**Dana M. Freund**

Curriculum Vitae

University of Minnesota

1970 Folwell Avenue | Saint Paul, MN 55108

<http://horticulture.umn.edu/directory/staff/dana-mfreund>

Email: dfreund@umn.edu

**CV SECTION 1: Education/Employment History/Awards**

**EDUCATION**

**Ph.D. - Biochemistry** Jan. 2013

Colorado State University, Fort Collins, CO

**B.A.** **- Biochemistry** May 2008

College of St*.* Scholastica, Duluth, MN

**RESEARCH EXPERIENCE**

**National Science Foundation Postdoctoral Research Fellow in Biology** Sept. 2014-present

 University of Minnesota-Twin Cities, Saint Paul, MN

Departments of Horticultural Science & Plant Biology, Microbial & Plant Genomics Institute

Mentors: Drs. Adrian D. Hegeman and Jerry D. Cohen

**Postdoctoral Associate** Feb. 2013-Sept. 2014

 University of Minnesota-Twin Cities, Saint Paul, MN

Departments of Horticultural Science & Plant Biology, Microbial & Plant Genomics Institute

Mentors: Drs. Adrian D. Hegeman and Jerry D. Cohen

**Graduate Research Assistant** Aug. 2008- Jan. 2013

 Colorado State University, Fort Collins, CO

Department of Biochemistry and Molecular Biology

Co-Advisors: Drs. Norman P. Curthoys and Jessica E. Prenni

**National Science Foundation Undergraduate Research Intern** June – Aug. 2007

Iowa State University, Ames, IA

National Science Foundation Research Experience for Undergraduates (NSF-REU)

 MolecularBiotechnology and Genomics Program

 Advisor: Dr. Eve S. Wurtele

**AWARDS**

2017 ASPB Women’s Young Investigator Travel Award ($1,000)

2017 NSF Phenome Travel Grant ($2,000)

2017Microbial Plant Genomics Institute travel award ($400)

2016 Outstanding Senior Postdoctoral Scholar Award, University of Minnesota ($400) 2016 Cold Spring Harbor Laboratory Course Stipend ($2,350)

2016Microbial Plant Genomics Institute travel award ($800)

2015Microbial Plant Genomics Institute travel award ($800)

2014 Microbial Plant Genomics Institute travel award ($800)

2014 NSF National Plant Genome Initiative Postdoctoral Fellowship in Biology ($216,000)

2014 American Society of Plant Biologists (ASPB) Travel Grant Program Award ($575)

2012 American Society of Mass Spectrometry workshop student travel award ($750)

2012 American Society of Mass Spectrometry Annual Meeting student travel award ($300)

2011 American Society of Mass Spectrometry Annual Meeting student travel award ($300)

2010 United States Human Proteome Organization Annual Meeting student travel award ($500)

2008 Biochemistry Student of the Year, College of St*.* Scholastica

2007 Tutor of the Year Recipient, College of St*.* Scholastica

**FUNDED RESEARCH**

***Current grants as PI****:*

“A systems biology approach to understanding lysine acetylation in the regulation of plant metabolism” National Science Foundation National Plant Genome Initiative Postdoctoral

Fellowship in Biology FY 2014, PGRP/IOS-1400818

**Dana M. Freund (PI)**, Adrian D. Hegeman and Jerry D. Cohen (sponsoring scientists)

($216,000)

***Current grants as role other than PI or Co-PI:***

“Improving dynamic metabolic flux analysis for the discovery of molecular determinants of plant phenotypes”, PGRP/IOS-1238812

Adrian D. Hegeman (PI), Jerry D. Cohen (Co-PI)

**Dana M. Freund (key personnel)**

($2,703,924)

**CV SECTION 2: Publications/Scholarly Record**

**PEER REVIEWED PUBLICATIONS**

1. Abate-Pella D, **Freund DM**, Slovin JP, Hegeman AD & Cohen JD. (In Press) An improved method for fast and selective separation of carotenoids by UPLC-MS. *J. Chromatogr. B, https://doi.org/10.1016/j.jchromb.2017.09.039*

2. **Freund DM**, Martin AC, Cohen JD, & Hegeman AD. (In Press) Direct chemical profiling of specialized metabolites from *Glycyrrhiza lepidota* (American licorice) by leaf spray mass spectrometry**.** *Planta, https://doi.org/10.1007/s00425-017-2782-9*

3. **Freund DM** & Hegeman AD. (2017) Recent Advances in Stable Isotope-Enabled Mass Spectrometry-Based Plant Metabolomics. *Current Opinion in Biotechnology, 43, 41-48*

4. Yang DQ, **Freund DM**, Harris B, Wang D, Cleary MP & Hegeman AD. (2016). Measuring relative utilization of aerobic glycolysis in breast cancer cells by positional isotopic discrimination. *FEBS lett, 590*(18), 3179-87

5. Fan K, Rendahl AK, Chen W, **Freund DM**, Gray WM, Cohen JD, & Hegeman AD. (2016). Proteome scale-protein turnover analysis using high resolution mass spectrometric data from stable-isotope labeled plants. *Journal of proteome research*, *15*(3), 851-867

6. Abate-Pella D, **Freund DM**, Ma Y, Simón-Manso Y, Hollender J, Broeckling CD, Huhman DV, Krokhin O, Stoll DR, Hegeman AD, Kind T, Fiehn O, Schymanski EL, Prenni JE, Sumner LW, & Boswell PG. (2015). Retention projection enables accurate calculation of liquid chromatographic retention times across labs and methods. *Journal of Chromatography A*, *1412*, 43-51

7. Wang Y, **Freund DM**, Magdaong NM, Urban VS, Frank HA, Hegeman AD, & Tang JKH. (2014). Impact of esterified bacteriochlorophylls on the biogenesis of chlorosomes in *Chloroflexus aurantiacus*. *Photosynthesis research*, *122*(1), 69-86

8. Schauer, KL, **Freund DM**, Prenni JE, & Curthoys NP. (2013). Proteomic profiling and pathway analysis of the response of rat renal proximal convoluted tubules to metabolic acidosis. *American Journal of Physiology-Renal Physiology*, *305*(5), F628-F640

9. **Freund DM**, Prenni JE, & Curthoys NP. (2013). Proteomic profiling of the mitochondrial inner membrane of rat renal proximal convoluted tubules. *Proteomics*, *13*(16), 2495-2499

10. **Freund DM**, & Prenni JE. (2013). Improved detection of quantitative differences using a combination of spectral counting and MS/MS total ion current. *Journal of proteome research*, *12*(4), 1996-2004

11. **Freund DM**, Prenni JE, & Curthoys NP. (2013). Response of the mitochondrial proteome of rat renal proximal convoluted tubules to chronic metabolic acidosis. *American Journal of Physiology-Renal Physiology*, *304*(2), F145-F155

12. Walmsley SJ, **Freund DM**, & Curthoys NP. (2012). Proteomic profiling of the effect of metabolic acidosis on the apical membrane of the proximal convoluted tubule. *American Journal of Physiology-Renal Physiology*, *302*(11), F1465-F1477

13. Okayasu E, **Freund DM**, Prenni JE, Curthoys NP. (2010). Elucidation of Phosphoproteins Involved in the Renal Cellular Response to Acute Metabolic Acidosis. *Journal of Undergraduate Research and Scholarly Excellence*; 1(1): 14-19

**PATENTS**

Yang, Da-Qing, Hegeman, AD, **Freund, DM**, Cleary, M. Method to Measure Relative Utilization of Aerobic Glycolysis by Positional Isotopic Discrimination. *U.S. Provisional Patent Application Serial No. 62/352,165*, filed 20 June 2016. Patent Pending.

**INVITED PRESENTATIONS & ORAL ABSTRACTS**

*Invited presentations*

2017 “Leaf spray mass spectrometry: an ambient ionization technique to directly assess

metabolites from intact plants” South East Regional American Chemical Society meeting,

Charlotte, NC (upcoming, Nov.)

2017 “A Perspective on the Greener Side of Protein Lysine Acylation” Plant Biological Sciences Colloquium series, University of Minnesota

2017 “Leaf spray-mass spectrometry for metabolite profiling of intact living plant tissue”

 University of Minnesota Center for Applied Phenomics

2015 “A Systems Level Understanding of Plant Metabolic Regulation in Response to Environmental Stimuli” Plant Biology Section, Cornell University

2015 “Plant metabolomics: An introduction and overview” Plant Biology Section, Cornell University

2015 “The Regulation of Plant Metabolism by Protein Acylation” Department of Horticultural

 Science, University of Minnesota

2014 “Exploring the Chemistry of Plant Biology via Mass Spectrometry” University of St.

 Thomas Chemistry Club

2014 “A Systems Biology Approach to Understanding Lysine Acetylation in the Regulation of

 Plant Metabolism” National Science Foundation Plant Genome Program awardee meeting

2014 “Direct tissue spray ionization of living plants by mass spectrometry”, Microbial Plant Genomics Institute, University of Minnesota

2014 “A Systems Biology Approach to Understanding Kidney Physiology and Plant Metabolism”

S-STEM program, NSF DUE-1060089. College of St*.* Scholastica

2013 “Mass Spectrometry Based Proteomics and Metabolomics” University of Minnesota Plant

Biological Sciences Graduate Program Orientation, Lake Itasca Biological Research Station, MN

2013 “Proteomic Profiling of the Rat Renal Proximal Convoluted Tubule in Response to Chronic

Metabolic Acidosis”, Doctoral Dissertation Defense

2012 “Regulation of Cellular Metabolism by Lysine Acetylation - Much More than Histones” Biochemistry and Molecular Biology Departmental Annual Retreat, Colorado State University

*Oral abstracts at symposia*

2014 “Direct Tissue Spray Ionization of Living Plants by Mass Spectrometry for Metabolomics”

 American Society of Plant Biologists Annual Meeting

2014 “Improved separation and detection of carotenoids by UPLC-MS/MS” Minnesota Chromatography Forum Spring Symposium

**POSTER PRESENTATIONS**

Jewett, EM, **Freund, DM**, Tivendale, ND, Hegeman AD, & Cohen JD. “Computationally Streamlined Metabolic Flux Estimation in Spirodela polyhiza Using a Simplified Metabolic Model with Single Nodes Representing Rapidly Equilibrating Metabolic Segments” (2016) American Society of Plant Biologists annual meeting (oral & poster)

Markelz RJC, Baker RL, An N, **Freund DM**, Devisetty UK, Covington MF, Brock M, Hegeman AD, Welch S, Weinig C, & Maloof JN. “Probabilistic network modeling predicts gene regulating metabolic pathway underlying QTL for high-throughput phenotyping data” (2016) American Society of Plant Biologists annual meeting (oral & poster)

Xu Y, **Freund DM**, Hegeman AD, & Cohen JD. “Metabolomics Study on Arabidopsis thaliana Combination Stress Responses” (2016) American Society of Plant Biologists annual meeting

Peters, CP, **Freund, DM**, Rendahl, AK, Cohen JD, & Hegeman AD. “Stable isotopic labeling of intact plants for molecular turnover measurement by HRMS: new labeling apparatus and data processing approaches” (2016) *J. Am. Soc. Mass Spec.* **27(S1)**

**Freund, DM**, Cohen, JD & Hegeman AD. “Emerging role of sirtuins and lysine acylation in the regulation of plant metabolism” (2016) *J. Am. Soc. Mass Spec.* **27(S1)**

Handler, N, **Freund, DM**, Brockman, SA, & Hegeman AD. “Effects of Increasing Salt Concentration on the Accuracy of Mass Spectrometry” (2016) University of Minnesota Undergraduate Research Opportunity Program (UROP) Symposium

Yang DQ, Harris B, Jiang S, Li Y, **Freund DM,** Hegeman AD & Cleary M. Inhibition of enhanced

Glucose uptake and glycolysis by KU-55933 as a novel strategy against aggressive breast cancer. (2016)

Cancer Research 76 (S4)

**Freund DM,** Cohen JD, & Hegeman AD “Metabolic Characterization of Arabidopsis thaliana

Sirtuins and Lysine Acylation” (2016) Plant and Animal Genome XXIV Conference

**Freund DM**, Cohen JD, & Hegeman AD “A Systems Biology Approach to Understanding Lysine

Acetylation in the Regulation of Plant Metabolism” (2015) National Science Foundation Plant Genome

Program awardee meeting

**Freund DM**, Radakovic A, Cohen JD, & Hegeman AD **“**Metabolic characterization of *Arabidopsis*

*thaliana* sirtuins” (2015) American Society of Plant Biologists Annual Meeting

Radakovic A, **Freund DM**, Cohen JD, & Hegeman AD "Reverse genetic studies of sirtuins assessing

protein lysine acylation in *Arabidopsis thaliana* under abiotic stresses”(2015) American Society of Plant

Biologists Annual Meeting

Fan K, Rendahl AK, Chen W, **Freund DM**, Gray WM, Cohen JD, & Hegeman AD "Analysis of

proteome-scale protein turnover in *Arabidopsis thaliana* seedlings and its application to the plant heat

stress response” (2015) American Society of Plant Biologists Annual Meeting

Xu Y, **Freund DM**, Cohen JD, & Hegeman AD “A mass spectrometry-based untargeted metabolomics

study of abiotic stress induced whole plant metabolic changes in *Arabidopsis thaliana*”(2015) American

Society of Plant Biologists Annual Meeting

Elwood J, MakiJ, & **Freund DM** “Discovering Relationships Between Lysine Ubiquitylation and

Acetylation Sites from Proteomic Datasets" (2015) Federation of American Societies for Experimental

Biology 29 (S1)

**Freund DM**, Cohen JD, & Hegeman AD “Evaluating the Role of Sirtuins in the Regulation of

Acetylation in Plant Metabolism” (2015) Keystone Symposium on Sirtuin Biology

 **Freund DM**, Martin AC, Cohen JD, & Hegeman AD “Direct Tissue Spray Ionization of Living Plants by

Mass Spectrometry for Metabolomics” (2014) American Society of Plant Biologists Annual Meeting

Pawlus AD, **Freund DM**, Gentle C, Munter D, E Starr, Kegley S, Suresh J, Wyse DL, & Hegeman AD

“Chemical profiles of American prickly ash, botanical dietary supplements from the Zanthoxylum

genera” (2014) Planta Medica 80 (10), PP36

Martin AC, **Freund DM**, Hegeman AD, & Masujima T “Real-time chemical profiling and direct

localization of living plant cell chemical contents by live single-cell mass spectrometry” (2014) JSPS

Summer Program Orientation, Hayama, Kanagawa Japan and RIKEN Quantitative Biology Center

Retreat

**Freund DM**, Martin AC, Cohen JD, & Hegeman AD “Direct Tissue Spray Ionization of Living Plants by

Mass Spectrometry for Metabolomics” (2014) *J. Am. Soc. Mass Spec.* 25(S1)

Brockman SA, Strauss MKL, **Freund DM**, Cohen JD, & Hegeman AD “Identification of potential

chemical giraffe-feeding deterrents in *Acacia robusta* using untargeted metabolomics with

LC-ESI-HRMS” (2014) *J. Am. Soc. Mass Spec.* 25(S1)

Xu Y, **Freund DM**, Plesofsky N, Brambl R, Brockman SA, Hegeman AD, & Cohen JD “Untargeted

metabolomics of *Neurospora crassa* wild type and the Os-2 mutant under heat shock stress and

2-deoxyglucose treatment” (2014) *J. Am. Soc. Mass Spec.* 25(S1)

Abate-Pella D, **Freund DM**, Ma Y, Beck B, Schymanski E, Kind T, Hegeman AD, & Boswell P

“Retention 'Projection' Enables Reliable Use of Shared HPLC Metabolite Retention Data Across Labs and

Methods” (2014) *J. Am. Soc. Mass Spec.* 25(S1)

**Freund DM**, Curthoys NP, & Prenni JE “Label Free Quantification of the Renal Mitochondria Proteome

During Metabolic Acidosis using MS/MS Total Ion Current (TIC) and Spectral Counting” (2012) *J. Am.*

*Soc. Mass Spec.* 23 (S1)

Van Treuren T, **Freund DM**, Taylor L, Michael N, Gummadi L, Curthoys NP “Expression and

Immunoprecipitation of FLAG-tagged mRNA Binding Proteins” (2011) NSF REU Molecular

Biosciences Poster Symposium, Colorado State University, Fort Collins, CO

**Freund DM**, Walmsley SJ, Curthoys NP, & Prenni JE “Quantitative Proteomic Analysis of Rat

Proximal Convoluted Tubule Cells in the Mitochondrial Renal Response to Chronic Metabolic Acidosis”

(2011) *J. Am. Soc. Mass Spec.* 22(S1)

Okayasu E, **Freund DM**, Prenni JE, Curthoys NP “Elucidation of Phosphoproteins Involved in

the Renal Cellular Response to Acute Metabolic Acidosis” (2010) NSF REU Molecular Biosciences

Poster Symposium, Colorado State University, Fort Collins, CO

**Gammelgaard DM\***, Goldstrohm, DA Broeckling CD, Curthoys NP, & Prenni JE “Proteomic Analysis

of Protein Phosphorylation in the Renal Response to Metabolic Acidosis” (2010) *J. Am. Soc. Mass Spec.*

21(S1)

**Gammelgaard DM\***,Broeckling CD, Curthoys NP, & Prenni JE “Proteomic Analysis of Protein

Regulation in the Renal Response to Metabolic Acidosis” (2010) United States Human Proteome

Organization Meeting

**Gammelgaard DM**\*, Peng J, & Wurtele ES “Reverse Genetic Studies of Genes Correlated with

 Starch or Fatty Acid Metabolism in *Arabidopsis thaliana*” (2007) NSF REU Poster Symposium

\*maiden name: Gammelgaard

**WORKSHOPS & TRAINING CERTIFICATIONS**

2016 Cold Spring Harbor Laboratory Course - Frontiers & Techniques in Plant Science, Cold Spring Harbor, NY

2014 Software Carpentry Workshop, American Society of Plant Biologists in collaboration with the

iPlant Collaborative and KBase, Portland, OR

2013 3rd Advanced Course on 13C-based Metabolic Flux Analysis Forschungszentrum Jülich GmbH, Jülich, Germany

2013 Practical LC-MS Maintenance and Troubleshooting American Society of Mass Spectrometry Short Course, Minneapolis, MN

2013 Q Exactive MS Operations Course Unity Lab Services Part of Thermo Fisher Scientific, West Palm Beach, FL

2013 Graduate Teaching Certificate, Colorado State University, Fort Collins, CO

2012 Mass Spectrometry-based Protein Phosphorylation Analysis and Phosphoproteomics, American Society of Mass Spectrometry Workshop, Boston, MA

2010 Bioinformatics for Protein Identification, American Society of Mass Spectrometry Workshop, Baltimore, MD

**CV SECTION 3: Teaching/Mentoring**

**TEACHING**

2015 NSF Plant Metabolomics Workshop Instructor, University of Minnesota. National and

international participants (graduate students, postdocs, and faculty) had minimal prior metabolomics knowledge. My role included designing and directing three hands-on laboratory sections, http://hegemanlab.cfans.umn.edu/plant-metabolomics-workshop-2015/2015

2014 HORT2100- Agricultural Biochemistry (15 lectures), University of Minnesota

2013 PBS8081 - Integrative Plant Biology: Connecting Molecules to Ecosystems (one

lecture), University of Minnesota

2012 BC403- Comprehensive Biochemistry II (one lecture), Colorado State University

2013 Graduate Teaching Certification: The Institute for Learning and Teaching (teaching

portfolio, Colorado State University,

[http://tilt.colostate.edu/proDev/gradStudents/certificates/portfolios/portfolio.cf](http://tilt.colostate.edu/proDev/gradStudents/certificates/portfolios/portfolio.cf%20m?portfolioid=284)

[m?portfolioid=284](http://tilt.colostate.edu/proDev/gradStudents/certificates/portfolios/portfolio.cf%20m?portfolioid=284)

2011 BC403- Comprehensive Biochemistry II, graduate teaching assistant, Colorado State University

2010 LIFE203- Introductory Genetics Laboratory, graduate teaching assistant, Colorado State University

2009 BC401- Comprehensive Biochemistry I, graduate teaching assistant, Colorado State University

2009 BC351-801 - Principles of Biochemistry (online course), graduate teaching assistant, Colorado State University

2008 BIO1036- Biology of the Cell (one lecture), College of St*.* Scholastica

2008 CHM1120 - General Chemistry II laboratory, undergraduate teaching assistant, College of St*.* Scholastica

2007 CHM1110 - General Chemistry I laboratory, undergraduate teaching assistant, College of St*.* Scholastica

2007-2008 Supplemental Instruction Leader for introductory chemistry and biology courses, College of St*.* Scholastica

2006-2007 Student Support Services Tutor for general and organic chemistry, biochemistry, & cell biology, College of St*.* Scholastica

**MENTORING**

*Undergraduate student training*

2015- 2016 Nadia Handler & Maria Soroka, University of Minnesota

2016 Harrison Fuchs, NSF REU intern, obtained supplemental funds from PGRP

2015 –2016 Eric Roden, University of Minnesota

2015 Aleksandar Radakovic, NSF REU intern, obtained supplemental funds from PGRP

2014-2015 Jake Elwood, College of St. Scholastica

2014-2015 Cecilia Gentle, St. Thomas University

2012-2013 Nicholas Bodmer, Colorado State University

2011-2012 Natalie Smith, Colorado State University

2011 Tim Van Treuren, NSF REU interns Summer Program in Molecular Biosciences, Colorado State University

2011 Kevin L. Schauer, Colorado State University

2010 Emi Okayasu, NSF REU interns Summer Program in Molecular Biosciences, Colorado State University

*Graduate student training*

2013-present Stephen Brockman, Yuan Xu, & Erin Evans, Ph.D. candidates

2013-2015 Kia-ting Fan Ph.D. candidate (degree obtained 2015)

2013-2014 Amanda C. Martin, Ph.D. (degree obtained 2014)

2011-2013 Kevin L. Schauer, Masters of Science (degree obtained 2013)

**CV SECTION 4: Outreach/Services**

**OUTREACH**

2015 Science Fair judge, Academy for Science and Agriculture High School, Vadnais Heights, MN

2014 Science Fair judge, Academy for Science and Agriculture High School, Vadnais Heights, MN

2012 “Biochemistry and Genetics Outreach Program”, Skyview Elementary School,

Windsor, CO. I participated in a seven-week outreach program that consisted of weekly visits to a local elementary school to conduct biochemistry and genetic experiments. The details of the outreach program are outlined in (doi: 10.1534/genetics.111.135285)

**UNIVERSITY SERVICE**

2016-2017 *Member*, Graduate and Research Policy and Review Committee for the College of Food,

Agricultural, and Natural Resource Sciences, University of Minnesota

2015-2016 *Member*, Faculty Consultative Committee, Department Horticultural Science, University of Minnesota

2015-2016 *Member*, Diversity Committee, Department of Horticultural Science, University of Minnesota

2014-2015 *Member*, Graduate and Research Policy and Review Committee for the College of Food,

Agricultural, and Natural Resource Sciences, University of Minnesota

**PROFESSIONAL SERVICE**

2015-present Ad hoc reviewer for National Science Foundation

2014-present Reviewer for various journals (e.g. Metabolites Journal, International Journal of Molecular

Sciences, Chemical Science Journal)

**PROFESSIONAL SOCIETY MEMBERSHIPS** (*italics denotes past*)

American Society of Plant Biologists, American Society of Plant Biologists Midwest Section, American

Society of Mass Spectrometry, Minnesota Mass Spectrometry Discussion Group, Metabolomics Society, American Association for the Advancement of Science, Metabolomics Association of North America *Colorado Biological Mass Spectrometry Society & United States Human Proteome Organization*