Nathan C. Frey

CONTACT INFORMATION

802 Belmont Avenue
Charlottesville, VA 22902
(985)-788-8279
nfrey@virginia.edu; nfrey@mit.edu
ORCID iD: 0000-0001-7406-1736

EDUCATION

B.S. Chemistry (ACS Concentration) April 2021
Mississippi State University
Summa Cum Laude

M.S. Chemistry December 2022
University of Virginia
National Science Foundation Graduate Research Fellow (Awarded 2021)

Ph.D. Chemistry June 2023 – present
Massachusetts Institute of Technology
National Science Foundation Graduate Research Fellow (Awarded 2021)

RESEARCH EXPERIENCE

Student Researcher (Mississippi State University) October 2018 – May 2021

- Advisor: Charles Edwin Webster
- Computational inorganic chemistry; computational benchmarking; electronic structure computations; investigations of thermodynamic properties.

Teaching/Research Assistant (UVA/MIT) May 2021 – present

- Advisor: Robert J. Gilliard, Jr.
- Main group chemistry; air- and moisture-sensitive techniques; novel boron compounds

Publications

1. K. E. Krantz, S. L. Weisflog, W. Yang, D. A. Dickie, **N. C. Frey**, C. E. Webster, R. J. Gilliard, Jr. "Extremely twisted and bent pyrene-fused N-heterocyclic germylenes" *Chem Commun*, **2019**, 55, 14954-14957. 10.1039/C9CC08703F.
2. K. E. Krantz, S. L. Weisflog, **N. C. Frey**, W. Yang, D. A. Dickie, C. E. Webster, R. J. Gilliard, Jr. "Planar, Stair-Stepped, and Twisted: Modulating Structure and Photophysics in Pyrene- and Benzene-Fused N-Heterocyclic Boranes" *Chem Eur J*, **2020**, 26, 10072-10082. 10.1002/chem.202002118.
3. A. D. Obi, J. E. Walley, **N. C. Frey**, Y. O. Wong, D. A. Dickie, C. E. Webster, R. J. Gilliard, Jr. "Tris(Carbene)-Stabilization of Monomeric Magnesium Cations: A Neutral, Non-tethered Ligand Approach" *Organometallics*, **2020**, 39, 4329-4339. 10.1021/acs.organomet.0c00462.
4. **N. C. Frey**, E. V. Dornshuld, C. E. Webster "Benchmarking the Fluxional Processes of Organometallic Piano Stool Complexes" *Molecules*, **2021**, 26, 2310-2323. 10.3390/molecules26082310.
5. C. M. Boudreaux, D. Nugegoda, W. Yao, N. L. Tri, **N. C. Frey**, Q. Li, F. Qu, M. Zeller, C. E. Webster, J. H. Delcamp, E. T. Papish "Low-Valent Cobalt(I) CNC Pincer Complexes as Catalysts for Light-Driven Carbon Dioxide Reduction" *ACS Catal*, **2022**, 12, 8718–8728. 10.1021/acscatal.2c01281.

6. A. D. Obi, **N. C. Frey**, D. A. Dickie, C. E. Webster, R. J. Gilliard, Jr. "N-Heterocyclic Carbene-Assisted Reversible Migratory Coupling of Aminoborane at Magnesium" *Angew Chem Int Ed*, **2022**, 134 e202211496. 10.1002/anie.202211496.
7. A. D. Obi, L. A. Freeman, S. J. Coates, A. J. H. Alexis, **N.C. Frey**, D. A. Dickie, C. E. Webster, R. J. Gilliard, Jr. "Carbene-Calcium Silylamides and Amidoboranes" *Organometallics*, **2022**, 41, 3064-3072. 10.1021/acs.organomet.2c00464.

Presentations

- Characterizing the Fluxional Behavior in (TMCOT)M$(CO)_3$ and (COT)Cr$(CO)_3$ Complexes with Computational Approaches (poster) — April 2019
  N. Frey, E. V. Dornshuld, F. Aghabozorgi, and C. E. Webster
  Spring Undergraduate Research Symposium, Mississippi State, MS
- Characterizing the Fluxional Behavior in (TMCOT)M$(CO)_3$ and (COT)Cr$(CO)_3$ Complexes with Computational Approaches (poster) — July 2019
  N. Frey, E. V. Dornshuld, F. Aghabozorgi, and C. E. Webster
  Feeding and Powering the World Research Conference, Oxford, MS
- Examining the Electronic Properties of Twisted Pyrene Compounds (poster) — July 2019
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  Feeding and Powering the World Research Conference, Oxford, MS
- Examining the Electronic Properties of Twisted Pyrene Compounds (poster) — August 2019
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  Summer Undergraduate Research Symposium, Mississippi State, MS
- Examining the Electronic Properties of Twisted Pyrene Compounds (poster) — October 2019
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  Mississippi Local Section Research Symposium, Jackson, MS
- Computational studies of extremely twisted pyrene-fused N-heterocyclic germylenes and diazaborolidines (oral presentation) — January 2020
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, S. L. Weisflog, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  52nd Southeastern Undergraduate Research Conference, Tuscaloosa, AL
- Computational analysis of benzene-fused and extremely twisted pyrene-fused N-heterocyclic germylenes and boranes (poster) — October 2020
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, S. L. Weisflog, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  Fall Undergraduate Research Symposium, Mississippi State, MS
- Computational studies of extremely twisted arene-fused N-heterocyclic boranes and N-heterocyclic germylenes (oral presentation) — February 2021
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, S. L. Weisflog, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  Mississippi Undergraduate Honors Conference, Virtual
- Computational analysis of benzene-fused and extremely twisted pyrene-fused N-heterocyclic germylenes and boranes (poster) — March 2021
  N. C. Frey, R. W. Lamb, E. V. Dornshuld, K. E. Krantz, S. L. Weisflog, W. Yang, P. Miller, D. A. Dickie, R. J. Gilliard, Jr., C. E. Webster
  Spring Undergraduate Research Symposium, Mississippi State, MS

Instrumentation/Techniques

- Schlenk Line
- Glovebox
- NMR (1H, 11B, 13C)
- X-Ray Diffraction
- Elemental Analysis (C, H, N)

AWARDS & HONORS

- President's List Scholar — Spring 2018, Fall 2018, Fall 2019, Spring 2020, Fall 2020, Spring 2021
- Dean's List Scholar — Fall 2017
- American Chemical Society Division of Inorganic Chemistry Undergraduate Award in Inorganic Chemistry — 2019
- Outstanding Third Year (MSU Department of Chemistry) — 2019
- Outstanding Undergraduate Researcher (MSU Department of Chemistry) — 2020, 2021
- Mississippi State University Undergraduate Student Research Award (MSU Department of Chemistry) — 2021
- Mississippi State University Undergraduate Student Research Award (MSU College of Arts & Sciences) — 2021
- Outstanding Fourth Year (MSU Department of Chemistry) — 2021
- Seth F. Oppenheimer Outstanding Research Award (MSU Shackouls Honors College) — 2021
- 3^{rd} Place at the MSU Spring Undergraduate Research Symposium — 2021

SCHOLARSHIPS

- Freshman Excellence Award (MSU) — 2017 – 2021
- Bagley College of Engineering Freshman Scholarship (MSU) — 2017
- Air Force Aid Society Arnold Grant (at MSU) — 2017, 2018, 2019, 2020
- Mathematics as a Common Language in Science Scholarship (MSU; NSF funded) — 2019 – 2021
- L.C. Behr Memorial Fund (MSU) — 2019
- Dr. David E. Wigley Endowed Scholarship (MSU) — 2020
- National Science Foundation Graduate Research Fellowship — 2021 – present

PROFESSIONAL MEMBERSHIP

- American Chemical Society — 2019 – present
- Phi Lambda Upsilon — 2020 – present
- Sigma Xi — 2021 – present

LEADERSHIP

Student Members of the American Chemical Society

- Secretary — 2019 – 2020
- Vice President — 2020 – 2021

Mississippi State Housing and Residence Life

- Resident Advisor — 2018 – 2019
- Well-Being Advocate — Fall 2018
- Council of Residential Experiences (CORE) Liaison — Spring 2019