Stanford

Noah Burns

Associate Professor of Chemistry

Curriculum Vitae available Online

CONTACT INFORMATION

- **Administrative Contact**

  Shannah McQueen

  Email smcqueen@stanford.edu

  Tel 650-723-2961

Bio

BIO

Assistant Professor Noah Burns' research explores the boundaries of modern organic synthesis to more rapidly create species of the highest molecular complexity. Projects in the Burns Lab take particular inspiration from natural products, not only for their importance as synthetic targets, but also for their potential to identify important unanswered scientific questions.

Noah Burns was born in Oakland, California, but grew up in south central Maine. He studied chemistry at Columbia University (B.A. 2004 summa cum laude), under the mentorship of Professor James Leighton. His doctoral work with Professor Phil Baran at the Scripps Research Institute in La Jolla, California (Ph.D. 2009) addressed the synthesis of haouamine A, a marine alkaloid. He then developed a catalytic enantioselective [5+2] cycloaddition as an NIH postdoctoral fellow with Professor Eric Jacobsen at Harvard University. He joined the Stanford Chemistry Department faculty in 2012, and was named a Terman Fellow in 2013.

Today, the Burns Lab focuses major efforts on the selective halogenation of organic molecules. Dihalogenation and halofunctionalization encompass some of the most fundamental transformations in our field, yet methods capable of accessing relevant halogenated motifs in a chemo-, regio-, and enantioselective fashion are lacking. Breakthroughs in this area could enable the controlled evaluation of the therapeutic potential of numerous chiral organohalogens.

The group also explores the practical total synthesis of natural products where there is true impetus for their construction due to unanswered chemical, medicinal, biological, and/or biophysical questions. Lab members are specifically engaged in the construction of unusual lipids with intriguing physical properties, for which synthesis offers a unique opportunity for study.

ACADEMIC APPOINTMENTS

- Associate Professor, Chemistry
- Faculty Fellow, Stanford ChEM-H

ADMINISTRATIVE APPOINTMENTS

- Faculty Mentor, Stanford ChemH CBI Training Program, (2014- present)

HONORS AND AWARDS

- Amgen Young Investigator Award, Amgen (2017)
- Dean's Award for First Years of Teaching, Stanford University (2016-2017)
- Terman Fellow, Stanford University (2013-2016)
- Thieme Chemistry Journal Award, Thieme Chemistry (2012)
- NRSA Postdoctoral Fellowship, NIH (2009-2011)
- Foundation Scholarship, ARCS Foundation (2006-2008)
- Excellence in Chemistry Award, Roche (2006)
- Dean’s Fellowship, TSRI (2005-2006)
- Summa Cum Laude, Columbia University (2004)
- Phi Beta Kappa, Phi Beta Kappa Society (2004)
- Barry M. Goldwater Scholarship, Barry Goldwater Scholarship and Excellence in Education Program (2003)

PROFESSIONAL EDUCATION

- Postdoctoral Fellow (NIH), Harvard University , Enantioselective catalysis (2012)
- Doctor of Philosophy, The Scripps Research Institute , Natural product total synthesis (2009)
- Bachelor of Arts, Columbia University , Chemistry (2004)

LINKS

- The Burns Lab: http://www.stanford.edu/group/burnslab/

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Research in our group explores the boundaries of modern organic synthesis to enable the more rapid creation of the highest molecular complexity in a predictable and controllable fashion. We are particularly inspired by natural products not only because of their importance as synthetic targets but also due to their ability to serve as invaluable identifiers of unanswered scientific questions.

One major focus of our research is selective halogenation of organic molecules. Dihalogenation and halofunctionalization encompass some of the most fundamental transformations in our field, yet methods capable of accessing relevant halogenated motifs in a chemo-, regio-, and enantioselective fashion are lacking.

We are also interested in the practical total synthesis of natural products for which there is true impetus for their construction due to unanswered chemical, medicinal, biological, or biophysical questions. We are specifically engaged in the construction of unusual lipids with unanswered questions regarding their physical properties and for which synthesis offers a unique opportunity for study.

Teaching

COURSES

2020-21

- Advanced Organic Chemistry II: CHEM 223 (Win)
- Organic Chemistry Seminar: CHEM 329 (Aut, Win)
- Synthesis Laboratory: CHEM 126 (Spr)

2019-20

- Advanced Organic Chemistry I: CHEM 221 (Aut)
- Synthesis Laboratory: CHEM 126 (Win)

2018-19

- Advanced Organic Chemistry III: CHEM 225 (Spr)
- Synthesis Laboratory: CHEM 132 (Win)

2017-18

- Advanced Organic Chemistry: CHEM 223 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Kerry Betz, Clayton Hardman, Zhaorui Huang, Quang Luu-Nguyen, Stephen Sarno, Steven Shuken, Nielson Weng

Postdoctoral Faculty Sponsor

Andrew Mayfield

Doctoral Dissertation Advisor (AC)

Ben Boswell, Gabrielle Cabrera, Brandon Derstine, Isaac Falk, Joshua Farr, Laura Handy, Carl Mansson, Grace McKenna, Ciara Ordner, Sajan Patel, Brenda Wu

Publications

PUBLICATIONS

- **Enantioselective Synthesis of Azamerone** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Landry, M. L., McKenna, G. M., Burns, N. Z.
  2019; 141 (7): 2867–71
- **Enantioselective Synthesis of Azamerone.** *Journal of the American Chemical Society*
  Landry, M. L., McKenna, G. M., Burns, N. Z.
  2019
- **Canvass: A Crowd-Sourced, Natural-Product Screening Library for Exploring Biological Space** *ACS CENTRAL SCIENCE*
  Kearney, S. E., Zahoranszky-Kohalmi, G., Brimacombe, K. R., Henderson, M. J., Lynch, C., Zhao, T., Wan, K. K., Itkin, Z., Dillon, C., Shen, M., Cheff, D. M., Lee, T. D., Bougie, et al
  2018; 4 (12): 1727–41
- **Catalytic Regio- and Enantioselective Haloazidation of Allylic Alcohols.** *Journal of the American Chemical Society*
  Seidl, F. J., Min, C., Lopez, J. A., Burns, N. Z.
  2018
- **Synthesis and Mechanochemical Activation of Ladderene-Norbornene Block Copolymers.** *Journal of the American Chemical Society*
  Su, J. K., Feist, J. D., Yang, J., Mercer, J. A., Romaniuk, J. A., Chen, Z., Cegelski, L., Burns, N. Z., Xia, Y.
  2018; 140 (39): 12388–91
- **Ladderane phospholipids form a densely packed membrane with normal hydrazine and anomalously low proton/hydroxide permeability.** *Proceedings of the National Academy of Sciences of the United States of America*
  Moss, F. R., Shuken, S. R., Mercer, J. A., Cohen, C. M., Weiss, T. M., Boxer, S. G., Burns, N. Z.
  2018
- **Synthesis and study of noncanonical membrane lipids**
  Burns, N.
  AMER CHEMICAL SOC.2018

- **Ladderane phospholipids form dense, low-polarity membranes with low proton/hydroxide permeability**
  Moss, F., Shuken, S., Mercer, J., Cohen, C., Weiss, T., Burns, N., Boxer, S.
  AMER CHEMICAL SOC.2018

- **Catalytic Enantioselective Dihalogenation in Total Synthesis** *ACCOUNTS OF CHEMICAL RESEARCH*
  Landry, M. L., Burns, N. Z.
  2018; 51 (5): 1260–71

- **Synthesis and Biophysical Characterization of the Chlorosulfolipids of Ochramonas danica**
  McKenna, G. M., Moss, F. R., Landry, M. L., Burns, N. Z., Boxer, S. G.
  CELL PRESS.2018: 16A

- **Ladderane Phospholipids Form Dense Membranes with Low Proton Permeability**
  Moss, F. R., Shuken, S. R., Mercer, J. M., Cohen, C. M., Burns, N. Z., Boxer, S. G.
  CELL PRESS.2018: 260A

- **Site-selective bromination of sp3 C–H bonds** *Chem.Sci*
  Sathyamoorthi, S., Banerjee, S., Du Bois, J., Burns, N. Z., Zare, R. N.
  2018; 9: 100-104

- **Site-selective bromination of sp3 C-H bonds.** *Chemical science*
  Sathyamoorthi, S., Banerjee, S., Du Bois, J., Burns, N. Z., Zare, R. N.
  2018; 9 (1): 100–104

- **Canvass: A Crowd-Sourced, Natural-Product Screening Library for Exploring Biological Space.** *ACS central science*
  Kearney, S. E., Zahoránszky-K#halmi, G., Brimacombe, K. R., Henderson, M. J., Lynch, C., Zhao, T., Wan, K. K., Itkin, Z., Dillon, C., Shen, M., Cheff, D. M., Lee, T. D., Bougie, et al
  2018; 4 (12): 1727–41

- **Enantiospecific Solvolytic Functionalization of Bromochlorides** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Burckle, A. J., Gal, B., Seidl, F. J., Vasilev, V. H., Burns, N. Z.
  2017; 139 (38): 13562–69

- **Understanding the mechanochemistry of molecular ladders**
  Chen, Z., Chen, L., Mercer, J., Zhu, X., Martinez, T., Burns, N., Xia, Y.
  AMER CHEMICAL SOC.2017

- **Chemical synthesis and absolute stereochemical determination of a ladderane phospholipid**
  Cohen, C., Burns, N.
  AMER CHEMICAL SOC.2017

- **Mechanochemical unzipping of insulating polyladderene to semiconducting polyacetylene.** *Science (New York, N.Y.)*
  Chen, Z., Mercer, J. A., Zhu, X., Romaniuk, J. A., Pfattner, R., Cegelski, L., Martinez, T. J., Burns, N. Z., Xia, Y.
  2017; 357 (6350): 475–79

- **Chemical Synthesis and Self-Assembly of a Ladderane Phospholipid** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Mercer, J. A., Cohen, C. M., Shuken, S. R., Wagner, A. M., Smith, M. W., Moss, F. R., Smith, M. D., Vahala, R., Gonzalez-Martinez, A., Boxer, S. G., Burns, N. Z.
  2016; 138 (49): 15845-15848

- **Chiral Alkyl Halides: Underexplored Motifs in Medicine** *MARINE DRUGS*
  Gal, B., Bucher, C., Burns, N. Z.
  2016; 14 (11)

- **A Unified Approach for the Enantioselective Synthesis of the Brominated Chamigrene Sesquiterpenes.** *Angewandte Chemie (International ed. in English)*
  Burckle, A. J., Vasilev, V. H., Burns, N. Z.
  2016; 55 (38): 11476-11479

- **Selective bromochlorination of a homoallylic alcohol for the total synthesis of (-)-anverene** *BEILSTEIN JOURNAL OF ORGANIC CHEMISTRY*
  Seidl, F. J., Burns, N. Z.
  2016; 12: 1361-1365

- **Catalytic Enantioselective Dihalogenation and the Selective Synthesis of (-)-Deschloromytilipin A and (-)-Danicalipin A** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Landry, M. L., Hu, D. X., McKenna, G. M., Burns, N. Z.
  2016; 138 (15): 5150-5158
- **Highly Selective Synthesis of Halomon, Plocamenone, and Isoplocamenone** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Bucher, C., Deans, R. M., Burns, N. Z.
  2015; 137 (40): 12784-12787
- **Catalytic Chemo-, Regio-, and Enantioselective Bromochlorination of Allylic Alcohols** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Hu, D. X., Seidl, F. J., Bucher, C., Burns, N. Z.
  2015; 137 (11): 3795-3798
- **Natural products: Emulation illuminates biosynthesis.** *Nature chemistry*
  Mercer, J. A., Burns, N. Z.
  2015; 7 (11): 860–61
- **Catalytic enantioselective dibromination of allylic alcohols.** *Journal of the American Chemical Society*
  Hu, D. X., Shibuya, G. M., Burns, N. Z.
  2013; 135 (35): 12960-12963
- **ORGANIC CHEMISTRY Catalysis in tight spaces** *NATURE*
  Burns, N. Z., Jacobsen, E. N.
  2012; 483 (7389): 278-279
- **Mannich Reaction** *Science of Synthesis, Stereoselective Synthesis*
  Z, B. N., N, J. E., G, D. J., A, M. G., Eds, E. A.
  2011; 2 (785-834)
- **Dual Catalysis in Enantioselective OxidopyryliumBased [5+2] Cycloadditions** *J. Am. Chem. Soc*
  Z, B. N., W, W. M., N, J. E.
  2011; 133 (14578-14581)
- **Sulfhydryl-based dendritic chain reaction** *CHEMICAL COMMUNICATIONS*
  Sella, E., Weinstain, R., Erez, R., Burns, N. Z., Baran, P. S., Shabat, D.
  2010; 46 (35): 6575-6577
- **Scalable Total Synthesis and Biological Evaluation of Haouamine A and Its Atropisomer** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Burns, N. Z., Krylova, I. N., Hannoush, R. N., Baran, P. S.
  2009; 131 (26): 9172-?
- **Redox Economy in Organic Synthesis** *ANGEWANDTE CHEMIE-INTERNATIONAL EDITION*
  Burns, N. Z., Baran, P. S., Hoffmann, R. W.
  2009; 48 (16): 2854-2867
- **Total synthesis of Haouamine A: the IndenoTetrahydropyridine Core** *Tetrahedron*
  Z, B. N., M, J., S, B. P.
  2009; 65 (6600-6610)
- **On the origin of the haouamine alkaloids** *ANGEWANDTE CHEMIE-INTERNATIONAL EDITION*
  Burns, N. Z., Baran, P. S.
  2008; 47 (1): 205-208
- **Total synthesis of (+/-)-haouamine A** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Baran, P. S., Burns, N. Z.
  2006; 128 (12): 3908-3909
- **The enantioselective allylation and crotylation of sterically hindered and functionalized aryl ketones: Convenient access to unusual tertiary carbinol structures** *ANGEWANDTE CHEMIE-INTERNATIONAL EDITION*
  Burns, N. Z., Hackman, B. M., Ng, P. Y., Powelson, I. A., Leighton, J. L.

2006; 45 (23): 3811-3813