Sarah Mersch

Department of Chemistry & Biochemistry
University of Minnesota- Duluth

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Education

Northwestern University

PhD. Chemistry — Expected 2028
Starting Fall 2023

University of Minnesota-Duluth

M.S. Chemistry & Biochemistry, Physics Minor — June 2023
Comparative Methodologies for Protein-Protein Interactions of a Novel Crowding Sensor: Ensemble versus Single-Molecule Studies

Gustavus Adolphus College

B.A. Chemistry, B.A. Environmental Studies — May 2021

Research Experience

Graduate (PhD) Student, Northwestern University — Fall 2023

Department of Chemistry
Advisor: TBD

Graduate (MS) Student, University of Minnesota- Duluth — 2021-2023

Department of Chemistry and Biochemistry
Advisors: Ahmed Heikal and Erin Sheets

- Perform transfection, culturing, and purification of fluorescent protein from *E. coli* via affinity chromatography and verify using SDS-PAGE.
- Characterization of fluorescent protein biosensors using steady-state fluorescence spectroscopy, fluorescence correlation spectroscopy, time-resolved fluorescence lifetime spectroscopy, time-resolved fluorescence depolarization anisotropy, and fluorescence lifetime imaging microscopy. Develop data analysis protocols for the aforementioned spectroscopic techniques.
- Disseminate results via scientific publications and presentations at academic conferences.
- Mentor graduate and undergraduate students in lab techniques, data analysis, data interpretation, and presentations.
    - Graduate Students: Clint McCue

- Undergraduate Students: Sarah Bergman (currently, graduate student, University of Minnesota School of Public Health), Austin Yang (currently, student, University of Minnesota Pharmacy School), Dan Bamigbade (currently, Sophomore), Cody Staydohar (currently, student, University of Minnesota Duluth Pharmacy School)

Undergraduate Summer Researcher, Gustavus Adolphus College 2019

Department of Chemistry
Advisor: Jeff Jeremiason

- Analyzed heavy metal isotopes in African lacustrine sediment core using inductively coupled plasma mass spectrometry (ICP-MS). Involved sediment digestion, digest preparation, mass spectrometry analysis, data interpretation, and presentation.
- Funded by Gustavus Adolphus College Presidential Student-Faculty Collaboration Summer Research Grant

Research Publications

Mersch, Brink, Simonet, Boersma, Sheets, Heikal. 2022. Ultrafast Laser Spectroscopy for Protein-Protein Interactions and Bioenvironmental Sensing. *Proceedings of SPIE*. DOI: 10.1117/12.2635951

Mersch, Bergman, Yang, Boersma, Sheets, Heikal. 2023. Translational Diffusion and Molecular Brightness Analysis of Novel mEGFP-Linker-mScarlet-I Crowding Biosensor using Fluorescence Correlation Spectroscopy. **Manuscript in Progress.**

Mersch, Bergman, Boersma, Sheets, Heikal. 2023. Time-Resolved Two-Photon Fluorescence Dynamics of a Novel mEGFP–linker–mScarlet–I Crowding Biosensor. **Manuscript in Progress.**

McCue, **Mersch**, Sheets, Heikal. 2023. Environmental Ionic-Strength Sensing using Donor-Linker-Acceptor Construct: From Single-Molecule to Ensemble Studies. *Proceedings of SPIE*. **Manuscript in Progress.**

Conference Presentations

Mersch, Bergman, Boersma, Sheets, Heikal. **2023.** Time-resolved two-photon fluorescence dynamics of a novel mEGFP–linker–mScarlet–I crowding biosensor. *Annual Biophysical Society Meeting,* San Diego (Feb 20, 2023) 193-Pos.

Bergman, **Mersch**, Yang, Bamigbade, Boersma, Sheets, Heikal. **2023.** Wavelength-dependent fluorescence fluctuation and molecular brightness analysis of a novel mEGFP-linker-mScarlet-I crowding biosensor at the single–molecule level. *Annual Biophysical Society Meeting,* San Diego (Feb 22, 2023) 2270-Pos.

Mersch, Brink, Simonet, Boersma, Sheets, Heikal. 2022. Integrated laser-induced fluorescence spectroscopy of donor-linker-acceptor constructs for bioenvironmental sensing. *SPIE*, Ultrafast Nonlinear Imaging and Spectroscopy X, San Diego (August 21- 25, 2022), Invited Talk. (12228-15).

Mersch, Brink, Simonet, Yang, Heikal, Sheets. **2022.** Comparing Different Modalities of Time-Resolved Two-Photon Fluorescence Measurements for FRET Analysis. *Annual Biophysical Society Meeting,* San Francisco (February 22, 2022) 2014-Pos.

Brink, **Mersch**, Simonet, Bergman, Boersma, Heikal, Sheets. **2022.** Examining the Donor Effect on FRET Efficiency of Macromolecular Crowding Sensors. *Annual Biophysical Society Meeting,* San Francisco (February 22, 2022) 1632-Pos.

Simonet, Brink, **Mersch**, Staydohar, Boersma, Heikal, Sheets. **2022.** Two-Photon Fluorescence Depolarization Dynamics of Ionic Strength FRET Biosensors. *Annual Biophysical Society Meeting,* San Francisco (February 22, 2022) 1637-Pos.

Mersch, Jeremiason. DeepCHALLA sediment core: Atmospheric mercury and lead in Equatorial East Africa over the last 250,000 yrs. *Midstates Consortium for Math and Science for Undergraduates, University of Chicago* (Fall 2019)

Teaching Experience

University of Minnesota-Duluth- Graduate Teaching Assistant

CHEM 4633 Physical Chemistry Laboratory	Fall 2021, 2022
CHEM 3324 Biochemistry Laboratory Course Delivery Development	Spring 2023
CHEM 1155 General Chemistry II Discussion	Spring 2022, 2023
CHEM 1156 General Chemistry II Laboratory	Spring 2022, 2023

Gustavus Adolphus College- Undergraduate Teaching Assistant

CHE 270/246 Analytical Chemistry Laboratory	Spring 2020, 2021
CHE 251 Organic Chemistry II Laboratory	Fall 2020
Chemistry Tutor	2018, 2019, 2020, 2021

Honors and Awards

- Biophysical Society Travel Grant Awardee, 2023
- Biophysical Society Student Research Achievement Award Poster Competition Entrant, 2023
- ThinkSwiss Research Scholarship Awardee, 2020 (Declined due to COVID-19)
- Gustavus Adolphus College Presidential Student-Faculty Collaboration Summer Research Grant Recipient, 2019
- Nominated Speaker, Department of Chemistry and Biochemistry, Swenson College of Science and Engineering Admitted Graduate Students Day, 2023

- Gustavus Adolphus College American Chemical Society Undergraduate Student Award, by Division: Environmental, 2020; Organic, 2021; Analytical, 2021
- Frances Engelman Knock Chemistry Undergraduate Student Scholarship Awardee, 2020
- President, Gustavus Adolphus College Chemistry Club, 2020-21 Academic Year
- Incoming Student Teaching "Microteaching" Evaluator, Department of Chemistry, University of Minnesota Duluth, 2022