C. Michael McGuirk

Assistant Professor
Colorado School of Mines, Department of Chemistry and Materials Science Program
National Renewable Energy Laboratory, Joint Appointment
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EDUCATION

University of California–Berkeley 5.1.2016–5.25.2019
Philomathia Postdoctoral Fellow with *Prof. Jeffrey R. Long*
Northwestern University 8.1.2011–3.30.2016
Ph.D. in Chemistry with *Prof. Chad A. Mirkin*
University of Minnesota–Twin Cities 9.1.2006–5.15.2010
B.A. in Chemistry with minor in Biochemistry
Summa Cum Laude with High Honors

APPOINTMENTS

Colorado School of Mines 6.1.2019–Present
Assistant Professor, Department of Chemistry

National Renewable Energy Laboratory 5.1.2024–Present
Joint Appointment, Chemistry and Nanosciences Division

RESEARCH TIMELINE

2019 – Present "Supramolecular Materials Chemistry"
Primary Investigator, Colorado School of Mines

2016 – 2019 "Elucidating the Molecular Origins of Step-Shaped Adsorption in Metal−Organic Frameworks"
Advisor: Prof. Jeff Long, University of California, Berkeley

2011 – 2016 "Coordination Chemistry-Based Strategies for the Regulation and Enhancement of Hydrogen Bond-Donating Catalyst Activity"
Advisor: Prof. Chad Mirkin, Northwestern University

2010 – 2011 "Development of Anti-Misting Formulations using Non-Newtonian Fluids"
Ecolab Inc.

2009 – 2010 "Characterization of Clathrin-Dependent Uptake Mechanisms of Natriuretic Peptide Receptors"
Advisor: Prof. Lincoln Potter, University of Minnesota, Twin Cities

2008 – 2009 "N-Heterocyclic Carbene-Based Ligands for the Isolation of Transient Cu(I)-Oxo Species"
Advisor: Prof. William Tolman, University of Minnesota, Twin Cities

PREVIOUS RESEARCH EXPERIENCE

- **Post-Doctoral Research – University of California, Berkeley – Long Lab**

- Discovery of, and molecular-level investigation into, the chemically specific cooperative adsorption mechanism of the commodity chemical carbon disulfide in diamine-appended metal–organic frameworks.
- Structural investigation of the origins of non-classic step-shaped adsorption in stimuli-responsive zeolitic imidazolate frameworks for storage and delivery of natural gas in the transportation sector.

- **Dissertation Research – Northwestern University – Mirkin Lab**
  - Established a platform for the *in situ* control of hydrogen bond-donating catalysis, based on a novel synthetic strategy that employed structurally addressable supramolecular coordination structures. These architectures have potential applications in controlled polymerization, chemical sensors, and amplification devices.
  - Harnessed the three-dimensional structural order of metal–organic frameworks for dramatically enhancing the activity of hydrogen bond-donating catalysis through the deliberate obviation of deleterious inter-catalyst association.

PRIMARY INVESTIGATOR EXTERNAL GRANTS

1. Title: High Capacity Step-Shaped Hydrogen Adsorption in Robust, Pore-Gating Zeolitic Imidazolate Frameworks
   Agency: Department of Energy, Office of Energy Efficiency and Renewable Energy
   Award Number: DE-EE0008823
   Awarded: August 2019, Start: January 2020.
   Time/Amount: 3 years, $380,000

2. Title: CAREER: Studies of Chalcogen Bonding-Mediated Assembly towards Porous Crystalline Frameworks, Hierarchical Assemblies and Multicomponent Materials
   Agency: National Science Foundation, Division of Materials Research, Solid State and Materials Chemistry
   Award Number: 2142623
   Awarded: November 2021, Start: January 2022.
   Time/Amount: 5 years, $760,394

3. Title: Building a Scientific Foundation for a New Generation of Low Energy Adsorptive Separations: Probing the Role of Responsive Structural Flexibility Using Synthetic Porous Frameworks
   Agency: Department of Energy, Basic Energy Sciences, Separation Science, Early Career Research Program (ECRP) Award
   Award Number: DE-SC0024164
   Awarded: May 2023, Start: July 2023.
   Time/Amount: 5 years, $875,000

4. Title: Plastic Waste to DAC: A Study of the Chemical and Lifecycle Feasibility Converting Polyolefin Waste to Aminopolymers for Direct Air Capture
   Agency: Research Corporation for Science Advancement
   Awarded: December 2023, Start: January 2024
   Time/Amount: 1 year, $55,000 (10% overhead)

5. Title: Examining the Regeneration Stability of Aminopolymers Under Hydrogen-Rich

Streams
Agency: Fortescue Future Industries
Awarded: May 2024, Start: June 2024
Time/Amount: 1 year, $149,818

6. Title: Getting on the Grid: Parallel Nano-Crystallography for Large-Scale Data Generation
   Agency: Research Corporation for Science Advancement
   Awarded: July 2024
   Time/Amount: 1 year, $66,000 (10% overhead)

7. Title: Understanding the Fundamental Origins of Flexibility in Porous Frameworks to Enable Low-Energy, On-Demand Delivery of Large Payloads of Gaseous Fuels, Oxidants, Propellants, and Therapeutics
   Agency: Army Research Office (ARO), Reactive Chemical Systems
   Award Number: W911NF2410286
   Awarded/Start Date: August 2024/September 2024
   Time/Amount: 3 year, $597,815.00

CO-PRIMARY INVESTIGATOR EXTERNAL GRANTS

1. Title: Solid State Based Hydrogen Loss Recovery During LH_2 Transfer
   Agency: Department of Energy, Office of Energy Efficiency and Renewable Energy, Hydrogen and Fuel Cells Technologies Office (Hydrogen Shot)
   Awarded: September 2023, Start: January 2024
   Time/Amount: 3 years, $6,000,000

2. Title: PFAS@Mines – A Multi-Scale and Interdisciplinary Center to Address the Environmental Fate, Transport, and Remediation of Per- and Polyfluoro-alkyl Substances (PFASs)
   Agency: ERDC, US Army Corp of Engineers
   Awarded: January 2024, Start: February 2024
   Time/Amount: 4 years, $498, 849 (5% of $9,976,998 total)

AWARDS

- Junior Faculty Teaching Award (2024)
- Thieme Chemistry Journal Award (2024)
- Scialog® Fellow for Automating Chemical Laboratories (2024)
- DOE Early Career Research Program Award (2023)
- Scialog® Fellow for Negative Emissions Science (2022)
- President's Award for Excellence in Safety (2022)
- University Public Policy Fellow (2022)
- NSF CAREER (2021)
- DOE EFRC Ten at Ten Award Contributor (2019)
- Philomathia Postdoctoral Fellowship (2016)
- Representative of the Lindau Nobel Laureate Meeting (2015)

CORRESPONDING AUTHOR PUBLICATIONS

1. Eckstein, B. J.; Martin, H. R.; Moghadasnia, M. P.; Halder, A.; Le Magueres, P.; **McGuirk, C. M.** A Permanently Porous Chalcogen-Bonded Organic Framework, *In Preparation.*
2. Cleary, S. R.; Starace, A. K.; Curran-Velasco, C. C.; Ruddy, D. A.; **McGuirk, C. M.** The Overlooked Potential of Sulfated Zirconia: Reexamining Solid Superacidity Toward the Controlled Depolymerization of Polyolefins, *Langmuir **2024**, 40, 6612.* **Invited as Part of "Highlights in Interface Science and Engineering: Heterogeneous Catalysis for Polymer Upcycling" Special Issue.**
3. Moghadasnia, M. P.; Eckstein, B. J.; Martin, H. B.; Paredes, J. U.; **McGuirk, C. M.** Towardds the Next Generaation of Permanently Porous Materials: Halogen-Bonded Organic Frameworks, *Cryst. Growth Des.* **2024**, *24*, 2304. **Invited Perspective.**
4. Eckstein, B. J.; Martin, H. R.; Moghadasnia, M. P.; Halder, A.; Melville, M. J.; Buzinski, T. N.; Balaich, G. J.; **McGuirk, C. M.** Influence of Donor Point Modifications on the Assembly of Chalcogen-Bonded Organic Frameworks, *Chem. Commun.* **2024**, *60*, 758. **Invited as Part of "2023 Emerging Investigators" Special Issue.**
5. Halder, A.; **McGuirk, C. M.** Exploring the Influence of Linker Substitution and Ratios on Cooperative Framework Flexibility Through the Mixed-Linker Approach, *Cryst. Growth Des.* **2024**, *24*, 1200. **Invited as Part of "Lattice Dynamics" Special Issue.**
6. Bingel, L. W.; Klein, R. A.; Halder, A.; Carter, M.; Trump, B. A.; Bloch, E. D.; Zhou, W.; Walton, K. S.; Brown, C. M.; **McGuirk, C. M.** A Dynamic and Inversely Selective Metal–Organic Framework for Record Propane/Propylene Separations, *J. Am. Chem. Soc.* **2023**, *145*, 21955.
7. Moghadasnia, M. P.; Eckstein, B. J.; Balaich, G. J.; **McGuirk, C. M.** Assembly of Multi-Dimensional Molecular Networks through Self Complementary Halogen-Bonded Tectons, *Cryst. Growth Des.* **2023**, *23*, 5066.
8. Halder, A.; Klein, R.A.; Shulda, S.; McCarver, G. A.; Parilla, P. A.; Furukawa, H.; Brown, C. M.; **McGuirk, C. M.** A Multivariate Flexible Framework with High Usable Hydrogen Capacity in a Reduced Pressure Swing Process, *J. Am. Chem. Soc.* **2023**, *145*, 8033.
9. Halder, A.; Klein, R.A.; Lively, R.; **McGuirk, C. M.** A Family of Multivariate Frameworks with an Inverting Trend in Flexibility and Adsorption Pressure Threshold, *Chem. Commun.* **2022**, *58*, 11394.
10. Eckstein, B. J.; Brown, L. C.; Noll, B.; Moghadasnia, M.; Balaich, G. J.; **McGuirk, C. M.** A Porous Chalcogen- Bonded Organic Framework, **2021**, *J. Am. Chem. Soc.* **2021**, *143*, 20207.
11. Klein, R. A.; Shulda, S.; Parilla, P. A.; Le Magueres, P.; Richardson, R. K.; Morris, W.; Brown, C. M.; **McGuirk, C. M.** Structural and Mechanistic Insight into Hydrogen Adsorption in Flexible Framework ZIF-7. *Chem. Sci.* **2021**, *12*, 15620.
12. **McGuirk, C. M.**; Bazilian, M. D.; Kammen, D. Mining Plastic: Harvesting Stored Energy in a Re-use Revolution. *One Earth.* **2019**, *1*, 392.

PRIMARY AUTHOR PUBLICATIONS

1. **McGuirk, C. M.**; Runčevski, T.; Oktawiec, J.; Turkiewicz, A.; Taylor, M.; Long, J. R. Influence of Metal Substitution on the Pressure-Induced Phase Change in Flexible Zeolitic Imidazolate Frameworks. *J. Am. Chem. Soc.* **2018**, *140*, 15924.
2. **McGuirk, C. M.**; Siegelman, R. L.; Drisdell, W. S.; Runčevski, T.; Milner, P. J.; Oktawiec, J.; Wan, L. F.; Su, G. M.; Jiang, H. Z. H.; Reed, D. A.; Gonzalez, M. I.; Prendergast, D.; Long, J. R.

Cooperative Adsorption of Carbon Disulfide in Diamine-Appended Metal–Organic Frameworks. *Nat. Commun.* **2018**, *9,* 5133.

3. **McGuirk, C. M.**; Mendez-Arroyo, J.; d'Aquino, A. I.; Stern, C. L.; Mirkin, C. A. A Concerted Two-Prong Approach to the *in Situ* Allosteric Regulation of Bifunctional Catalysis. *Chem. Sci.* **2016**, *7*, 6674.
4. **McGuirk, C. M.**; Katz, M. J.; Stern, C. L.; Sarjeant, A. A.; Hupp, J. T.; Farha, O. K.; Mirkin C. A. Turning on Catalysis: Incorporation of a Hydrogen Bond Donating Squaramide Moiety into a Zr-Metal-Organic Framework. *J. Am. Chem. Soc.* **2015**, *137*, 919.
5. **McGuirk, C. M.**; Mendez-Arroyo, J.; Lifschitz, A. M.; Mirkin, C. A. Allosteric Regulation of Supramolecular Oligomerization and Catalytic Activity via Coordination-Based Control of Competitive Hydrogen Bonding Events. *J. Am. Chem. Soc.* **2014,** *136*, 16594.
6. **McGuirk, C. M.**; Stern, C. L.; Mirkin, C. A. Small Molecule Regulation of Self-Association and Catalytic Activity in a Supramolecular Coordination Complex. *J. Am. Chem. Soc.* **2014**, *136*, 4689.

SECONDARY AUTHOR PUBLICATIONS

1. Massimi, S. E.; Metzger, K. E.; **McGuirk, C. M.**; Trewyn, B. G. Best Practices in the Characterization of MOF@MSN Composites. *Inorg. Chem.* **2022**, *61*, 4219.
2. Mao, V. Y.; Milner, P. J.; Lee, J.-H.; Forse, A. C.; Kim, E. J; Siegelman, R. L.; **McGuirk, C. M.**; Porter-Zasada, L.; Neaton, J. B.; Reimer, J. A.; Long, J. R. Cooperative Carbon Dioxide Adsorption in Alcoholamine- and Alkoxyalkylamine-Functionalized Metal–Organic Frameworks. *Angew. Chem. Int. Ed.*, **2020**, *59*, 2.
3. Wang, S.; **McGuirk, C. M.**; d'Aquino, A. I.; Mason, J. A.; Mirkin, C. A. Metal-Organic Framework Nanoparticles. *Adv. Mater.* **2018**, *30*, 1800202.
4. d'Aquino, A. I.; Cheng, H. F.; Barroso-Flores, J.; Kean, Z. S.; Mendez-Arroyo, J.; **McGuirk, C. M.**; Mirkin, C. A. An Allosterically Regulated, Four-State Macrocycle. *Inorg. Chem.* **2018**, *57*, 3568.
5. Wang, S.; **McGuirk, C. M.**; Ross, M. B.; Wang, S.; Chen, P.; Xing, H.; Liu, Y.; Mirkin C. A. General and Direct Method for Preparing Oligonucleotide-Functionalized Metal−Organic Framework Nanoparticles. *J. Am. Chem. Soc.* **2017**, *139*, 9827.
6. Shahjamali, M. M.; Zhou, Y.; Zaraee, N.; Xue, C.; Wu, J.; Large, N.; **McGuirk, C. M.**; Boey, F.; Dravid, V.; Schatz, G. C.; Mirkin, C. A. Ag-Ag_2S Hybrid Nanoprisms: Structural vs. Plasmonic Evolution. *ACS Nano* **2016**, *10*, 5362.
7. Lifschitz, A. M.; Young, R. M.; Mendez-Arroyo, J.; **McGuirk, C. M.**; Wasielewski, M. R.; Mirkin, C. A. Cooperative Electronic- and Structural-Regulation in a Bioinspired Allosteric Photoredox Catalyst. *Inorg. Chem.* **2016,** *55*, 8301.
8. Wang, S.; Morris, W.; Liu, Y.; **McGuirk, C. M.**; Zhou, Y.; Hupp, J. T.; Farha, O. K.; Mirkin, C. A. Surface-Specific Functionalization of Nanoscale Metal-Organic Frameworks. *Angew. Chem. Int. Ed.* **2015**, *54*, 14738.
9. Lifschitz, A. M.; Rosen, M. S.; **McGuirk, C. M.**; Mirkin, C. A. Allosteric Supramolecular Coordination Constructs. *J. Am. Chem. Soc.* **2015**, *137*, 7252.
10. Lifschitz, A. M.; Young, R. M.; Mendez-Arroyo, J.; Stern, C. L.; **McGuirk, C. M.**; Wasielewski, M. R.; Mirkin, C. A. An Allosteric Photoredox Catalyst Inspired by Photosynthetic Machinery. *Nat. Comm.* **2015**, *6*, 6541.
11. Lifschitz, A. M.; Young, R. M.; Mendez-Arroyo, J.; Roznyatovskiy, V. V.; **McGuirk, C. M.;** Wasielewski, M. R.; Mirkin, C. A. Chemically Regulating Rh(I)-Bodipy Photoredox Switches. *Chem. Comm*. **2014**, *50*, 6850.

12. Kennedy, R. D.; Machan, C. W.; **McGuirk, C. M.**; Rosen, M. S.; Stern, C. L.; Sarjeant, A. A.; Mirkin, C. A. General Strategy for the Synthesis of Rigid Weak-Link Approach Platinum(II) Complexes: Tweezers, Triple-Layer Complexes, and Macrocyles. *Inorg. Chem.* **2013**, *52*, 5876.
13. Dickey, D. M.; Barbieri, K. A.; **McGuirk, C. M.;** Potter, L. R. Arg 13 of B-Type Natriuretic Peptide Reciprocally Modulates Binding to Guanylyl Cyclase but not Clearance Receptors. *Mol. Pharmacol.* **2010**, *78*, 431.

PATENTS

1. Hodge, C. A.; **McGuirk, C. M.**; Blattner, A. R.; Notermann, C. L. Sprayable Aqueous Chlorine-Based Cleaning Compositions with Reduced Misting. PCT Int. Appl., WO 2015123324 A1 20150820, **2015**.
2. Hodge, C. A.; **McGuirk, C. M.**; Levitt, M. D.; Larson, D.; Kiesel, E.; Blattner, A. R. Development of Extensional Viscosity for Reduced Atomization for Diluted Concentrate Sprayer Applications. PCT Int. Appl., WO 2013043699 A2 20130328, **2013**.
3. Hodge, C. A.; Blattner, A. R.; Kohnke, T. J.; Levitt, M. D.; Marquardt, J. E.; **McGuirk, C. M.**; Silvernail, C. M.; Larson, D. Bio-Based Glass Cleaner and Forming Use Solution. U.S. Pat. Appl. Publ. 20130255719 A1 20131003, **2013**.

SELECT LEADERSHIP AND OUTREACH ACTIVITIES

2022 – 2023 Organizer for Telluride Research Workshop on Main Group Chemistry
- Initiated and currently organizing a workshop as part of the Telluride Science and Innovation Center, bringing together 30 of the foremost scientists on main group chemistry to discuss their emergent properties in molecules, materials, and interfaces

2022 – 2023 Organizer for Telluride Research Workshop on Metal–Organic Frameworks
- Initiated and organized a workshop as part of the Telluride Science and Innovation Center, bringing together 30 of the foremost scientists on porous materials to discuss the importance of studying atomic-level structure in extended lattice materials.

2022 – 2023 University Public Policy Fellow
- Participated in an 8-month course on developing skills for communicating scientific ideas and concepts to the public and government officials.

2022 – Now Early Career Editorial Board at the *Journal of Physics and Chemistry of Solids*
- Serve as an associate editor at the journal, managing paper submissions, peer reviews, and themed issues.

2020 – 2021 Co-Organizer for the International Conference on the Fundamentals of Adsorption (FOA 14)
- Served as a local liaison for planning committee for global conference taking place in Colorado.

2020 – 2021 Organizer for Front Range Inorganic Colloquium
- Initiated and organized a virtual workshop for inorganic chemistry in the Colorado Front Range region, with talks from faculty, post-doctoral researchers, and graduate students.

2020 – 2022 Cientifico Latino Graduate Student Mentor
- Mentor a college senior from a underrepresented minority through the application process for graduate school, including proofreading application materials.

2018 – 2020 Skype a Scientist Participant

- Hold question and answer sessions about my research and general science with 10th–12th grade classes in schools in Hawaii and Alberta, Canada.

SELECT EXTERNAL PRESENTATIONS

1. "Exploring Function and Form in Synthetic Porous Frameworks", University of California, Davis, October 1, 2024, **invited speaker**.
2. "Influence of donor point modifications on the Assembly of chalcogen-bonded organic frameworks" *American Chemical Society National Meeting,* August 19, 2024, Denver, CO, **invited speaker**.
3. "Exploring the influence of linker substitution and ratios on cooperative framework flexibility through the mixed-linker approach", *American Chemical Society National Meeting,* August 18, 2024, Denver, CO, **invited speaker**.
4. "Exploring Function and Form in Synthetic Porous Frameworks", Cornell University, March 26, 2024, **invited speaker**.
5. "Exploring Function and Form in Synthetic Porous Frameworks", Rochester University, March 25, 2024, **invited speaker**.
6. "Studies of Sulfated Zirconia Towards Low-Energy Polyolefin Depolymerization", *American Chemical Society National Meeting,* March 19, 2024, New Orleans, LA, **invited speaker**.
7. "Exploring Function and Form in Synthetic Porous Frameworks", Rice University, March 13, 2024, **invited speaker**.
8. "Exploring Function and Form in Synthetic Porous Frameworks", Northwestern University, February 29, 2024, **invited speaker**.
9. "Exploring Function and Form in Synthetic Porous Frameworks", University of California–San Diego, February 9, 2024, **invited speaker**.
10. "Exploring Function and Form in Synthetic Porous Frameworks", University of California–Los Angeles, February 6, 2024, **invited speaker**.
11. "Exploring Function and Form in Synthetic Porous Frameworks", University of Southern California, February 5, 2024, **invited speaker**.
12. "Exploring Function and Form in Synthetic Porous Frameworks", University of Houston, January 30, 2024, **invited speaker.**
13. "Exploring Function and Form in Synthetic Porous Frameworks", University of Oregon, January 19, 2024, **invited speaker.**
14. "Exploring Function and Form in Synthetic Porous Frameworks", University of Wisconsin–Madison, December 7, 2023, Madison, WI, **invited speaker**.
15. "Exploring Function and Form in Synthetic Porous Frameworks", University of Minnesota–Twin Cities, November 6, 2023, Minneapolis, MN, **invited speaker**.
16. "Exploring Function and Form in Synthetic Porous Frameworks", University of Virginia, October 27, 2023, Charlottesville, VA, **invited speaker**.
17. "Exploring Function and Form in Synthetic Porous Frameworks", Colorado State University, October 24, 2023, Fort Collins, CO, **invited speaker**.
18. "Exploring Function and Form in Synthetic Porous Frameworks", University of California–Berkeley, October 20, 2023, Berkeley, CA, **invited speaker**.
19. "Exploring Function and Form in Synthetic Porous Frameworks", University of Notre Dame, October 6, 2023, South Bend, IN, **invited speaker**.
20. "Exploring Function and Form in Synthetic Porous Frameworks", Purdue University, October 5, 2023, West Lafayette, IN, **invited speaker**.
21. "Exploring Function and Form in Synthetic Porous Frameworks", University of Colorado–Boulder, September 25, 2023, Boulder, CO, **invited speaker**.

22. "Exploring Function and Form in Synthetic Porous Frameworks", Michigan State University, September 14, 2023, Lansing, MI, **invited speaker**.
23. "Exploring Function and Form in Synthetic Porous Frameworks", Wayne State University, September 15, 2023, Detroit, MI, **invited speaker**.
24. "A Multivariate Flexible Framework with High Usable Hydrogen Capacity in a Reduced Pressure Swing Process" *American Chemical Society National Meeting,* August 13, 2023, San Francisco, CA, **invited speaker**.
25. "A Porous Chalcogen-Bonded Framework" *Harry Gray Young Investigator Award Symposium, American Chemical Society National Meeting,* March 27, 2023, Indianapolis, IN, **invited speaker**.
26. "Exploring Function and Form in Synthetic Porous Frameworks", Texas Tech University, March 1, 2023, Lubbock, TX, **invited speaker**.
27. "A Porous Chalcogen-Bonded Framework" *North American Supramolecular Chemistry Conference 2022,* December 19, 2022, **invited speaker**.
28. "Adsorption in Flexible Frameworks" *Materials Research Society Fall Meeting*, December 1, 2022, Boston, MA, **invited speaker**.
29. "Exploring Function and Form in Synthetic Porous Frameworks" *Abraham Clearfield Student Invited Seminar in Inorganic Chemistry*, Texas A&M University, September 14, 2022, College Station, TX, **invited speaker**.
30. "A Porous Chalcogen-Bonded Framework" *American Chemical Society Southwest Regional Meeting,* November 1, 2021, Austin, TX, **invited speaker**.
31. "Synthetic Porous Frameworks: Connectivity-Dependent Discovery and Application" University of Denver, September 23, 2021, Denver, CO, **invited speaker.**

TEACHING ASSIGNMENTS

1. CHGN 505: Advanced Organic Chemistry
   - Core graduate level course cross listed with senior undergraduates
   - Taught 5 times
   - Wrote new course from scratch focusing on frontier orbital theory and stereoelectronic effects
2. CHGN 222A: Organic Chemistry II
   - 170–185 students
   - Taught 3 times
3. CHGN 221A: Organic Chemistry I
   - 170–185 students
   - Taught 1 time
4. Planned for 2025: Launching new Physical Organic Chemistry course
   - Never previously offered at Colorado School of Mines