

DEPARTMENT OF BIOCHEMISTRY, MOLECULAR BIOLOGY, & BIOPHYSICS, THE UNIVERSITY OF MINNESOTA
244A GORTNER LABORATORY • 1479 GORTNER AVE. ST. PAUL, MN 55108
(+1) 612-201-2003 (CELL) • (+1) 612-624-8575 (OFFICE) • (+1) 612-625-4017 (LAB) • MFFREEMA@UMN.EDU

MICHAEL F. FREEMAN

EDUCATION

Johns Hopkins University, Baltimore, Maryland, USA
Ph.D. Biology, 2008

University of Massachusetts, Amherst, Massachusetts, USA
B.S. Biochemistry and Molecular Biology, 2001
GPA: 3.9/4.0

RESEARCH EXPERIENCE

- | | |
|--------------|--|
| 2016-present | Assistant Professor at the University of Minnesota
Department of Biochemistry, Molecular Biology, and Biophysics & The
Biotechnology Institute |
| 2010-2015 | Post-doctoral Research with Professor Jörn Piel
Eidgenössische Technische Hochschule (ETH) Zurich, Zurich, Switzerland
University of Bonn, Bonn, Germany
<i>Discovery and Elucidation of Marine Natural Products</i> |
| 2008-2010 | Post-doctoral Research with Professor Craig A. Townsend
Johns Hopkins University, Baltimore, Maryland, USA
<i>Regulation of β-Lactam Antibiotics in <i>Streptomyces</i></i> |
| 2001-2008 | Graduate Research with Professor Craig A. Townsend
Johns Hopkins University, Baltimore, Maryland, USA
<i>Characterization of Enzymes Involved in Thienamycin Biosynthesis</i> |
| 1999-2001 | Undergraduate Research with Professor Craig T. Martin
University of Massachusetts, Amherst, Massachusetts, USA
<i>Directed Evolution of T7 RNA Polymerase Promoters</i> |

RESEARCH FUNDING

2017-2018	University of Minnesota Biocatalysis Initiative for Advancing Biomanufacturing for the Environment, Health and Industry (\$58,140)
2011-2014	Human Frontier Science Program (HFSP) Long-Term Fellowship recipient <i>Harnessing the Bacterial Biodiversity of Marine Invertebrates</i>
2000, Fall	Honors Research Fellowship, University of Massachusetts, Amherst
2000, Summer	Howard Hughes Fellowship for Undergraduate Research (REU)

PUBLICATIONS AND PRESENTATIONS

Publications

** Equal contribution of authors, § Co-corresponding authors*

16. van der Velden, NS, Kaelin, N, Helf, MJ, Piel, J, **Freeman, MF**[§], Kuenzler, M[§] (2017) "Autocatalytic backbone N-methylation in a family of ribosomal peptide natural products", *Nat. Chem. Biol.* 13(8): 833-835. [News and Views: *Nat. Chem. Biol.* 2017 13: 821-822.]

15. Morinaka, BI, Verest, M, **Freeman, MF**, Gugger, M, Piel, J (2017) "An orthogonal D₂O-based induction system provides insights into D-amino acid pattern formation by radical S-adenosylmethionine peptide epimerases", *Angew. Chem. Int. Ed. Engl.* 56: 762-766.

14. **Freeman, MF**[§], Helf, MJ, Bhushan, A, Morinaka, BI, Piel, J[§] (2016) "Seven enzymes create extraordinary molecular complexity in an uncultivated bacterium" *Nat. Chem.* 9: 387-395. [Research Highlight: *Nat. Chem. Biol.* 2017 13: 129.]

13. **Freeman, MF**, Vagstad, AL, Piel, J (2016) "Polytheonamide biosynthesis showcasing the metabolic potential of sponge-associated uncultivated 'Entotheonella'" *Curr. Opin. Chem. Biol.* 31: 8-14.

12. Buller, AR, **Freeman, MF**, Schildbach, JF, Townsend, CA (2014) "Exploring the role of conformational heterogeneity in *cis*-autoproteolytic activation of ThnT" *Biochemistry* 53(26): 4273-4281.

11. Morinaka, BI, Vagstad, AL, Helf, MJ, Gugger, M, Kegler, C, **Freeman, MF**, Bode, HB, Piel, J (2014) "Radical S-adenosyl methionine epimerases: regioselective introduction of diverse D-amino acid patterns into peptide natural products" *Angew. Chem. Int. Ed.* 53(32): 8503-8507.

10. Cai, X, Teta, R, Kohlhass, C, Cruesemann, M, Ueoka, R, Mangoni, A, **Freeman, MF**[§], Piel, J[§] (2013) "Manipulation of regulatory genes reveals complexity and fidelity in hormaomycin biosynthesis" *Chem. Biol.* 20(6): 839-846.

9. **Freeman, MF**^{*}, Gurgui, C^{*}, Helf, MJ, Uria, AR, Oldham, NJ, Sahl, HG, Matsunaga, S, Piel, J (2012) "Metagenome mining reveals polytheonamides as posttranslationally modified ribosomal peptides" *Science* 338: 387-390. [Concentrates: *Chem. Eng. News* 2012 90(3): 26.]

8. Buller, AR, Labonte, JW, **Freeman, MF**, Wright, NT, Schildbach, JF, Townsend, CA (2012) "Autoproteolytic activation of ThnT results in structural reorganization necessary for substrate binding and catalysis" *J. Mol. Biol.* 422(4): 508-518.

7. Labonte, JW, Kudo, F, **Freeman, MF**, Raber, ML, Townsend, CA (2012) “Engineering the synthetic potential of b-lactam synthetase and the importance of catalytic group dynamics” *MedChemComm.* 3: 960-966.
6. Buller, AR, **Freeman, MF**, Wright, NT, Schildbach, JF, Townsend, CA (2011) “Insights into cis-autoproteolysis reveal a reactive state formed through conformation rearrangement” *Proc. Natl. Acad. Sci. U.S.A.* 109(7): 2308-2313.
5. Bodner, MJ, Li, R, Phelan, RM, **Freeman, MF**, Moshos, KA, Lloyd, E, Townsend, CA (2011) “Definition of the common and divergent steps in carbapenem β -lactam antibiotic biosynthesis” *ChemBioChem.* 12(14): 2159-2165.
4. Gulder, TAM, **Freeman, MF**, Piel, J (2011) “The catalytic diversity of multimodular polyketide synthases: natural product biosynthesis beyond textbook assembly rules” *Top. Curr. Chem.* Springer-Verlag Berlin Heidelberg DOI: 10.1007/128_2010_113: 1-53.
3. Bodner, MJ, Phelan, R, **Freeman, MF**, Li, R, Townsend, CA (2010) “Non-heme iron oxygenases generate natural structural diversity in carbapenem antibiotics” *J. Am. Chem. Soc.* 132(1): 12-13.
2. Raber, ML, **Freeman, MF**, Townsend, CA (2009) “Dissection of the stepwise mechanism to b-lactam formation and elucidation of a rate-determining conformational change in b-lactam synthetase” *J. Biol. Chem.* 284(1): 207-217.
1. **Freeman, MF**, Moshos, KA, Bodner, MJ, Li, R, Townsend, CA (2008) “Four enzymes define the role of coenzyme A in thienamycin biosynthesis” *Proc. Natl. Acad. Sci. U.S.A.* 105(32): 11128-11133. [Research Highlight: *ACS Chem. Biol.* 2008 3(9): 522.]

Oral Presentations

Freeman, MF Joint Symposium on Microbial Biotechnology, University of Minnesota, August 8, 2017.

Freeman, MF Invited speaker. Biofilm club, University of Minnesota, April 4, 2017.

Freeman, MF Directing Biosynthesis V, Norwich England, March 22, 2017. (*Lightning talk*)

Freeman, MF Co-organizer, 2017 Microbial Factories Symposium, University of Minnesota, February 6, 2017.

Freeman, MF Invited speaker. Microbial Communication Colloquium, Friedrich Schiller University, Jena, Germany, November 30, 2016.

Freeman, MF Invited speaker. Mini-symposium: Structural aspects of synthetic biology systems, University of Minnesota, St. Paul, Minnesota, USA, August 3, 2016.

Freeman, MF Invited Speaker. Biofilm Club Symposium, University of Minnesota, St. Paul, Minnesota, USA, May 20, **2016**.

Freeman, MF Invited Speaker. Science on the Spot, University of Minnesota, St. Paul, Minnesota, USA, April 14, **2016**.

Freeman, MF Invited Speaker. Host: Prof. Dr. Yaniv Brandvain. PBS Colloquium, University of Minnesota, St. Paul, Minnesota, USA, April 5, **2016**.

Freeman, MF Invited Speaker. Host: Prof. Dr. Michael H. Walter. University of Northern Iowa, Cedar Falls, Iowa, February 29, USA, **2016**.

Freeman, MF Gordon Research Seminar, Marine Natural Products Gordon Conference, Ventura, CA, USA, March 2, **2014**.

Freeman, MF Invited Speaker. Host: Prof. Dr. Gregory L. Challis. University of Warwick, Warwick, England, November 26, **2013**.

Freeman, MF Young Microbiologists Symposium 2013, The John Innes Centre, Norwich, England, November 18, **2013**.

Freeman, MF 1st European Conference on Natural Products: Research and Applications, Frankfurt, Germany, September 25, **2013**.

Freeman, MF Host Microbe Interactions Symposium, Eidgenössische Technische Hochschule (ETH) Zurich, Zurich, Switzerland, July 1, **2013**.

Freeman, MF C. A. Townsend Symposium, Johns Hopkins University, Baltimore, MD, USA, August 11, **2012**. (*Convener*)

Freeman, MF Synthetic Biology, Biotransformation, and Natural Products Conference, Massachusetts Institute of Technology, Cambridge, MA, USA, August 7, **2012**.

Freeman, MF Marine Natural Products Gordon Conference, Ventura, CA, USA, February 27, **2012**. (*Brief Glimpse*)

Freeman, MF Invited Speaker. Host: Prof. Dr. Fumitaka Kudo. Tokyo Institute of Technology, Tokyo, Japan, September 12, **2011**.

Freeman, MF International Union of Microbiological Societies (IUMS) 2011 Congress, Sapporo, Japan, September 8, **2011**. (*Presenter & Convener*)

Freeman, MF Invited Speaker. Host: Prof. Dr. Haruko Takeyama. Waseda University, Tokyo, Japan, September 5, **2011**.

Freeman, MF Invited Speaker. Host: Prof. Dr. Trina A. Schroer. Cell, Molecular, Developmental Biology, and Biophysics Retreat, Johns Hopkins University, St. Michael's, MD, USA, **2009**.

Poster Presentations

Freeman, MF Directing Biosynthesis V, Norwich England, March 22-24, **2017**.

Freeman, MF Challenges in Chemical Biology, Zurich, Switzerland, June 15-18, **2015**.

Freeman, MF D-Biol-Symposium 2014, Davos, Switzerland, June 10-12, **2014**.

Freeman, MF Marine Natural Products Gordon Conference, Ventura, CA, USA, March 2-8, **2014**.

Freeman, MF XIV International Symposium on Marine Natural Products (MaNaPro), La Toja Island, Galicia, Spain, September 15-20, **2013**.

Freeman, MF Natural Products Gordon Conference, Andover, NH, USA, July 28 - August 2, **2013**.

Freeman, MF 13th HFSP Awardees Meeting, Strasbourg, France, July 7-10, **2013**.

Freeman, MF Society for Industrial Microbiology and Biotechnology Annual Meeting, Washington D.C., USA, August 12-16, **2012**.

Freeman, MF Marine Natural Products Gordon Conference, Ventura, CA, USA, February 26 - March 2, **2012**.

PATENTS

Spring 2013 Piel, J, Gurgui, C, **Freeman, MF**, Uria, AR, Helf, MJ, Biosynthetic Gene Cluster for the Production of Peptide/Protein Analogues, WO2013034579 A1, March 14, **2013**.

Fall 2012 Townsend, CA, Bodner, MJ, Phelan, RM, **Freeman, MF**, Method for Late Introduction of the (8R)-Hydroxyl Group in Carbapenem Beta-lactam Antibiotic Synthesis, EP2513112 A2, October 24, **2012**.

TEACHING

2017, Summer	Co-director of MCSB graduate research course, Itasca Biological Station, University of Minnesota.
2017, Spring	BioC5309 Biocatalysis and Biodegradation, Guest lecturer, University of Minnesota
2014, Fall	551-1147-00L - HS 2014. Lab Block Course: <i>Bioactive Natural Products from Bacteria</i> , ETH Zurich
	2007, Spring Chemistry 030-624. Guest Lecturer: Bioorganic and Natural Product Chemistry, Johns Hopkins University
2003-Present	Research mentor to numerous undergraduates, graduate students, and post-docs

2003, Spring	Biology 020-316. Cell Biology Lab, Johns Hopkins University
2002, Fall	Biology 020-315. Biochemistry Lab, Johns Hopkins University
2000-2001	Academic tutor in eleven subject areas. Learning Support Services, University of Massachusetts, Amherst
1997, Fall	Biology 100L. Academic tutor, University of Massachusetts, Amherst

AWARDS AND HONORS

2016-2017	Residence Workplace Agreement, The Institute of Microbiology, Eidgenössische Technische Hochschule (ETH) Zurich, Zurich, Switzerland
2015	ETH Institute of Microbiology Performance Award
2011-2014	Human Frontier Science Program (HFSP) Long-Term Fellowship recipient <i>Harnessing the Bacterial Biodiversity of Marine Invertebrates</i>
2000, Fall	Honors Research Fellowship, University of Massachusetts, Amherst
2000, Summer	Howard Hughes Fellowship for Undergraduate Research (REU)
2000, Spring	Phi Beta Kappa, Nu Chapter
1997, Fall	Advanced Placement Scholar
1997, Fall	Biological Talent Advancement Program (BioTAP)

MEMBERSHIPS

2017-present	American Society of Pharmacognosy
2016-present	Microbial and Plant Genomics Institute faculty member, University of Minnesota
2016-present	Microbial Engineering graduate program faculty member, University of Minnesota
2016-present	Minnesota Craniofacial Research Training Program (MinnCRest) mentor, University of Minnesota

LEADERSHIP ACTIVITIES

2015	AAAS Webinar: Careers for US Scientists in Europe and China
2004-2010	Sam Dan, Third Degree Black Belt in Korean Hapkido (Teaching certified)
2002-2005	Volunteer Judge at Parkville High School Science Fair, Baltimore, MD
2000-2001	Head Racquetball Instructor, University of Massachusetts, Amherst

REFERENCES

Professor Dr. Jörn Piel
Eidgenössische Technische Hochschule (ETH) Zurich
Institute of Microbiology
Vladimir-Prelog-Weg 1-5/10
8093 Zürich, Switzerland
jpiel@ethz.ch
Phone: (+41) 44.63.30755

Professor Dr. Craig A. Townsend
Johns Hopkins University
Department of Chemistry
3400 N. Charles St.
Baltimore, MD USA 21218
ctownsend@jhu.edu
Phone: (+01) 410.516.7444

Professor Dr. Joel F. Schildbach
Johns Hopkins University
Department of Biology
3400 N. Charles St.
Baltimore, MD USA 21218
joel@jhu.edu
Phone: (+01) 410.516.0176

Professor Dr. Tamara L. Hendrickson
Wayne State University
Department of Chemistry
5101 Cass Ave.
Detroit, MI USA 48202
tamara.hendrickson@chem.wayne.edu
Phone: (+01) 313.577.6914