

Emma R. Guiberson, PhD
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EDUCATION AND TRAINING

Postdoctoral Scholar, Microbiology and Immunology September 2022 – July 2024
Stanford University, Palo Alto, CA
Faculty Sponsor: Dr. Justin Sonnenburg

Ph.D., Chemistry August 2022
Vanderbilt University, Nashville, TN
Advisors: Dr. Richard Caprioli, Dr. Jeffrey Spraggins, Dr. Eric Skaar

B.S., Chemistry and Philosophy May 2018
University of Notre Dame, Notre Dame, IN

RESEARCH EXPERIENCE

Sonnenburg Laboratory Fall 2022 – Spring 2024
Dr. Justin Sonnenburg, Stanford University
Postdoctoral Scholar
Project: Microbiota-Dependent Metabolomic Changes After Nutritional Intervention During Pregnancy

- Harnessed and updated an untargeted library-based metabolomics pipeline for the detection and identification of microbial-derived metabolites (MDMs) from biological samples using a LC-qTOF
- Established and developed targeted mass spectrometry methods for quantitation and high-level identification of MDMs of interest in biological samples using a triple quadrupole instrument
- Project focused on studying MDM metabolomic changes resulting from a dietary intervention via fecal samples from undernourished pregnant women in Burkina Faso throughout their pregnancy in collaboration with the Gates Foundation

Mass Spectrometry Research Center Fall 2018 – Summer 2022
Dr. Richard Caprioli, Vanderbilt University
Graduate Research Assistant
Dissertation Project: Discovery of Bile Acid-Associated Molecular Changes in the Murine Gastrointestinal Tract during *Clostridioides difficile* Infection

- Project focused on investigating bile acid changes during *Clostridioides difficile* infection in a murine model using both MALDI imaging mass spectrometry applied to gastrointestinal tissue and targeted quantitation using LC-MS/MS
- Developed a sample preparation method for gastrointestinal tissue with intact luminal content for MALDI imaging
- Applied standard microbiology techniques including cell culture, RNA sequencing, qPCR to investigate the impact of bile acid changes on the host

Secondary Project: Spatially-targeted Proteomics for the Analysis of *Staphylococcus aureus* Abscess Formation

- Applied a spatially-targeted LESA-based proteomics workflow (termed microLESA) to investigate the abscess interface during *Staphylococcus aureus* infection in murine kidneys

Naval Nuclear Laboratory- Radiochemistry

Jeff Wetzler, Bechtel Marine Propulsion Corporation

Research Intern

Summer 2017
and 2018

Project: Optimization of a Portable Liquid Scintillation Counter

- Developed and optimized a portable liquid scintillation counter for deployment in the field after nuclear disasters using tritium standards to measure radioactivity in water sources

Warren Family Drug Development and Discovery Facility

Dr. Bruce Melancon, University of Notre Dame

Undergraduate Research Assistant

Fall 2015 –
Fall 2016

Project: Full synthesis of AR-42

- Obtained skills in synthesis, recrystallization, purification and spectral analysis procedures
- Ran procedural research on determining optimum conditions for synthesis reactions and contributed to a cataloging project within the group
- Independent research project focused on synthesis of the compound AR-42

TEACHING EXPERIENCE

Preparing Future Professors Program

Winter 2024

University of San Francisco and Stanford University | *San Francisco, CA*

- Selected for the Stanford Preparing Future Professors program which pairs postdocs and graduate students with faculty at teaching institutions in the surrounding area for mentorship
- Participation in a weekly practicum course to discuss teaching, service and research at a teaching institution led by the program in addition to weekly shadowing of my faculty mentor
- Guest lecture for a Microbiology course at U. San Francisco

Bucknell Aspiring PUI Workshop

Sept. 2023

Bucknell University | *Lewisburg, PA*

- One of 14 individuals selected for a 2-day working for aspiring PUI professors sponsored by Bucknell University
- Guest-lectured for General Chemistry course at Bucknell

Biosciences Mini-Course Primary Instructor

Fall 2023 –
Winter 2024

Developing LC-MS/MS Targeted Assays Course | Stanford University| *Palo Alto, CA*

- Primary instructor for a mini-course focused on developing LC-MS/MS targeted assays in both the Fall and Winter quarter (BIOS 223)
- Fully developed and designed 3-week course for ~15 graduate students, which included a lab component in collaboration with the Stanford University Mass Spectrometry facility

- Solely responsible for course design, including developing learning goals and corresponding authentic assessments

Certificate in College Teaching Facilitator

Fall 2021 –
Fall 2022

Center for Teaching | Vanderbilt University | *Nashville, TN*

- Served as an instructor/facilitator for the Certificate in College Teaching (CiCT) program through the Vanderbilt Center for Teaching
- Facilitated the second semester, the practicum, for two semesters as the primary instructor for approximately 20 graduate students and postdocs per semester in the program
- Developed the course, gave continued feedback on materials to students, and regularly met with the CFT staff

Workshop Leader

April 2022

Analytical Imaging Mass Spectrometry Course | Vanderbilt University | *Nashville, TN*

- Served as a workshop leader and assistant for the annual AIMS course at Vanderbilt University
- Responsible for both designing and leading a workshop with a hands-on component on “Sample Prep: Fresh frozen staining and autofluorescence”
- Assisted in leading and designing two additional workshops on “Matrix Applications: Manual Spray Coating” and “Data Processing: SCiLS”
- Full workshop included 40 participants, and each workshop was led 4 times for groups of 10 individuals.

Teaching Affiliate

Fall 2019 –
Fall 2022

Center for Teaching | Vanderbilt University | *Nashville, TN*

- Served as a Teaching Affiliate through the CFT as a representative of the Chemistry Department for 4 years
- Participated in a week of training to discuss inclusive teaching, assessment strategies, and development of our individual courses
- Tailored course to be specific to laboratory courses within the department
- Led a check-in with participants at the end of the semester to gather feedback to improve future TAO sessions
- Adapted the course in 2020 to be taught virtually over 3 days

Co-Instructor

Winter 2020

The School for Science and Math at Vanderbilt | Vanderbilt University | *Nashville, TN*

- Served as part of a student team through the Chemical Biology Association of Students (CBAS) to develop a class for the SSMV summer program
- Course focused on natural product discovery and antibiotic resistance in bacteria, including bacterial culture, physiology tests, and tests for antibiotic resistance
- Fully designed the course and experiments, but course was canceled due to COVID-19

Workshop Assistant

April 2019

Analytical Imaging Mass Spectrometry Course | Vanderbilt University | *Nashville, TN*

- Served as a workshop assistant for the annual AIMS course at Vanderbilt
- Assisted in the design and leading of a workshop on “Small Volumes: Spatially Targeted Analyses”

Graduate Teaching Assistant – Physical Chemistry Laboratory

Fall 2018

Vanderbilt University Department of Chemistry | *Nashville, TN*

- Aided in the re-design of Physical Chemistry laboratory course
- Led two lab sections of CHEM 3315 on FT-IR spectroscopy
- Responsible for leading the lab, grading reports with detailed feedback, and writing and grading pre-lab quizzes
- Gave an introductory lecture on the lab at the beginning of the semester to introduce students to the technique of FT-IR spectroscopy

Graduate Teaching Assistant – General Chemistry Laboratory

Spring 2019

Vanderbilt University Department of Chemistry | *Nashville, TN*

- Lead instructor for two sections of the General Chemistry laboratory course
- Prepared for ten different labs designed to highlight various chemical concepts, and presented a pre-lab lecture on these concepts each week
- Responsible for grading lab notebooks and lab reports and holding weekly office hours for students

Laboratory Course Development

Spring 2017

University of Notre Dame | *Notre Dame, IN*

- Notre Dame Laboratory Instrumentation Giving Hope to Students program
- Designed and developed a full laboratory experiment for high school students utilizing donated lab equipment
- Optimized a donated centrifuge and pH meter for use in a high school, and developed a lab for teaching the concept of acidity
- Wrote a full lab manual for the course for both the teacher and the students with suggested questions, a protocol, and operation instructions

Teaching Assistant

Spring 2016

Center for Bright Kids Summer Program | *Golden, CO*

- Served as a teaching assistant for three courses through the Center for Bright Kids (CBK) summer program
- Program spanned from 3rd grade through high school via three separate camps targeted at gifted children
- Assisted with a neurobiology course, which included labs such as a brain dissection, and course on the Philosophy of Reality which included moderating various groups discussions and debates
- Taught Formal Logic as a TA for 2 weeks and the primary instructor for the third week

PEDAGOGICAL TRAINING

Undergraduate Research Assistant

Spring 2017 –
Spring 2018

Center for STEM Education | University of Notre Dame | *Notre Dame, IN*

- Research evaluating the impact of active learning strategies on class test scores in K-12 STEM education courses
- Utilized qualitative evaluation techniques of recordings of STEM teachers in the classroom.

Certificate in College Teaching

Completed
Spring 2020

Center for Teaching | Vanderbilt University | *Nashville, TN*

CIRTL@ Stanford Teaching Certificate

In Progress

Center for Teaching and Learning | Stanford University | *Palo Alto, CA*

TEACH Conference
Teaching Commons | Stanford University | *Palo Alto, CA*

May 2023

IDEAL Pedagogy Course
Center for Teaching and Learning | Stanford University | *Online*

Completed
July 2023

FUNDING

Vermont Biomedical Research Network (VBRN) Pilot Award	Spring 2025
ASMS Research Award at Primarily Undergraduate Institution	Spring 2025
• \$20,000 award from Agilent Technologies	
Stanford Mass Spectrometry Training Seed Program for Hands-On Platforms	Spring 2023
MSACL Young Investigator Educational Grant	Spring 2023
T32 Molecular Basis of Host Parasite Interaction	Fall 2022
• Project number 5T32AI007328-35	
Graduate School Travel Grant	Spring 2022
• Awarded by Vanderbilt Graduate School	
Mass Spectrometry & Advances in the Clinical Laboratory (MSACL) Young Investigator Educational Grant	Spring 2020
Graduate School Travel Grant	Spring 2020
American Society of Mass Spectrometry Student Stipend	Spring 2019
Vanderbilt Microbiome Venture Fund	Fall 2019
• “Spatially-Targeted Proteomics of Bacterial Proteins in the Human Gut Microbiota” Proposal Funded	

PUBLICATIONS

1. **Guiberson ER***, Wexler AG*, Beavers WN, Washington MK, Shupe JA, Lacey DB, Caprioli RM, Spraggins JM, Skaar EP. “*Clostridioides difficile* infection induces a rapid influx of bile acids into the gut during colonization of the host.” *Cell Reports*. **2021**. (36) DOI: 10.1016/j.celrep.2021.109683
*Equal Contributions
2. **Guiberson ER**, Good CJ, Wexler AG, Skaar EP, Spraggins JM, Caprioli RM. “Multimodal Imaging Mass Spectrometry of Murine Gastrointestinal Tract with Retained Luminal Content.” *JASMS*. **2022**. (33) 1073-1076. DOI: 10.1021/jasms.1c00360
3. **Guiberson ER***, Weiss A*, Ryan DJ, Monteith AJ, Sharman K, Gutierrez DB, Perry WJ, Caprioli RM, Skaar EP, Spraggins JM. “Spatially-targeted proteomics of the host-pathogen interface during staphylococcal abscess formation.” *ACS Infect. Dis.* **2021**. (7) 101-113. DOI: 10.1021/acsinfecdis.0c00647
4. Han S, **Guiberson ER**, Li, Y, Sonnenburg JL. High-throughput identification of gut microbiome-dependent metabolites. *Nat Protoc* 19, 2180–2205 (2024). DOI: 10.1038/s41596-024-00980-6
5. Sharman K, Patterson NH, Weiss A, Neumann EK, **Guiberson ER**, Gutierrez DB, Spraggins JM, Van de Plas R, Skaar EP, Caprioli RM. “Analyzing High-Dimensional Spatially Targeted Proteomics Data to Investigate *Staphylococcus aureus* Infection.” *J. Proteome Res.* **2022**. DOI: 10.1021/acs.jproteome.2c00206

6. Rivera ES, Jones MA, **Guiberson ER**, & Norris JL (2020). Fundamentals of Mass Spectrometry-Based Metabolomics. In G. Sindona, J. H. Banoub & M. L. Di Gioia (Eds.), *Toxic Chemical and Biological Agents: Detection, Diagnosis and Health Concerns* (pp. 61-81). Springer. DOI: 10.1007/978-94-024-2041-8_4
7. Voogdt CGP, Tripathi S, Bassler SO, McKeithen-Mead SA, **Guiberson ER**, et. al. "Randomly barcoded transposon libraries for gut commensals II: exploiting libraries for functional genetics." *Cell Reports*. **2024**. (43) DOI: 10.1016/j.celrep.2023.113519
8. Shriver AL, Sun J, Culver R, Violette A, Wynter C, Drescher SP, Sekhon PK, Nieckarz M, Friess L, Carlson HK, Wong D, Higginbottom S, Waglerz M, WAng W, Knapp BD, **Guiberson ER**, et. al. "Genome-scale resources in the infant gut symbiont *Bifidobacterium breve* reveal genetic determinants of colonization and host-microbe interactions." *Cell*. **2025**. (188) DOI:10.1016/j.cell.2025.02.010
9. Nicholson MR, Ma S, Strickland BA, Cecala M, Zhang L, Reasoner S, **Guiberson ER**, et. al. "The Gut Microbiome and Butyrate Differentiate *Clostridioides difficile* Colonization and Infection in Children." *Accepted at Journal of Infectious Disease*.

AWARDS

Midd.data Mini Grant	Fall 2024
ASMS Postdoctoral Career Development Award	Summer 2023
\$5,000 grant awarded	
VICB Richard Armstrong Prize for Research Excellence in Chemical Biology Research	Summer 2022
Awarded to a graduate student who has conducted exceptional research in chemical biology	
Outstanding Individual Research Proposal	Spring 2022
Outstanding Chemistry Forum Presentation Award	Spring 2021
Department of Chemistry and Biochemistry Leadership Award, U. Notre Dame	Spring 2018
Awarded to a senior student in the department for outstanding and lasting contributions to the department and student experience	

SERVICE

Middlebury Goldwater Review Committee	September 2025 - Present
CTLR Advisory Committee	August 2025 - Present
MSACL Attendee Engagement Committee Founder	Sept. 2024- Sept. 2025
Oral Session Chair (Microbes and the Microbiome) for ASMS 2024	January 2024 – June 2024
Co-Chair for Department of Microbiology & Immunology Seminar Series	July 2023 - June 2024
Females in Mass Spectrometry (FeMS) Events Committee	July 2023 – Present
Reviewer for <i>Journal of the American Society for Mass Spectrometry</i>	June 2023 – Present
Sonnenburg Lab DEI Committee	Spring 2023 – Present
MSACL Metabolomics Session Co-Chair	April 2023
Guest Lecturer for AP Chemistry Class, <i>Air Academy High School</i>	September 2022
Chemistry Forum Committee	Fall 2019 – Spring 2021
Chair, 2020-2021	
President, <i>Graduate School Honor Council</i>	Summer 2020 – 2021

Vice President, <i>Graduate School Honor Council</i>	Summer 2019 – 2020
Vanderbilt Chemistry Department Recruitment Grad Student Representative	Spring 2019 – Spring 2022
Communications in Science Conference, <i>Atlanta</i>	Spring 2019
Selective conference focusing on developing scientific communications skills, accompanying financial award for travel	
Departmental Representative, <i>Graduate Student Council</i>	Fall 2018 – Spring 2019
Undergraduate Representative for Recruitment Weekend, <i>ND Chemistry Department</i>	Spring 2018
Guest Speaker for STEM Club, <i>Discovery Canyon Middle School</i>	March 2017
Notre Dame Chemistry and Biochemistry Mentoring Program	Fall 2016 – Spring 2018
Program Head, 2017-2018	

PRESENTATIONS

ORAL PRESENTATIONS

Invited: Bile Acid-Associated Changes in the Murine Gastrointestinal Tract during <i>Clostridioides difficile</i> Infection <i>M2P2 Dartmouth Retreat, Lake Morey, VT</i>	Feb. 2025 ³
Microbiota-Dependent Metabolomic Changes After Nutritional Intervention During Pregnancy <i>Mass Spectrometry & Advances in the Clinical Laboratory, Monterrey, CA</i>	April 2023
Pregnancy and the Microbiome: A Metabolomics Approach <i>CZ Biohub Inter-lab Confab Lightning Talk, San Francisco, CA</i>	April 2023
<i>Clostridioides difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine Gastrointestinal Tract <i>Chemical Biology Association of Students Symposium, Armstrong Prize Seminar, Nashville, TN</i>	Aug. 2022
<i>Clostridioides difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine Gastrointestinal Tract <i>Chemical Biology Association of Students Seminar, Nashville, TN</i>	Mar. 2022
<i>Clostridioides difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine Gastrointestinal Tract <i>American Society for Mass Spectrometry Annual Conference, Philadelphia, PA</i>	Nov. 2021
<i>C. difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine GI Tract <i>Mass Spectrometry & Advances in the Clinical Laboratory EU, Virtual</i>	Sep. 2021
Discovery of Bile Acid-Associated Molecular Changes in Murine GI Tract during <i>C. difficile</i> Infection <i>Just Another Chemistry Webinar Series, Virtual</i>	June 2021
Discovery of Bile Acid-Associated Molecular Changes in Murine GI Tract during <i>C. difficile</i> Infection <i>Chemistry Forum Seminar, Vanderbilt University, Nashville, TN</i>	Jan. 2021
Awarded “Outstanding Chemistry Forum Presentation” from Chemistry Department	

Spatially-Targeted Proteomics for Analysis of Host-Pathogen Interactions in <i>Staphylococcus aureus</i> <i>Lightning talk for Imaging Mass Spectrometry Society International Poster Gala, Virtual</i>	Dec. 2020
Spatially-targeted Proteomics for Analysis of <i>Staphylococcus aureus</i> Abscess Formation <i>Mass Spectrometry & Advances in the Clinical Laboratory, Palm Springs, CA</i>	July 2020
Spatially-targeted Proteomics for Analysis of <i>Staphylococcus aureus</i> Abscess Formation <i>American Society for Mass Spectrometry Annual Conference, Houston, TX</i>	June 2020
Imaging Mass Spectrometry of the <i>Clostridioides difficile</i> Infected Gastrointestinal Tract <i>NATO Advanced Study Institute G5535, Cetraro, Italy</i>	Oct. 2019

POSTERS

Changes in Infant Health-Related Metabolites During Pregnancy After a Nutritional Intervention <i>Mass Spectrometry & Advances in the Clinical Library, Monterrey, CA</i>	Mar. 2024
Microbiota-Dependent Metabolomic Changes After Nutritional Intervention During Pregnancy <i>American Society for Mass Spectrometry Annual Conference, Houston, TX</i>	June 2023
Microbiota-Dependent Metabolomic Changes After Nutritional Intervention During Pregnancy <i>CZ Biohub Inter-lab Confab, San Francisco, CA</i>	April 2023
<i>C. difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine GI Tract <i>Gordon Research Conference, Microbial Toxins and Pathogenesis, Southbridge, MA</i>	July 2022
<i>C. difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine GI Tract <i>Gordon Research Seminar, Microbial Toxins and Pathogenesis, Southbridge, MA</i>	July 2022
<i>C. difficile</i> Infection Causes a Rapid Influx of Bile Acids in the Murine GI Tract <i>Vanderbilt Institute for Infection, Immunology and Inflammation Symposium, Nashville</i>	April 2022
Mapping Molecular Interactions in the <i>C. difficile</i> Infected Gastrointestinal Tract Using Multimodal IMS <i>Imaging Mass Spectrometry Society, Colorado Springs, CO</i>	Oct. 2021
Spatially-targeted Proteomics for Analysis of <i>Staphylococcus aureus</i> Abscess Formation <i>VICB Student Research Symposium, Nashville, TN</i>	Aug. 2020
Spatially-targeted proteomics for the analysis of <i>Staphylococcus aureus</i> Abscess Formation <i>Vanderbilt Institute of Infection, Immunology and Inflammation Symposium (VI4), Nashville, TN</i>	June 2020
Mapping Bile Acids in the <i>Clostridioides difficile</i> Infected GI Tract Using Multimodal IMS <i>Digestive Disease Research Center Retreat, Nashville, TN</i>	Mar. 2020
Mapping Molecular Interactions in the <i>C. difficile</i> Infected Gastrointestinal Tract Using Multimodal IMS <i>NATO Advanced Study Institute G5535, Cetraro, Italy</i>	Oct. 2019

Using Multimodal IMS to Map Molecular Interactions in the <i>C. difficile</i> Infected Gastrointestinal Tract <i>VICB Student Research Symposium, Nashville, TN</i>	Aug. 2019
Mapping Molecular Interactions in the <i>C. difficile</i> Infected GI Tract Using Multimodal IMS <i>American Society for Mass Spectrometry Annual Conference, Atlanta, GA</i>	June 2019
Mapping Molecular Interactions in the <i>C. difficile</i> Infected Gastrointestinal Tract Using Multimodal IMS <i>Vanderbilt Institute of Infection, Immunology and Inflammation Annual Symposium, Nashville, TN</i>	April 2019

STUDENT POSTERS

Investigating Oral Microbial Growth in Various Sugar Sources Under Aerobic and Anaerobic Conditions - Presented by <u>Penny Ly</u> <i>M2P2 Dartmouth Retreat, Lake Morey, VT</i>	Feb. 2025
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STUDENTS MENTORED

Pearl Dlamini, <i>Undergraduate Thesis Student</i> (Middlebury College)	AY 2024-2025
• Awarded the 2024 Senior Research Project Supplement Grant	
Caroline Lawler	2025
Penny Ly, <i>Undergraduate Research Assistant</i> (Middlebury College)	AY 2024-2025
Roxy Alvarado, <i>Undergraduate Research Assistant</i> (Middlebury College)	AY 2024-2025
Elisa Caffrey, <i>Graduate Student in Sonnenburg Lab</i> (Stanford University)	Fall 2022 – 2024
Jacquelyn Spathies, <i>Rotation Student in Spraggins Lab</i> (Vanderbilt University)	Summer 2022

Thesis Committees

Andrew Planting, <i>Thesis Committee Member</i>	AY 2024-2025
Taylor Han, <i>Thesis Committee Member</i>	AY 2024-2025

PROFESSIONAL MEMBERSHIPS

American Society of Mass Spectrometry	2019 – Present
American Society for Microbiology	2021 – Present
Imaging Mass Spectrometry Society	2021 – Present
American Chemical Society	2023 – Present