MARCUS H. SAK

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EDUCATION

Harvard University — Cambridge, MA
Ph.D. Candidate, Department of Chemistry and Chemical Biology — 2021–present
Expected graduation: June 2026
Tentative thesis title: Catalytic Principles for Selective Small-Molecule Catalysis

Yale University — New Haven, CT
B.S./M.S. in Chemistry, *summa cum laude*, Phi Beta Kappa — 2017–2021
Grade Point Average: **3.98**/4.00

RESEARCH EXPERIENCE

Merck & Co., Inc. — Boston, MA
Visiting Scientist, Process R&D Enabling Technologies — 2025–present
High-throughput and automated experimentation for combinatorial screening

Harvard University — Cambridge, MA
Ph.D. Candidate, Department of Chemistry and Chemical Biology — Aug 2021–present
Advisor: Prof. Eric N. Jacobsen
Asymmetric catalysis of ionic pathways; screening for cooperative catalysis

Yale University — New Haven, CT
Advisor: Scott J. Miller — Jan 2018–May 2021
Peptide-catalyzed enantioselective reactions and associated mechanistic/computational studies

Justus-Liebig-Universität Giessen — Giessen, Germany
Advisor: Peter R. Schreiner — May–Jul 2019
Synthesis, computational studies, and matrix isolation of minimal mercaptocarbenes

National University of Singapore — Singapore
Advisor: Yixin Lu — Jun 2015–Jul 2016
Asymmetric phosphine catalysis of [3 + 2] and [3 + 3] cycloadditions

PUBLICATIONS IN PROGRESS

1. Sak, M. H.; Liu, R. Y.; Kwan, E. E; Jacobsen, E. N. Accelerating the Discovery of Cooperative Catalysis. *Manuscript in preparation.*

PUBLICATIONS

1. Sak, M. H.; Jacobsen, E. N. Selective Noncovalent Catalysis with Small Molecules. *Chem. Rev.* **2025.** DOI: 10.1021/acs.chemrev.5c00121
2. Sak, M. H.*****; Lovinger, G. J.*****; Jacobsen, E. N. Catalysis of An S_N2 Pathway by Geometric Preorganization. *Nature* **2024**, *632*, 1052.
3. Turek, A. K.; Sak, M. H.; Miller, S. J. Kinetic Analysis of a Cysteine-Derived Thiyl-Catalyzed Asymmetric Vinylcyclopropane Cycloaddition Reflects Numerous Attractive Noncovalent Interactions. *J. Am. Chem. Soc*. **2021**, *143*, 16173.
4. Chan, Y.-C.; Sak, M. H.; Frank, S. A.; Miller, S. J.; Tunable and Cooperative Catalysis for Enantioselective Pictet-Spengler Reaction with Varied Nitrogen-Containing Heterocyclic Carboxaldehydes. *Angew. Chem. Int. Ed.* **2021**, *60*, 24573.

Jul 2025

5. Coombs, G.; Sak, M. H.; Miller, S. J. Peptide-Catalyzed Fragment Couplings that Form Axially Chiral Non-C_2-Symmetric Biaryls. *Angew. Chem. Int. Ed.* **2020**, *59*, 2875.

PRESENTATIONS

1. Talk: Catalytic Principles in Phosphonium Dealkylation towards *P*-Stereogenic Compounds. ACS DOC Graduate Research Symposium, **2025**, San Diego, CA
2. Talk: Catalytic Principles in Phosphonium Dealkylation towards *P*-Stereogenic Compounds. Johnson & Johnson, **2025**, San Diego, CA
3. Talk: Accelerating the Discovery of Cooperative Catalysis. Rowan Scientific, **2025**, Boston, MA
4. Poster: Catalysis of An S_N2 Pathway by Geometric Preorganization. *Stereochemistry Gordon Research Conference*, **2024**, Newport, RI.
5. Poster: Catalytic Enantioselective Arbuzov Reaction by Ion Pair Reorganization Towards Stereogenic-at-P(V) Compounds. *Boston Symposium on Organic and Bioorganic Chemistry*, **2024**, Boston, MA.
6. Talk: *Catalytic Enantioselective Arbuzov Reaction by Ion Pair Reorganization.* Harvard Chemistry & Chemical Biology Symposium, **2023**, Cambridge, MA
7. Talk: "Efficient data retrieval for large-scale smart city applications through applied Bayesian inference," in *IEEE International Conference on Intelligent Sensors, Sensor Networks, and Information Processing*, 2015. (Best Paper Nomination)

FELLOWSHIPS

Industry-Sponsored Research Fellowship 2024–2027
Merck & Co., Inc.

DAAD Research Internship in Science and Engineering (RISE) 2019
German Academic Exchange Service

Alan S. Tetelman 1958 Fellowship for International Research in the Sciences 2019
Yale University

HONORS AND AWARDS

Certificate of Distinction in Teaching 2023
Harvard University

Exceptional Distinction in the Major (first award since 2015) 2021
Werner Bergmann Prize for Outstanding Senior in Chemistry
Yale University

TEACHING EXPERIENCE

Harvard University Cambridge, MA
Teaching Fellow 2022–2023
- CHEM 105 (Advanced Organic Chemistry)
- CHEM 17 (Principles of Organic Chemistry), CHEM 20 (Organic Chemistry I)

Yale University New Haven, CT
Quantitative Reasoning/Science Peer Tutor 2018–2021
- General Chemistry I/II, Organic Chemistry I, Physical Chemistry I/II

MENTORING EXPERIENCE

Harvard University Cambridge, MA

- John Rezk (Third-year graduate student, 2022–present)
- Frank Lee (Harvard College undergraduate, 2022–present)
- Maximilian Frank (Visiting Masters student, LMU Munich, 2025–present)

SERVICE AND RELEVANT EXPERIENCE

Gordon Research Seminar

Chair 2024

- Managed finances, applications, and speaker program for Stereochemistry GRS

Letters to a Pre-Scientist

STEM Professional 2021–2022

- Exchanged letters with rural middle-schoolers about experiences in STEM

Yale Scientific Magazine

Editor in Chief 2020

- Headed editorial and business operations for a national popular science publication
- Performed science demonstrations for local middle- and high-schoolers
- Previously Science Writer and Features Editor