Daniel Graham Delafield

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Education

DOCTOR OF PHILOSOPHY | (MAY 2023) | UNIVERSITY OF WISCONSIN-MADISON
- Primary Field: Chemistry
- Division: Analytical Chemistry
- GPA: 4.0

MASTER OF SCIENCE | MAY 2018 | UNIVERSITY OF OKLAHOMA
- Primary Field: Chemistry
- Division: Analytical Chemistry
- GPA: 3.9

BACHELOR OF SCIENCE | MAY 2016 | UNIVERSITY OF OKLAHOMA
- Major: Biochemistry
- Minor: Music
- Honors: Cum Laude

Employment and Internships

- June 2021 – August 2021: **Summer Research Intern**, Genentech
    - Developed custom, full-stack desktop applications to automate and streamline immunogenicity assessment of drug candidates, which enabled > 99% reduction in analysis time.
    - Engineered custom user interfaces to enable high-throughput analysis of large tabular datasets, providing a 500-fold increase in data utilization.
- 2019-Present: **Ambassador**, Wisconsin Alumni Research Foundation
    - Successfully identified, summarized, and advertised gene edited cell lines in order to move them from invention to commercial license.
    - Utilized custom web scraping, literature term finding, and personal networking to identify potential technologies suitable for patent and licensing.
    - Responsible for establishing, maintaining, and utilizing network of academic and industrial researchers and disseminating procedural knowledge for technology transfer.

Research Experience

UNIVERSITY OF WISCONSIN-MADISON, LI LAB

- **Graduate Research/Teaching Assistant**, August 2018 – Present
    - Fabricated and validated PGC-enabled separation strategies that increased peptide and glycopeptide coverage by up to 20%.
    - Revealed systematic drawbacks when leveraging high temperature chromatography for enhanced separation of glycopeptide isomers.
    - Facilitated higher throughput in microfluidic capillary electrophoresis-driven bottom-up proteomics through optimization of data-independent acquisition mass spectrometry.
    - Deployed custom web-application based solutions for browsing, filtering, and sharing mass spectrometry data.
    - Implementation of informatics pipelines to establish inter- and intrasample quantitative accuracy in data-independent acquisition bottom-up proteomics.
    - Performed custom informatic analysis of MALDI-MSI datasets to normalize multiplexed datasets, extract features of interest, and perform machine learning classification.

- Development of novel online multiplexed analysis of bottom-up, middle-down, and top-down glycoconjugate species utilizing capillary electrophoresis, porous graphitized carbon liquid chromatography, ion mobility spectrometry, and mass spectrometry.

UNIVERSITY OF OKLAHOMA, WU LAB

- **Graduate Research/Teaching Assistant**, May 2016 – August 2018
  - Developed a three-dimensional method of glycopeptide purification and characterization allowing universal application, unbiased separation, and rapid recognition through the use of HPLC, concurrent fractionation, Mass Spectrometry, and Differential Ion Mobility (FAIMS). Presented at ASMS, June 2017.
  - Demonstrated correlation between differential ion mobility detection and glycopeptide analytes based on backbone variation, glycan composition, and a combination thereof.
  - Analyzed post translationally modified glycoproteins of control and SLE patient serum immunoglobulin searching for correlations to immune response and glycan features based on our previous glycopeptide purification platform.
- **Honors Research Assistant**, January 2016 – May 2016
  - Conceptualized, designed, and constructed an online affinity capture technique for immunoprecipitation application involving intensive immunoglobulin purification, original apparatus design, and top-down mass spectrometry. ASMS, June 2016.
- **Undergraduate Research Assistant**, August 2015 – January 2016
  - Determined activity of novel biomass degrading enzymes from Great Lakes fungal samples through culturing, secretome extraction, enzymatic assays, concentration determination, electrophoresis, liquid chromatography and mass spectrometry. Published in JASMS, April 2017 (Online January 2017).

Funding

- Acquisition of a Dual-Source, High-Performance, Ion Mobility, Quadrupole Time-of-Flight Mass Spectrometry System for Biomedical Research at UW-Madison (**1S10OD028473-01A1**)
  - Role: Primary Author
  - Funding Amount: $1,275,704

Publications

- **D.G. Delafield**, H.N. Miles, Y. Liu, W.A. Ricke, L. Li, (2021). "Complementary Proteome and Glycoproteome Access Revealed Through Comparative Analysis of Reversed Phase and Porous Graphitic Carbon Chromatography." *Analytical Bioanalytical Chemistry*. Invited contribution to the topical paper collection featuring **Promising Early-Career (Bio-)Analytical Researchers**. Published online February 9, 2022. 10.1007/s00216-022-03934-7.
- **D.G. Delafield**, Li, L., (2020) "Chemical Tags and Associated Strategies for Quantitative Glycoproteomics." *Molecular & Cellular Proteomics*. Published online June 23, 2020. 10.1074/mcp.R120.002095.
- **D.G. Delafield**†, H.N. Miles†, L. Li, (2020). "Recent Developments and Applications of Quantitative Proteomics Strategies for High-Throughput Cancer Biomolecular Analyses in Cancer Research. *RSC Chemical Biology*. Published online May 15, 2021. 10.1039/D1CB00039J. († Co-First Authors)
- **D.G. Delafield,** A. Phetsanthad, L. Li. "Gas Phase Fractionation, Data-Independent Acquisition for Improved Profiling Depth in Microfluidic Capillary Electrophoresis Mass Spectrometry." (In preparation)
- **D.G. Delafield**, D. Wang, H.N. Miles, L. Li. "Biphasic Reversed-Phase, Porous Graphitic Carbon Capillary Columns facilitates Comprehensive Bottom-up Glycoproteomics." (In preparation)
- **D.G. Delafield,** H.N. Miles, W.A. Ricke, L. Li. "Higher Temperature Porous Graphitic Carbon Separations Differentially Impact Distinct Glycopeptide Classes." (In preparation)
- **D.G. Delafield**, H.N. Miles, W.A. Ricke, L. Li. "Non-tryptic Enzymatic Cleavage for Improved PGC-Based Glycoproteomic Profiling." (In preparation)
- **D.G. Delafield**, H.N. Miles, W.A. Ricke, L. Li. "Six-plex Isobaric Labeling Reveals Glycosylation Dysregulation Across Benign, Metastatic, and Tumorigenic Prostate Cancer." (In Preparation)

- **D.G. Delafield†,** X. Zhong†, L. Li. "Sample Agnostic Spectral Libraries Improve Profiling Depth in Data Independent Analysis of Cerebrospinal Fluid." (In preparation) († Co-First Authors)
- **D.G. Delafield†,** X. Zhong†, L. Li. "Enhanced Proteomic Coverage Enabled through BoxCar DIA and Sample Agnostic Spectral Libraries." (In preparation) († Co-First Authors)
- **D.G. Delafield†,** H.N. Miles, W.A. Ricke, L. Li. "Sample Agnostic Spectral Libraries Reveal Underlying Molecular Pathways in Aggressive Metastatic Prostate Cancer." (In preparation)
- **D.G. Delafield**, C. Kaminsky, G. Liu, L. Li. "High-End Ion Mobility Mass Spectrometry: A Current Review of Analytical Capacity in Omics Applications and Structural Investigations." (In submission)
- M. Ma, Q. Yu, **D.G. Delafield**, Y. Cui, Z. Li, W. Wu, X. Shi, A. Gutierrez, P.R. Westmark, M. Xu, C.J. Westmark, L. Li. "On-tissue Spatial Proteomics Integrating MALDI-MS Imaging with Shotgun Proteomics Reveals Soy Consumption-induced Biomarkers in a Fragile X Syndrome Mouse Model". *Nature Communications. (*In submission)
- N. Wang, N. Wang, S. Yu, H. Zhang, S. Tang, D. Wang, W. Lu, H. Li, D.G. Delafield, Y. Kong, X. Wang, C. Shao, L. Lv, G. Wang, R. Tan, N. Wang, H. Hao, H. Ye (2022) "Cyclic Immonium Ion of Lactyllysine Reveals Widespread Lactylation in the Human Proteome," *Nature Methods*. Published online June 28, 2022. 10.1038/s41592-022-01523-1.
- Z. Li, D. M. Tremmel, F. Ma, Q. Yu, M. Ma, **D.G. Delafield**, Y. Shi, B. Wang, S. A. Mitchell, A. K. Feeney, V. S. Jain, S. D. Sackett, J. S. Odorico, L. Li (2020) "Proteome-wide and Matrisome-specific Alterations during Human Pancreas Development and Maturation," *Nature Communications*. Published online February 15, 2021. 10.1038/s41467-021-21261-w.
- Ruiz, M., Y. Yang, C. A. Lochbaum, **D. G. Delafield**, J. J. Pignatello, L. Li and J. A. Pedersen (2019). "Peroxymonosulfate Oxidizes Amino Acids in Water without Activation." *Environmental Science and Technology*. *53*, 10845-10854.
- Li, G., **D.G. Delafield,** L. Li (2019). "Improved Structural Elucidation of Peptide Isomers and Their Receptors Using Advanced Ion Mobility-Mass Spectrometry." *Trends in Analytical Chemistry*. Published online, June 4, 2019, in press, https://doi.org/10.1016/j.trac.2019.05.048.
- Y Shi, Z. Li, B. Wang, X. Shi, H. Ye, **D.G. Delafield**, L. Lv, Z. Ye, Z. Chen, F. Ma, L. Li (2021) Enabling Global Analysis of Protein Citrullination and Homocitrullination via Biotin Thiol Tag-assisted Mass Spectrometry. *Chemical Science..* (In submission). https://www.researchsquare.com/article/rs-215281/v1
- G. Li, C. Jeon, M. Ma, Z. Zheng, **D.G. Delafield**, E. Romanova, J. Sweedler, B. Ruotolo, L. Li, "Site-specific Chirality-conferred Structural Compaction Differentially Rescues the Cytotoxicity of Aβ42" *Angewandte Chemie* (In Submission)
- Y. Liu, **D.G. Delafield**, L. Li "Comprehensive Mass Spectrometric Characterization of Neuropeptidome in Nervous System of the Atlantic Blue Crab, *Callinectes sapidus*," *Analytical Chemistry*, to be submitted.
- Ma, H., **D. G. Delafield**, Z. Wang, J. You and S. Wu (2017). "Finding Biomass Degrading Enzymes Through an Activity-Correlated Quantitative Proteomics Platform (ACPP)." *Journal of American Society for Mass Spectrometry*. *28,* 655-663.

Presentations

- Delafield, D.G.; Li, L. "Evaluation of Porous Graphitic Carbon at Elevated Temperatures for Glycopeptide Analyses: Impacts on Signal Suppression, Reduced Identification and Quantitative Inaccuracies" ASMS 2022 (poster).
- **Delafield, D.G.**; Xia, J.; Li, L. "High Resolution Demultiplexing Ion Mobility: A New Paradigm for Intact Glycopeptide Structural Assignment" ASMS 2021 (poster).
- **Delafield, D.G.**; Cui, Y.; Li, L. "Uncovering Glycoprotein Structural and Compositional Heterogeneity Through Capillary Electrophoresis-Ion Mobility Mass Spectrometry" ACS Fall Meeting 2021 (**oral**).
- **Delafield, D.G.**; Li, L. "Enhancing Glycopeptide Detection, Identification, and Structural Characterization through PGC-Incorporated LC-MS" Pittcon 2021 (**oral**).
- **Delafield, D.G.**; Li, L. "Enhancing Glycopeptide Detection, Identification, and Structural Characterization through PGC-Incorporated LC-IMS" ASMS 2020 (poster).

- **Delafield, D.G.**; Li, G.; Li, L. "Pursuit of Bottom-Up, Middle-Down, and Top-Down Glycoconjugate Analysis Enabled Through Online CE-ESI-IMS" ASMS 2019 (poster).
- **Delafield, D.G.**; Wang, Z.; Baird, M.A.; Shvartsburg, A.; Wu, S. "Characterization Analysis of Glycopeptides Through Arrival Time Correlation using Concurrent RPLC Fraction Monitoring and FAIMS Filtering" ASMS 2018 (poster).
- **Delafield, D.G.,** N-Glycopeptide Feature Identification by Revealing Trends Between Analyte Composition and Compensation Field Through FAIMS-Coupled MS Platform" US HUPO 2018 (**oral**).
- **Delafield, D.G.**; Wang, Z.; Baird, M.A.; Shvartsburg, A.; Smith, K.; Wu, S. "Three-Dimensional Platform for N-Linked Glycopeptide Separation and Analysis" ASMS 2017 (poster).
- **Delafield, D.G.**; Wang, Z.; Woodard, T. Wu, S. "Magnetic Resin Microreactor for Affinity-Capture Top-Down Mass Spectrometry" ASMS 2016 (poster).

Awards and Honors

- **2022:** Chemistry Department Travel Award
  - Application Based
- **2022**: Department of Chemistry Harold Hay Fellowship
  - Nomination Based
- **2019**: Student Research Travel Grant
  - Application-based.
- **2018**: Honored Instructor Award
  - Student nomination based. Awarded in recognition of challenging, helpful and inspirational teaching.
- **2018**: ASMS Travel Grant
  - Application-based.
- **2017**: Head Teaching Assistant
  - Merit-based. Awarded for significant display of teaching aptitude, leadership, and organization.
- **2017**: Certificate of Distinction in Teaching
  - Evaluation-based. Awarded to the top 10% of all Graduate Teaching Assistants at the University.
- **2017**: College of Arts & Sciences Travel Grant
  - Application-based.
- **2016**: Scott Laing Outstanding Undergraduate Research Award
  - Nomination/Committee-based. Awarded for significant accomplishments as an undergraduate researcher.
- **2016**: Honors Research Assistant
  - Application-based appointment. Awarded in recognition of significant contribution to ongoing and future research.
- **2016**: Outstanding Senior Man Award
  - Peer vote based. Awarded in recognition of superior contribution, peer relationships, and valuable talent.
- **2016**: J. Lee Burke Outstanding Student Achievement Award
  - Nomination/Committee-based. Awarded for outstanding service, achievement, and organizational success.

Teaching Experience and Community Involvement

- **Teaching Assistant**, August 2018-May 2019
  - Formulated and delivered bi-weekly lesson plans based on outlined course objectives
  - Assisted in exam writing and proofing
  - Aided student groups in the development of unique experiment design and result presentation
- **Head Teaching Assistant**, August 2017-May 2018
  - Coordinated teaching schedules, materials, and lesson plans for 57 Teaching Assistants across 71 classes
  - Served as primary contact between professors of record and 2,000+ undergraduate students

    - Led teaching assistants through development of weekly instruction, grading expectations, and lesson preparation
    - Reviewed and rewrote exam material based on learning objectives

- **Teaching Assistant**, August 2016-May 2017
    - Designed interactive lessons based on course learning objectives
    - Promoted individual and group demonstration of knowledge
    - Created, submitted, explained, and graded weekly assignments

- **Norman North High School**, 2015-2017
    - Formulated and implemented lesson plans for groups small and large
    - Assisted team members in goal-based teaching strategies
    - Adapted learning concepts to promote growth and retention

Professional Affiliations

- **American Society for Mass Spectrometry (ASMS)**
- **United States Human Proteome Organization (U.S. HUPO)**