Simon J. Cooper, Ph. D.

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Date of birth: Jan. 28th, 1993

EDUCATION

Princeton University, Princeton, NJ
Ph.D., Organic Chemistry — June 2020
M.S., Chemistry — May 2017

University of San Francisco, San Francisco, CA
B.S., Chemistry with Biochemistry emphasis & ACS certification — May 2015

RESEARCH EXPERIENCE

California Institute of Technology, Pasadena, CA — Sept. 2020 – March 2024
Postdoctoral Research Fellow with Sarah E. Reisman

- Discovered/developed a radical-polar crossover annulation initiated by beta scission of an alkoxy radical to construct the [3.2.1] bicyclic core of (-)-enterocin, realized subsequent transformations towards final target.

- Pursued syntheses of the complex natural products rhodomollanol A and morphine

August 2015 – June 2020

Princeton University, Princeton, NJ
Graduate Research Assistant with Todd K. Hyster

- Discovered and developed an enantioselective deacetoxylation of α-acetoxyketones via a previously undisclosed activation mode effected through a merger of photoredox catalysis and biocatalysis. Investigated mechanistic nuances of this transformation via Stern-Volmer analysis, deuterium labeling studies, fluorescence anisotropy, and radical clock experiments.
- Discovered and developed a stereoselective radical cyclization of α-chloroamides to chiral lactams enabled by a photoinduced charge transfer of a complex formed between flavin hydroquinone and chloroamides in 'ene'-reductases. Investigated mechanistic nuances via deuterium labeling, radical clock experiments, and photo-NMR Michaelis-Menten kinetics.
- Discovered intermolecular coupling between α-chloroamides and α-substituted styrenes that displays high levels of γ stereoselectivity.

University of San Francisco, San Francisco, CA — Sept. 2013 – June 2015
Undergraduate Research Assistant with Lawrence K. Margerum

- Developed a synthesis of trialkoxysilyl-terminated, urethane-linked terpyridine chelating molecules designed for incorporation onto the surface of silica nanoparticles intended for use as metal ion sensors. The surface of a functional nanoparticle sensor is covalently decorated with both terpyridine and a fluorescent Rhodamine dye. When the terpyridine becomes complexed with a metal ion analyte the fluorescence of a nearby Rhodamine molecule is quenched via FRET, thus providing the basis for a 'turn-off' sensor.

TEACHING EXPERIENCE

Princeton University, Princeton, NJ Fall 2016
Precept Leader for Organic Chemistry I with Martin F. Semmelhack

- Conducted workshops for all students enrolled in the class and assisted with practice problems.
- Prepared problem sets for workshops and administered them to students.

Princeton University, Princeton, NJ Spring 2017
Precept Leader for Drug Discovery in the Genomics Era with Paul J. Reider

- Organized review sessions with short lectures for students to discuss recent material
- Organized review sessions prior to examinations.
- Helped proctor and grade examinations throughout the semester.

California Institute of Technology, Pasadena, CA Summer 2022
SURF mentor with Sarah E. Reisman

- Served as a mentor for an undergraduate researcher doing a natural products synthesis project

AWARDS & HONORS

- Ruth L. Kirschstein NRSA Postdoctoral Fellowship 6.2021 – 3.2024
- MacMillan-Cava Prize for Outstanding Thesis Research 2020
- Edward C. Taylor graduate research fellowship 2017 – 2018
- American Institute of Chemists – Undergraduate Award 2015

PUBLICATIONS

4. **Cooper, S.J.** NAD(P)/NAD(P)H. *e-EROS Enclyopedia of Reagents for Organic Syntheses*

3. Page, C.G.; **Cooper, S.J.**; DeHovitz, J.S.; Oblinsky, D.G.; Biegasiewicz, K.F.; Antropow, Alyssa; et al. Quaternary Charge-Transfer Complex Enables Photoenzymatic Intermolecular Hydroalkylation of Olefins. *J. Am. Chem. Soc.* **2021**, 143, 97.

2. Biegasiewicz, K.F.*; **Cooper, S.J.***; Gao, X.*; Garfinkle, S.E.; Sandoval, B.A.; Oblinsky, D.J.; Scholes, G.D.; Hyster, T.K. "Photoexcitation of a Flavoenzyme Enables a Stereoselective Radical Cyclization," *Science*, **2019**, 364, 1166.
*=equal contribution

1. Biegasiewicz, K.F.*; **Cooper, S.J**.*; Emmanuel, M.A.; Miller, D.C.; Hyster, T.K. "Catalytic promiscuity enabled by photoredox catalysis in nicotinamide-dependent oxidoreductases," *Nat. Chem.*, **2018**, *10*, 770.
*=equal contribution

SELECT PRESENTATIONS

The 15th International Kyoto Conference on New Aspects of Organic Chemistry
Rhiga Royal Hotel – Kyoto, Japan – *Nov. 20-23, 2023*
Poster: "Novel Light-Enabled Transformations – Asymmetric HAT in Oxidoreductases & Synthesis of Highly Oxidized [3.2.1] Bicycles via a Radical Polar Crossover Annulation

Nagoya University, Nagoya Japan – Invited Lecture
"Light-Driven New-to-Nature Biocatalytic Transformations & Progress Towards the Total Synthesis of (-)-Enterocin via a Radical-Polar Crossover Annulation" – *Nov. 16th 2023*

ACS Spring 2020 National Meeting & Expo
Pennsylvania Convention Center in Philadelphia, PA (2020)
1. **Talk:** "Photoexcitation of FMN-Dependent Ene-Reductases Enables a Stereoselective Cyclization"
   Cooper, S.J.*; Biegasiewicz, K.F.*; Gao, X.*; Oblinsky, D.G.; Kim, J-H; Garfinkle, S.E.; Joyce, L.A.; Sandoval, B.A.; Scholes, G.D.; Hyster, T.K.
2.

Gordon Research Conference on Stereochemistry
Salve Regina University in Newport, RI (2018)
Poster: "Catalytic Promiscuity Enabled by Photoredox Catalysis in Nicotinamide Dependent Oxidoreductases"
Cooper, S.J.*; Biegasiewicz, K.F.*; Emmanuel, M.A.; Miller, D.C.; Hyster, T.K.

North California Undergraduate Research Symposium (NCURS)
University of California, Santa Cruz
Talk: "Fluorometric Studies on FTIC/RITC-Terpy Silica Nanoparticle Systems as Turn-on and Turn-off Sensors"
Cooper, S.J.; Liu, J.; Margerum, L.K.

LANGUAGES

• High Level of fluency in Japanese, working knowledge of Spanish

SERVICE AND OUTREACH

Princeton University, Princeton, NJ 2015
Volunteer for National Chemistry Week 2015, "Chemistry Colors our World"

- Planned and executed demonstrations using paper chromatography to separate plant pigments for children ages 5-15

Princeton University, Princeton, NJ 2016
Volunteer for Chemistry Saturdays at Princeton Public Library

- Participated in demonstrations using alginate polymer cubes for children ages 5-15 at Princeton Public Library.

California Institute of Technology, Pasadena, CA
2022-23

- Participated in chemistry demonstrations at Sierra Madre Middle School and Marengo Elementary

REFERENCES

Professor Todd K. Hyster
Graduate Research Advisor
Princeton University
609-258-5042
thyster@princeton.edu

Abigail G. Doyle
Candidacy Exam Committee Member
University of California, Los Angeles
agdoyle@chem.ucla.edu

Professor Erik J. Sorensen
Graduate Committee Member
Princeton University
609-258-5202
ejs@princeton.edu

Professor Sarah E. Reisman
Postdoctoral Research Advisor
California Institute of Technology
626-395-6044
reisman@caltech.edu