8. **H. W. Kavunja, B. F. Piligian, T. J. Fiolek, H. N. Foley, T. O. Nathan, B. M. Swarts\***. A Chemical Reporter Strategy for Detecting and Identifying *O*-Mycoloylated Proteins in *Corynebacterium*, *Chem. Commun.*, **2016**, 52, 13795–13798.
7. **S. R. Rundell,† Z. L. Wagar,† L. M. Meints, C. D. Olson, M. K. O'Neill, B. F. Piligian, A. W. Poston, R. J. Hood, P. J. Woodruff, and B. M. Swarts\***. Deoxyfluoro-D-trehalose (FDTre) analogues as potential PET probes for imaging mycobacterial infection, *Org. Biomol. Chem.*, **2016**, 14, 8598–8609. †Equal contribution.
6. **H. N. Foley,† J. A. Stewart,† S. R. Rundell, Herbert Kavunja, and B. M. Swarts\***. Bioorthogonal Chemical Reporters for Selective Probing of Mycomembrane Components in Mycobacteria, *Angew. Chem. Int. Edit*, **2016**, 55, 2053–2057. †Equal contribution.
5. **J. A. Stewart,† B. F. Piligian,† S. R. Rundell, and B. M. Swarts\***. A Trifunctional Cyclooctyne for Modifying Azide-Labeled Biomolecules with Photocrosslinking and Affinity Tags, *Chem. Commun.*, **2015**, 51, 17600–17603. †Equal contribution.
4. M. S. Siegrist, **B. M. Swarts**, D. M. Fox, C. R. Bertozzi\*. Illumination of Growth, Division and Secretion by Metabolic Labeling of the Bacterial Cell Surface, *FEMS Microbiol. Rev.*, **2015**, 39, 184–202.
3. **B. L. Urbanek,† D. C. Wing,† K. S. Haislop, C. Hamel, R. Kalscheuer, P. Woodruff, and B. M. Swarts\***. Chemoenzymatic Synthesis of Trehalose Analogues: Rapid Access to Chemical Probes for Investigating Mycobacteria, *ChemBioChem*, **2014**, 15, 2066–2070. †Equal contribution.

2. **J. A. Stewart, C. J. Wilson, and B. M. Swarts\***. Effect of Azide Position on the Rate of Azido Glucose–Cyclooctyne Cycloaddition, *J. Carbohydr. Chem.*, **2014**, *33*, 408–419.
1. **B. M. Swarts\***. Recent Advances in the Chemical Synthesis of Glycosylphosphatidylinositols (GPIs): Expanding Synthetic Versatility for Investigating GPI Biology, *J. Carbohydr. Chem.*, **2013**, *32*, 275.

### ***Peer-Reviewed Publications from Graduate and Postdoctoral Research***

9. K. E. Beatty, M. Williams, B. L. Carlson, **B. M. Swarts**, P. D. van Helden, C. R. Bertozzi\*. Sulfatase-Activated Fluorophores for Rapid Discrimination of Mycobacterial Species and Strains, *Proc. Natl. Acad. Sci. U. S. A.*, **2013**, *110*, 12911-12916.
8. **B. M. Swarts**, C. M. Holsclaw, J. C. Jewett, M. Alber, D. M. Fox, M. S. Siegrist, J. A. Leary, R. Kalscheuer, C. R. Bertozzi\*. Probing the Mycobacterial Trehalome with Bioorthogonal Chemistry, *J. Am. Chem. Soc.*, **2012**, *134*, 16123-16126.
7. S. Burgula,<sup>‡</sup> **B. M. Swarts**,<sup>‡</sup> and Z. Guo\*. Total Synthesis of a Glycosylphosphatidylinositol Anchor of the Human Lymphocyte CD52 Antigen, *Chem. Eur. J.*, **2012**, *18*, 1194-1201.  
<sup>‡</sup>Equal contribution.
6. **B. M. Swarts** and Z. Guo\*. Chemical Synthesis and Functionalization of Clickable Glycosylphosphatidylinositol Anchors, *Chem. Sci.* **2011**, *2*, 2342-2352.
5. **B. M. Swarts** and Z. Guo\*. Synthesis of Glycosylphosphatidylinositol Anchors Bearing Unsaturated Lipid Chains, *J. Am. Chem. Soc.*, **2010**, *132*, 6648-6650.
4. Z. Wu, X. Guo, Q. Wang, **B. M. Swarts**, and Z. Guo\*. Sortase A-Catalyzed Transpeptidation of Glycosylphosphatidylinositol Derivatives for Chemoenzymatic Synthesis of GPI-Anchored Proteins, *J. Am. Chem. Soc.*, **2010**, *132*, 1567-1571.
3. X. Guo, Q. Wang, **B. M. Swarts**, and Z. Guo\*. Sortase-Catalyzed Peptide-Glycosylphosphatidylinositol Analog Ligation, *J. Am. Chem. Soc.*, **2009**, *131*, 9878-9879.
2. H. Hu, J. Xue, **B. M. Swarts**, Q. Wang, Q. Wu, and Z. Guo\*. Synthesis and Antibacterial Activities of *N*-Glycosylated Derivatives of Tyrocidine A, a Macrocyclic Peptide Antibiotic, *J. Med. Chem.*, **2009**, *52*, 2052-2059.
1. **B. M. Swarts**, Y.-C. Chang, H. Hu, and Z. Guo\*. Synthesis and CD Structural Studies of CD52 Peptides and Glycopeptides, *Carbohydr. Res.*, **2008**, *343*, 28940-2902.

### ***Book Chapters and Other Publications***

3. **B. M. Swarts** and Z. Guo\*. Chemical Synthesis of Glycosylphosphatidylinositol Anchors, *Adv. Carbohydr. Chem. Biochem.*, **2012**, *67*, 137-219.
2. Z. Wang, G. Wasonga, **B. M. Swarts**, and X. Huang\*. Chemoselective Glycosylation of Thioglycosyl Donors in *Carbohydrate Chemistry: Proven Synthetic Methods*; Kovac, P., Ed. CRC Press, Taylor & Francis Group: Boca Raton, **2011**, pp 47-53.
1. **B. M. Swarts** and Z. Guo\*. Carbohydrate-Based Antiviral Vaccines in *Carbohydrate-Based Vaccines and Immunotherapies*; Z. Guo and G.-J. Boons, Eds.; John Wiley & Sons, Inc.: Hoboken, **2009**, pp 167-193.

### **Patents**

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2. B. M. Swarts. O-Acyl Trehalose Analogues for the Detection and Therapeutic Targeting of Mycobacteria. Provisional patent filed September 9<sup>th</sup>, **2016**; US patent filed October 24<sup>th</sup>, **2016**.
1. B. M. Swarts and P. J. Woodruff. Chemoenzymatic Synthesis of Trehalose Analogs. Provisional patent filed March 7<sup>th</sup>, **2014**; US patent filed March 6<sup>th</sup>, **2015**.

## Grants Awarded as PI

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### *Funded*

3. Title: “Chemical Tools for Understanding the Mycomembrane of the *Corynebacterineae*”  
Agency/Mechanism: NSF CAREER Chemistry of Life Processes  
Award Period: **05/2017–04/2022**  
Amount Requested: \$661,475
2. Title: “Chemoenzymatic Synthesis of Trehalose Analogs as Tools for Studying Mycobacteria”  
Agency/Mechanism: NIH R15 AREA  
Award Period: **02/2015–12/2018**  
Amount Requested: \$420,085
1. Title: “A Chemical Approach to Identifying and Profiling Proteins in the Mycobacterial Outer Membrane”  
Agency/Mechanism: Research Corporation for Science Advancement Cottrell College Science Award  
Time Period: **07/01/2014–06/30/2016**  
Amount: \$45,000

## Presentations

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### *Oral Presentations at National or International Meetings*

5. B. M. Swarts. “Marking the Mycomembrane: Chemical Probes for Studying Glycolipids of the Mycobacterial Outer Membrane,” Young Researcher Award Address, 2016 International Carbohydrate Symposium, New Orleans, LA, July 17, **2016**.
4. B. M. Swarts. “Trehalose Analogues: New Synthetic Methods and Applications in Mycobacteria Research,” 250<sup>th</sup> ACS National Meeting, Carbohydrates Division, San Diego, CA, March 15, **2016**.
3. B. M. Swarts. “Chemoenzymatic Synthesis of Trehalose Analogues: Rapid Access to Chemical Probes for Investigating Mycobacteria,” 248<sup>th</sup> ACS National Meeting, San Francisco, CA, August 13, **2014**.
2. B. M. Swarts and C.R. Bertozzi. “Metabolic Labeling of Trehalose Glycolipids in Mycobacteria,” 243<sup>rd</sup> ACS National Meeting, San Diego, CA, March, **2012**.
1. B. M. Swarts and Z. Guo. “Synthesis of a Clickable GPI Anchor,” 239<sup>th</sup> ACS National Meeting, San Francisco, CA, March 25<sup>th</sup>, **2010**.

### *Other Oral Presentations*

- 17 B. M. Swarts. “Marking the Mycomembrane: Chemical Probes for Studying the Unique Outer Membrane of Pathogenic Mycobacteria,” Oakland University, March 15, **2017**.

16. B. M. Swarts. "Marking the mycomembrane: Chemical probes for studying the unique outer membrane of pathogenic mycobacteria," Univeristy of Toledo, Toledo, OH, November 21, **2016**.
15. B. M. Swarts. "Marking the mycomembrane: Chemical probes for studying the unique outer membrane of pathogenic mycobacteria," Grand Valley State University, Allendale, MI, November 11, **2016**.
14. B. M. Swarts. "Propagating a Love of Chemistry Through Mentorship in Academia," For the Love of Chemistry Symposium, Wayne State University, Detroit, MI, February 20, **2016**.
13. B. M. Swarts. "Chemical Probes for Mycobacteria: New Tools for Tuberculosis Research," Kenyon College, Gambier, OH, November 3, **2015**.
12. B. M. Swarts. "Chemical Probes for Mycobacteria: New Tools for Tuberculosis Research," 11<sup>th</sup> Midwest Carbohydrate & Glycobiology Symposium, Cleveland, OH, October 24, **2015**.
11. B. M. Swarts. "Rapid Synthesis of Trehalose Analogs: Toward Tuberculosis-Specific Diagnostic Agents," ACS Great Lakes/Central Regional Joint Regional Meeting, Grand Rapids, MI, May 28, **2015**.
10. B. M. Swarts. "Rapid Synthesis of Trehalose Analogs: Toward Tuberculosis-Specific Diagnostic Agents," 10<sup>th</sup> Midwest Carbohydrate & Glycobiology Symposium, University of Michigan, Ann Arbor, MI, October 10, **2014**.
9. B. M. Swarts. "Chemical Reporters for Mycobacterial Cell-Wall Glycoconjugates," 9<sup>th</sup> Midwest Carbohydrate & Glycobiology Symposium, Toledo, OH, October 12, **2013**.
8. B. M. Swarts. "Mechanisms of Bioorthogonal Reactions," CMU Organic Discussion Group, Central Michigan University, October 9, **2013**.
7. B. M. Swarts and C.R. Bertozzi. "Metabolic Labeling of Trehalose Glycolipids in Mycobacteria," 243<sup>rd</sup> ACS National Meeting, San Diego, CA, March, **2012**.
6. B. M. Swarts. "Metabolic Labeling of Mycobacterial Trehalose Glycolipids as a Potential Diagnostic Tool for Tuberculosis," UC Berkeley Infectious Diseases Seminar, Berkeley, CA, February, **2012**.
5. B. M. Swarts. "Investigating Glycolipids with Click Chemistry," Kenyon College, Gambier, OH, November 29th, **2011**.
4. B. M. Swarts. "Investigating Glycolipids with Click Chemistry," College of Wooster, Wooster, OH, November 28th, **2011**.
3. B. M. Swarts. "Click Chemistry-Based Approaches to Investigating Glycolipids," Stellenbosch University, Stellenbosch, South Africa, September 16th, **2011**.
2. B. M. Swarts and Z. Guo. "Synthesis of a Clickable GPI Anchor," 239<sup>th</sup> ACS National Meeting, San Francisco, CA, March 25th, **2010**.
1. B. M. Swarts and Z. Guo. "Synthesis of a Clickable GPI Anchor," 11<sup>th</sup> Annual Chemistry Graduate Research Symposium, Wayne State University, Detroit, MI, October, **2009**.

### *Selected Poster Presentations*

7. B. M. Swarts. "Tailoring Trehalose for Applications in Mycobacteria Research," Gordon Research Conference Carbohydrates, Mt. Snow Resort, VT, June, **2017**.

6. B. M. Swarts. “Chemical Tools for Tuberculosis Diagnostic and Therapeutic Development,” Faculty Excellence Exhibition, CMU, March, **2014**.
5. B. M. Swarts, M. S. Siegrist, R. Kalscheuer, and C. R. Bertozzi. “Imaging the Mycobacterial Cell Wall with Bioorthogonal Chemistry,” EMBO Tuberculosis 2012, Paris, France, September, **2012**.
4. B. M. Swarts, M. S. Siegrist, R. Kalscheuer, and C. R. Bertozzi. “Probing the Mycobacterial Trehalome with Bioorthogonal Chemical Reporters,” Chemical Biology in the Bay Area Day, Berkeley, CA, April 5, **2012**.
3. B. M. Swarts, M. S. Siegrist, R. Kalscheuer, and C. R. Bertozzi. “Metabolic Labeling of Trehalose Glycolipids in Mycobacteria,” Keystone Symposium: Chemical Biology and Novel Tools in Pharmacology, Santa Fe, NM, February, **2012**.
2. B. M. Swarts and Z. Guo. “Synthesis of a Fully Phosphorylated GPI Anchor Bearing Unsaturated Lipid Chains,” 2010 Midwest Carbohydrate and Glycoscience Symposium, September 25<sup>th</sup>, **2010**.
1. B. M. Swarts and J. C. Amburgey-Peters. Synthesis and Purification of Cyclohexylphospho-L-Serines as Phosphatidylserine Analogs,” 227<sup>th</sup> ACS National Meeting, Anaheim, CA, March, **2004**.

## Peer-Reviewing of Manuscripts and Grant Proposals

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### *Journals*

- ACS Central Science
- ACS Chemical Biology
- ACS Macro Lett
- Angewandte Chemie International Edition
- Bioconjugate Chemistry
- Carbohydrate Research
- ChemBioChem
- Chemical Science
- International Journal of Molecular Sciences
- Journal of Carbohydrate Chemistry
- MedChemComm
- PLoS One
- Small
- SpringerPlus
- Theranostics

### *Grant Proposals*

- NIH Special Emphasis Panel, “Tools for Characterizing Glycans” (ZRG1 OBT-L (50)R), **2015**
- NIH Special Emphasis Panel, “Facile Methods and Technologies for Synthesis of Biomedically Relevant Carbohydrates” (BCMB-W (50)), **2017**
- Research Corporation
- ACS Petroleum Research Fund
- Canadian Glycomics Network

## **Thesis Supervision & Research Mentoring**

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### ***Postdoctoral Fellows (\*Co-authored one or more papers)***

1. \*Dr. Herbert Kavunja (Ph.D. Michigan State University), May 2015–current.

### ***Graduate Students (\*Co-authored one or more papers)***

7. \*Nicholas Banahene (M.S.), December 2016–current.
6. Douglas C. Wing (M.S.), December 2016–current.
5. \*Taylor Fiolek (M.S.), December 2015–current.
4. \*Claire D. Olson (M.S.), August 2015–current.
3. \*Temitope O. J. Nathan (M.S.), August 2015–current.
2. \*Lisa M. Meints (M.S.), January 2015–August 2016.
1. \*Jessica Stewart (M.S.), August 2013–August 2015.

### ***Undergraduate Students (\*Co-authored one or more papers)***

22. Devin Moore, January 2017–current.
21. \*Jessica Groenevelt, August 2016–current.
20. \*Nate Holmes, August 2016–current.
19. \*Alicyn Stothard, August 2016–current.
18. \*Jeff Wolber (HON 499), October 2015–February 2017.
17. Krestina Bednarz (CHM 491/HON 499), August 2015–current.
16. Claudia Ramsey (BIO 495), August 2015–current.
15. Abigail Detzler (CHM 491), September 2015–current.
14. \*Brent Piligian, September 2014–current.
13. \*Adrian Rylski (CHM 491), January 2015–current.
12. \*Mara O’Neill (CHM 491), January 2015–current.
11. Hannah Brinkman, September 2014–December 2015.
10. \*Temitope Nathan (CHM 491/HON 499), May 2014–August 2015.
9. \*Sarah Rundell (CHM 491), April 2014–July 2016.
8. \*Zac Wagar (BIO 403), March 2014–August 2015.
7. Christian Burns, February 2013–August 2014.
6. \*Cody Wilson, October 2013–January 2014.
5. \*Maxwell Hogue (CHM 491/HON 499), September 2013–May 2015.
4. \*Hannah Foley (CHM 491/HON 499), September 2013–May 2015.
3. \*Douglas Wing (CHM 491), August 2013–May 2014.

2. \*Bailey Urbanek (HON 499), August 2013–June 2015.
1. \*Chelsey Hamel (CHM 491), May 2013– May 2014.

***Non-CMU Outreach Students (\*Co-authored one or more papers)***

6. Dan Gepford (MMCC), May 2017–August 2017.
5. Dillon Vannest (MMCC), May 2016–August 2016 and May 2017–August 2017.
4. Alicyn Stothard (Delta College), May 2016–August 2016.
3. \*Kailey Zochowski (Chippewa Hills HS, ACS SEED), June 2015–August 2015; June 2016–August 2016.
2. \*Irene Lopez-Casillas (SCTC, Community College Outreach), May 2015–August 2015.
1. Abigail Detzler (MMCC, Community College Outreach), May 2015–August 2015.

## **Service**

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***Ongoing service activities***

- *Departmental Curriculum Committee* (August 2014–current)
- *CST Website Committee* (September 2014–current; chair since August 2015)
- *Biosciences Building Committee/BSL-3 Development* (May 2013–current)
- *Stellenbosch Science Study Abroad Development & Advising* (January 2013–current)
- *Community College Outreach Program* (May 2015–current)
- *Peer review for academic journals and grant agencies* (see above)

***Other service activities***

- *CMU Grant-Writing Workshop Speaker & Panel member* (November 2016)
- *11<sup>th</sup> Midwest Carbohydrate and Glycobiology Symposium @ CMU Host & Organizer* (October 2016)
- *10<sup>th</sup> Midwest Carbohydrate and Glycobiology Symposium Session Chair* (October 2015)
- *ACS Central Regional Meeting Session Chair & CMU Student Recruiting* (May 2015)
- *9<sup>th</sup> Midwest Carbohydrate and Glycobiology Symposium Session Chair* (October 2014)
- *8<sup>th</sup> Midwest Carbohydrate and Glycobiology Symposium Session Chair* (October 2013)
- *ACS Central Regional Meeting Session Chair & CMU Student Recruiting* (May 2013)

## **Professional Organizations**

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*American Chemical Society* (2004–current)  
*Council on Undergraduate Research* (2012–current)

## **Professional Development**

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*CMURC Right Choice Program* (2014-2015)  
*CMU Assessment Workshop* (January 2015)  
*NIH NIGMS Grant-Writing Workshop* (August 2014)



*ASBMB Grant-Writing Workshop* (June 2013)

**Courses Taught**

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<i>Spring 2017</i>	CHM 349 Organic Chemistry Lab (6)
<i>Fall 2016</i>	CHM 345H Honors Organic Chemistry (3)
<i>Spring 2016</i>	CHM 346 Organic Chemistry II (3)
	CHM 349 Organic Chemistry Lab (6)
<i>Fall 2015</i>	CHM 345H Honors Organic Chemistry (3)
<i>Spring 2015</i>	CHM 346 Organic Chemistry II (3)
	CHM 131 General Chemistry Lab (2)
	CHM 131 General Chemistry Lab (2)
<i>Fall 2014</i>	CHM 345H Honors Organic Chemistry (3)
	CHM 131 General Chemistry Lab (2)
<i>Spring 2014</i>	CHM 346 Organic Chemistry II (3)
<i>Fall 2013</i>	CHM 345 Organic Chemistry I (3)