43rd National Organic Chemistry Symposium

Statue of George Washington outside Meany Hall looking west to the Olympic Mountains. Photo courtesy of Loyd C. Heath.

University of Washington
Seattle, Washington
June 23-27, 2013

UNIVERSITY of WASHINGTON
SEATTLE

NOS 2013
University of Washington

Division of Organic Chemistry
American Chemical Society

For information on the Division and other items of interest, visit our website: **http://organicdivision.org**

Graduate Research Symposium (GRS)

The GRS provides an opportunity for 50-75 graduate students in organic chemistry to interact with leaders from academia, industry, various funding agencies, and publishers at a single venue will take place this year at the University of Delaware on July 25–28. Watch the monthly DOC newsletters for the call for applications for 2014.

Technical Achievement in Organic Chemistry (TAOC) Awards

Nominations for the TAOC Awards to recognize outstanding contributions to the field of organic chemistry from accomplished Junior-level chemists (i.e., those who do not have a Ph.D. degree or equivalent). Awards are given at the ACS Meeting. Nominations typically open late fall and are accepted through the online nomination form until mid January.

Travel Awards

Travel awards ($600 each) for graduate students, undergraduates, and faculty at PUIs for travel to ACS National Meetings to present their work within the Organic Division's Symposia/Poster Sessions. Application deadlines for National Meetings will typically be November 15th for the Spring meeting and May 1st for the Fall Meeting.

Videos: Eminent Organic Chemists, The Human Side

Chemical historian Jeffrey I. Seeman has conducted a series of video interviews with prominent organic chemists (to date, 15 have been released). One goal of these interviews was to reveal the human side of these scientists by exploring their values, and breadth of experiences. See the videos at: layingthegroundwork.com/chemists

Symposia Proposals for National Meetings

Do you have an idea for a meeting symposium that will help reflect the diversity of interests and membership in the Division, including representation from academics and industry, established and beginning investigators, and groups historically underrepresented in the profession? Proposals are due ONE YEAR prior to the meeting where the session is requested on the following dates: February 15 and July 15.

Njardarson Group Disease Focused Pharmaceutical Posters

This group has created a new class of posters that build upon the design philosophy and success of their Top200 drug posters but that aim to capture a larger number of pharmaceuticals and to present thematically according to their medical use. See their website at: http://tinyurl.com/njardarson-posters

Contact with Members/Social Media

Look for the nearly once per month Organic Division email messages, Also, the Organic Division now has a significant presence on Linkedin, Facebook, and Twitter.

Organic Chemistry Reference Resolver

Oleksandr Zhurakovskyi has created the Organic Chemistry Reference Resolver. This utility/website is intended to facilitate reference retrieval from the internet from a wide variety of publishers and be redirected straight to the desired abstract. The DOC has added the search widget directly to our Organic Journals and Organic Web Links pages (both found under Resources in the Navigation bar). Also see: chemsearch.kovsky.net

Organic Division Undergraduate Award

The DOC is pleased to sponsor a new award program called the Undergraduate Award in Organic Chemistry, that is intended to recognize a top graduating senior student majoring in either chemistry or biochemistry who has demonstrated excellence in organic chemistry based on a combination of research experience, coursework and a desire to pursue a career in chemistry. The award consists of a letter of recognition, an award certificate, and a one-year free membership to the Organic Division.

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American Chemical Society

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43rd National Organic Chemistry Symposium

University of Washington
Seattle, Washington
June 23 – 27, 2013

Table of Contents

Welcome to the University of Washington

On behalf of the Executive Committee of the **Division of Organic Chemistry** of the **American Chemical Society** and the **Department of Chemistry at the University of Washington**, we welcome you to the 43rd National Organic Chemistry Symposium (a k a NOS). The goal of this biennial event is to present a roster of distinguished speakers that represent the breadth and creative advances of organic chemistry.

The first National Organic Chemistry Symposium was held December 1925 in Rochester NY under the auspices of the Rochester Section of the Division of Organic Chemistry. Subsequent meetings were held every two years until WWII. The symposia resumed in 1947 in Boston and have been held biennially since. The National Organic Chemistry Symposium is the premier event sponsored by the Division of Organic Chemistry. In 1959, the Roger Adams Award was established and the Roger Adams Award Address has become a key focus of the symposium. That year the 16th NOS was held in Meany Hall at the University of Washington, organized by Stanley J. Cristol, and Derek H. R. Barton received the first Roger Adams Award. This 43rd National Organic Chemistry Symposium consists of 13 invited speakers, the 2013 Roger Adams Awardee David A. Evans and hundreds of posters. The lectures will be presented during morning and evening sessions at Meany Hall* on the campus of the University of Washington. The poster sessions will take place in the evenings from approximately 9:00 pm - midnight in the Meany Hall Lobby, Sunday through Wednesday. The Symposium Banquet on Wednesday evening is open to all registered attendees and guests.

The campus of the University of Washington and its immediate area are well worth exploring on foot. The Seattle area offers many recreational opportunities. The organizers have arranged free afternoon bus service to key tourist destinations: the Seattle Center (including the Space Needle, Duck tours, the Discover Music Center), Pike Place Market (the original Starbucks, the popular fish market and much more), and to the local Washington State wine area where Redhook Brewing, Chateau St. Michelle, and many other wineries are represented.

We thank our Sponsors and our Exhibitors for providing financial support for the Symposium. We also thank the University of Washington Conference Management group and our volunteers, including our student volunteers, for assisting with the organization of this event. Finally, thank <u>you</u> for attending and being a part of the 43rd National Organic Chemistry Symposium.

Scott Sieburth
43rd NOS Executive Officer
Temple University

Champak Chatterjee
43rd NOS Co-Chair
University of Washington

Marisa Kozlowski
Division Co-Organizer
University of Pennsylvania

Gojko Lalic
43rd NOS Co-Chair
University of Washington

Paul Hopkins
43rd NOS Co-Chair
University of Washington

Andrew Boydston
43rd NOS Co-Chair
University of Washington

Forrest Michael
43rd NOS Co-Chair
University of Washington

* Meany Hall was originally constructed as part of the 1909 Alaska-Yukon-Pacific Exposition. It was badly damaged in the 6.7-magnitude 1965 Olympia earthquake and was demolished. The current building was built in 1974, close to the original Meany Hall footprint.

Sponsors

We acknowledge and appreciate the generous financial support
and sponsorship by the following organizations

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ACS Division of Organic Chemistry

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TCI America

ThalesNano

Thieme Chemistry

Wiley

Exhibitors

The following organizations have exhibitor tables at the evening poster sessions.

ACS Division of Organic Chemistry
ACS Publications
Advion
Alchemical Research, LLC
Biotage
BoroPharm, Inc.
Bruker
Gelest
The Journal of Organic Chemistry
KD Scientific
Organic Letters
Pharmaron
Q Labtech LLC
Sigma-Aldrich
Strem Chemicals
TCI America
ThalesNano
Thieme Chemistry
Wiley

ACS Division of Organic Chemistry
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Secretary-Treasurer-Elect:	Dr. Barry Snider
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NOS Executive Officer Elect:	Dr. Marisa Kozlowski
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	Dr. Seth Herzon
	Dr. Randall Hungate
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	Dr. Richmond Sarpong
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43rd National Organic Chemistry Symposium Organizers

Professor Scott McN. Sieburth – Temple University
Symposium Executive Officer

Professor Marisa Kozlowski – University of Pennsylvania
ORGN Division Co-Chair

Professor Paul B. Hopkins – University of Washington
Local Symposium Co-Chair

Professor Andrew J. Boydston – University of Washington
Local Symposium Co-Chair

Professor Champak Chatterjee – University of Washington
Local Symposium Co-Chair

Professor Gojko Lalic – University of Washington
Local Symposium Co-Chair

Professor Forrest Michael – University of Washington
Local Symposium Co-Chair

UW Conference Management

Ms. Debra Bryant & Ms. Jan Kvamme

43rd National Organic Chemistry Symposium
Program

SUNDAY, JUNE 23

3:00 PM – Midnight	Registration	Meany Hall Lobby
8:00 PM – Midnight	Reception and Poster Session, Exhibitor Booths	Meany Hall Lobby

MONDAY, JUNE 24

7:30 AM – Noon	Registration	Meany Hall Lobby
8:30 AM - 9:00 AM	**Opening Remarks**:	Meany Hall
	Professor Scott McN. Sieburth, Temple University, Conference Chair	
	Professor Paul Hopkins, University of Washington, Department of Chemistry	
	Session Chair: Gregory W. O'Neil, Western Washington University	
9:00 AM - 10:15 AM	**Professor François Diederich**, ETH Zürich "Molecular Recognition in Chemical and Biological Systems: A Multidimensional Approach"	Meany Hall
10:15 AM-10:45 AM	Break *Sponsored by ThalesNano*	
	Session Chair: Kirk Stevens, Gilead Sciences	
10:45 AM – Noon	**Professor Peter Wipf**, University of Pittsburgh "Cycloadditions in Heterocycle and Alkaloid Synthesis"	Meany Hall

Afternoon – free time

	Session Chair: Professor Lawrence T. Scott, Boston College Chair ACS Division of Organic Chemistry	
7:00 PM - 8:30 PM	**2013 Roger Adams Award Lecture**	Meany Hall
	Professor David A. Evans, Harvard University "The Enduring Challenge of Controlling Stereochemical Relationships"	
8:30 PM – Midnight	Mixer and Poster Session, Exhibitor Booths	Meany Hall Lobby

TUESDAY, JUNE 25

6:30 AM – 8:00 AM	5K Fun Run/Walk	
	S**ession Chair:** Neal A. Yakelis, Pacific Lutheran University	
8:30 AM - 9:45 AM	**Professor Erick M. Carreira**, ETH Zürich "Surprises and Discoveries with Human Derived Natural Products" *Sponsored by Organic Letters*	Meany Hall
9:45 AM - 10:30 AM	Break	
	Session Chair: Peter J. Alaimo, Seattle University	
10:30 AM - 11:45 AM	**Professor William R. Roush**, Scripps Florida "Synthesis of Chiral Allylboron and Enolborane Reagents via Enantioselective Allene and Acrylamide Hydroboration Reactions, and Applications to the Synthesis of Natural Products"	Meany Hall
11:45 AM - 1:00 PM	**Professor Paul Knochel**, Ludwig-Maximilian Universität München "Functionalized Organometallics in Organic Synthesis"	Meany Hall
Afternoon – free time		
5:30 PM - 6:30 PM	Undergraduate Context Session Pizza and Soda will be provided	BAG 260
	Session Chair: Professor Andrew J. Boydston, University of Washington	
7:00 PM - 8:15 PM	**Professor Lawrence T. Scott**, Boston College "Can Organic Chemists Deliver Structurally Uniform Fullerenes and Carbon Nanotubes by Custom Synthesis?"	Meany Hall
8:15 PM - 9:30 PM	**Professor Jin-Quan Yu**, The Scripps Research Institute "Ligand-Accelerated C-H Activation Reactions: new synthetic disconnections"	Meany Hall
9:30 PM – Midnight	Mixer and Poster Session, Exhibitor Booths	Meany Hall Lobby

WEDNESDAY, JUNE 26

Session Chair: Stephane Perreault, Gilead Sciences

8:30 AM - 9:45 AM **Professor Hanadi F. Sleiman**, McGill University Meany Hall
"DNA Cages and Nanotubes: Simple, DNA-Minimal Synthesis and Biological Properties"

9:45 AM - 10:30 AM Break *Sponsored by Thieme Chemistry*

Session Chair: Craig Fryhle, Pacific Lutheran University

10:30 AM -11:45 AM **Dr. Joanna S. Fowler**, Brookhaven National Laboratory Meany Hall
"Radiotracer Chemistry and Imaging the Human Brain"

11:45 AM - 1.00 PM **Dr. Paul J. Coleman**, Merck Research Laboratories Meany Hall
"Discovery of Suvorexant: A New Approach for the Treatment of Sleep Disorders"

Afternoon – free time

5:00 PM - 7:00 PM Conference Banquet Rainier Vista

Session Chair: Kerry Fowler, Kineta, Inc.

7:30 PM - 8:45 PM **Professor Eiichi Nakamura**, The University of Tokyo Meany Hall
"Single-molecule, Real-time Transmission Electron Microscope (SMRT-TEM) Imaging for Organic Chemistry"

8:45 PM – Midnight Mixer and Poster Session, Exhibitor Booths Meany Hall Lobby

THURSDAY, JUNE 27

Session Chair: Professor Champak Chatterjee, University of Washington

9:00 AM - 10:15 AM **Professor Shana O. Kelley**, University of Toronto Meany Hall
"Mitochondria-Specific Peptide Delivery Vehicles"

10:15 AM-10:45 AM Break

Session Chair: Professor Marisa C. Kozlowski, University of Pennsylvania, Chair NOS 2015

10:45 AM – Noon **Professor Richmond Sarpong**, Univ. of California, Berkeley Meany Hall
"Strategies and Tactics Inspired by Complex Alkaloids"

Closing Remarks

The Roger Adams Award in Organic Chemistry

The Roger Adams Award in Organic Chemistry is sponsored jointly by the American Chemical Society, Organic Reactions, Inc., and Organic Syntheses, Inc. The award recognizes the distinguished career of Roger Adams, who played a vital role in each of these three organizations. He was Chairman of the Board of Directors as well as President of the American Chemical Society, and he co-founded Organic Syntheses and Organic Reactions.

The award was established in 1959 and is made biennially to an individual, without regard to nationality, for outstanding contributions to research in organic chemistry. The award consists of a gold medal, a sterling silver replica of the medal, and an honorarium of twenty-five thousands dollars. It is presented at the biennial National Organic Chemistry Symposium of the Division of Organic Chemistry of the American Chemical Society. The awardee is a featured lecturer in the program of the symposium.

The recipient of this year's Roger Adams Award is Professor David A. Evans of Harvard University, Cambridge, Massachusetts in recognition of outstanding contributions to research in organic chemistry. Professor Evans' Award Address, titled *The Enduring Challenge of Controlling Stereochemical Relationships*, will be delivered on Monday evening.

Roger Adams Awardee

Professor David A. Evans
Department of Chemistry & Chemical Biology
Harvard University
12 Oxford St.
Cambridge, MA 02138 USA
http://evans.harvard.edu/index.html

presenting Monday June 24, 7:00 p.m.

Plenary Lecturers

Professor Erick M. Carreira
ETH Zürich
Zürich, Switzerland

Surprises and Discoveries with Human Derived Natural Products

Presenting Tuesday, June 25, 8:30 a.m.

Dr. Paul J. Coleman
Merck & Co. Inc.
West Point, Pennsylvania, USA

Discovery of Suvorexant: A New Approach for the Treatment of Sleep Disorders

Presenting Wednesday, June 26, 11:45 a.m.

Professor François Diederich
ETH Zürich
Zürich, Switzerland

Molecular Recognition in Chemical and Biological Systems: A Multidimensional Approach

Presenting Monday, June 24, 9:00 a.m.

Professor David A. Evans
Harvard University
Cambridge, Massachusetts, USA

The Enduring Challenge of Controlling Stereochemical Relationships

Presenting Monday, June 24, 7:00 p.m.

Plenary Lecturers Continued

Dr. Joanna Fowler
Brookhaven National Laboratory
Upton, New York, USA

Radiotracer Chemistry and Imaging the Human Brain

Presenting Wednesday, June 26, 10:30 a.m.

Professor Shana O. Kelley
University of Toronto
Toronto, Ontario, Canada

Mitochondria-specific peptide delivery vehicles

Presenting Thursday, June 27, 9:00 a.m.

Professor Paul Knochel
Ludwig-Maximilians-Universität
München, Germany

Functionalized Organometallics in Organic Synthesis

Presenting Tuesday, June 25, 11:45 a.m.

Professor Eiichi Nakamura
The University of Tokyo
Tokyo, Japan

Single-molecule, Real-time Transmission Electron Microscope (SMRT-TEM) Imaging for Organic Chemistry

Presenting Wednesday, June 26, 7:30 p.m.

Plenary Lecturers Continued

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The Scripps Research Institute, Scripps Florida
Jupiter, Florida, USA

Synthesis of Chiral Allylboron and Enolborane Reagents via Enantioselective Allene and Acrylamide Hydroboration Reactions, and Applications to the Synthesis of Natural Products

Presenting Tuesday, June 25, 10:30 a.m.

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University of California
Berkeley, California, USA

Strategies and Tactics Inspired by Complex Alkaloids.

Presenting Thursday, June 27, 10:45 a.m.

Professor Lawrence T. Scott
Boston College
Chestnut Hill, Massachusetts, USA

Can Organic Chemists Deliver Structurally Uniform Fullerenes and Carbon Nanotubes by Custom Synthesis?

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Montreal, Quebec, Canada

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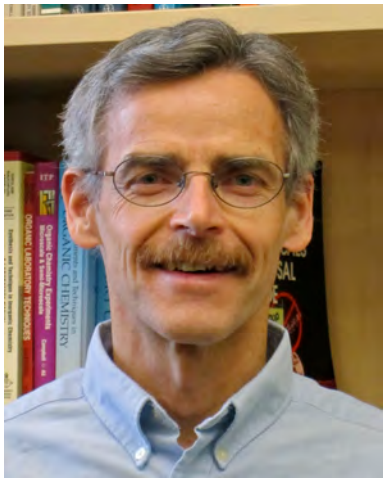
Plenary Lecturers Continued



Professor Peter Wipf
University of Pittsburgh
Pittsburgh, Pennsylvania, USA

Cycloadditions in Heterocycle and Alkaloid Synthesis

Presenting Monday, June 24, 10:45 a.m.

Professor Jin-Quan Yu
The Scripps Research Institute
La Jolla, California, USA

Ligand-Accelerated C-H Activation Reactions: new synthetic disconnections

Presenting Tuesday, June 25, 8:15 p.m.

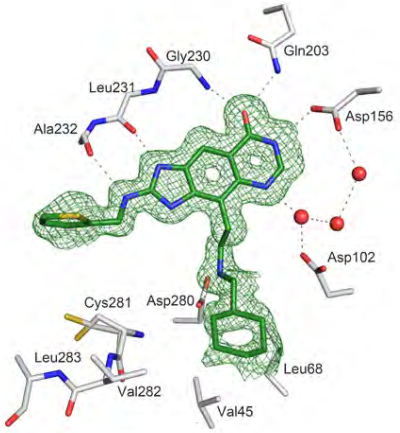
Molecular Recognition in Chemical and Biological Systems: A Multidimensional Approach

François Diederich

Laboratorium für Organische Chemie, Department of Chemistry and Applied Biosciences, ETH Zurich, Hönggerberg, HCI, CH-8093 Zurich, Switzerland

diederich@org.chem.ethz.ch
http://www.diederich.chem.ethz.ch

We pursue a multi-dimensional approach towards deciphering and quantifying weak intermolecular interactions in chemical and biological systems. Starting from the observation of an unfamiliar intermolecular contact seen in the X-ray crystal structures of protein-ligand complexes, we undertake data base mining in the Cambridge Crystallographic Database (CSD) and the Protein Data Bank (PDB) to explore its statistical relevance. If the contact is of a more general nature, we quantify it - depending on its energetic magnitude - by protein-ligand binding assays, molecular recognition studies with synthetic receptors or, if very weak, by studying intramolecular dynamic processes in designed model systems. This multidimensional approach is illustrated in examples taken from a variety of structure-based drug design projects pursued by our group in collaboration with Roche, Basel and the group of G. Klebe (Univ. of Marburg).



The first example deals with cation-π interactions at the active site of Factor XA, a serine protease from the blood coagulation cascade. They are among the most potent interactions in chemical and biological systems. The second example analyzes energetically favorable water displacements by ligand parts at the active sites of catechol-O-methyltransferase, a target in Parkinson therapy, and t-RNA guanine-transglycosylase, a new target against Shigellosis. The last part of the lecture reports on our program aimed at the quantification of intermolecular interactions involving bond and molecular dipoles. Optimal stacking of heteroarenes on peptide amide bonds is analyzed, and orthogonal dipolar interactions, such as C–F...C=O and C=O...C=O, are quantified using synthetic molecular torsion balances. Halogen bonding interactions between peptide C=O groups and aryl halides (X = Cl, Br, I) are identified as a potent driving force to strengthen protein-ligand complexation, and their geometric requirements are illustrated for protein-ligand complexes formed by the human cysteine protease Cathepsin L.

Notes

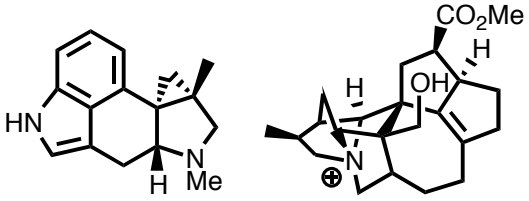
Cycloadditions in Heterocycle and Alkaloid Synthesis

P. Wipf*, Michael Yang, Yongzhao Yan, and Laurent Ferrié

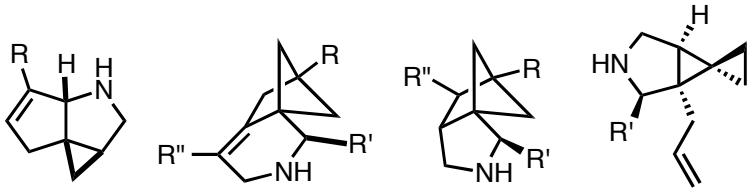
Department of Chemistry, University of Pittsburgh, Pittsburgh PA

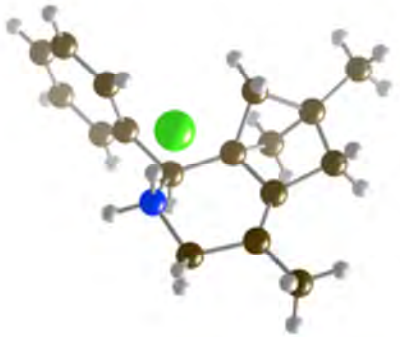
pwipf@pitt.edu

Cycloaddition processes illustrate the efficiency of organic synthesis and the structural diversity that can be accomplished using relatively simple building blocks. The intramolecular Diels-Alder reaction of β-hydroxy 2-aminofurans delivers substituted indoles in a convergent approach. The biologically important 5-hydroxy indole scaffold can also be obtained with this methodology. Furan cycloadditions provide versatile building blocks for alkaloid synthesis. In contrast, intramolecular methylene cyclopropane Diels-Alder reactions can be used to access novel heterocyclic scaffolds. Complementing these approaches is the use of bicyclobutanes, which are precursors for novel bridged pyrrolidines as well as the polycyclic core structures of alkaloids, including the tetracyclic ammonium cation of daphniglaucin A.



Cycloclavine ***Daphniglaucin A***





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4. Ueda, M.; Walczak, M. A. A.; Wipf, P. *Tetrahedron Lett.* **2008**, *49*, 5986.
5. Walczak, M. A. A.; Wipf, P. *J. Am. Chem. Soc.* **2008**, *130*, 6924.
6. Wipf, P.; Fang, Z.; Ferrié, L.; Ueda, M.; Walczak, M. A. A.; Yan, Y.; Yang, M. *Pure Appl. Chem*. **2013**, *85*, in press.

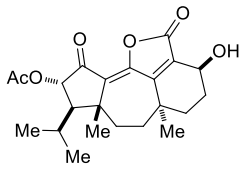
Notes

Discovery and Surprises with Natural Products

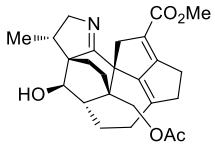
Erick M. Carreira

ETH Zürich
Zürich, Switzerland

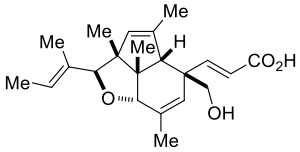
Stereochemically and structurally complex natural products represent an ideal forum for research at the interface of chemistry, biology and medicine. As targets for total synthesis the molecules of nature provide inspiration for the discovery and development of both novel tactics and innovative strategies. The presentation will focus on recent development dealing with synthesis, biology, and methods development. The center piece of the talk will focus on observations we have made in the context of our interest in a variety of diverse structures.



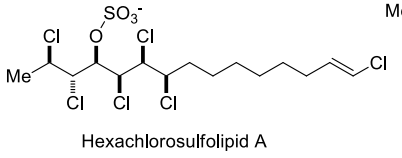
Guanacastepene O



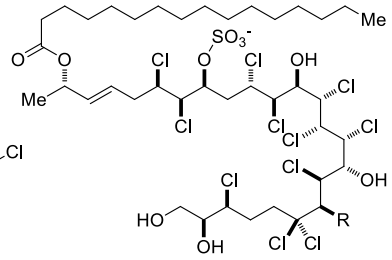
Daphmanidin E



indoxamycin B
[revised structure]



Hexachlorosulfolipid A



Undecachlorosulfolipid A (R=OH) and B (R=H)

Notes

Synthesis of Chiral Allylboron and Enolborane Reagents via Allene and Acrylamide Hydroboration Reactions, and Applications to the Synthesis of Natural Products

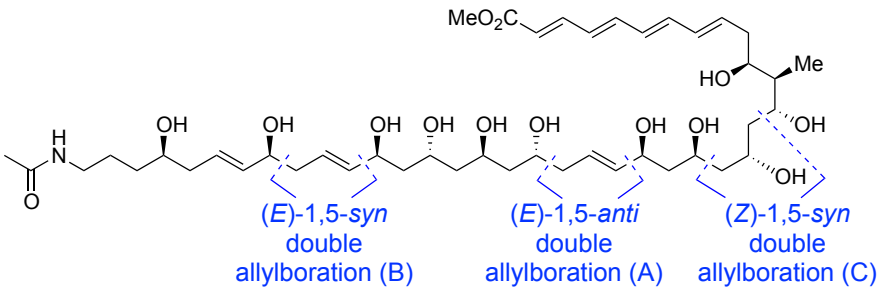
William R. Roush

Department of Chemistry, The Scripps Research Institute, Florida
Jupiter, FL 33458

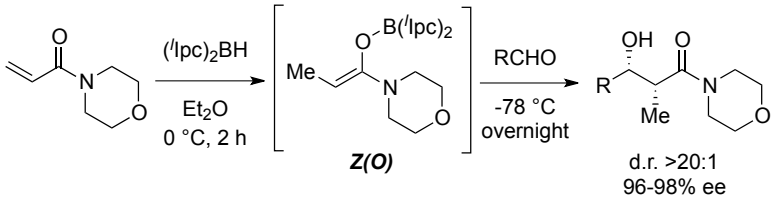
roush@scripps.edu
http://www.scripps.edu/roush/Roush.html

The synthesis of highly enantioselective allylboron reagents via hydroboration reactions of allenes with chiral organoboranes has been a topic of investigation in our laboratory in recent years. For example, the double allylborating agents A, B, and C were developed via hydroboration reactions of substituted allenylboron intermediates for use in the highly enantio- and diastereoselective synthesis of 1,5-diols via the coupling of two different aldehyde units. The utility of these reagents will be discussed in connection with a highly stereocontrolled synthesis of N-acetyl 13-dihydrotetrafibricin methyl ester. As an extension of this methodology, specifically targeting the synthesis of chiral enolborane reagents for use in enantioselective aldol reactions, we have found that the 1,4-hydroboration of morpholine acrylamides constitutes an exceptionally useful method for synthesis of syn aldols with 96-98% e.e. and >20:1 d.r. Synthetic applications of this new aldol methodology will also be presented.

Synthesis of *N*-Acetyl 13-Dihydrotetrafibricin Methyl Ester



Enantioselective Aldol Reactions via 1,4-Hydroboration of Acrylamides



Notes

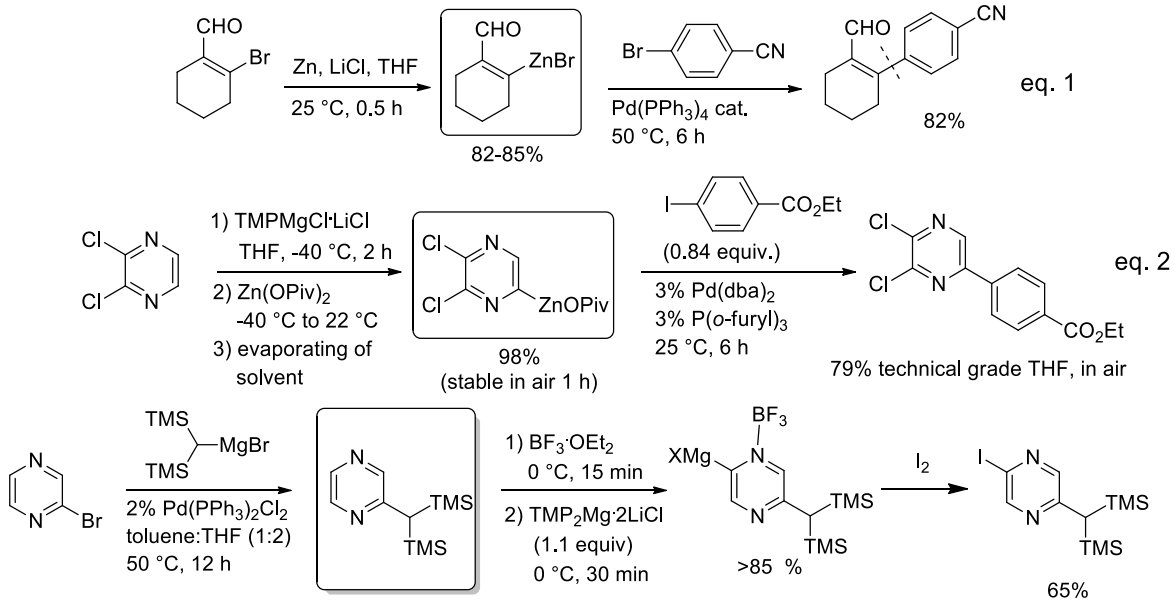
Functionalized Organometallics in Organic Synthesis

Prof. Paul Knochel

Ludwig-Maximilians-University Munich, Chemistry Department/Munich, (Germany)

Paul.Knochel@cup.uni-muenchen.de

In this lecture, we will describe several new methods for preparing polyfunctional organometallics of Li, Mg and Zn. The use of Zn/LiCl allows for example, the preparation of organozinc reagents bearing an aldehyde function,[1] (eq. 1). Also the preparation of air-stable organozinc pivalates will be described (eq. 2).[2] A stereoselective synthesis of functionalized cyclic and acyclic lithium reagents will also be described using an iodine/lithium exchange reaction. The stereochemical outcome of the exchange, transmetalation and quenching reactions with electrophiles will be described.[3] By combining the use of the Lewis-acid BF_3•OEt_2 and TMP-bases (TMP = 2,2,6,6-tetramethylpiperidyl), several selective metalations of N heterocycles such as pyridazines, could be achieved (eq. 3).[4] Several new "green" cross couplings involving iron and related transition-metals as well as transition-metal free will be described.[5]



1 Haag, B. A.; Saemann, C.; Jana, A.; Knochel, P. *Angew. Chem. Int. Ed.* **2011**, *50*, 7290-7294.

2 Stathakis, C. I.; Bernhardt, S..; Quint, V.; Knochel, P. *Angew. Chem. Int. Ed.* **2012**, *51*, 9428-9432.

3 Seel, S.; Dagousset, G.; Thaler, T.; Frischmuth, A.; Karaghiosoff, K.; Zipse, H.; Knochel, P. *Chem. Eur. J.* **2013**, *19*, 4614-4622.

4 Groll, K.; Manolikakes, S. M.; Mollat du Jourdin, X.; Jaric, M.; Bredihhin, A.; Karaghiosoff, K.; Carell, T.; Knochel, P. *Angew. Chem. Int. Ed.* **2013**, *52*, DOI: 10.1002/anie.201301694.

5 a) Kuzmina, O. M.; Steib, A. K.; Markiewicz, J. T.; Flubacher, D.; Knochel, P. *Angew. Chem. Int. Ed.* **2013**, *52*, 4945-4949; b) Chen, Q.; Mollat du Jourdin, X.; Knochel, P. *J. Am. Chem. Soc.* **2013**, *135*, 4958-4961.

Notes

Can Organic Chemists Deliver Structurally Uniform Fullerenes and Carbon Nanotubes by Custom Synthesis?

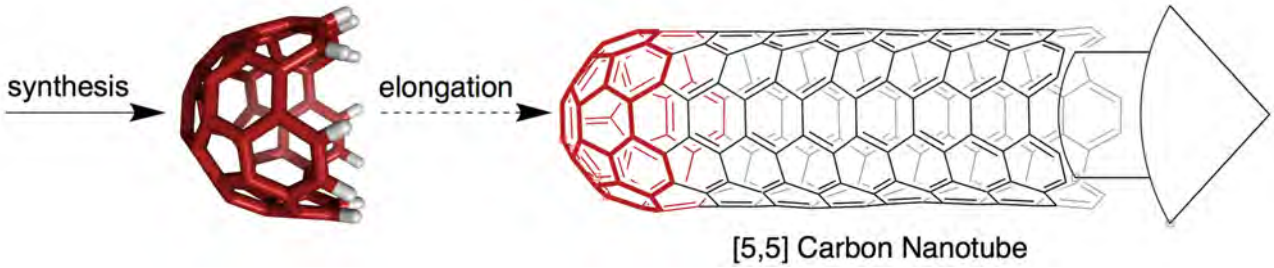
Lawrence T. Scott

Merkert Chemistry Center, Boston College,
Chestnut Hill, Massachusetts 02467-3860 USA

lawrence.scott@bc.edu

In the ten years since the first directed chemical synthesis of C_{60},[1] no other fullerene has been prepared in isolable quantities by rational chemical methods. We organic chemists have an obligation to address this conspicuous shortcoming in our current synthesis capabilities. Very few fullerenes are available isomerically pure from soot by chromatography, and the vast majority of higher fullerenes lie beyond the reach of materials scientists, who could put them to good use. The situation is even worse for carbon nanotubes (CNTs). Separating useful amounts of metallic CNTs from those that are semiconducting is virtually impossible, and the quest for single-chirality, uniform diameter CNTs remains an even more formidable challenge.[2]

This lecture will present methods for synthesizing geodesic polyarenes[3] and describe how those methods can be applied to syntheses of fullerenes and end-caps for single-index [*n*,*m*]CNTs by design.[4] Strategies for elongating hemispherical polyarenes into full-length CNTs will also be outlined.[5]



1. a) Boorum, M. M.; Vasil'ev, Y. V.; Drewello, T.; Scott, L. T. *Science* **2001**, *294*, 828. b) Scott, L. T.; Boorum, M. M.; McMahon, B. J.; Hagen, S.; Mack, J.; Blank, J.; Wegner, H.; de Meijere, A. *Science* **2002**, *295*, 1500. c) Scott, L. T. *Angew. Chem. Int. Ed*. **2004**, *43*, 4995.
2. Scott, L. T. *Polycycl. Aromat. Compd*. **2010**, *30*, 247.
3. Tsefrikas, V. M.; Scott, L. T. *Chem. Reviews* **2006**, *106*, 4868.
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5. a) Fort, E. H.; Donovan, P. M.; Scott, L. T. *J. Am. Chem. Soc.* **2009**, *131*, 16006. b) Fort, E. H.; Scott, L. T. *Angew. Chem., Int. Ed.* **2010**, *49*, 6626. c) Fort, E. H.; Scott, L. T. *Tetrahedron Lett.* **2011**, *52*, 2051. d) Fort, E. H.; Scott, L. T. *J. Mater. Chem.* **2011**, *21*, 1373.

Notes

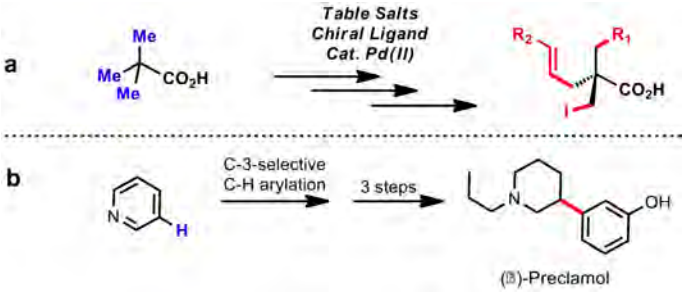
Ligand-Accelerated C-H Activation Reactions: new synthetic disconnections

Jin-Quan Yu

Department of Chemistry, The Scripps Research Institute, 10550 N. Torrey Pines Road, BCC-372, La Jolla, California, 92037-1000, U.S.A.

yu200@scripps.edu
http://www.scripps.edu/chem/yu/

Pd(II)-catalyzed enantioselective and position-selective C–H activation reactions are developed using mono-N-protected chiral amino acid ligands. C–H activation intermediates are characterized, offering insights into the origin of the observed stereoselectivity. Most importantly, these chiral ligands are found to accelerate drastically C–H activation reactions, shortening the reaction time from two days to 20 minutes.



Notes

DNA Cages and Nanotubes: Simple, DNA-Minimal Synthesis and Biological Properties

Hanadi Sleiman

Department of Chemistry, McGill University
801 Sherbrooke St. W., Montreal, Quebec, H3A 0B8, Canada

Hanadi.sleiman@mcgill.ca

Three-dimensional structures made of DNA hold the potential to encapsulate and release drugs, regulate the assembly and activity of proteins, and organize networks for catalysis and biomolecule crystallization. A number of strategies for DNA construction have been developed, through weaving together DNA strands into tiles, or stapling a DNA strand into origami structures. Our group has been examining a different approach to build DNA nanostructures, in which synthetic molecules are used to control and modify DNA self-assembly.

We will describe the use of this approach to generate 3D-DNA structures, such as DNA cages and nanotubes, with deliberate variation of geometry, size, single- and double-stranded forms, permeability and length. These can be dynamically switched to different internal volumes, and can be 'opened' or closed with specific DNA strands. The size-selective encapsulation of nanoparticles and small molecules within these host structures and the release of this cargo when specific DNA strands are added will be shown. We will also describe the use of these cages for the anisotropic organization of hydrophobic units, thus defining new modes of protein-inspired interactions. These compact 3D-DNA structures can travel across the plasma membrane of a number of mammalian cells, without the aid of transfection reagents. The molecules shown here represent a new class of selective cellular probes and drug delivery tools, and can assist the development of nucleic acid therapeutic routes.

Selected References:

Science, 2008, 321, 1795; ACS Nano 2013, 7, 3022; Chem. Science, 2012, 3, 1980. c. J. Am. Chem. Soc., 2012, 134 14382; J. Am. Chem. Soc., 2012, 134, 4280; J. Am. Chem. Soc. 2012, 134, 2888; J. Am. Chem. Soc., 2010, 132, 10212; Nature Chem. 2010,2, 319; Nature Chem., 2009, 1, 390; Nature Nanotech., 2009, 4, 349; J. Am. Chem. Soc., 2007, 13376.

Notes

Rapid Radiotracer Chemistry and Imaging the Human Brain

Joanna S. Fowler
Brookhaven National Laboratory
Upton, New York 11973

Jfowler@bnl.gov
http://www.bnl.gov/biosciences/staff/Fowler.php

In vivo molecular imaging utilizing positron emission tomography(PET) and labeled compounds continues to provide new knowledge of the healthy human brain and of brain circuits which are altered in disease and by drugs. This knowledge, in turn,generates new opportunities to design and develop better drugs and to monitor treatment. The full utilization of PET in human neuroscience requires advances in radiotracer chemistry, particularly in the development of rapid synthetic methods for introducing the short-lived isotopes, carbon-11 ($t_{1/2}$: 20.4 min) and fluorine-18 ($t_{1/2}$: 110 min) into a wide variety of chemical compounds which are targeted to different cellular elements. In this presentation, we will introduce PET technology and highlight some examples of the use of PET and selective radiotracers to measure the pharmacokinetics and pharmacodynamics of drugs of abuse on the human brain. We will also highlight some new radiotracers and imaging instrumentation whichwill serve as scientific tools to advance our knowledge of the human brain.

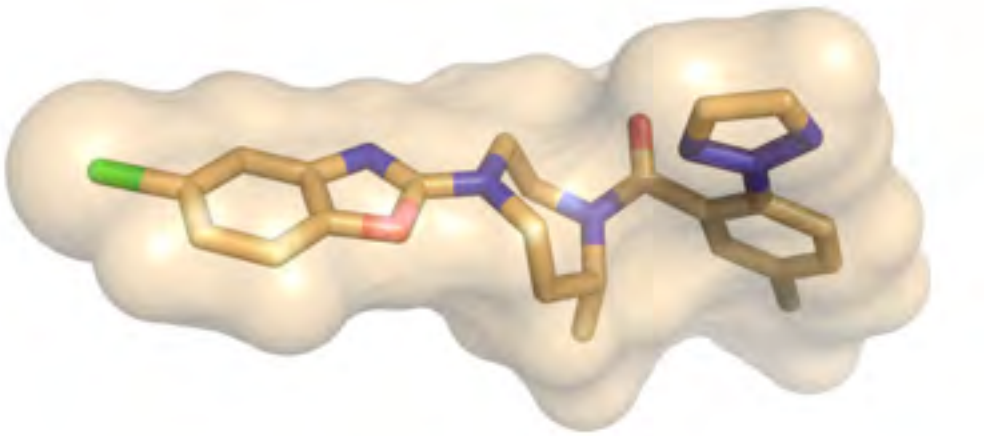
Notes

Discovery of Suvorexant: A New Approach for the Treatment of Sleep Disorders

Paul J. Coleman, Ph.D.

Merck Research Laboratories
West Point, PA, USA 19486

paul_coleman@merck.com



Orexins are excitatory neuropeptides secreted by hypothalamic neurons that project into regions of the brain that modulate sleep and wakefulness. Two receptors respond to orexin signaling, Orexin 1 Receptor (OX1R) and Orexin 2 Receptor (OX2R) with partially overlapping brain distributions. Genetic and pharmacological studies suggest orexin receptor antagonists could provide benefit for insomnia and other disorders in which sleep/wake cycles are disrupted.

We have identified dual orexin receptor antagonists including suvorexant with excellent brain penetration and robust in vivo activity. We will describe the discovery and synthesis of suvorexant including an optimized manufacturing route using asymmetric catalysis. The development and optimization of lead molecules along with the profile of clinical compounds will also be presented.

Notes

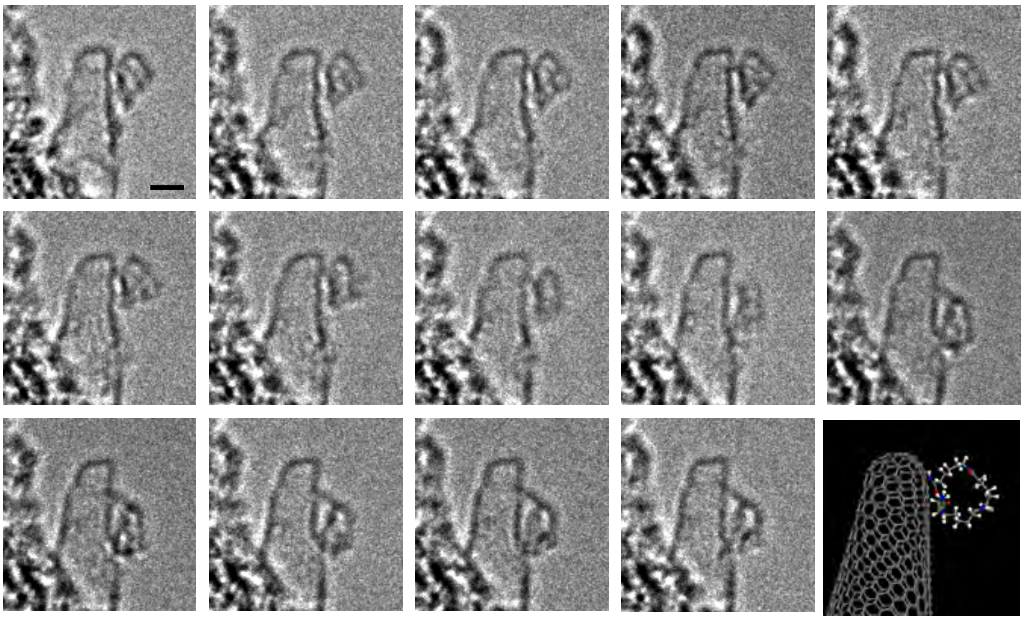
Single-molecule, Real-time Transmission Electron Microscope (SMRT-TEM) Imaging for Organic Chemistry

Eiichi Nakamura

Department of Chemistry
The University of Tokyo
Hongo, Bunkyo-ku, Tokyo, 133-0033 Japan

nakamura@chem.s.u-tokyo.ac.jp
http://www.chem.s.u-tokyo.ac.jp/users/common/NakamuraLabE.html

Molecules are too small to see. For sometime, we ponder over the possibility of taking a look at molecules by a high-resolution transmission electron microscope, and succeeded recently in obtaining time-resolved, near atomic resolution images of organic and organometallic molecules in motion. Continuing the work, we are now able to examine reaction intermediates of a chemical reaction and to study the process of crystal formation.



SMRT-TEM movie of a biotin triamide (bottom right) on a carbon nanohorn recorded for ca. 15 sec

Notes

Mitochondria-Specific Peptide Delivery Vehicles

Shana O. Kelley

Department of Biochemistry
University of Toronto
Toronto, Ontario, Canada

shana.kelley@utoronto.ca

The mitochondria of human cells play a central role in the life and death of the cell due to the diverse processes and proteins - such as energy production and cell death regulators - that it houses. The role of mitochondria in cancer progression and tumorigenesis has been widely acknowledged. A major challenge to the study of mitochondrial processes and the development of mito-targeted therapies is presented by the impermeability of the innermost mitochondrial membrane and its highly negative membrane potential, which exclude most exogenous molecules from the organelle. We have developed a new class of peptide-based mitochondria-targeting vectors that can deliver various cargos to this previously impenetrable organelle. We have used these vectors to understand the chemical requirements for mitochondrial entry, to study oxidative stress in the organelle, and to deliver several different therapeutics. Insights into the unique chemical and biochemical features of this organelle gained from the use of these peptides will be presented.

Notes

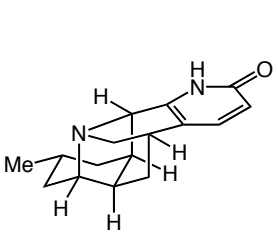
Strategies and Tactics Inspired by Complex Alkaloids

Richmond Sarpong

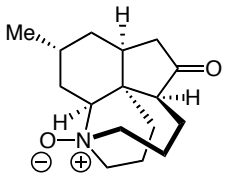
Department of Chemistry
University of California
Berkeley, California, USA

rsarpong@berkeley.edu
http://chem.berkeley.edu/faculty/sarpong/

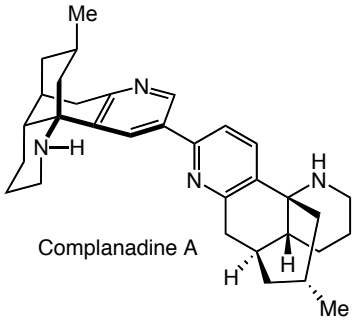
Natural products continue to provide intricate problems that challenge us to make advances in the strategies and methods that are utilized in their chemical syntheses. Several strategies and methods that have been applied to the syntheses of diterpenoid alkaloids and several Lycopodium alkaloids, will be discussed.



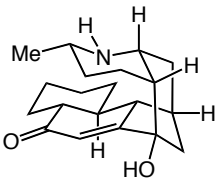
Lyconadin A



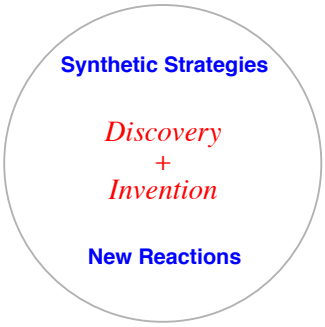
Lannotinidine B

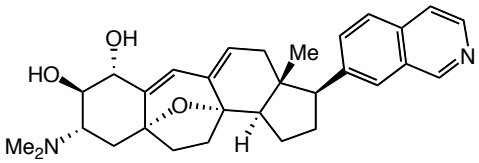


Complanadine A

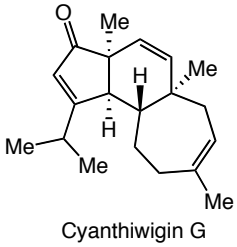


Alkaloid GB 13

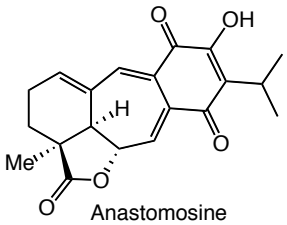




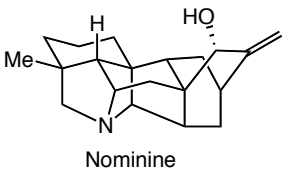
Cortistatin A



Cyanthiwigin G



Anastomosine



Nominine

Notes

Listed below are the advanced graduate students who were awarded Division of Organic Chemistry Graduate Fellowships in the past two years. All of these students are presenting a poster at the symposium. Also listed are the names of their institution, faculty research advisor, and the company that sponsored the specific award. The Division of Organic Chemistry is pleased to honor these extraordinary students and to gratefully acknowledge the substantial financial support provided by their generous sponsors.

2011–2012 Fellowship Awardees

Nicholas Calandra
Sponsor: Boehringer Ingelheim
Yale University
Advisor: Seth Herzon

Daniel Tzvi Cohen
Sponsor: Organic Syntheses/Organic Reactions
Northwestern University
Advisor: Karl A. Scheidt

Kaid Harper
Sponsor: Organic Syntheses (Nelson Leonard Fellowship)
University of Utah
Advisor: Matthew S. Sigman

Julia Kalow
Sponsor: Pfizer
Princeton University
Advisor: Abigail Doyle

2011–2012 Fellowship Awardees continued

Justin Malinowski
Sponsor: GlaxoSmithKline
University of North Carolina at Chapel Hill
Advisor: Jeffrey Johnson (advisor)

Lindsay Repka
Sponsor: Genentech
California Institute of Technology
Advisor: Professor Sarah E. Reisman

Joseph Tucker
Sponsor: Amgen
Boston University
Advisor: Prof. Corey R. J. Stephenson

Adam B. Weinstein
Sponsor: Organic Syntheses
University of Wisconsin-Madison
Advisor: Shannon S. Stahl

2012–2013 Fellowship Awardees

Michael Joseph Ardolino
Sponsor: Merck/Division of Organic Chemistry Fellowship
Boston College
Advisor: James P. Morken

Adam Goetz
Sponsor: Organic Reactions/Organic Syntheses
University of California, Los Angeles
Advisor: Neil Garg

Aaron T. Herrmann
Sponsor: Genentech Fellowship
University of California, Santa Barbara
Advisor: Armen Zakarian

Jeffrey C. Holder
Sponsor: Boehringer Ingelheim Fellowship
California Institute of Technology
Advisor: Brian M. Stoltz

2012–2013 Fellowship Awardees continued

Alison Metz
Sponsor: Organic Syntheses Fellowship
University of Pennsylvania
Advisor: Marisa Kozlowski

Rebecca Murphy
Sponsor: Organic Syntheses Fellowship
University of California, Berkeley
Advisor: Richmond Sarpong

John Duy Nguyen
Sponsor: Amgen Felllowship
Boston Univeristy
Advisor: Corey R. J. Stephenson

Bradley D. Rose
Sponsor: Troyansky Fellowship
University of Oregon
Advisor: Michael M. Haley

POSTER SESSION S – SUNDAY JUNE 23rd

S-1 **Synthesis, Characterization, Anticancer and Antioxidant Studies of Some New Chalcones and Thiadiazepines**

Dhanya Sunil,* Arun M Isloor, Prakash Shetty, Pawan G Nayak, K. S. R Pai
Department of Chemistry, Manipal Institute of Technology, Manipal University, India.

S-2 **Synthesis of 1,5-Disubstituted 3-Amino-1H-1,2,4-triazoles from 1,3,4-Oxadiazolium Hexafluorophosphates**

Haiming Zhang,* Brian Wong, Andreas Stumpf, Diane Carrera and Christine Gu
Genentech, Inc.

S-3 **Synthesis and Biological Activity of Dihydroimidazole and 3,4-dihydrobenzo[4,5]imidazo[1,2-a][1,3,5]triazines**

Ahmed M.M. Soliman,* Mahmoud. Abd El-Aleem. Ali.Ali. El Remailya, Shaaban K. Mohameda
University of Sohag, Egypt; Manchester Metropolitan University, Manchester, UK

S-4 **Novel Route Towards Preparation of 6-Substituted Pterins**

Winston Nxumalo* and Andrew Dinsmore
University of Limpopo

S-5 **Diastereoselective Furan Synthesis and Elucidation of Stereochemistry**

Aki Katori, Yoshiaki Sashihara, Satoshi Kojima,* Yohsuke Yamamoto
Hiroshima University

S-6 **Stereoselective Synthesis of Carbocycles and Heterocycles Using Dianion / Enolate Chemistry**

Sauvik Samanta,* Sandipan Halder, Manas K. Ghorai
Indian Institute of Technology, Kanpur

S-7 **Heterocyclic Arynes: From Computational Design to Synthetic Applications**

Adam E. Goetz,* Neil K. Garg
University of California, Los Angeles

S-8 **Continuous Synthesis of [n]Cycloparaphenylene and its Derivatives**

Evan Darzi,* Professor Ramesh Jasti
Boston University

S-9 **Process Development of Daclatasvir Dihydrochloride, A Potent HCV NS5A Inhibitor**

Shawn Pack,* Lotfi Derdour, Junying Fan, Peng Geng, Amit Joshi, Sergei Kolotuchin, Brenda Remy, Eric Saurer, Jason Sweeney, Mike Smith, Steve Tymonko, Jim Vernille, Jason Zhu
Bristol-Myers Squibb

S-10 **Enantioslective Alkene Halogenation Reactions for the Synthesis of Chiral Heterocycles**

Arvind Jaganathan,* Richard Staples, Babak Borhan
Michigan State University

S-11 **Synthesis of Dibenzo[e.g]isoindol-1-ones via Oxidative Cyclization of 3,4-Diaryl-3-Pyrrolin-ones**

Amy van Loon,* Maeve K. Holton, Carly E. Rolph, Catherine R. Downey, Taryn M. White, Stephen R. Bruening, Guanqun Li, and Erin T. Pelkey
Hobart and William Smith Colleges

S-12 **Regiocontrolled Synthesis of 3,4-Diaryl-3-pyrrolin-2-ones**

Maeve K. Holton,* Amy A. van Loon, Taryn M. White, Catherine R. Downey, and Erin T. Pelkey
Hobart and William Smith Colleges

S-13 **Thermodynamically Controlled, Dynamic Binding of Polyols to a 1,2-BN Cyclohexane Derivative**

Gregory P. Harlow,* Andrew W. Baggett, Lev N. Zakharov, Shih-Yuan Liu
University of Oregon

S-14 **Mild in situ Reduction of Pyridine-N-Oxides**

Jun Xiao,* Allyn Londregan, David W. Piotrowski
Pfizer Inc.

S-15 **Evolution of the Synthesis and Process Development of a New and Practical Route to a Novel Antiretroviral**

S. Brueggemeier, M.Bultman, K. Chen, D. A. Conlon,* K. Dambalas, M.D. Eastgate, D. Fanfair, R. Fox, J. Ho, S. Ivy, T. LaCruz, M. Mahoney, D. Mcleod, B. Mudryk, S. Murugesan, J. Payack, C. Risatti, J. Simpson, M. Soumeillant, M. Sugiyama, J. Tripp, Y. Hsiao, B. Zheng
Bristol-Myers Squibb Company, Department of Chemical Development

S-16 **Synthesis of Triazolopyridines by Cyclodehydration: A Process Perspective**

Sean H. Wiedemann,* Matthew M. Bio, Yuan-Qing Fang, Jacqueline E. Milne, Ashraf Wilsily
Amgen

S-17 **Synthetic Methods of 2-Substituted Tetrazole Derivatives**

Takuya Onaka,* Hideaki Umemoto
Fujimoto Chemicals Co., Ltd.

S-18 **Transition-Metal-Free, Low-Temperature Intramolecular Amination of Aromatic C(sp^2)-H Bonds: Rapid and Scalable Preparation of Fused Heterocycles**

Hongyin Gao,* Qing-Long Xu, Daniel H. Ess, Laszlo Kurti
University of Texas Southwestern Medical Center

S-19 **Synthesis and Structure of Novel Nonplanar Polycyclic Aromatic Hydrocarbons**

Takao Fujikawa,* Katsuaki Kawasumi, Kenji Mochida, Yasumoto Segawa, Kenichiro Itami
Nagoya University

S-20 **Process Chemistry Development on the AKT Inhibitor GDC-0068**

Chong Han,* Keena Green,* Francis Gosselin, Scott Savage, Herbert Yajima, Travis Remarchuk
Genentech, Inc.

S-21 **Novel Fullerene-Chromophore Dyads: Proton Responsive Donor-Acceptor System Absorbing in the Near-IR Region**

Yu-Ming Yu,* Liang-Bing Gan
Institute of Organic Chemistry

S-22 **Sequential Reduction/Cyclization of (2-Nitrophenyl)acetylenes to Prepare Indoles**

C Eric Ballard*
Department of Chemistry, Biochemistry and Physics, University of Tampa

S-23 **Synthetic Studies on Guaipyridine Alkaloids**

Patrick Shelton,* and James R. Vyvyan
Western Washington University

S-24 **Efforts Towards the Synthesis of Amino-Substituted β-Iodo N-Alkenyl Pyridones**

John A. LaGrand,* Mitchell C. Groenenboom, Emily R. Rhude, Carolyn E. Anderson
Calvin College

S-25 **Trapping of Strained Polycyclic Allenes formed via [4+4] Enyne-Pyridone Photocycloadditions**

Buddha B. Khatri,* Svitlana Kulyk, Scott McN. Sieburth
Temple University

S-26 **Efforts in Scale-up for Efficient Chemical Delivery of LY2801653**

Chin Liu,* Eugene Kogut, Matthew Jones, Richard Rathmell, Todd Simard, Michael Prunier, James Ray, Jennifer Tinsley, Craig Ruble, Carolina Alhambra
Eli Lilly and Company

S-27 **Gold(I)-Catalyzed Approach to the Synthesis of N-Alkyl 2-Pyridones**

David C. Wierenga,* Nicholas W. Vryhof, Carolyn E. Anderson
Calvin College

S-28 **Development of a Scaleable Synthesis of a Clinical Candidate MET Inhibitor**

Andreas Stumpf,* Mark Reynolds, Daniel Sutherlin, Srinivasan Babu, Brian Wong, Erhard Bappert, Felix Spindler, Michael Welch, and John Gaudino
Genentech Inc.

S-29 **Formation, Structure, and Reactivity of Meso-tetraaryl Porphyrinoids Incorporating Oxazolone or Imidazolone Moieties**

Joshua Akhigbe,* John Haskoor, Jeanette A. Krause, Matthias Zeller, Christian Bruckner
Department of Chemistry, University of Connecticut; Department of Chemistry, University of Cincinnati; Department of Chemistry, Youngstown State University

S-30 **Indabacteriochlorins: Bacteriochlorin-like Indaphyrin Derivatives**

Lalith P. Samankumara,* Matthias Zeller, Christian Bruckner
Department of Chemistry, University of Connecticut; Department of Chemistry, Youngstown State University

S-31 **Synthesis of 1H-5-Trifluoromethyl-Pyrroles: (3+2) dipolar cycloaddition of pentacarbonyl-[(Alkynyl)(Ethoxy)Carbene]Chromium with triflouromethyloxazolones**

Eloy Rodriguez-de Leon,* Fabiola N. de la Cruz Duran, Julio C. Lopez Martinez, Juvencio Robles Garcia, Francisco Delgado Reyes, Miguel A. Vazquez Guevara.

S-32 **Radical-Based Regioselective C-H Functionalization of Electron-Deficient Heteroarenes: Scope, Tunability, and Predictability**

Fionn O'Hara,* Donna G. Blackmond, Phil S. Baran
The Scripps Research Institute

S-33 **Trapping the Elusive Aza-oxyallylic Cation for the Synthesis of Seven-membered Heterocycles**

Christopher Jeffrey, Arjun Acharya, Devendar Anumandla, Korry Barnes, John Eickhoff, Anna Koster*
University of Nevada, Reno

S-34 **Synthesis of Pyrrole-2-carboxylate Through Imine Esters with Fischer Carbenes Complexes Reactions**

Noemi de la Cruz,* Eloy Rodriguez, Julio Lopez, J. Oscar C. Jimenez-Halla, Francisco Delgado, Miguel A. Vazquez
University of Guanajuato, and National Polytechnic Institute

S-35 **Novel Planar Chiral N-Heterocyclic-Substituted Pyridinophanes**

Joshua J. P. Kramer,* Martin Nieger, Stefan Brase
Karlsruhe Institute of Technology (KIT)

S-36 **Synthesis of the Anti-microbial Bacterial Pigment Violacein via a Three Component, One-pot, Pyrrolidinone Cyclization**

Emily C. McLaughlin,* Thant Ko Ko, Matthew Norman, Ingrid Stolt, and Brooke A. Jude
Bard College

S-37 **Polycyclic Aromatics via Visible-Light Photoredox Catalysis**

Ebenezer Jones-Mensah,* Christopher Hatch, Megha Karki, Jakob Magolan
University of Idaho

S-38 **Dehydroaromatization with V_2O_5**

Megha Karki,* Hugo C. Araujo, Jakob Magolan
University of Idaho

S-39 **One-pot, Sequential Protocols to the Synthesis of Diverse Polycyclic Fused and Bridged Sultams**

Joanna K. Loh,* Naeem Asad, Moon Young Hur, Thiwanka B. Samarakoon and Paul R. Hanson
Department of Chemistry, University of Kansas; University of Kansas Center for Chemical Methodologies and Library Development

S-40 **The Development of Sulfinate Reagents for the Direct C-H Functionalization of Heterocycles**

Ryan D. Baxter,* Michael R. Collins, Erik Daa Funder, Darryl D. Dixon, Janice A. Dixon, Yuta Fujiwara, Bart Herle, Fionn O'Hara, Rodrigo R. Rodriguez, Neal Sach, Donna G. Blackmond, Phil S. Baran
The Scripps Research Institute; Pfizer Inc. La Jolla

S-41 **Preparation, Analysis and Reactions of 3-Substituted Pyridiniums**

Anton W. Jensen,* Holly L. Witte
Department of Chemistry, Central Michigan University

S-42 **TBD**

V. Rajeswar Rao,* Tewodros Birhanu Aychiluhim
National Institute of Technology of Warangal

S-43 **Scalable, Enantioselective Synthesis of Germacrenes and Related Sesquiterpenes Inspired by Terpene Cyclase Phase Logic**

Klement Foo,* Ippei Usui, Daniel C. G. Gotz, Erik W. Werner, Dane Holte, Phil S. Baran
The Scripps Research Institute

S-44 **Pd(II) Complexes Bearing Chromone Based Schiff Bases: Synthesis, Characterisation and Biological Activities**

P. Kavitha and K. Laxma Reddy*
National Institute of Technology, Warangal, India

S-45 **Progress Towards the Total Synthesis of Yaku'amide A**

Joseph M. Cardon,* Zhiwei Ma, Jintao Jiang, Steven L. Castle
Brigham Young University

S-46 **Domino Diels-Alder Strategies Towards Aromatic Steroids**

Emily G. Mackay,* Michael S. Sherburn
The Australian National University

S-47 **Progress Towards the Total Synthesis of Ammocidin D**

Claire Gregg,* Stephen T. Chau, Jesse Teske, Gary A. Sulikowski
Vanderbilt University

S-48 **Synthetic Studies on the Archazolids**

Brianne King,* Sara Schaefer, Steven Swick, Gregory W. O'Neil
Western Washington University

S-49 **Allene and Mean Approach to the Pseudopterosins**

Christopher G. Newton,* Samuel L. Drew, Andrew L. Lawrence, Michael S. Sherburn
The Australian National University

S-50 **Approach to Plakortethers**

Duminda S. Liyanage,* Jinu P. John, and Alexei V. Novikov
University of North Dakota

S-51 **Toward the Synthesis of the Lycopladine- and Magellanine-type Lycopodium Alkaloids**

Rebecca A. Murphy,* Vincent N. G. Lindsay, Eugenia Pushkarskaya, Richmond Sarpong
University of California, Berkeley

S-52 **Convergent Total Syntheses of the Amaryllidaceae Alkaloids Lycoranine A, Lycoranine B and 2-Methoxypratosine**

Hye Sun Kim,* Martin G. Banwell and Anthony C. Willis
The Australian National University

S-53 **Total Synthesis of Pactamycin**

Justin T. Malinowski,* Robert J. Sharpe, Jeffrey S. Johnson
University of North Carolina at Chapel Hill

S-54 **Progress Towards the Enantioselective Total Synthesis of Hamigeromycin B**

Michael S. Probasco, John W. Kirby, Alexander H. Cleveland, Jesse D. Carrick*
Tennessee Technological University

S-55 **Studies towards the Synthesis of the Pestalofones: [4+2] Dimerization of Vinylallenones**

Robert E. Ziegler* and John A. Porco Jr.
Boston University

S-56 **Biomimetic Synthesis of Zeylanone and Zeylanone Epoxide by Dimerization of 2-Methyl-1,4-Naphthoquinone**

Kouji Kuramochi,* Sayako Maruo, Kazuyuki Nishio, Kazunori Tsubaki
Kyoto Prefectural University

S-57 **An Enantioselective Total Synthesis of Sesquiterpenoid (+)-Armillarivin**

Eliska Matousova,* Martin G. Banwell, Brett D. Schwartz, Richard White and Anthony C. Willis
The Australian National University

S-58 **Synthesis of Complex Alkaloids as a Driving Force for Discovery**

Joshua G. Pierce,* Il Hwan An, Yasamin Moazami, Yunlong Shi and Nataliia V. Shymanska
North Carolina State University

S-59 **Progress Toward the Synthesis of the Tetrahydroisoquinoline Antitumor Antibiotic Jorumycin**

Guillaume Lapointe,* Christopher D. Gilmore, Pamela M. Tadross, Kevin M. Allan, Brian M. Stoltz
California Institute of Technology

S-60 **A Carbene-Cyclization Cycloaddition Cascade Strategy towards the Asymmetric Total Synthesis of Anthecularin**

Yang Yu,* Pauline Chiu
Department of Chemistry, The University of Hong Kong

S-61 **Studies Toward the Total Synthesis of Cortistatin J**

Liping Kuang,* Pauline Chiu
The University of Hong Kong

S-62 **[4+4] Photocycloaddition of 2-Pyridones: Progress Towards the Total Synthesis of Fusicoccin A**

Paul B. Finn,* Scott McN. Sieburth
Temple University

S-63 **Towards a Total Synthesis of Endiandramide A**

Bethany K. Okada,* Julia S. Lee, Anastasia L. Patterson, David A. Vosburg
Harvey Mudd College

S-64 **Enantioselective Synthesis of Quinolizidine containing Lycopodium Alkaloids**

Nagarathanam Veerasamy,* Rich G. Carter
Department of Chemistry, Oregon State University

S-65 **Progress toward the Total Synthesis of Plumisclerin A**

Michael S. Holzwarth,* Scott D. Rychnovsky
University of California, Irvine

S-66 **Unified Approach Toward the Synthesis of C10-functionalized Lycopodium Alkaloids**

Mrinmoy Saha,* Rich G. Carter
Oregon State University

S-67 **Total Synthesis of Pyrrolidine-Containing Natural Products Preussin and Salinosporamide C**

Jason A. Draper,* Robert Britton
Department of Chemistry, Simon Fraser University

S-68 **Progress Toward the Synthesis of Cossonidine and Related Diterpenoid Alkaloids**

Jessica K. Kisunzu,* Ethan Fisher, Kyle Clagg, Richmond Sarpong
University of California, Berkeley

S-69 **Studies Toward the Right-hand Side of Solanoeclepin A**

Roel A. Klein Nijenhuis,* Nabil Tahiri, Brian J. J. Timmer, Jan H. van Maarseveen, Henk Hiemstra
Universiteit van Amsterdam

S-70 **A Photo-[4+4]-cycloaddition Approach to the Synthesis of the Crinipellins**

Svitlana Kulyk* and Scott McN Sieburth
Temple University

S-71 **Heterocyclic Motifs for Natural Products Synthesis**

Stephen Philip Fearnley,* Charnsak Thongsornkleeb, Maciej Domaradzki, Robert Lapo, Pedro Lory
The City University of New York-York College

S-72 **Gallium(III)-catalyzed Cycloisomerization Approach Toward Hetidine Type Diterpenoid Alkaloids**

Amy M. Hamlin,* David Lapointe, Felipe de Jesus Cortez, Richmond Sarpong
University of California Berkeley

S-73 **A Bioinspired Oligomerization Strategy Towards the Synthesis of the Resveratrol Oligomers**

Bryan S. Matsuura,* Mitch Keylor, Corey R. J. Stephenson
Boston Univeristy

S-74 **Function-Oriented Synthesis: Step-Economical Synthesis of Novel Bryostatin Analogs**

Daryl Staveness*
Stanford University

S-75 **Total Synthesis of Dioncophylline E**

Hamish D. Toop,* Jason S. Brusnahan and Jonathan C. Morris
University of New South Wales

S-76 **Total Synthesis of the Galbulimima Alkaloid (-)-GB17**

Reed T. Larson,* Michael D. Clift, Regan J. Thomson
Northwestern University

S-77 **Progress Toward the Synthesis of Phomoidride D**

Aaron Bedermann,* Naoto Hama, Christopher M. Schneider, John L. Wood
Colorado State University

S-78 **Progress Toward the Total Synthesis of Citrinadins A & B**

Monica E. McCallum,* Genessa M. Smith, Ke Kong, John A. Enquist, Jr., John L. Wood
Colorado State University

S-79 **Progress Toward the Total Synthesis of Cyclopent[b]indole Natural Products**

Justin M. Lopchuk,* Gordon W. Gribble
Dartmouth College

S-80 **Total Synthesis of the Antidepressant Marine Alkaloid Veranamine**

Hugo C. Araujo,* Steve D. Holmbo, Sarah I. Vukelich, Jakob Magolan
University of Idaho

S-81 **Phosphate Tether-mediated Ring Closing Metathesis: Towards the Total Synthesis of Sanctolide A**

Jana L. Markley,* Rambabu Chegondi, Phanindra Venukadasula, Susanthi Jayasinghe, Soma Maitra and Paul R. Hanson
University of Kansas

S-82 **Phosphate Tether-Mediated, One-Pot, Sequential Protocols for Use in Natural Product Synthesis**

Rambabu Chegondi,* Phanindra Venukadasula, Susanthi Jayasinghe, Soma Maitra, and Paul R. Hanson
University of Kansas

S-83 **Asymmetric Synthesis of Pactamycin and Studies Toward the Total Synthesis of Paspaline**

Robert J. Sharpe,* Justin T. Malinowski, Jeffrey S. Johnson
University of North Carolina at Chapel Hill

S-84 **Applications of Bis(trimethylsilyl)acetylene in 1,2,3-Triazole Synthesis**

Ronald Brisbois,* Jesse Cutter, Francis Gwandu, Anna Johnson
Macalester College

S-85 **Efforts Toward the Total Synthesis of Cylindradine A and Other Related Natural Products**

Nicole Hewlett* and Jetze J. Tepe
Michigan State University

POSTER SESSION M – MONDAY JUNE 24th

M-1 **Then and Now: Seattle NOS 1959 vs. 2013**

Edward E. Fenlon*,[1] and Brian J. Myers[2]
(1) Franklin & Marshall College, (2) Ohio Northern University

M-2 **History of the National Organic Symposium**

Brian J. Myers*,[1] and Edward E. Fenlon[2]
(1) Ohio Northern University and (2) Franklin & Marshall College

M-3 **Functionalized Graphene Stably Dispersible in Water and Poly(vinyl alcohol)**

Hyeon Myeong Seo,* Trung Dung Dao, Hyung-il Lee, Han Mo Jeong*
University of Ulsan

M-4 **Shape Memory Polyurethane Nanocomposites with Functionalized Graphene**

Jin Ho Park,* Trung Dung Dao, Kyung Min Oh, Hyung-il Lee, Han Mo Jeong* and Byung Kyu Kim
University of Ulsan

M-5 **Coating of Graphene with Alumina Improves Performance of its Composite with Acrylic Rubber**

Kitae Kim,* Trung dung Dao, Erdenedelger Gansukh, Han Mo Jeong*
University of Ulsan

M-6 **Super-flexible Functionalized-graphene Film as High-capacity Anode for Lithium-ion Batteries**

Jeong Ho Kim,* Trung Dung Dao, Han Mo Jeong *
University of Ulsan

M-7 **Preparation and Electropolymerization of Brooker's Merocyanine Derivatives for Sensing Applications**

James P. Ayers,* Kyle Brubaker, Robert D. Muterspaugh, Elizabeth M. Sanford, and Kenneth L. Brown
Hope College

M-8 **The Preparation of EDOT-Functionalized Ferrocene Compounds for Glucose Sensing**

Caitlin V. Kozack,* Zachary J. Beswick, Elizabeth M. Sanford, and Kenneth L. Brown
Hope College

M-9 **The Preparation and Characterization of Diketopyrrolopyrrole Functionalized PEDOT Films**

Elizabeth M. Sanford,* Kenneth L. Brown, Marco G. Tori, and Thomas M. Smeltzer
Hope College

M-10 **β-Lactam Composites via Surface-Initiated Polymerization**

Brenden P. Derstine,* Li Chen, Yong Lei, Abbas G. Shilabin, James D. Delaney, George R. Baran and Scott McN. Sieburth
Temple University

M-11 **Deposition Ni-Co/ TiO_2 Nanocomposite Coating by Electrodeposition**

Farah A. Abed* and Latef M. Ali
Applied Science Department, University of Technology, Iraq

M-12 **Direct Arylation of Quinoxaline by Novel C-H Activation**

Anthony Rojas,* Junxiang Zhang, Seth Marder
Georgia Institute of Technology

M-13 **The Design and Synthesis of a New Class of Densely-functionalised Configurationally-stable Spirocyclic Orthoamides**

Zohreh Nazarian,* Helen Rachel Lagiakos, Patrick Perlmutter
Monash University

M-14 **Synthesis of Thiirane-N-benzo[d]thiazole Derivatives**

Ella Meltzer-Mats,* Hugo E. Gottlieb, Arie Gruzman
Division of Medicinal Chemistry, Department of Chemistry, Faculty of Exact Sciences, Bar Ilan University, Ramat Gan, Israel

M-15 **Palladium Catalysed Long Range Arylations of Amino Esters**

Samuel Aspin,* Anne-Sophie Goutierre, Paolo Larini, Rodolphe Jazzar, Olivier Baudoin
Universite Claud Bernard Lyon 1, ICBMS

M-16 **Inter and Intramolecular Reaction of Carbanions with Peroxides: An Umpoled Approach to Cyclic Ethers**

Benjamin Puffer, Rachel Willand-Charnley,* and Patrick H. Dussault*
University of Nebraska-Lincoln

M-17 **High Throughput Reaction Screening Enabled by Matrix-Free Laser Desorption-Ionization Mass Spectrometry**

Jaime R. Cabrera-Pardo,* David I. Chai, Song Liu, Milan Mrksich and Sergey A. Kozmin
Chicago Tri-Institutional Center for Chemical Methods and Library Development & Department of Chemistry, University of Chicago, Chicago, IL, USA

M-18 **Phosphonic Acid Promoted Addition of Imines and Aldehydes**

Lindsey Davis,* Caitlin Meyer, Christopher Durant, Marceälla Putri
Berry College

M-19 **Epoxide-based Methodology for the Synthesis of Polypropionates**

Alejandra Cruz-Montanez,* Jeishla L. Melandez-Matos, Jose A. Prieto, PhD
University of Puerto Rico, Rio Piedras Campus

M-20 **Effective Exploitation of Carboxylic Acids as Radical Precursors**

David W. Manley,* John C. Walton
University of St Andrews

M-21 **Diastereoselective Intramolecular Carbonyl Hydrosilylations for Complex Polyketide Synthesis**

Casey Medina,* Timothy B. Clark, Gregory W. O'Neil
Western Washington University; University of San Diego

M-22 **A Scalable beta-Selective Oxidative Heck-coupling of Cyclic Tosyl Protected Enamides and Arylkboroxines**

Santosh Kumar Alamsetti,* Andreas K. A. Persson, Tuo Jiang and
Jan-Erling Bäackvall
Stockholm University

M-23 **Development of an Alkaloid-Pyrone Annulation: Synthesis of Pleiomaltinine**

Robert E. Ziegler,[1,*] Charles S. Yeung,[2] Eric N. Jacobsen,[2] John A. Porco Jr.[1]
(1) Boston University, (2) Harvard University

M-24 **Carbolithiation of S-Alkenyl-N-aryl Thiocarbamates: Carbanion Arylation in a Connective Route to Tertiary Thiols**

Daniele Castagnolo,[2,*] Daniel Foley,[1] Hatice Berber,[1] Renzo Luisi,[1] Jonathan Clayden[1]
(1) University of Manchester, (2) University of Northumbria

M-25 **Intermolecular [4+3] Cycloaddition Reactions of Epoxy and Aziridinyl Enolsilanes**

Sarah Lam,* Brian Lo, Sze Kui Lam, Pauline Chiu
The University of Hong Kong

M-26 **The Synthesis and Use of Bis(amino)cyclopropenylidenes in Umpolung Catalysis**

Myron Wilde,* Michel, Gravel
University of Saskatchewan

M-27 **Investigations of Intramolecular [4+3] Cycloadditions**

Jiayun He,* Pauline Chiu
The University of Hong Kong

M-28 **Controlling Site-Selectivity in Platinum-catalyzed Direct C-H Arylation Reactions**

Anna Wagner,* Amanda J. Hickman, Melanie S. Sanford
University of Michigan

M-29 **Diboration/Elimination of Ketones: Facile Synthesis of 1,1- and Tri-substituted Vinyl Boronate**

Weiye Guan,* Alicia K. Michael, Liza Koren-Selfridge, Melissa L. McIntosh, Timothy B. Clark
University of San Diego

M-30 **Copper-catalyzed Diboration/Homologation of Aldehydes: Facile Synthesis of β-Hydroxyboronate Esters**

Peter C. Cannamela,* Andrew J. Roering*, Cameron M. Moore, Casey R. Medina, Melissa L. McIntosh
University of San Diego

M-31 ***N*-Heterocyclic Carbene Catalyzed Dynamic Kinetic Resolution**

Daniel T. Cohen,*[,1] Chad C. Eichman,[1] Ryne C. Johnston,[2] Paul Ha-Yeon Cheong,[2] and Karl A. Scheidt[1]
(1) Northwestern University, (2) Oregon State University

M-32 **Intramolecular Oxidative Alpha-Amination of Enolates**

Ioana I. Nitulescu,* Evan S. Krygowski, David L. Waller, Brian B. Liau, Matthew D. Shair
Harvard University, Department of Chemistry and Chemical Biology

M-33 **New Route to Azomethine Ylides: Application Towards the Anti-Cancer Compound Peduncularine**

Natalie K. Machamer,* Xiaoxi Liu, Stephen P. Waters
The University of Vermont

M-34 **Tandem Dienone-Photorearrangement-Cycloaddition for the Rapid Generation of Molecular Complexity**

Pieter H. Bos,* John A. Porco Jr., Corey R. J. Stephenson
Boston University

M-35 **Annulated beta-Carbolines via Intramolecular [2+2+2] Cyclization**

Seann P. Mulcahy,* Jonathan Varelas, Michael O'Donnell, Satyam Khanal
Providence College

M-36 **Transition-Metal-Free, Direct and Regiospecific Mono-alpha-Arylation of Ketones: Synthetic Studies and Mechanism by DFT Calculations**

Qing-Long Xu, Hongyin Gao, Daniel H. Ess and Laszlo Kurti*
University of Texas Medical Center

M-37 **Organocatalytic Carbonyl-Olefin Metathesis**

Allison K. Griffith,* Christine M. Vanos, Tristan H. Lambert
Columbia University

M-38 **Chemoselective NHC-Catalyzed Cross-Benzoin Reactions**

Steven M. Langdon,* Myron Wilde, Karen Thai, Michel Gravel
University of Saskatchewan

M-39 **Preparation of Vinyl Silyl Ethers and Disiloxanes via the Silyl-Heck Reaction of Silyl Ditriflates**

Sara E. S. Martin,* Donald A. Watson
University of Delaware

M-40 **Carbon-to-carbon [1,2]-Silyl Migration in alphaSilyl Allylic Alcohols Triggered by Epoxidation**

Maria del Rosario I. Amado Sierra,* Luis Mori-Quiroz, and Robert E. Maleczka, Jr.
Michigan State University

M-41 **Through-Bond and Through-Space Anion Relay Chemistry with Vinylepoxide Linchpins**

Ming Z. Chen,* Amos B. Smith, III
University of Pennsylvania

M-42 **Generation and Trapping of *N*-Silyl Ketenimines at Low Temperature**

Masafumi Ando,* Michiko Sasaki, Kei Takeda
Hiroshima University

M-43 **Copper-Catalyzed α-Amination of Esters, Amides, and Phosphonates Using O-Acylhydroxylamines**

Stacey McDonald,* Qiu Wang
Duke University

M-44 **Reactions Between Diazocompounds and Indium Salts: S-H, Se-H Insertion Reactions and Selective Reduction of α-Diazo Detones**

Mario Garcia-Carrillo*, Eduardo Diaz
Instituto de Quimica, Universidad Nacional Autonoma de Mexico

M-45 **Green C-Alkylation of N-Heterocycles with Direct C-H Activation in Continuous Flow**

Tamas Sipacz, Gellart Sipos, Laszlo Kocsis, Gyorgy Dorman, Richard Jones, Ferenc Darvas, Heather Graehl*
ThalesNano Inc.

M-46 **Practical Methods for the Copper-Catalyzed/Mediated Trifluoromethylation of Arylboronic Acids with CF_3 Radicals**

Yingda Ye,* Stefan Kunzi, and Melanie Sanford
University of Michigan

M-47 **A Unique TMSOTf Mediated Acetal Opening: A Mercury-free Preparation of a Vinyl Ether**

William P. Gallagher,* Prashant Deshpande, Jun Li, Kishta Katipally and Justin Sausker
Bristol-Myers Squibb

M-48 **Rhodium-Catalyzed Intramolecular Guanidinylation of C=C Bonds**

Johannes A. Burkhard,* J. Du Bois
Stanford University

M-49 **Catalytic N-tert-Prenylation of Indoles**

Kirsten Johnson,* Ryan Van Zeeland, Levi Stanley
Iowa State University

M-50 **Hydrogen-Bonding Catalysts: Library Development and Evaluation**

Alison E. Metz,* Ryan R. Walvoord, Marisa C. Kozlowski
Department of Chemistry, University of Pennsylvania

M-51 **Discovery and Development of Catalytic Deborylations**

Fangyi Shen,* Shane W. Krska, Robert E. Maleczka, Jr., Peter E. Maligres, Damith Perera, Milton R. Smith, III
Michigan State University

M-52 **Transfer Hydrogenation by Hantzsch Ester Analogs**

Scott A. Van Arman*
Franklin and Marshall College

M-53 **A Regiospecific Synthesis of 3-substituted-2-nitronaphthalenes and an Organocatalytic Atroposelective Benzannulation**

Craig Keene,* Daniel H. Ess
University of Texas Southwestern Medical Center; Brigham Young University

M-54 **Radical Cascade Reactions of Bicyclic Ring Systems**

Ian J. Rosenstein*, Alexander D. Thompson, Phillip Milner, Kate D. Otley
Hamilton College

M-55 **Synthesis of Novel Heterocyclic Scaffolds via [5+2] and [4+2] Cycloadditions**

Justin A. Simanis,* Erica L. Woodall, John R. Goodell, and T. Andrew Mitchell*
Illinois State University

M-56 **Diastereoselective Synthesis of α,α,α-Trisubstituted Pyrrolidines and Piperidines by Directed Lithiation/Alkylation**

Scott Morris,* Timothy K. Beng, Robert E. Gawley
University of Arkansas

M-57 **[3+2] Annulation of Cyclopropylamines with Alkynes under Photocatalysis**

Theresa H. Nguyen,* Nan Zheng
University of Arkansas

M-58 **Visible Light Catalyzed [4+2] Annulation of Cyclobutylamine and Alkynes**

Jiang Wang,* Nan Zheng
University of Arkansas

M-59 **Sorbicillactone A: Inspiration for Methodology and Catalyst Development**

Kelly A. Volp* and Andrew M. Harned
University of Minnesota

M-60 **Development of an Aza-Piancatelli Rearrangement**

Donald Wenz,* Gesine Veits, Leoni Palmer, Javier Read de Alaniz
University of California, Santa Barbara

M-61 **Studies on the Transannular [4+3] Cycloaddition Reactions of Macrocyclic Epoxy Enolsilanes**

Diana Chan,* Pauline Chiu
The University of Hong Kong

M-62 **Palladium-catalyzed Relay Suzuki Cross-coupling Reactions of Unactivated Primary- and Secondary Alkyl Electrophiles**

Benjamin J. Stokes,* Susanne M. Opra, Amanda J. Bischoff, Matthew S. Sigman
University of Utah

M-63 **Insertion of Reactive Rhodium Carbenes into Boron-hydrogen Bonds of Stable *N*-Heterocyclic Carbene Boranes**

Xiben Li,* Dennis P. Curran
University of Pittsburgh

M-64 **Triphosgene-Amine Base Promoted Chlorination of Unactivated Aliphatic Alcohols**

Andres Villalpando, Caitlan E. Ayala, Rendy Kartika*
Louisiana State University

M-65 **Dichotomous Reactivity of Cyclobutenediones towards Organolithium and Organoytterbium Reagents extends their Value as Isoprene Equivalents**

Emma Packard,* David Pascoe, David Harrowven
University of Southampton, United Kingdom

M-66 **Synthesis of Trifluoromethyl Olefins via Julia-Kocienski-Olefination**

Andreas Hafner,* Tobias S. Fischer, Martin Nieger, Stefan Brase
Karlsruhe Institute of Technology (KIT)

M-67 **New Methods for the Synthesis of Protected Primary Amides and beta-Amino Acids**

Brian R. Linton,* Steven C. Hahneman, Megan H. Hanly, Daniel J. Arnold, Christopher R. Shugrue
College of the Holy Cross

M-68 **Advances and Applications of Aqueous Wittig-type Olefination Reactions**

David McLeod,* James McNulty
McMaster University

M-69 **Heterocycle Syntheses and Reaction Methodology with a Focus on Carbon-carbon Bond Formation**

Robert Sammelson,* Rachel Pelly, Christopher Fullenkamp, Lucas Moore, Nicholas Connors
Ball State University

M-70 **Poly-heterocyclic Scaffolds Through Intramolecular Cycloaddition Reactions of Aza-oxyallyl Cation Intermediates**

Arjun Acharya,* John A Eickhoff, Christopher S Jeffrey
University of Nevada Reno

M-71 **Synthesis of N,N-Diethylbenzamides via a Non-Classical Mitsunobu Reaction**

J. Mason Hoffman,* Justin N. Miller, Margaret E. Gardner, Rongson Pongdee
Sewanee: The University of the South

M-72 **Preparation of C-Arylglycals via the Suzuki-Miyaura Cross-Coupling Reaction of Ketene Acetal Phosphates**

Michelle R. Leidy,* Rongson Pongdee
Sewanee: The University of the South

M-73 **Visible Light Photoredox Catalysis in Flow**

Joseph Tucker,* Yuan Zhang, Timothy F. Jamison, Corey R. J. Stephenson
Boston University; Massachusetts Institute of Technology

M-74 **Expedient Synthesis of Benzannulated Heterocycles via Aryne Acyl-amination/Condensation**

Christopher K. Haley,* Guillaume Lapointe, Brian M. Stoltz
California Institute of Technology

M-75 **Synthesis of mono, di and trifluoromethoxy aryl ethers by photo-fluorodecarboxylation**

Claire Chatalova Sazepin,* Joe C.T. Leung, Julian G. West, Montserrat Rueda-Becerril, Jean-Francois Paquin, Glenn M. Sammis
University of British Columbia; Universite Laval

M-76 **Access to Interrupted Fischer-Indole Intermediates via Oxyarylation of Alkenyl Boronic Acids**

Heng-Yen Wang,* Laura L. Anderson
University of Illinois at Chicago, Department of Chemistry

M-77 **Phosphate Tether-Mediated Ring-Closing Metathesis Studies: Application in Natural Product Synthesis**

Soma Maitra,* Rambabu Chegondi, Jana Markley and Paul R. Hanson
Department of Chemistry, University of Kansas

M-78 **The Chemistry of 1-Alkynyl Ethers: Useful Reagents for Carbon-Carbon Bond Formation**

Thomas Minehan* and Vincent Tran
California State University, Northridge

M-79 **Integration of a Novel Green Chemistry Experiment into The Organic Chemistry Lab at Florida Atlantic University**

Donella Beckwith,* Stephane Roche, Evonne Rezler
Florida Atlantic University

M-80 **Application of In Situ Generated Rh-Bound Trimethylene-methane Variants to the Synthesis of 3,4-Fused Pyrroles**

Erica E. Schultz,* Richmond Sarpong
University of California, Berkeley

M-81 **Discovery of TRPA1 Antagonists as Potential Therapeutics for Pain**

Katrina W. Copeland,* A. A. Boezio, E. Cheung, H. L. Deak, R. Emkey, R. Graceffa, H. Gunaydin, J. Lee, X. Li, P. Olivieri, L. Schenkel, Q. Wan, W. Wang, M. C. Wells, B. Youngblood, V. Yu, N. Gavva, S. G. Lehto, S. Geuns-Meyer.
Amgen

M-82 **Development of a Scalable Continuous Lithiation/Formylation and Subsequent Reduction Process to Synthesize Benzyl Alcohol 2191308**

Patrick Pollock,* Kevin Cole, Martin Johnson, Michael Kopach, Christopher Doecke
Eli Lilly and Company

M-83 **Distribution Analysis of Components in the ORTHO EVRA® Patch by Confocal Raman Microscopy**

Sarah A. Nielsen,* Kevin B. Biggs, Amber Mantz, and Cynthia A. Maryanoff
Johnson & Johnson

M-84 **Synthesis of Substituted 3-Hydroxy-2-Furanone Derivatives via an Unusual Enolate Wittig Rearrangement/Alkylative Cyclization Sequence**

Renata K. Everett,* John P. Wolfe
University of Michigan

M-85 **Fragmentation of Catharanthine with Photoredox Catalysis**

Joel W. Beatty*, Joseph W. Tucker, and Corey R. J. Stephenson
Boston University

M-86 **Employing Sugar Silanes to Control the Stereochemistry of Newly Formed Glycosidic Bonds**

Jordan Walk,* John Montgomery
University of Michigan

M-87 **Transition-Metal-Free α-Arylation of Disubstituted Carbonitriles via N-Diazonium Aniline Intermediate**

Chan W Huh,* Jeffrey Aube
University of Kansas

M-88 **Halonium Ion Initiated Cascade Spiroketalization**

Kumar Ashtekar,* Chris Rahn, Hadi Gholami and Babak Borhan*
Michigan State University

POSTER SESSION T – TUESDAY JUNE 25th

T-1 **Stereoselectivity of Nucleophilic Additions to Five-Membered Ring Oxocarbenium Ions**

Vi Tran,* Keith Woerpel
New York University

T-2 **New Methods for Asymmetric Nucleophilic Fluorination and Radiofluorination**

Julia A. Kalow,* Thomas J. Graham, R. Frederick Lambert, Abigail G. Doyle
Department of Chemistry, Princeton University

T-3 **Development of a Palladium-catalyzed Enantioselective Conjugate Addition of Arylboronic Acids to Cyclic Conjugate Acceptors**

Jeffrey C. Holder,* Kotaro Kikushima, Alexander N. Marziale, Michele Gatti, Brian M. Stoltz
California Institute of Technology

T-4 **Harnessing Crystallization-induced Asymmetric Transformations (CIAT): An Expedient Route Towards Chiral Phosphine Ligands**

Felix A. Kortmann,* Erik P.A. Couzijn, Adriaan J. Minnaard
Rijksuniversiteit Groningen, Netherlands

T-5 **Process Understanding of Related Copper Catalyzed Reactions**

Matthew A. Zajac,* Christopher Morgan, Kevin Leach, and Mark Strohmeier
GlaxoSmithKline Pharmaceuticals

T-6 **Schiff Bases of Aminoisoborneol (SBAIB): A Versatile Chiral Reagent in Asymmetric Synthesis**

Boobalan R,* Chinpiao C
National Dong Hwa University

T-7 **Enantioselective Synthesis of Pyrroloindolines and Tryptophan Derivatives by an Asymmetric Protonation Strategy**

Lindsay Repka,* Jane Ni, Madeleine Kieffer, Sarah Reisman
California Institute of Technology

T-8 **Enantioselective Ring Opening of Epoxides with $TMSN_3$ by Macrocyclic Oligomeric Cr(III)-salen Complexes**

Yu Liu,* Kurt Kinslow, Alejandro Macias Sevde, Jian Liang
Northern Michigan University

T-9 **Palladium Catalyzed Allyl-Allyl and Allyl-Propargyl Cross-Couplings: Utilizing a 3,3' Reductive Elimination to Generate Optically Enriched 1,5-Dienes and Enynes**

Michael J. Ardolino,* Meredith S. Eno, Laura A. Brozek, James P. Morken
Boston College

T-10 **Substrate-controlled Asymmetric Morita-Baylis-Hillman Reaction: an Aprroach to the Synthesis of Pyrrolizidinones and Pyrrolizidines**

Kristerson R. Luna-Freire, Joao Paulo S. Scaramal, Jackson A. L. Resende, Claudio F. Tormena, Fabio L. Oliveira, Ricardo Aparacio and Fernando Coelho*
Universidade de Campinas; Universidade Federal Fluminense

T-11 **Separation of Racemic Solids by Preferential Zone Crystallization**

Ivy Price,* Jason Hein
University of California, Merced

T-12 **Radical Haloalkylations via Titanium, Zirconium, and Hafnium Enolates**

Aaron T. Herrmann,* Elizabeth Ilardi, Stephanie Beaumont, Luke Monroe, Lindsay Smith, Zhenhua Gu, Armen Zakarian
University of California, Santa Barbara

T-13 **Metalloradical Catalysis for Stereoselective Carbene and Nitrene Transfers**

Xin Cui, Xue Xu, Limei Jin, Yang Hu, X. Peter Zhang*
University of South Florida

T-14 **Enantioselective and Site-selective Reactions Using Peptide-embedded Oxidation Catalysts**

David K. Romney,* Scott J. Miller
Yale University

T-15 **Enantioselective Synthesis of Hydrocarbazoles by Thulium-Catalyzed [4+2] Cycloaddition**

Shinji Harada,* Takahiro Morikawa, Atsushi Nishida
Chiba University

T-16 **Pd-Catalyzed Asymmetric Beta-Hydride Elimination En Route to Chiral Allenes**

Ian T. Crouch, Robynne K. Neff,* Doug E. Frantz
University of Texas at San Antonio

T-17 **Atroposelective Synthesis of Benzamides through Peptide-Mediated Bromination**

Kimberly T. Barrett,* Scott J. Miller
Yale University

T-18 **Discovery and Development of a Direct Asymmetric Reductive Amination (DARA) for Evacetrapib**

Andrea Frederick,* Ryan Linder, Scott Frank, and Marvin Hansen
Eli Lilly and Company

T-19 **The Synthesis of trans 3-Amino-4-Substituted-Pyrrolidines via Aziridine Ring Opening for CHK1 Inhibitors**

Fen Wang,* Indrawan McAlpine, Michael Collins, Sacha Ninkovic, Stephanie Scales, Michelle Tran-Dube, Sarah Johnson, John Braganza
Pfizer Inc.

T-20 **Dynamic Kinetic Asymmetric Transformations of α-Stereogenic β-Keto Esters and Their Congeners**

Michael T. Corbett,* Jeffrey S. Johnson
University of North Carolina at Chapel Hill

T-21 **Catalytic Asymmetric Synthesis of Tertiary Alkyl Fluorides by α-Fluorination of Ketenes: Synthetic and Mechanistic Studies**

Sarah Yunmi Lee,* Stefan Neufeind, Gregory C. Fu
Massachusetts Institute of Technology; California Institute of Technology

T-22 **Enantioselective Alpha-Amination of Aldehydes via a Photoredox Process**

Giuseppe Cecere,* Christian Konig,* Jennifer Alleva*
Merck Center for Catalysis, Princeton University

T-23 **Resolution of Omeprazole Using Coupled Preferential Crystallization: Efficient Separation of a Non-Racemizable Conglomerate Salt under Near-Equilibrium Conditions**

Blessing Huynh Cao,* Jason E. Hein, Maarten van der Meijden, Michel Leeman, and Richard M. Kellogg
University of California, Merced

T-24 **Enantiodivergent Deprotonation-Benzoylation of a-Amino Nitriles**

Michiko Sasaki,* Yuri Kotomori, Tomo Takegawa, Kunihiro Sakamoto, Rumiko Shimabara, Kei Takeda
Hiroshima University

T-25 **Synthesis of α-Silylamines via Enantioselective Reduction of α-Silylimines by Chiral Lithium Amide**

Yasuhiro Kondo,* Michiko Sasaki, Kei Takeda
Hiroshima University

T-26 **Inversion Dynamics of Racemization and Resolution of α-Alkoxyorganolithiums**

Barry K. Sharp,* Bob Gawley (deceased)
University of Arkansas

T-27 **Remarkably Large Remote-stereocenter-induced Chromatographic Differences: Azulenyl 1,5-diols**

Dana A. Horgen,* Harry Shen, Kevin Klausmeyer, Charles Garner
Baylor University

T-28 **Organocatalytic Atroposelective Aryl-Aryl Bond Formation: A [3,3]-Rearrangement Approach to BINAM Derivatives**

Gongqiang Li, Hongyin Gao, Craig Keene, Michael Devonas, Daniel H. Ess and Laszlo Kurti*
UT Southwestern Medical Center

T-29 **Applications of the Asymmetric [C+NC+CC] Coupling Reaction to Synthesis**

Laksiri Weerasinghe,* Philip Garner
Washington State University

T-30 **Organocatalytic Sulfa-Michael Additions with C6-Substituted Cinchona Alkaloids**

A.C. Breman,* J. H. van Maarseveen, S. Ingemann, H. Hiemstra
University of Amsterdam

T-31 **Dynamic Kinetic Resolution of Sterically Bulky α-Chiral Propargyl Alcohols**

Yeonock Oh,* Jaiwook Park, Mahn-Joo Kim
Pohang University of Science and Technology

T-32 **Facile Synthesis of Versatile Enantioenriched Hydroxy Esters through a Bronsted Acid Catalyzed Kinetic Resolution**

Amanda R Benavides,* Ghassan Qabaja, Kimberly S. Petersen
University of North Carolina at Greensboro

T-33 **Enantioselective Desymmetrization via Carbonyl-directed Catalytic Asymmetric Hydroboration**

Gia L. Hoang,* Zhao-di Yang, Sean M. Smith, Damaris Perez, James M. Takacs
University of Nebraska-Lincoln

T-34 **Enantioselective Intramolecular Hydroacylation of N-Vinylindoles**

Avipsa Ghosh,* Levi. M Stanley
Iowa State University

T-35 **Asymmetric Conjugate Addition of Heteroaryl Boronates to Enones catalyzed by Binaphthols**

Didi C. Y. Cheung and J. Michael Chong*
Department of Chemistry, University of Waterloo

T-36 **A New Approach to Cyclic and Spirocyclic Frameworks by Intramolecular Phosphine-catalyzed Nucleophilic Addition**

Nicole Biber,* Gregory C. Fu
California Institute of Technology

T-37 **Ionic Surfactant-Coated Burkholderia Cepacia Lipase as a Highly Active Catalyst for use in Organic Media**

Eungyeng Lee,* Hyunjin Kim, Yoon Kyung Choi, Jusuk Lee, Jaiwook Park, Mahn-Joo Kim
Pohang University of Science and Technology

T-38 **Highly Selective Lactonization of Prochiral Diesters to Yield Enantioenriched γ-Lactones**

Jennifer Wilnet* and Kimberly Petersen
University of North Carolina at Greensboro

T-39 **Regioselective Hydroarylations and Parallel Kinetic Resolution of Vince Lactam**

Adam S. Kamlet,* Cathy Preville, Kathleen A. Farley, and David W. Piotrowski
Pfizer

T-40 **Copper-Catalyzed Asymmetric Hydrogenation of Aryl and Heteroaryl Ketones**

Scott W. Krabbe,* Mark A. Hatcher, Roy K. Bowman, Mark B. Mitchell, Michael S. McClure, and Jeffrey S. Johnson
University of North Carolina at Chapel Hill and GlaxoSmithKline

T-41 **The Diastereodivergent Preparation of Polysubstituted Alkenes Through Lithiation-borylation Methodology**

Matthew Hesse,* Jack Chen, Helen Scott, Christine Willis, Varinder Aggarwal
University of Bristol

T-42 **Catalytic Thiooxyfunctionalization of Alkenes**

Scott E. Denmark, David J. P. Kornfilt,* Thomas Vogler
University of Illinois Urbana-Champaign

T-43 **Dynamic Kinetic Resolution of β-Stereogenic α-Keto Esters via Asymmetric Transfer Hydrogenation.**

C. Guy Goodman,* Kimberly M. Steward, Dung T. Do, Jeffrey S. Johnson
University of North Carolina at Chapel Hill

T-44 **Synthesis, Structure and Hydrogen-bonding Interactions of Silanediols for Enantioselective Catalysis**

Sean O. Wilson,* Annaliese K. Franz
University of California, Davis

T-45 **Z-Selective Asymmetric Ring Opening/Cross Metathesis Catalyzed by a Resolved Stereogenic-at-Ru Complex**

John Hartung* and Robert H. Grubbs
California Institute of Technology

T-46 **Chiral Lanthanide Complexes Based on Amino Acids for Asymmetric Reactions in Aqueous Media**

Ingo Janser,* Nathaniel Martinez, Romy Janser
Eastern Michigan University

T-47 **Catalytic Asymmetric Hydroboration of *O*-Allylic Oxime Ethers**

Andrew E. Geis,* Nathan C. Thacker, Michelle P. Takacs, and James M. Takacs
University of Nebraska-Lincoln

T-48 **Mechanism and Sources of Stereoselectivity in Catalytic Asymmetric [3+2] Annulation of Allylsilanes with Isatins and Oxindoles**

Gonzalo Jimenez-Oses,* Joseph J. Badillo, Annaliese K. Franz, K. N. Houk
University of California, Los Angeles

T-49 **Examining Steric Effects in Asymmetric Catalysis**

Kaid C. Harper,* Matthew S. Sigman
University of Utah

T-50 **Catalytic Enantioselective Carbon-Carbon Bond Formations of α-bromosulfonamides and α-bromosulfones via Negishi Arylations**

Junwon Choi,* Pablo Martin-Gago, Gregory C. Fu
California Institute of Technology

T-51 **Bronsted Acid Catalyzed Enantioselective Indole Aza-Claisen Rearrangement**

Pradip Maity,* Uttam K Tambar
University of Texas Southwestern Medical Center at Dallas

T-52 **Then and Now: Seattle NOS 1959 vs. 2013**

Edward E. Fenlon*,[1] and Brian J. Myers[2]
(1) Franklin & Marshall College, (2) Ohio Northern University

T-53 **History of the National Organic Symposium**

Brian J. Myers*,[1] and Edward E. Fenlon[2]
(1) Ohio Northern University and (2) Franklin & Marshall College

T-54 **Designed Ligand-Directed Anti Attack of Gold Alkyne complex: A New Paradigm for Efficient Catalysis**

Yanzhao Wang,* Liming Zhang, Gongde Wu
University of California, Santa Barbara

T-55 **Generation of Rhodium(I) Carbenoids from Ynamides and Their Reactions with Alkynes and Alkenes**

Renhe Liu,* Gabrielle N. Winston-McPherson, Xin Zhou, Wangze Song, Ilia A. Guzei, Weiping Tang
University of Wisconsin-Madison

T-56 **Double Directing and Activation Group Strategy for the Regioselective Rh(III)-Catalyzed C-H Activation of Nicotinic Acid Derivatives**

John R. Huckins,* Eric A. Bercot, Oliver R. Thiel, Tsang-Lin Hwang and Matthew M. Bio
Amgen

T-57 **Diastereoselective Additions to Allenyl Aldehydes Directed by an Organo-Manganese η^2-Auxiliary**

Animesh Roy,* Salvatore Lepore
Florida Atlantic University

T-58 **Silver-Mediated Methoxycarbonyltetrafluoroethylation of Aromatic Triazenes**

Andreas Hafner,* Thomas J. Feuerstein, Martin Nieger, Stefan Brase
Karlsruhe Institute of Technology (KIT)

T-59 **ortho-Bromination of [2.2]Paracyclophanes by Pd-Ag-catalyzed CH-Activation**

Joshua J. P. Kramer,* Ceylan Yildiz, Stefan Brase
Karlsruhe Institute of Technology (KIT)

T-60 **Reduction of Enamino Esters with $Co_2(CO)_8$-modified Complexes**

Manuel Amezquita-Valencia,* Armando Cabrera
Universidad Nacional Autonoma de Mexico

T-61 **Stereoselective Pd-Catalyzed Carboamination Reactions for the Synthesis of Tricyclic Guanidine Alkaloids**

Nicholas R. Babij,* John P. Wolfe
University of Michigan

T-62 **Photoredox Catalyzed Radical Reductive Cleavage of C-X and C-O Bonds**

John D. Nguyen,* Bryan S. Matsuura, Erica D'Amato, Jagan Narayanam, and Corey R. J. Stephenson
Boston University

T-63 **Amine-directed Arene C-H Borylation Reactions: Catalyst Study and Development**

Marissa A. Ringgold,* Andrew J. Roering, Lillian V. A. Hale, Timothy B. Clark
University of San Diego

T-64 **Phosphine-directed C-H borylation of Arenes**

Kristina M. Crawford,* Timothy R. Ramseyer*, Timothy B. Clark
University of San Diego

T-65 **Iron promoted Allylic Amination of Unactivated Alkenes**

Ayesha Hussain,* Peter J. Rutledge
The University of Sydney, Australia

T-66 **Alkene Chemoselectivity in Ruthenium-Catalyzed Z-Selective Olefin Metathesis**

Jeffrey S. Cannon,* Robert H. Grubbs
California Institute of Technology

T-67 **Development of Stereoselective Aza-Wacker Cyclization Reactions**

Adam B. Weinstein,* David P. Schuman, Zhi Xu Tan, Shannon S. Stahl
University of Wisconsin - Madison

T-68 **Iron-Catalyzed C-C and C-N Bond Formation**

Toolika Agrawal,* Silas P. Cook
Indiana University, Bloomington

T-69 **Gold-Catalyzed Tandem Aminocyclization/1,3-Sulfonyl Migration of *N*-Substituted-*N*-sulfonyl-aminobut-3-yn-2-ols to 1-Substituted-3-sulfonyl-1*H*-pyrroles**

Wan Teng Teo,* Weidong Rao, Ming Joo Koh, Philip Wai Hong Chan
Nanyang Technological University

T-70 **Enantiospecific Lewis Acid Mediated [3+2] Cycloadditions of Donor-Acceptor Cyclopropanes with Heteroallenes**

Alexander F. G. Goldberg, Nicholas R. O'Connor,* Robert A. Craig, II,*
and Brian M. Stoltz
California Institute of Technology

T-71 **The Development of a Cobalt-Mediated Synthesis of Strained Cyclic Alkynes Using an Intramolecular Nicholas Reaction**

Szilvia B. Kiss, Katie Barbor,* Kevin M. Shea
Smith College

T-72 **Synthesis of γ-Lactams via a Nickel-Catalyzed Addition of in situ Prepared Diorganozinc Nucleophiles to Phthalimides**

Joseph Dennis,* Catherine Calyore, Jeffrey Johnson
Hope College

T-73 **Probing the Regioselectivity of Catalytic Arene C-H Borylations**

Hao Li,* Robert E. Maleczka, Jr., Jossian Oppenheimer, Milton R. Smith, III
Michigan State University

T-74 **The Synthesis of a Novel Cationic Dienophile Stabilized by a Cobalt-Complexed Alkyne and Its Reactivity in the Diels-Alder Reaction**

Gloria Ortiz,* Tessa Clark, Emma Whetsell, Kevin Shea
Smith College

T-75 **Fluorous Emulsions for Catalytic Aerobic Oxidation of Primary Alcohols**

Valentin Rodionov,* Batian Chen, Konstantin Bukhriakov, and Clement Mugemana
King Abdullah University of Science and Technology

T-76 **Development of a Tandem Diels-Alder/Pauson-Khand Reaction Strategy for the Synthesis of Tetracycles**

Elsa Hinds, Zulema Peralta,* Kevin Shea
Smith College

T-77 **Homogeneous Metal Catalysis: The Remarkable Effect of Hemilabile Ligands**

Kunal Keskar,* James McNulty
McMaster University

T-78 **Ligand-Dependent Multi-Metal Catalysis: Insight into Mechanism and the Development of Multi-Component Reactions**

Lei Zhang,* Jane Panteleev, Lorenzo Sonaglia, Jason Stacey, Mark Lautens
University of Toronto

T-79 **Cycloadditions of Biphenylenes with Alkynes and Nitriles**

Ales Korotvicka,* Martin Kotora
Charles University in Prague

T-80 **Catalytic Hydrosilylative Reduction of Carbohydrates to Alkanes**

Laura L. Adduci,* Matthew P. McLaughlin, Trandon A. Bender, Jennifer J. Becker, Michel R. Gagne
University of North Carolina at Chapel Hill, US Army Research Office

T-81 **Synthetic and Mechanistic Aspects of Palladium-Catalyzed Hydrodehalogenation of Aryl Chlorides**

Margaret E. Logan,* Cory J. Charbonneau, Mark E. Oinen, Daniel T. Zdanowski
Department of Chemistry and Biochemistry, The College at Brockport, State University of New York

T-82 **Palladium-Catalyzed Alkyne Insertion/Reduction Route to Trisubstituted Olefins**

Erin R. Fruchey,* Brendan M. Monks, Andrea M. Patterson, Silas P. Cook
Indiana University

T-83 **Copper-catalyzed, Selective Mono N-alkylation of Primary Amides with Alkylboronic Esters**

Luis M. Mori-Quiroz,* Steve A. Rossi, Kirk W. Shimkin, Donald A. Watson
University of Delaware, Department of Chemistry and Biochemistry

T-84 **Investigating C-O, C-N, C-S Bond Cleavages Utilizing Photoredox Catalysis**

Leanne Sebren,* John Nguyen, Bryan Matsuura, Corey R.J. Stephenson
University of Michigan

T-85 **Mechanistic Investigations into Rh and Pd-Catalyzed C-C Single Bond Activations**

James R. Bour,* Jacob C. Green, Jeffrey B. Johnson
Hope College

T-86 **Palladium-catalyzed Synthesis of Functionalized Indolizines**

Phillip R. Lazzara, Chad C. Eichman*
Loyola University Chicago

T-87 **Catalysis and Screening at GSK**

Jeremiah Powers,* Roy Bowman, Mark Mitchell
GlaxoSmithKline

T-88 **Development of an Efficient and Practical Asymmetric Synthesis of a TrpV1 Antagonist**

Dennie S. Welch,* Ashok V. Bhatia, Steven C. Cullen, Jorge Gandarilla, and Albert W. Kruger
AbbVie, Process Research and Development

T-89 **Synthesis of JWH-250 4-Hydroxypentyl Metabolite**

Martha Liu,* Kenan Yaser, Dillon Edwards and Uma Sreenivasan
Cerilliant Corporation, USA

T-90 **Synthesis of Hasubanan and Acutumine Alkaloids**

Nicholas A. Calandra,* Sandra M. King, Seth B. Herzon
Yale University

T-91 **Cu^{2+} Clay Mineral Catalysed Reactions of Diazoalkanes: Effects of the Restrictions of the Interlayer Space on the Stereochemistry of the Carbene Reactions**

Vishwapathi Vinod* and Richard W McCabe
University of Central Lancashire

T-92 **Development and Applications of Novel Masked Prochiral Enolates**

Corey Reeves,* Chistian Eidamshaus, Jimin Kim, Wen-Bo Liu
California Institute of Technology

T-93 **Rhodium-Catalyzed Enantioselective Vinylogous Addition of Enol Ethers to Vinyldiazoacetates**

Austin G. Smith* and Huw M. L. Davies
Emory University

POSTER SESSION W – WEDNESDAY JUNE 26th

W-1 **Analgesic Activity of Some New 1,4-Dihydropyridine Derivatives**

R. Surendra Kumar*
Department of Chemistry, J.J College of Engineering &Technology Trichy, Tamil Nadu

W-2 **Targetting Lysosome and Its Applications with Sensitive Fluorescent Probes**

Nazmiye B. Yapici,* Lanrong Bi
Michigan Technological University

W-3 **Light Activated Serotonin for Exploring Its Action in Biological Systems**

Adam C. Rea, Laura N. Vandenberg, Rebecca E. Ball, Lindsey L. Johnston, Yue Zhu, Duncan E. McLain, Louise Ashall, James D. Lauderdale, Michael Levin, and Timothy M. Dore*
University of Georgia; Tufts University; and New York University Abu Dhabi

W-4 **Regioselective Silyl Exchange Technology (ReSET) and Glycosyl Iodide Glycosylation: Two Practical Tools for Synthesizing Biologically Important Oligosaccharides**

Hsiao-Wu Hsieh,* Prof. Jacquelyn Gervay-Hague
University of California, Davis

W-5 **Partially *O*-Acetylated *N*-Acetyl Neuraminic Acid Derived from using Regioselective Silyl Exchange Technology (ReSET)**

Simon S. Park* and Jacquelyn Gervay-Hague
University of California, Davies

W-6 **Development of a Chemiluminescent Immunoassay for Valproic Acid**

Jonathan Grote* and Yon-Yih Chen
Abbott Laboratories

W-7 **Synthesis and Dvaluation of New Phenothiazinium Based Photosensitizer for Antimicrobial Photodynamic Therapy**

Ardeshir Rineh,* Michael J. Kelso, George P. Tegos and Michael R. Hamblin
University of Wollongong; Harvard Medical School and University of New Mexico

W-8 **An Investigation on the Synthesis of New Phenothiazinium-Based Photosensitizer**

Ardeshir Rineh,* Michael R. Hamblin and Michael J. Kelso
University of Wollongong

W-9 **Shedding Light on DNA Structure with Fluorescent Nucleosides**

Guillaume Mata,* Nathan, W. Luedtke
Department of Chemistry, University of Zurich, Switzerland

W-10 **The Synthesis of Functionalized Benzofulvenes and their Possible Application towards Thioredoxin Reductase Inhibition and Cancer Treatment**

Gregg Lowery, Valerie Lesniak, Austin Erler, Jack Rubenkonig, Adam Glass*
Pacific Lutheran University

W-11 **Desensitizers of the α4β2 Nicotinic Acetylcholine Receptors with Reduced Agonist Properties for the Treatment of Alcohol Addiction**

Yong Liu,* Janell Richardson, Thao Tran, Nour Al-Muhtasib, Teresa Xie, Hannah G. Sexton, Amir H. Rezvani, Edward D. Levin, Niaz Sahibzada, Kenneth J. Kellar, Mikell Paige, Yingxian Xiao and Milton L. Brown
Georgetown University

W-12 **New Reaction-Based Probes for Multimodal Imaging of Carbon Monoxide and Hydrogen Peroxide**

Brian W. Michel,* Christopher J. Chang
University of California, Berkeley

W-13 **The Mechanism of Caseinolytic Protease (ClpP) Inhibition. Design of Novel ClpP Inhibitors**

Malte Gersch, Vadim S. Korotkov,* Anja List, Felix Gut, Gerhard Klebe, Michael Groll, Stephan A. Sieber
Department of Chemistry, Center for Integrated Protein Science Munich, Technische Universitat Munchen, Germany

W-14 **Chemoenzymatic Synthesis of Cholesteryl Glycosides**

Jacquelyn Gervay-Hague,* Ryan A. Davis
University of California, Davis

W-15 **Synthesis and Structure-Activity Relationships of GPR35 Antagonists**

Manahil M. Abdalhameed,* Pingwei Zhao, Dow P. Hurst, Mary E. Abood, Patricia H. Reggio, Mitchell P. Croatt
University of North Carolina at Greensboro

W-16 **Steroid-Derived Cyclopamine Analogs as Sonic Hedgehog Pathway Inhibitors: Design, Synthesis and Biological Evaluation**

Lyndsay M. Wood,* Jeffrey D. Winkler, Andre K. Isaacs, Zhihui Zhang, Christian Ventocilla, David C. Schultz, Brian J. Frederick
University of Pennsylvania, The Wistar Institute

W-17 **Optimization of Novel Bacterial Topoisomerase Type II Inhibitors (NBTIs)**

F. Reck, D.E. Ehmann, T.J. Dougherty, J.V. Newman, G. Stone, P. Ciaccio, J. McNulty, H. Barthlow, K. Goteti, J. Breen,A. Nayar, J. Comita-Prevoir, M. Cornebise, M. Cronin, C.J. Eyermann, B. Geng,G. Carr, L. Pandarinathana, L.Zhao,* N. Bezdenejnih, J.L. O'Donnell
Infection Innovative Medicines Unit, and Safety Assessment, AstraZeneca R&D Boston

W-18 **Fluoroaniline Derivatives of Quinazoline as HIV-1 Capsid Assembly Inhibitors**

Ondrej Stepanek,* Jak Konvalinka, Milan Kozisek, Martin Kotora
Institute of Organic Chemistry and Biochemistry, Praha, Czech Republic; Department of Organic Chemistry, Faculty of Science Charles University, Praha, Czech Republic

W-19 **Synthesis and Biological Activity of New 15-Substituted Estrone Derivatives**

Eva Prchalova,[2,*] David Sedlak,[3] Petr Bartunek,[1] Jerzy Adamski,[4] Martin Kotora[2]
(1) Institute of Organic Chemistry and Biochemistry AS, Czech Republic. (2) Charles University in Prague, Faculty of Science, Department of Organic and Nuclear Chemistry, Czech Republic. (3) Institute of Molecular Genetics AS, Czech Republic. (4) Helmholt

W-20 **Synthesis of Fluorophore-Conjugated Carbohydrates and Polymer-Linked Carbohydrates**

Bridget G. Trogden,* Cory J. White, Grant Geist, Kelly Ferrill, Jamesa Hogges
Mercer University

W-21 **The Synthesis and Biological Activity of Fluroinated Chalcones**

Thrineshen Moodley,* Neil.A Koorbanally, Deresh Ramjugernath

W-22 **Development of New Controllable Hydrogen Sulfide Donors**

Powell Bagdon,* Nelmi O. Devarie-Baez, Chung-Min Park, Yu Zhao, Bo Peng, Ming Xian
Washington State University

W-23 **Synthetic Applications of Monoamine Oxidase-N**

Beatrice Bechi,* Diego Ghislieri, Nicholas J. Turner
University of Manchester

W-24 **Progress on Size Selective Lipid Nanovesicle Capture Using Engineered Peptides**

Brandan M. Cook,* Jonel P. Saludes
Washington State University

W-25 **Improvement of a Sandwich ELISA Assay to Enhance Quantification Capabilities of LNA Oligonucleotides**

Jacob Ravn,* Nanna Albak, Henrik Frydenlund Hansen, Troels Koch, Christoph Rosenbohm
Santaris Pharma A/S, Denmark

W-26 **Conservative Structural Modifications in Quillaja Saponin Analogues Result in Striking Modulation of Adjuvanticity and Toxicity**

William E. Walkowicz,* Payal Damani, Constantine M. George, Philip O. Livingston, Govind Ragupathi, Derek S. Tan, David Y. Gin, PhD
Gerstner Sloan-Kettering Graduate School of Biomedical Sciences & Molecular Pharmacology and Chemistry Program, Memorial Sloan-Kettering Cancer Center

W-27 **Sulfenic Acid Determination Via Small Molecule Probes**

Thomas H. Poole,* Julie A. Reisz, Christina M. Furdui, S. Bruce King
Wake Forest University

W-28 **Pharmacophore Based Design and Synthesis of Novel Neonicotinic Insecticides**

Zoltan L. Benko,* David A. Demeter, Carl V. DeAmicis, W. Randall Erickson and Gerald B. Watson
Dow AgroSciences

W-29 **Synthesis of a Macrocycle Based on Linked Amino Acid Mimetics**

David S. Maxwell, Duoli Sun, Zhenghong Peng, William G. Bornmann*
University of Texas - MD Anderson

W-30 **Modular, Efficient Synthesis of Asymmetrically Substituted Piperazine Scaffolds as Potent Calcium Channel Blockers**

Andrey Borzenko,* Terrance Snutch, Sven Tobisch, Laurel Schafer
University of British Columbia; University of St Andrews

W-31 **New Chemical Approaches to Trapping Nitroxyl (HNO)**

Zhengrui Miao,* Julie A. Reisz, Susan Mitroka, S. Bruce King
Wake Forest University

W-32 **New Selective Reaction-Based Fluorescent Probes for Hydrogen Sulfide: Synthesis and Applications**

Vivian S. Lin,* Alexander R. Lippert, Christopher J. Chang
University of California, Berkeley; Southern Methodist University; Howard Hughes Medical Institute

W-33 **Development of Novel *N*-Acyl-3,5-bis(benzylidene)-4-piperidones as Potent Cytotoxins**

Mohammad Hossain,* Swagatika Das, Umashankar Das, Jan Balzarini, Lizette van Berckelaer, and Jonathan R. Dimmock
Asian University for Women, Chittagong, Bangladesh; University of Saskatchewan, Saskatoon, Canada; and Katholieke Universiteit Leuven, Leuven, Belgium

W-34 **Oxanorbornadiene Reagents: Labeling of and Release from Biomolecules**

Alexander A. Kislukhin,*[,1] Cody J. Higginson,[2] M.G. Finn[3]
(1) The Scripps Research Institute; (2) University of California San Diego; (3) Georgia University of Technology

W-35 **A Bisoxetanyl Sulfoxide as a DMSO Substitute in Chemical and Biological Applications**

Melissa M. Sprachman,* Michael W. Epperly, Joel S. Greenberger, Peter Wipf
Department of Chemistry, University of Pittsburgh

W-36 **Reactivity Assessment of Chalcones by NMR Studies**

Christine Hart,* Ingo Janser
Eastern Michigan University

W-37 **Detection of Acetylcholinesterase Inhibitors using Backscattering Interferometry**

Gabrielle L. Haddad-Weiser,* Sherri C. Young, Ned D. Heindel, Darryl J. Bornhop, Robert A. Flowers
Lehigh University, Vanderbilt University

W-38 **Characterization and Inhibition of Bacterial Quorum Sensing**

Tanya L. Schneider,* Kathryn Tutunjian, Emily N. Arner, Andrew J. Duarte
Connecticut College

W-39 **Synthesis of Novel sigma-2 Receptor Ligands as Potential Therapeutics for Alzheimer's Disease**

Ricardo Garza Jr.,* James J. Sahn, Stephen F. Martin, Luisa Scott, Sargeetha Iyer, John-Pierce Shimomura, Gabriella Zuniga
The University of Texas at Austin, Texas Institute for Drug and Diagnostic Development, Waggoner Center for Alcohol and Addiction Research

W-40 **Functionalized Coumarins as Potential Anti-Pancreatic Cancer Agents**

Conner M. Farley,* Eric A. Hall, Jakob Magolan
University of Idaho

W-41 **Phytochemistry and Seciation: Synthesis as a Tool for Understanding the Chemical-ecology of Piper Kellyii**

Trang T. Nguyen,* Christopher Jeffrey, Kevin McMahon, Michael Leonard, Andrea Glassmire, Lora Richards, Lee Dyer
University of Nevada, Reno; Carroll University

W-42 **Frustrated Lewis Pairs beyond the Main Group: Small molecule activation with Zirconium-Phosphorous Pairs**

Stephanie R. Flynn,* Andy M. Chapman and Duncan F. Wass
University of Bristol

W-43 **Limits of Guest Migration in Polymeric Molecular Switches**

Eric S. Clevenger,* Micah J. Green, Michael F. Mayer
Texas Tech University

W-44 **Fluorescent Anion Sensors Based on the 2,6-Bis-(2-anilinoethynyl) Pyridine Scaffold**

Jeffrey M. Engle,* Timothy E. Robitshek, Calden N. Carroll, Darren W. Johnson and Michael M. Haley
University of Oregon

W-45 **Synthesis of Novel Chromophore Dimers for Aqueous Halide Detection**

Cassandra J. Henderson,* Noel M. Paul, J. Clay Harris
The Ohio State University, Department of Chemistry and Biochemistry

W-46 **Synthesis of Carbamoylmethylphosphine Oxide Ligands for f-Element Recognition**

Katherine Coburn,* Julie Stoscup,* Shannon M. Biros
Grand Valley State University

W-47 **TBD**

Seyed Hassan Dadvar,* Ahmad Arefazar, Elham Babazadeh Rezaei
Amirkabir University of Technology (TehranPolytechnic)

W-48 **Plastics Recycling: A Service Learning Project in the Undergraduate Organic Chemistry Curriculum, with North Park University and the City of Chicago as Community Partners.**

Kaitlin Dailey,* Isabel Larraza, Laura Burt-Nicholas
North Park University

W-49 **Stereoelectronic Effects in Conformationally Fixed Oxathiane Derivates**

Daniel Weingand,* Joachim Podlech
Karlsruhe Institute of Technology (KIT)

W-50 **Development of Solvent Selection Guides for Sustainable Synthesis and Purification**

Fiona I. McGonagle,* Donna S. MacMillan, Jane Murray, Helen F. Sneddon, Craig Jamieson, Allan J. B. Watson
University of Strathclyde; GlaxoSmithKline; Sigma-Aldrich

W-51 **Palladium Catalyzed Tandem Deprotection-Dimerization-Macrocyclization Route to C2 Symmetric Cyclo-Tetrapeptides**

Khanh Ha,* Kristin Martin, Eric Faby
University of Florida

W-52 **Synthesis of a Novel Polymyxin Analog via Enzymatic Hydrolysis of Global Boc-Protected Polymyxin B**

Bryan Li,* Carlos Martinez, Tom Magee, and Anne Akin
Pfizer Inc.

W-53 **Conformational Analysis of a Highly Bioavailable Helical Amide-linked Homooligomer of Sialic Acid**

Jonel P. Saludes,[1,*] Travis Q. Gregar,[3] Isaac A. Monreal,[1] Brandan M. Cook,[1] Lieza M. Danan-Leon,[2] and Jacquelyn Gervay-Hague[2]
(1) Washington State University, (2) University of California Davis, (3) University of Arizona

W-54 **The Design and Synthesis of Peptides Containing the S,S-Tetrazine Photochemical Trigger**

Joel R. Courter,* Stephen P. Brown, Mohannad Abdo, Matthew J. Tucker, Jianxin Chen, Robin M. Hochstrasser, and Amos B. Smith, III
University of Pennsylvania

W-55 **Cyclic, Cysteine-containing Depsipeptide Synthesis via Latent Thioester Key Intermediates**

Gregory B. Shelkey, Wade S. Perkins, Xiaoyu Zang, Leila Peraro, Stephanie L. Cramer, Janae N. Garofalo, Travis R. Blum, and Justin S. Miller*
Hobart and William Smith Colleges

W-56 **Synthesis of Novel Synthetic Intermediates *N*-Cbz-protected-Peptidoyl Bis-benzotriazolides**

Amir Nasajpour*
University of Florida

W-57 **Asymmetric Catalysis with Peptide Ligands**

Ramya Sambasivan,* Zachary T. Ball
Rice University

W-58 **Rapid Formation of N-Glycopeptides via Cu(II)-Promoted Glycosylative Ligation**

Ryan Joseph,* Frank Brock Dyer, Philip P. Garner
Washington State University

W-59 **Dysprosium (III) Triflate Catalyzed Aza-Piancatelli Rearrangement**

Diana Yu,[1,*] Van T. Thai,[1] Javier Read de Alaniz,[2] Jason E. Hein[1]
(1) University of California, Merced and (2) University of California, Santa Barbara

W-60 **The Synthesis of New Precursors to Pentacyclo[4.3.0.02,4.03,8.05,7]non-4-ene**

Eric Eisenhauer, Elena Montoto,* Mark Forman
Saint Joseph's University

W-61 **Photosensitized Radical Cyclizations of o-Alkynyloximes**

Wanshin Kim, Peter de Lijser*
California State University, Fullerton

W-62 **On the Mechanism of Asymmetric Organocatalytic Chlorocyclization Reactions**

Nastaran Salehi Marzijarani,* Kumar Ashtekar, Arvind Jaganathan, Sarah Marshall, Atefeh Garzan, Roozbeh Yousefi, James E. Jackson, Babak Borhan
Michigan State University

W-63 **Computational Exploration on Thermal Isomerization of Solution-phase Substituted Benzaldehyde Phenylhydrazones**

Shih-I Lu*
Department of Chemistry, SooChow University, Taiwan

W-64 **Understanding Cyclobutenone Rearrangements - A Study in Flow**

Mubina Mohamed,* Theo P. Goncalves, David C. Harrowven
University of Southampton, United Kingdom

W-65 **Application of Flow Chemistry and In-line Analysis to Fast Optimisation of Organic Synthesis**

Cyril Henry,* David Bolien, Thomas Durand, Richard J. Whitby
University of Southampton, United Kingdom

W-66 **A Simple Meso-scale Flow Photochemical Reactor: Application to Efficient UV Synthesis**

David Bolien,* Cyril Henry, Richard J. Whitby
University of Southampton, United Kingdom

W-67 **The Element Effect in Nucleophilic Aromatic Substitution Reactions of Pyridiniums**

Jeannette T. Bowler,* Freeman M. Wong, James R. Keeffe, Weiming Wu
Department of Chemistry and Biochemistry, San Francisco State University

W-68 **Indenofluorenes as Electron Accepting Organic Molecules**

Bradley D. Rose,* Aaron Fix, Peter J. Santa Maria, Lev N. Zakharov, Michael M. Haley
University of Oregon

W-69 **CASSCF Computational Investigations of the [3,3] Sigmatropic Rearrangement of Allyl Esters: Are they Pericyclic or Pseudopericyclic?**

Mackenzie E. Batali,* Henry W. Kreiman,* James A Duncan
Lewis & Clark College

W-70 **On the Mechanism of Ag(I)-Catalyzed Decarboxylative Fluorination**

Niki R. Patel,* Robert A. Flowers, II
Lehigh University

W-71 **The Attraction of Lone Pairs to Sulfur Atoms - Origins and Consequences**

Brandi M. Hudson,* Dean J. Tantillo
University of California, Davis

W-72 **Determining Transition State Structures for a Series of Concerted Proton-Electron Transfer Agents**

Melissa Vettleson,* Dr. Jeffery P. Wolbach, Katherine Tong
Albright College

W-73 **Mechanistic Analysis of $Ir(ppy)_3$-catalyzed Photoredox Coupling**

James J Devery, III,* James J Douglas, John Nguyen
Boston University

W-74 **How Conformation Affects Concerted Proton-Electron Transfer for Two Structurally Related Base-Appended Radical Cations**

Evan A. Welker, Matthew A. Zuchero, Wing-Sze Tong, Melissa J. Vettleson, Robert A. Richards, Brittney L. Tiley, Crina M. Sasaran, Victoria Polito, Stefan Stoll,[1] Jeffrey P. Wolbach, Ian J. Rhile*
Albright College, (1) University of Washington

W-75 **An Electrophilic Aromatic Substitution Discovery Experiment Including Hydride and Methyl Shifts**

Mallory V. Maskornick,* Ian J. Rhile, and Christian S. Hamann
Albright College

W-76 **Probing New Approaches for Teaching Nuclear Magnetic Resonance Spectroscopy**

Kyle T. Smith* and Christian S. Hamann
Albright College

W-77 **Measuring Structural Effects on Keto-Enol Equilibria Using Nuclear Magnetic Resonance Spectroscopy**

Kyle T. Smith, Sherri C. Young, James W. DeBlasio, and Christian S. Hamann*
Albright College

W-78 **Exploring Dynamics on the Triplet Surface**

Ricardo A. Matute,* Gonzalo Jimenez-Oses, Peng Liu, K. N. Houk
University of California, Los Angeles

W-79 **Sigmatropic Shifts of EWG; Applications to Selective Synthesis of Substituted Indoles**

Jason G Harrison,* Tom Driver, Dean Tantillo
University of California - Davis

W-80 **Studies Towards 10-Membered Rings Through [6+4] Cycloadditions**

Nicholas J. Barron,* Kevin I. Booker-Milburn, Roger W. Alder
University of Bristol

W-81 **The Origins of Stereoselectivity of Ketone Hydrogenations using Noyori Catalytic Systems**

Dusty Ventura*
University of California Merced

W-82 **Assessing the Possibility and Probability of Surface Crossings in High Energy Ring Expansions Using Trapping Studies**

Kyle S. Stumetz, Ismael A. Rodríguez Pérez,* *ÁÓÏÎ
T. Nadeau, and Matthew E. Cremeens
Gonzaga University

W-83 **Kinetic Investigation of the Cu(I)-Catalyzed Azide-Iodoalkyne Cycloaddition**

Anh Vo, Blessing Cao, Matthew T. Berry, Jason E. Hein*
University of California Merced

W-84 **Monoamine Oxidase Catalysed Desymmetrisation and Deracemisation of Cyclic Amines**

Marta Pontini,* Nicholas J. Turner
University of Manchester

W-85 **Cytotoxicity of Diaryl Propyl Ketones**

A. Jill Petree, Kyla J. Stingley, P. Barrett Honeycutt,* Ben R. Wiener, Kimberly S. Petersen
University of North Carolina at Greensboro

W-86 **Direct Arylation via Microwaves in the Synthesis of Aporphine-Inspired CNS Receptor Ligands**

Nirav Kapadia,* Wayne Harding
Hunter College of City University of New York

W-87 **Small Molecules for Stem Cell Differentiation**

Garr-Layy Zhou,* Daniel Tams, Todd B. Marder, Andy Whiting
Durham University

GENERAL INFO

The University of Washington is an urban campus in Seattle. The metropolitan area has a population of over 3.5 million and is home to Boeing, Microsoft and Starbucks and much more.

https://www.seattle.gov/visiting/
http://www.visitseattle.org/

An extensive bus system connects the campus with local light rail and other transportation options.

http://www.washington.edu/discover/visit/

Accommodations
Residence halls are not air conditioned. Hard wire Ethernet access is available in sleeping rooms for those who bring their computers (Ethernet cord required). UW wireless access is available in all public areas of campus and is also accessible in guest rooms. Required login and password is issued by the Conference Desk. Microwave ovens, laundry facilities, television lounges and other gathering areas are conveniently located in each residence hall. Guests may deposit funds into their conference card laundry account at the Conference Desk. Residence halls are designed for adult usage, and facilities are not childproof. Adults are responsible for the supervision of their children at all times. Smoking anywhere at the University of Washington is prohibited, including in residence hall sleeping rooms. A list of designated outdoor smoking areas is available from the Conference Desk. The University of Washington is a pedestrian campus, and the residence halls are within a ten- to fifteen-minute walk of most meeting facilities on campus.

Guests may check-in any time after 2 p.m. and must checkout by 11 a.m. unless the confirmation states otherwise.

West Campus – Private Bath: Conference guests will reside in double- or single-occupancy rooms with private baths. All rooms are furnished with twin-size beds, desks, night stands, dressers, bedding, towels, a small fan, soap, toilet paper and drinking cups. Telephones providing Conference guests with free local service are available at the Conference Desk.

North Campus – Shared Bath: Conference guests will reside in double- or single-occupancy rooms, and all rooms are furnished with twin-size beds, desks, bedding, towels, a small fan, soap and drinking cups. Guests share community, single gender bath facilities and occasionally the appropriate bath facility will be located one floor above or below your room. Telephones providing Conference guests with free local service are conveniently located on each residential floor and at the Conference Desk.

Dining Service
Guests will be issued a conference card programmed with a prearranged dollar amount that may be used at any University of Washington Housing & Food Services dining location on campus and card-reader equipped vending machines. Guests purchase food, snacks and beverages by the item. Conference cards programmed with dollar amounts work the same as a debit card. The amount is deducted from the card balance at each purchase, and the balance is displayed on both

the cash register and the customer's receipt. State sales tax is collected at the point of sale and is also deducted from the card balance.

Programmed dining arrangements are available only during the scheduled Conference dates. Guests who exceed their allotted dining funds can pay the difference in cash. Dining funds are not included in Early Arrival or Late Departure housing arrangements, but dining services may be purchased using cash or credit cards.

Residence hall dining facilities serve a variety of entrées, salads, desserts and beverages, routinely offering a meatless selection for vegetarians willing to eat egg and dairy products. The wide variety of food choices offered will accommodate most dietary restrictions. A complete list of dining facilities, grocery and express markets and espresso bars offered on campus will be provided upon check-in.

Parking

Overnight parking is available near the residence halls. Complimentary parking is not available, and rates are subject to change without advance notice. Availability is limited and not guaranteed. More information regarding parking will be sent with your confirmation.

Activities

Seattle has a multitude of places to explore. The 43rd NOS will provide buses to several of the local high points and provide information on activities within walking distance of campus and those accessible by public transportation. And don't forget the Tuesday morning 5k Fun Run!

Seattle: A comprehensive list of the opportunities in the Seattle area:
http://www.seattle.gov/HTML/VISITOR/points.htm

NOS-sponsored Buses

Two sets of buses will run during the afternoons of Monday, Tuesday and Wednesday. These will take attendees to and from the following destinations.

Pike Place Market and Seattle Center

A set of buses will travel a circular route, dropping attendees off at both the Pike Place Market and Seattle Center. Both of these popular destinations are surrounded by other outstanding attractions. When you are done, hop on the bus back to campus.

Be sure to bring your conference badge for entrance to the bus.

Pike Place Market: At 105 years, Pike Place Market is the oldest continuously operating market in the United States. The original Starbucks and Sur La Table stores can be found here, as well as the world famous fish-throwing Pike Place fish guys. Walk inside the main thoroughfares of the Pike Place Market and tour the Lower Levels where hidden treasures await.
http://pikeplacemarket.org

Seattle Center: Visit Seattle Center, where you will find the Space Needle, where a glass elevator will transport you 520 feet up to the observation deck, giving you a 360-degree view of the city, lakes, and snow-capped mountains. After your sky-high adventure, enjoy a visit to Chihuly Garden and Glass, a collection of outdoor and indoor exhibits by world renowned glass artist Dale Chihuly: the Exhibition Hall contains eight galleries; the Glasshouse presents a suspended 1,400-piece, 100-foot-long sculpture; and the Garden is a backdrop for four monumental sculptures and other installations. spaceneedle.com This is also an excellent starting point for the Experience Music Project, the Duck Tours and the Monorail (see below for more about these).

Red Hook Brewery and Washington State Wineries

Take one of these buses to the famous Red Hook Brewery in Woodinville, less than 30 minutes away. Surrounding the brewery are a multitude of winery tasting rooms. There are more than 90 wineries in the Woodinville area, including Chateau St. Michelle and the Columbia winery. When you are done, hop on the bus back to campus.

Be sure to bring your conference badge for entrance to the bus.

http://redhook.com/breweries/woodinville-brewery/
http://woodinvillewinecountry.com

Five Other Local Activities

1. Washington Park Arboretum and Japanese Garden

Description: The Arboretum is a hidden gem on the shores of Lake Washington. Jointly managed by UW and the City of Seattle, its 230 acres are a dynamic assortment of plants found nowhere else. The Graham Visitors Center contains an information desk and a gift shop managed by the Arboretum Foundation. The Japanese Garden, located at the south end of the Arboretum has an entrance fee and is managed by the City of Seattle.

How to get here by Bus: Metro bus routes 43 and 48 run near the Arboretum. Ask for the McGraw street stop. If you are coming from Madison Street, you can take route 11, get off at Lake Washington Boulevard East, and walk north into the Arboretum. Several buses coming from the Eastside stop at the end of SR-520. Not sure which one you need? Use Metro's Trip Planner (http://tripplanner.kingcounty.gov/) to get here.

Location (Arboretum): 2300 Arboretum Drive E, Seattle, WA 98112
Website: http://depts.washington.edu/uwbg/gardens/wpa.shtml
Hours: Mon-Fri 9:00 AM-5:00 PM , Sat-Sun 10:00 AM-4:00.
Cost: Free

Location (Japanese Garden): 1075 Lake Washington Blvd E, Seattle WA 98112
Hours: Mon-Sun 10 am - 7 pm
Cost: Adults 18-64: $6, Youths 6-17/Senior Adults 65+/College students with ID/Disabled: $4, Children 0-5: FREE
Contact: (206) 684-4725

2. Agua Verde Paddle Club (Kayaking)

Description: Explore Seattle by kayak! Head towards Lake Union for views of the city, houseboats and Gas Works Park or venture through the Arboretum to paddle through water trails and check out the local flora and fauna. The Paddle Club stocks a variety of boats for different body types and experience levels and they put people in boats for the first time every day! Visit on a weekday and take advantage of their weekday specials to enjoy kayaks, food and ambiance.

How to get here: A short 5 minute walk from campus!
Location: 1303 Northeast Boat Street, Seattle, WA 98105
Website: http://aguaverde.com/paddleclub/
Hours: Mon.-Fri. 10:00 am - 6:30 pm, Sat. 9:00 am - 6:30 am, Sun. 9:00 am - 4:30 pm.
Cost: Varies starting from $17/hour for single kayaks
Contact: (206) 545-8570

3. Seattle Underground Tours

Description: BILL SPEIDEL'S UNDERGROUND TOUR is a leisurely, guided walking tour beneath Seattle's sidewalks and streets. As you roam the subterranean passages that once were the main roadways and first-floor storefronts of old downtown Seattle, our guides regale you with the

stories our pioneers didn't want you to hear. It's history with a twist! The tour begins inside Doc Maynard's Public House, a restored 1890s saloon. Following a short intro, we'll walk through historic Pioneer Square to three different sections of Underground-about three blocks in all. After hearing the history of the invention of the flush toilet in England on the tour, you can check out our beautiful, original Crapper toilet imported from England.

How to get here by Bus: Take Express Bus 73 from NE Campus Parkway and Brooklyn Ave NE straight to Pioneer Square. The Underground Tour is an easy 3 min walk from Pioneer Square.
Location: 608 1st Ave, Seattle, WA 98104
Website: http://www.undergroundtour.com/
Hours: Tours start on the hour, 10 am-7 pm.
Cost: Adults (18-59 yrs): $16.00; Seniors (60+ yrs): $13.00; Students (13-17 yrs or w/valid college ID): $13.00; Children (7-12 yrs): $8.00; Kids 6 and under: free, but may find the 75-minute tour challenging.
Contact: (206) 682-4646

4. Gasworks Park

Description: This 20-acre point on Lake Union was cleared in 1906 to construct a plant to manufacture gas from coal - later converted to crude oil. Import of natural gas in the 1950's made the plant obsolete. The city acquired the site for a park in 1962. The park was opened to the public in 1975. The boiler house has been converted to a picnic shelter with tables, fire grills and an open area. The former exhauster-compressor building, now a children's play barn, features a maze of brightly painted machinery. Special park features include a sundial, and a beautiful view of downtown Seattle.

How to get here: The Burke-Gilman Trail starting at UW runs right past the Gas Works parking lot and is a leisurely ~35 min walk (1.6 miles).
Location: 2101 N Northlake Way, 98103
Website: http://www.seattle.gov/parks
Hours: 6 am to 10 pm
Cost: Free

5. University Village (Shopping and Dining)

Description: Located just northeast of campus, University Village is an open-air lifestyle shopping center which offers a unique formula of locally-owned boutiques and signature national retailers. U Village is a regional destination for home furnishings, popular fashions and unique gift items with a distinct collection of restaurants and eateries.

How to get here: A leisurely 20 minute walk from campus. Many bus routes through campus also go past U Village. Please check with the driver.
Website: http://www.uvillage.com/
Store Hours: Monday - Saturday: 9:30 am to 9 pm. Sunday: 11 am to 6 pm.

Other Options Near Or Part Of The Univ. Of Washington

Alki Beach
Seal viewing and picnicking.
Alki Beach Park

The Hiram Chittenden Locks (1911)
Separating the salt Puget Sound from the fresh water lakes, see the parade of boats, the salmon ladder and the Carl S. English, Jr. Botanical Gardens
http://www.seattle.gov/tour/locks.htm

The UW's Burke Museum of Natural History and Culture
On the north side of campus
http://www.burkemuseum.org/

Golf and other sports
On campus!
http://depts.washington.edu/ima/

Capitol Hill
Discover the hip, urban, wooded and stately neighborhood 2.5 miles south of campus.
Capitol Hill Neighborhood

The Freemont Troll
Find the TROLL! Just 2.5 miles west of campus.
http://www.fremont.com/fremonttroll.html

Tour Seattle

Pioneer Square
Seattle's original downtown.
http://www.seattle.gov/tour/pioneer.htm

Seattle Aquarium
Learn about the rich sea life surrounding Seattle in the 9th largest aquarium in the US.
http://www.seattleaquarium.org/

The Experience Music Project
Visit the Gehry designed building that "celebrates the creative process."
http://www.empmuseum.org

Seattle Monorail
Ride the nation's first full-scale commercial monorail system.
http://www.seattlemonorail.com/

Ride the Ducks!
Tour Seattle and cruise on Lake Union in a WWII amphibious landing craft
http://www.ridetheducksofseattle.com/

Indoor Skydiving
What more needs be said? Experience one of the few vertical wind tunnels in the country.
http://www.iflyseattle.com/ifly-indoor-skydiving

Flight

The Future of Flight Aviation Center & Boeing Tour

"The only opportunity to tour a commercial jet assembly plant in North America", 22 miles N of campus

http://www.futureofflight.org/

The Museum of Flight

Visit one of the largest air and space museums in the world, 11 miles north of UW.

http://www.museumofflight.org/directions

Nearby Opportunities

Bainbridge Island

Take a 35 minute ferry ride across Puget Sound to "one of the Northwest's most happening destinations."

http://www.wsdot.wa.gov/ferries/Schedule/

http://www.bainbridgechamber.com/default.aspx?SS=3

History of the National Organic Chemistry Symposium
1925 – 2011

During and after the 2011 National Organic Chemistry Symposium, Professors Edward Fenlon (Franklin & Marshall College) and Brian Myers (Ohio Northern University) pieced together the complete history of the NOS, which is detailed on the Organic Division's NOS web page. In addition, an article describing this history recently appeared in the *Journal of Organic Chemistry*. Below you will find a very brief outline of the meeting dates and locations, followed by a B&W version of the JOC article. We are grateful to JOC, and in particular JOC editor C. Dale Poulter, for allowing us to include the article in this symposium booklet.

1st
December 29-31, 1925
Eastman School of Music
Rochester, NY

2nd
December 29-31, 1927
Ohio State University
Columbus, OH

3rd
Dec. 30, 1929, to Jan. 1, 1930
Princeton University
Princeton, N. J.

4th
December 28-30, 1931
Yale University
New Haven, CT

5th
December 28-30, 1933
Ithaca, NY

6th
Dec. 30, 1935 to Jan. 1, 1936
Hotel Seneca
Rochester, NY

7th
December 28-30, 1937
The John Marshall Hotel
Richmond, VA

8th
December 28-30, 1939
St. Louis University
St. Louis, MO

9th
December 29-31, 1941
University of Michigan
Ann Arbor, MI

10th
June 11-14, 1947
Harvard University
Cambridge, MA

11th
June 20-22, 1949
University of Wisconsin
Madison, WI

12th
June 11-15, 1951
Shirley-Savoy Hotel
Denver, CO

13th
June 15-18, 1953
University of Michigan
Ann Arbor, MI

14th
June 13-16, 1955
Purdue University
Lafayette, IN

15th
June 17-20, 1957
The University of Rochester
Rochester, NY

16th
June 15-17, 1959
University of Washington
Seattle, WA

17th
June 25-29, 1961
Indiana University
Bloomington, IN

18th
June 16-20, 1963
Ohio State University
Columbus, OH

19th
June 13-17, 1965
Arizona State University
Tempe, AZ

20th
June 18-22, 1967
University of Vermont
Burlington, VT

21st
June 15-19, 1969
Univeristy of Utah
Salt Lake City, UT

22nd
June 13-17, 1971
University of Michigan
Ann Arbor, MI

23rd
June 17-21, 1973
Florida State University
Tallahassee, FL

24th
June 22-26, 1975
Colorado State University
Fort Collins, CO

25th
June 19-23, 1977
West Virginia University
Morgantown, WV

26th
June 24-28, 1979
University of Arizona
Tucson, AZ

27th
June 21-25, 1981
Vanderbilt University
Nashville, TN

28th
June 19-23, 1983
Montana State University
Bozeman, MT

29th
June 19-23, 1985
University of Delaware
Newark, DE

30th
June 21-25, 1987
University of British Columbia
Vancouver, British Columbia, CA

31st
June 18-22, 1989
Cornell University & Ithaca College
Ithaca, NY

32
June 16-20, 1991
University of Minnesota
Minneapolis, MN

33rd
June 13-17, 1993
Montana State University
Bozeman, MT

34th
June 11-15, 1995
The College of William and Mary
Williamsburg, VA

35th
June 22-26, 1997
Trinity University
Antonio, TX

36th
June 13-17, 1999
University of Wisconsin
Madison, WI

37th
June 10-14, 2001
Montana State University
Bozeman, MT

38th
June 8-12, 2003
Indiana University
Bloomington, IN

39th
June 12-16, 2005
University of Utah
Salt Lake City, UT

40th
June 3-7, 2007
Duke University
Durham, NC

41st
June 7-11, 2009
University of Colorado
Boulder, CO

42nd
June 5-9, 2011
Princeton University
Princeton, NJ

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Perspective

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Profiles in Chemistry: A Historical Perspective on the National Organic Symposium

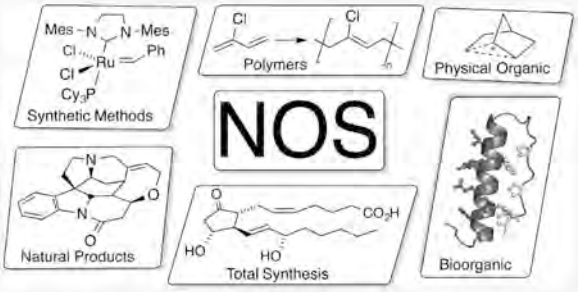
Edward E. Fenlon*,† and Brian J. Myers‡

†Department of Chemistry, Franklin & Marshall College, P.O. Box 3003, Lancaster, Pennsylvania 17604, United States

‡Department of Chemistry, Ohio Northern University, 525 South Main Street, Ada, Ohio 45817, United States

Supporting Information

ABSTRACT: This perspective delineates the history of the National Organic Chemistry Symposium (NOS) and, in doing so, traces the development of organic chemistry over the past 88 years. The NOS is the premier event sponsored by the ACS Division of Organic Chemistry (ORGN) and has been held in odd-numbered years since 1925, with the exceptions of 1943 and 1945. During the 42 symposia, 332 chemists have given 549 plenary lectures. The role the NOS played in the launch of *The Journal of Organic Chemistry* and *Organic Reactions* and the initiation of the Roger Adams Award are discussed. Representative examples highlighting the chemistry presented in each era are described, and the evolution of the field is examined by assigning each NOS talk to one of seven subdisciplines and analyzing how the number of talks in each subdiscipline has changed over time. Comparisons of the demographics of speakers, attendees, and ORGN members are made, and superlatives are noted. Personal interest stories of the speakers are discussed, along with the relationships among them, especially their academic lineage. Logistical aspects of the NOS and their historical trends are reviewed. Finally, the human side of science is examined, where over the past century, the NOS has been intertwined with some of the most heated debates in organic chemistry. Conflicts and controversies involving free radicals, reaction mechanisms, and nonclassical carbocations are discussed.



INTRODUCTION

On December 15, 1925, James F. Norris (Figure 1), President of the American Chemical Society (ACS), was in Richmond, Virginia on the last stop of one of his "swings around the circuit".[1] In just under a month, Norris had proceeded to visit 19 local ACS sections. The train from Boston took him first to Toledo, as far west as St. Louis, and as far south as Gainesville. After such a whirlwind tour, one can imagine he was looking forward to being home for the holidays. However, he also must have been thinking of his upcoming talk at the first Symposium on Organic Chemistry that was to begin in two weeks in Rochester, NY, because in the weeks leading up to the Symposium, Norris was inspired to change the title of his talk[2,3] from the advertised *Quantitative Measurement of Chemical Reactivity of Organic Compounds* to the actual talk he gave on December 29, which was entitled *The Opportunities for Research in Aliphatic Chemistry*.[4,5] The talk was well-received, and the Associated Press wrote a wire story focusing on his remarks that synthetic rubber might one day be made from petroleum.[6] Norris was prescient in some of his remarks, noting that "the mechanism of polymerization can be advantageously studied... [and] the structure of the polymers, ... [and] new methods of [their] synthesis should be investigated." Furthermore, he said "the olefins can be made the starting point in the synthesis of many compounds.... [and] a still more profitable field for research can be found in the diolefins."[4,5] What Norris could not know was that 86 years later, three of his academic descendants would address the 42nd meeting of the National Organic Chemistry Symposium (NOS) and demonstrate the

Figure 1. James Flack Norris gave the opening talk at the first National Organic Symposium in 1925. He also spoke in 1927 and 1933. Photograph of Norris in 1908 courtesy of Simmons College Archives.

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truth of his statements. His academic great-great grandson Robert H. Grubbs presented an overview of ruthenium-based olefin metathesis catalysis that has proven to be so valuable to today's chemists.[4] Amir Hoveyda, another of Norris' academic great-great grandsons, described the use of molybdenum- and tungsten-based metathesis catalysts to give (Z)-alkenes.[4] Of course, the changes that occurred in the intervening 86 years are monumental. For example, in 1925, Norris touted petroleum as America's "great natural resource" as a feedstock for polymers, and by the 2011 NOS, his academic great-great-great-great grandson Geoffrey Coates stressed the desire to "transition from fossil fuels to renewable resources" as polymer feedstocks.[4]

This Perspective delineates the history of the NOS and, in doing so, traces the development of organic chemistry in the U.S. through most of the 20th century and into the first decade of the 21st century. The NOS is the premier event sponsored by the ACS Division of Organic Chemistry (ORGN) and has been held in odd-numbered years since 1925 with the exceptions of 1943 and 1945, and during those 42 symposia 332 chemists have given 549 plenary lectures.[7] Changes in the demographics of speakers, attendees, and ORGN members and the chemistry presented in each of three eras are discussed.

The NOS itself has a tradition of examining history, and numerous talks have involved reminiscences of developments of organic chemistry. The first was Moses Gomberg's 1941 address,[8] but other examples include talks by Hermann O. L. Fischer (1953), Roger Adams (1955), John D. Roberts (1995), and Jeffrey I. Seeman (1997).[4] Furthermore, two NOS speakers, Treat B. Johnson[9] and Harry L. Fisher,[10] wrote papers about the history of organic chemistry in America, and D. Stanley Tarbell, one of the organizers of the 1957 symposium, wrote a monograph on the subject.[11,12]

THE THREE ERAS

To facilitate analysis, the 42 NOS were divided into three equal periods. Even though there are 14 symposia in each era, the number of talks in each period are not equal: the Genesis Era had 206, the Cold War Era had 164, and the Modern Era had 179 talks. The discussion begins with each individual era followed by a comprehensive analysis of how the number of talks in seven subdisciplines has changed over time.

Genesis Era (1925–1955). The early NOS had a relatively high percentage (>17%) of nonacademic speakers, an extremely low number of international speakers, and no women speakers. Figure 2 shows the decadal trends for each of these categories and the steady decrease in the nonacademic speakers from the high of 25% in the 1920s to the low of ~3% at the end of the Genesis Era. The high number of nonacademic speakers was meant to promote collaborations between university, industrial, and government chemists. An example of this type of collaboration is the one between Father Julius A. Nieuwland (Figure 3), a chemist from Notre Dame, and chemists from DuPont. Nieuwland spoke in 1925 and 1927 on the catalytic reactions of acetylene, and his work provided key information for Elmer Bolton and Wallace Carothers of DuPont, who were investigating polymerization reactions to develop synthetic rubber (Figure 4a). Nieuwland consulted with DuPont as the industrial chemists developed DuPrene, which was first prepared in 1930.[13,14] Later renamed neoprene, this polymer is still widely used today. Nieuwland was also active in ORGN, serving as Secretary in 1924 and Chair in 1925. According to Fisher, during the time that Nieuwland was Secretary an alarm

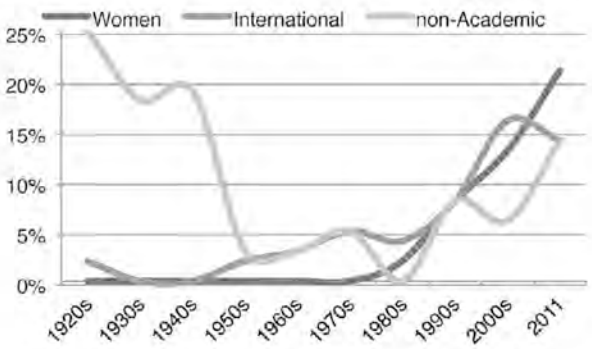

Figure 2. Decadal trends in the average percentage of female, international institutional, and nonacademic NOS speakers. The 2011 values are for one NOS, the values for 1920s and 1940s are an average of three NOS, and all other decades are an average of five NOS.

Figure 3. Julius Nieuwland, C.S.C., Ph. D., working at a desk in a laboratory at Notre Dame, c1910s. Nieuwland was born in Belgium, and his work on catalytic reactions of acetylene was presented at the first two NOS. Photograph courtesy of the University of Notre Dame Archives.

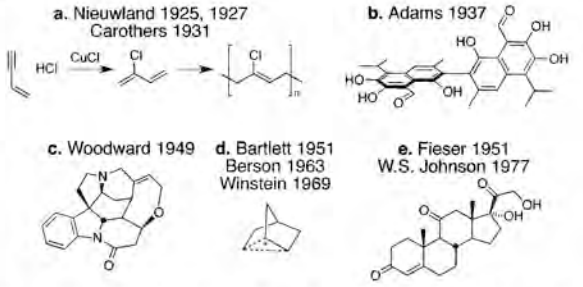

Figure 4. Molecules discussed at the NOS, principally from the Genesis Era. (a) Chemistry related to the synthesis of neoprene was presented by Julius Nieuwland and Wallace Carothers. (b) Roger Adams spoke on the structure of gossypol. (c) The structure of strychnine was discussed by R. B. Woodward. (d) Paul D. Bartlett, Jerry Berson, and Saul Winstein discussed nonclassical carbocations. (e) Approaches for the synthesis of cortisone were presented by Louis Fieser and William S. Johnson.

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clock was used as a reminder to conference speakers of their time limit. Unfortunately, as he "worked in acetylene chemistry and often had explosions in his laboratory, [he] never got used to the alarm.... He always jumped at the sound, even when he was looking at the face of the clock."[10]

Some aspects of science have changed over time. One example that predates the NOS is clearly demonstrated by Moses Gomberg's 1900 paper that reports the discovery of free radicals. The paper ends with this statement: "This work will be continued and I wish to reserve the field for myself."[15,16] The idea of exclusively reserving a research area was still pervasive in the Genesis Era, as Roger Adams (Figure 5) noted in a 1941

Figure 5. Roger Adams played a significant role in the development of the NOS. The Adams NOS academic tree is the third largest. The Roger Adams Award has been presented at the NOS since its inception in 1959. Photo by Bachrach and courtesy of the School of Chemical Sciences, University of Illinois.

paper, "It was assumed that [our] discovery and publication... would allow us a certain priority in the study of synthetic analogs and homologs of the tetrahydrocannabinols without competition."[17] He was peeved by recent publications by Alexander R. Todd (Lord Todd), which he felt encroached upon his territory and led him to "immediate publication... of the results... before they are complete [in] as great detail as had been hoped." As an aside, it is interesting to note the respect that Adams had for Gomberg; as Adams and five of his Illinois colleagues nominated him (unfortunately without success) for the Nobel Prize in 1940.[16]

Another bygone from this Era is the expectation that the NOS speaker personally conducted some of the experiments and analysis. During his New Year's Eve address[18] in 1935, James Conant "apologized at the outset of his address for appearing before the Symposium solely in the role of a reporter."[19] He explained that although he helped write the grant and started the research, his "duties as president of Harvard had prevented him from taking part in the chemical research" and his colleague Professor G. B. Kistiakowsky obtained the results presented.

The Genesis Era preceded most spectroscopic techniques and structure elucidation of natural products was an arduous and time-consuming process. Talks on structure determination during this era included Adams' *The Structure of Gossypol* in 1937 and Robert B. Woodward's *The Structure of Strychnine* in 1949 (parts b and c, respectively, of Figure 4).[20,21] The long-standing controversy over the structure of the 2-norbornyl cation[22] (Figure 4d) was discussed on several occasions at the NOS, including by Paul D. Bartlett (Figure 6) in 1951, by Jerome Berson in 1963, and by Saul Winstein shortly before his

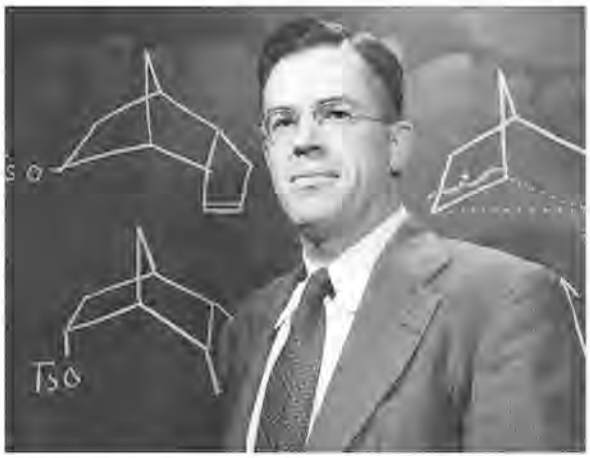

Figure 6. Paul D. Bartlett in 1951. His talk in Denver that year was entitled *Recent Developments in Carbonium Ion Theory*. In 1963, he was the third recipient of the Adams Award. Photograph courtesy of Harvard University Archives, HUP Bartlett, Paul D. (5).

death in 1969 (vide infra). Steroid chemistry was also prevalent during this era; for example, Louis F. Fieser's talk on cortisone chemistry (Figure 4e) was the lead in the *Chemical & Engineering News* report on the 1951 symposium.[23] Interest in steroid chemistry, and cortisone in particular, continued into the Cold War Era and was the subject of the Roger Adams Award talk given by William S. Johnson in 1977.

The launches of *The Journal of Organic Chemistry (JOC)* and *Organic Reactions* occurred during the Genesis Era, and both have direct ties to the NOS. During the afternoon session on December 31, 1935, it was announced that the Williams and Wilkins Company, with the assistance of the chemistry department of the University of Chicago, would start publishing *JOC* as long as enough subscriptions were ordered.[19,24] Morris Kharasch and Henry Gilman were instrumental in the launch of this journal, and the first issue was published in March 1936 with four of the seven articles by NOS speakers.[25,26] Otto Reinmuth, a friend of Kharasch, was the first editor-in-chief, as he retained his position as editor-in-chief of *The Journal of Chemical Education*.[27] At least part of Kharasch's motivation for starting *JOC* was his frustration with having some of his papers rejected by other journals.[28] Lyndon F. Small, who spoke at the 1933 and 1935 NOS, served as the *JOC* editor-in-chief from 1938 to 1951.[29] The journal always had an association with ORGN,[25] but it was not until 1954 that it became owned and published by the ACS,[30] thanks mostly to the initiative of Arthur C. Cope.[31]

The origins of *Organic Reactions* are traced to the eighth NOS held December 28–30, 1939, in St. Louis.[32] The concept for the series resulted from a meeting between chemists who served as editors of *Organic Syntheses* and representatives of John Wiley & Sons Publishers. During that meeting, they determined the general operational parameters, the topics, and the authors for the first volume, which was published in 1942 with 10 out of the 12 authors being NOS speakers.[32]

Cold War Era (1957–1983). During these years, one of the most important developments was the initiation of the Roger

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Adams Award. This biennial award was founded "to recognize and encourage outstanding contributions to research in organic chemistry in its broadest sense", and it has been presented at the NOS since its inception.[33] As explained by John D. Roberts in his autobiography, Nelson J. Leonard originally had the idea to use the tremendous financial successes from *Organic Syntheses* and *Organic Reactions* to fund an award honoring Adams.[34] The recipient receives a gold medal, a replica medallion, and a cash prize. The first recipient was Derek H. R. Barton at the 1959 NOS in Seattle, and his award address was *Photochemical Rearrangements*. After this initial selection, the award was then managed by the ACS with Organic Synthesis, Inc. and Organic Reactions, Inc. remaining as sponsors. Amusingly, as a member of the Organic Synthesis, Inc. board, Roberts voted to increase the cash prize from $5,000 to $10,000 in 1966 and then won the award the following year![34] Figure 7 shows Andrew Streitwieser (the 1973 ORGN Chair

Figure 7. Organic Division Chair Andrew Streitwieser, Jr. (L) presenting the Roger Adams Award Medal to Georg Wittig (R) at the 1973 NOS. Streitwieser was the oldest chemist to speak at the NOS when he won the Adams Award in 2009. Photograph courtesy of Andy Streitwieser.

and 2009 Adams Awardee) presenting the 1973 Adams Medal to Georg Wittig. Ten of the twenty-seven Adams Awardees have also won the Nobel Prize, and eight of the ten won the Adams Award first.

The height of physical organic chemistry occurred during the Cold War Era (vide infra) with talks by most of the leaders in the field. However, Howard Lucas, Christopher K. Ingold, and Louis P. Hammett, who never spoke at the NOS, were notable exceptions to this trend. At the 1961 NOS in Bloomington, IN, George Hammond presented *Organic Chemistry of Triplet States* and Howard Zimmerman presented *A Mechanistic Approach to Organic Photochemistry* (Figure 8a). Angelo Lamola and Nick Turro, who both spoke in 1975, view the 1961 talks as the birth of modern organic photochemistry.[35] NMR spectroscopy was developed in the Cold War Era, and John D. Roberts spoke on its use to address questions of conformational analysis and steric effects in 1965 and 1967 (Figure 8b). The number of total synthesis talks rose sharply in the Cold War Era (vide infra), and E. J. Corey's landmark prostaglandin work illustrates the state of the art from 1975 (Figure 8c). Natural products started to decline in this era, but in 1979, Jerrold Meinwald discussed the structure and chemical ecology of lucibufagins – steroidal defense compounds that make fireflies unpalatable to

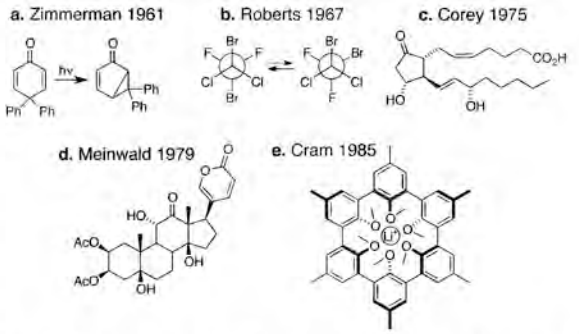

Figure 8. NOS talks from the Cold War Era. (a) Howard Zimmerman spoke on mechanistic organic photochemistry. (b) Jack Roberts discussed steric effects including restricted rotation in haloethanes during his Adams Award address. (c) E. J. Corey discussed prostaglandin syntheses. (d) The structure of lucibufagins from fireflies was presented by Jerrold Meinwald. (e) Donald Cram's Adams Award address included spherand guest complexes.

predators (Figure 8d). Molecular recognition was developed during this era and formed the basis of Donald J. Cram's 1985 talk *Molecular Cells, Their Guests, Portals, and Behavior* (Figure 8e). This era also marked a time with very few international institutional and nonacademic speakers (Figure 2).

Modern Era (1985–2011). This era is characterized by a number of significant changes (see Figure 2), and perhaps women chemists giving plenary lectures for the first time is the most noteworthy. In planning for the 1985 NOS, Symposium Executive Officer (SEO) Peter Stang and the ORGN Executive Committee selected Marye Anne Fox as a speaker (Figure 9).

Figure 9. Marye Anne Fox was the first woman to give a plenary lecture at the NOS when she spoke in 1985 in Newark, DE. Fox spoke again in 1995. Reprinted (adapted) with permission from *Chem. Rev.* **1993**, 93, 341–357. Copyright 1993 American Chemical Society.

When asked about this, Stang said, "To the best of my recollection I was NOT aware that there had been no previous female speaker at an NOS (nor was there any discussion of this). I simply knew of Marye Anne and was impressed by her science. What I do recall, was consciously looking for outstanding 'younger persons' and she was clearly one of them."[36] Fox's talk was entitled *Chemical Control: Combining Photochemistry with Electrochemistry*. After Fox broke the glass ceiling, there were again only male speakers at the next three NOS. Then in 1993, Cynthia J. Burrows spoke on *Oxidation of*

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hydrocarbons and DNA using Nickel Catalysts, and ever since each NOS has had at least one woman speaker. In 1995, both Fox and Alanna Schepartz gave lectures, making this the first NOS with more than one female speaker. In 2011, a new milestone was achieved when three women (Carolyn Bertozzi, Vy Dong, and M. Christina White) gave talks.

During the Modern Era there was also a significant rise in the number of speakers from international institutions (Figure 2). The 2001 NOS in Bozeman set the record with three speakers from international institutions. The relative percentage of speakers from nonacademic institutions had a resurgence in the Modern Era because of talks given by chemists from the pharmaceutical industry (Figure 2).

The first poster sessions were introduced during the Modern Era. Since they began at the Vancouver NOS in 1987, poster sessions have been a part of every symposium.[37] The change had a significant impact, as the majority of attendees now actively participate by presenting their research to receive feedback from their peers. The 1987 poster session was apparently the first at an ORGN-sponsored national conference, taking place a year before the ORGN poster session at the 195th ACS National Meeting in Toronto in 1988.[38] In this regard, ORGN was a laggard, as poster sessions first appeared at ACS National Meetings in 1975 hosted by the Divisions of Chemical Education and Inorganic Chemistry.[39] By 1980, six ACS Divisions, Education, Inorganic, Nuclear, Polymer, Professional Relations, and Physical, had poster sessions at the National Meeting in Houston.

Figure 10 shows some of the important chemistry described at the NOS during the Modern Era including the growth of

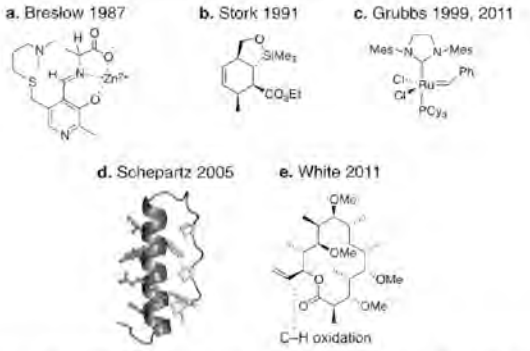

Figure 10. NOS talks from the Modern Era. (a) Ron Breslow discussed enzyme models including transaminase mimics such as aldimines. (b) Gilbert Stork's Adams Award address described the use of the temporary silicon connection for $[4\pi + 2\pi]$ cycloadditions. (c) Bob Grubbs discussed olefin metathesis, including his second-generation catalyst. (d) Alanna Schepartz described miniproteins based on an avian pancreatic polypeptide scaffold. (e) M. Christina White described several C–H oxidations including the macrocyclization step in the synthesis of 6-deoxyerythronolide B.

bioorganic chemistry, which became an important subdiscipline in the era. Ronald Breslow's 1987 talk on enzyme models, including transaminase mimics, typifies this work (Figure 10a). More recently, in 2005, Alanna Schepartz (Figure 10d) described her work on miniproteins that are engineered variants of avian pancreatic polypeptide and exhibit high levels of specificity for various DNA sequences or protein family members. Methodology development talks span the history of the NOS and Gilbert Stork's talk on the use of the temporary silicon connection for $[4\pi + 2\pi]$ cycloadditions is a good example of the state of the art from 1991 (Figure 10b). At his 1999 NOS talk, Robert Grubbs presented groundbreaking work on his olefin metathesis catalyst (Figure 10c). In the fall of 2005, he was awarded, jointly with Yves Chauvin and Richard Schrock, the Nobel Prize in Chemistry for developing ruthenium metathesis catalysts. He also presented metathesis work at the 2009 and 2011 NOS, the latter as the Roger Adams Awardee.

As noted in the opening of this perspective, research topics described by Norris are still important today. Likewise, although many chemists view C–H oxidation chemistry as a recent development in the field, for example, work presented by Justin Du Bois and M. Christina White at the NOS in 2005 and 2011, respectively, at the first NOS, E. Emmet Reid of Johns Hopkins presented a talk entitled *The Oxidation of Hydrocarbons by Air at High Temperature and Pressure*. Reid's talk was mostly "a general statement of the present situation and ... an effort to stimulate discussion and investigation" into this research area.[4] He stated that all common functional groups could be obtained by direct hydrocarbon oxidation, but selectivity was a problem, which he explained by the following analogy: "There are two problems in driving an auto, to get it started and to steer it. If it will go, there is a chance of making it go where we want to go." He went on to say that a solution involved "determining the exact conditions" and that "the search for a 'suitable catalyst' should not be abandoned."[4] Of course, this is what has been done in the intervening 88 years, as highlighted by White's talk entitled *The Emergence of Predictable Selectivity for Aliphatic C–H Oxidations*. White described many C–H oxidation examples, including the key stereoselective macrocyclization reaction in the synthesis of 6-deoxyerythronolide B. She also explained that, despite prevailing dogma, preorganization is not required for achieving the macrocyclization (Figure 10e).[4]

Organic Chemistry Research over the Three Eras. To address evolution of organic chemistry since 1925, all of the plenary talks have been categorized into subdisciplines and the number of talks in each category for each era has been compiled (see Figure 11). In this way, the trends in the field over this time period can be tracked. The task of choosing categories and pigeonholing each talk into only one category was difficult. The talk titles and abstracts were used to assign each talk into one of these categories: physical organic, synthetic methods, bioorganic, natural products, polymers/materials, total synthesis, and history of chemistry. The process used to classify the talks, a more detailed description of each category, and the assignment for each talk can be found in the Supporting Information. In many cases, the subject of the lecture spanned two or even three categories. In those cases, the perceived principal emphasis of the talk and the reputation of the chemist were used in assigning the category.

The synthetic methods category has been a prominent area of research over all three eras and constituted the most talks in both the Genesis and Modern Eras. Physical organic talks dominated the Cold War Era and were essentially equal in number to synthetic method talks in the Genesis Era; however, work in physical organic showed a sharp decline in the Modern Era. Natural products talks have also waned in number over the years, with the sharpest decline being observed between the Genesis and Cold War Eras. Conversely, bioorganic talks have shown the greatest increase in the Modern Era and they are second in number only to synthetic methods in that era.

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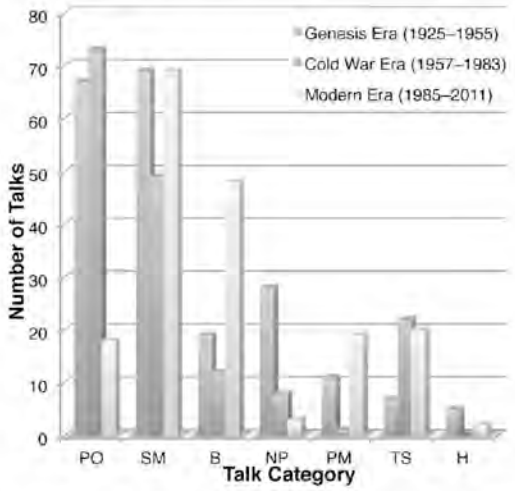

Figure 11. Number of talks in seven different categories presented at the NOS during each of the three eras. Key: PO, physical organic; SM, synthetic methods; B, bioorganic; NP, natural products; PM, polymers and materials; TS, total synthesis; H, history of chemistry.

Polymers and materials chemistry talks have bounced back after dropping to very low numbers during the Cold War Era. This is also true of history of chemistry talks, although this category has always been a minor contributor to the NOS. Finally, total synthesis talks were rare in the Genesis Era but have been the third most common category of talk in both the Cold War and Modern Eras.

■ DEMOGRAPHICS

Scope. To properly consider the demographic data of the 332 speakers, it helps to examine the constitution of ORGN members and NOS attendees. This data was gathered from various sources[40−43] and is presented in Table 1.[44] Academic chemists outnumber industrial chemists, in some cases approaching a 2:1 ratio, but the large number of people in the unknown/other category introduces uncertainty to these numbers. The relative percentage and absolute number of NOS attendees who were graduate and undergraduate students is significantly higher today than it was in 1937. The participation of international chemists (as defined by mailing address) has also increased. Today, the percentage of international chemists who are ORGN members and NOS attendees is approximately 20%, whereas in the 1920s it was less than 2% for both.[45] Likewise, in 2012, the percentage of female ORGN members is approximately 18%, whereas in 1921 it was merely 1.6%.[46] However, there is a general perception that organic chemistry has the fewest number of women of the chemistry subdisciplines.[47,48] Generally, NOS speakers have been men (95.5%) from academic institutions (91.4%) and from U.S. institutions (94.9%). How these percentages vary over time is discussed below.

Table 1. Demographic Information for Organic Division Members (ORGN) and NOS Attendees

demographic category[a]	ORGN 1921[40]	ORGN 2012[43]	NOS 1929[41]	NOS 1937[42]	NOS 2011[43]
total members/ attendees	308	15353	394	466	690
male	303	10255			484
female	5	2223			184
unknown gender		2875			22
industrial	74	6081		156	234
total academic	125	6892		233	450
professors/staff		2978		175	196
graduate students		2618		58	194
undergraduate students		1296		0	60
unknown/other	109	2380		77	6
U.S.[b]	304	12081	387		600
international[b]	4	3272	7		90

[a]Demographic data for additional NOS are available in the Supporting Information. [b]U.S. and international members/attendees geographic location is based on mailing address.

The issue of U.S. versus international speakers can be examined in other ways besides the location of the speaker's institution. The birthplace of the speakers is an alternative way to define this aspect.[7] NOS speakers were born on all six inhabitable continents. North America leads the way with 239 speakers, followed by 69 from Europe, 19 from Asia, 2 each from Africa (Magid Abou-Gharbia and Stephen Hanessian) and South America/Caribbean (F. Dean Toste and Bert Fraser-Reid), and one from Australia (Rowland Pettit). In terms of countries, 71% of NOS speakers were born in the U.S.; the remaining 29% were born in 34 different countries. Figure 12 shows the number of NOS speakers born in countries where more than one NOS speaker was born. An additional 19 countries were birthplaces to a single NOS speaker.[7] For speakers born outside of the U.S., England and Germany lead the way and together account for ~10% of all NOS speakers. Within the U.S., speakers come from 39 different states. In terms of cities, New York City (all boroughs) leads by a large margin (22), followed by Chicago (11), Boston (9), Philadelphia (5), and Los Angeles (5). London leads all international cities with five speakers born there, and three each were born in Berlin, Budapest, and Vienna.

Figure 12. Birth countries for NOS speakers. An additional 19 countries had one NOS speaker.

Since only 5.1% of all of the talks were given by speakers from international institutions and 29% were presented by speakers of international birth, it is clear that many immigrated to the U.S. There are four possible combinations of birthplace and home institution:

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- 235 speakers were born in the U.S. and employed at a U.S. institution
- 69 speakers were born abroad but employed at a U.S. institution
- 26 speakers were born abroad and employed at an international institution
- 2 speakers were born in the U.S. but employed at an international institution

The two speakers in this final category are Donna Blackmond, who was born in Pittsburgh but was employed at the University of Hull when she spoke in 2003, and Vy Dong, who was born in Texas but was employed at the University of Toronto when she spoke in 2011. It is interesting that both of these cases involved women chemists who moved to U.S. institutions (Scripps, CA and UC Irvine, respectively) after their NOS talks.

Superlatives. Generally, the speakers at the NOS are at the height of their profession, and they have won numerous awards including the Nobel Prize (18), the Priestley Medal (24), and the National Medal of Science (28) (Figure 13).[7] Interestingly,

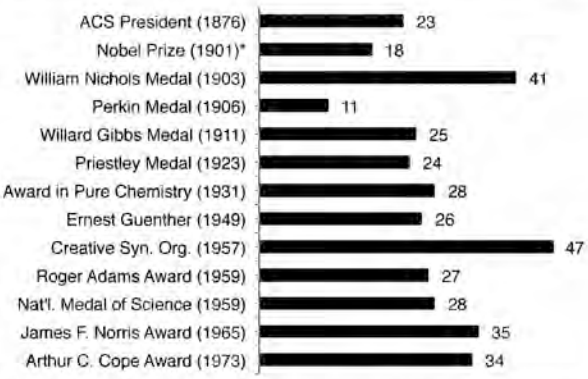

Figure 13. Awards won and ACS Presidencies held (year established) by the 332 NOS speakers. *Sixteen Nobel Prizes were for Chemistry and two were for Physiology or Medicine (see the Supporting Information for details of individual winners and when each prize was won).

16 of the 18 Nobel Prize winners spoke prior to winning, and on average, their first talk was given 17 years before their Nobel was won. Every symposium has an outstanding lineup of speakers, but the 1969 NOS held in Salt Lake City holds a record—five of the eleven speakers had a future date in Stockholm. Kudos to SEO Jerry Berson and the Executive Committee for choosing future Nobel laureates Herbert C. Brown, Donald J. Cram, Roald Hoffmann, George A. Olah, and Vladimir Prelog. Other speakers at the 1969 symposium are also highly accomplished individuals. For example, some believe Saul Winstein may have been awarded a Nobel Prize if he had not died in late 1969 at the age of 57.[49,50] Additionally, Ronald Breslow, William Doering, and Jerrold Meinwald[51] have received numerous awards and honors including a combined total of 14 NOS lectures.

It is interesting to analyze the institutional affiliations of the speakers. It is no surprise that Harvard University and the University of Illinois at Urbana−Champaign lead the pack, as these universities have a long and distinguished history of organic chemists. These two institutions alone account for almost 15% of the talks! As shown in Figure 14, scientists associated with 14 different institutions have given at least 10 talks. In terms of current associations with athletic conferences, the Ivy League leads with 132 talks, followed by the Big 10 with 113, and the Pac-12 with 62. Together these three conferences account for 56% of the talks.

For scientists associated with international institutions, the ETH with six talks is the leader followed by the Max-Planck Institute with three and Cambridge University, University of Tokyo, and University of Toronto, with two talks each. For nonacademic institutions, Merck is the leader with eight talks followed closely by Rockefeller Institute with seven,[52] DuPont is next with four talks, and the NIH had three. A handful of other international and nonacademic institutions have had one or two speakers.

It is fairly common for chemists to move from one institution to another during their career. Twenty-seven NOS speakers gave talks while affiliated with two different universities, and two chemists, Ralph L. Shriner and Samuel J. Danishefsky, presented three talks while associated with three different universities. Shriner was on the faculty at the University of Illinois, Indiana University, and University of Iowa when he

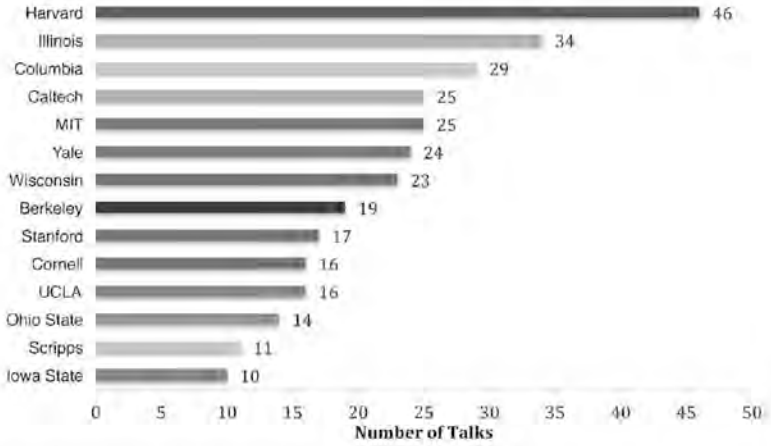

Figure 14. Ranking of the number of talks for academic institutions; bar colors correspond to school colors. In terms of athletic conferences, the Ivy League leads with 132 talks followed by the Big 10 with 113 and the Pac-12 with 62.

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spoke in 1933, 1941, and 1949, respectively. Danishefsky gave a lecture exactly every ten years: 1977, 1987, 1997, and 2007. He was on the faculty at the University of Pittsburgh and Yale for the first two talks and Columbia/Sloan-Kettering for the latter two.

In terms of individual superlatives, Figure 15 shows the 16 chemists who gave five or more talks along with the years they spoke. Most of these chemists also won the Roger Adams Award (vide supra), and four are Nobel Laureates. E. J. Corey (Figure 16) has given the most talks (8) and holds another distinction: In 1955, when he spoke on the *Structure of Friedelin*, Corey was a 26-year old assistant professor at Illinois and became the youngest speaker. C. Fred Koelsch, who was 28 when he spoke in 1935, previously held this record. In terms of multiple talks given by female chemists, Marye Anne Fox (vide supra), Alanna Schepartz, and Carolyn Bertozzi each gave two lectures. Schepartz (Figure 16) was the youngest woman to speak, as she was 33 years old at her first talk in 1995 on *A Chemical Perspective on Transcriptional Activation*.[53] The oldest chemist to present was Andy Streitwieser (Figure 7) who was just shy of 82 years old when he spoke in 2009. Streitwieser also holds the hard-to-believe record of a 50-year gap between talks (1959 and 2009). The most concentrated grouping of multiple talks were the six given by Homer Adkins between 1925 and 1949. In terms of the life spans of the speakers, Wallace H. Carothers (vide infra) had the shortest life when he died in 1937 at the age of 41 years. Charles D. Hurd, who spoke at three NOS, had the longest lifespan of any speaker, dying in 1998 at the age of 101.[54]

Chemist	Years of NOS Presentations
Elias J. Corey	1955, 1959, 1965, 1975, 1989, 1993*, 1999, 2007
Roger Adams	1925, 1927, 1931, 1937, 1939, 1955
Homer B. Adkins	1925, 1927, 1931, 1935, 1941, 1949
Paul D. Bartlett	1937, 1947, 1951, 1959, 1963*, 1973
Donald J. Cram	1953, 1957, 1963, 1969, 1977, 1985*
Jerrold Meinwald[51]	1963, (1969), 1979, 1991, 2001, 2005*
John D. Roberts	1951, 1955, 1959, 1965, 1967*, 1995
Gilbert Stork	1955, 1959, 1963, 1973, 1987, 1991*
R. B. Woodward	1949, 1953, 1957, 1961*, 1967, 1977
Ronald Breslow	1961, 1969, 1979, 1987, 2003
James B. Conant	1925, 1927, 1931, 1935, 1947
Arthur C. Cope	1939, 1947, 1951, 1955, 1965*
Louis F. Fieser	1931, 1935, 1939, 1947, 1951
Robert Grubbs	1983, 1991, 1999, 2009, 2011*
W. S. Johnson	1947, 1955, 1961, 1973, 1977*
Nelson Leonard	1951, 1955, 1961, 1971, 1981*

Figure 15. The 16 chemists who have given at least five plenary lectures and the years of their talks. *Roger Adams Award winner this year.

Figure 16. E. J. Corey (L) was only 26 years old in 1955 when he spoke at the first of his record eight NOS lectures, making him the youngest chemist ever to give a plenary lecture. Alanna Schepartz (R) was the youngest woman to speak; she was 33 years old at her first NOS lecture in 1995. Photograph of E. J. Corey from 1968 courtesy of the Harvard University Archives, UAV 605 Box 18 Corey, Negative #5–68. Photograph of A. Schepartz by Mike Marsland courtesy of A.S.

FAMILY TIES

We Are Family. The only blood relatives to talk at the NOS were Robert R. Williams (7th NOS) and his younger brother Roger J. Williams (9th NOS); see Figure 17.[55,56] They both won the Perkin Medal and were jointly awarded the Charles Frederick Chandler Medal by Columbia University in 1941,[57] and Roger served as ACS President in 1957. The brothers were independently involved in vitamin research; for example, Robert determined the structure of and synthesized thiamin (vitamin B_1)[55] as Roger discovered pantothenic acid (vitamin B_5).[56] Linus Pauling thought so highly of the Williams brothers that he tried to recruit them as faculty at Caltech.[58] In addition, there is another set of siblings with an NOS connection. William G. Dauben spoke at the 15th NOS, as his older brother Hyp J. Dauben, Jr. served as a local organizer for the 16th NOS. While a parent and child have never spoken at the NOS, a husband and wife have both given talks: Peter B. Dervan (29th and 32nd NOS) and his wife Jacqueline Barton (35th NOS).

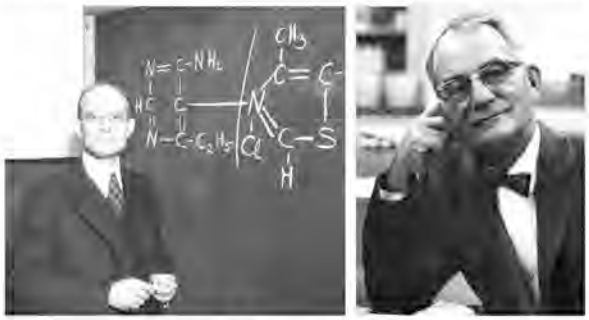

Figure 17. Brothers Robert R. Williams (L) and Roger J. Williams (R) are the only blood relatives to speak at the NOS. Robert's talk "The Chemistry of Thiamin" was given in 1937, and Roger spoke on Organic "Growth Substances" in 1941. Photograph of R. R. Williams reprinted with permission of Alcatel-Lucent USA, Inc. Photograph of R. J. Williams by Jim Seymour courtesy of Graham Seymour.

The most common family name among speakers is Johnson, accounting for 2.4% of all NOS talks. Four chemists had this surname: Treat B. Johnson (3 talks), John Raven Johnson (3 talks), William S. Johnson (5 talks), and Carl R. Johnson (2 talks). It does not appear that these Johnsons are related.[59,60] Other names appearing more than once but with no familial relationship are Bartlett, Barton, Bergman/Bergmann, Evans, Jones, Russell, Smith, Taylor, White, and Wood.

Academic NOS Lineage. Similar to having a traditional genealogical lineage, every chemist with a doctorate has an academic lineage traced through his or her mentor. The Ph.D. or D.Sc. advisor of 330 of the 332 NOS speakers has been

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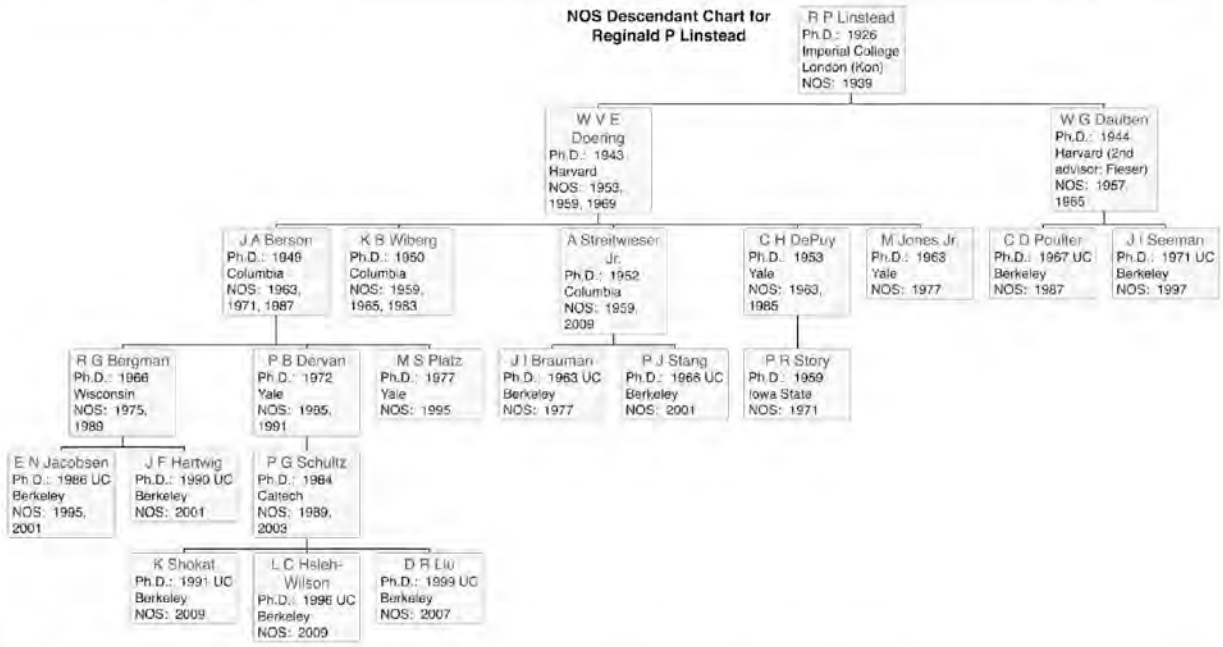

Figure 18. Family tree for Reginald Linstead showing his academic descendants who spoke at the NOS.

determined, and family trees based on these data have been constructed.[7,61] The Reginald Linstead tree provides an example; see Figure 18. The number of chemists and the number of talks for each NOS academic tree has been counted in two ways. The first allows the skipping of a person who did not speak[62] and the second does not; i.e., it only counts contiguous lineages. Data from the 11 trees with the largest number of chemists are presented in Table 2.

■ LOGISTICS AND STRUCTURE

Timing Is Everything. If you have attended the NOS anytime in the last 45 years, you know that the symposium is in June, the talks are held in the morning and evening, and the afternoons are free so that you may explore the area, check in with your research group back home, exercise, or discuss chemistry with colleagues. Prior to 1947, this was not the case. The NOS was held at the end of December, and in 1929 and 1935, the organikers spent New Year's Eve at the symposium! Initial advertisements for the 10th NOS showed that it was scheduled for December 28−30, 1943, in Boston.[63] After April 1943, the symposium was canceled, likely because of war travel restrictions.[64] After the war hiatus in 1943 and 1945, the 10th NOS resumed in 1947 in Boston with the now-familiar June date. The talks at the early NOS were in the mornings, afternoons, and evenings. "The program was purposely planned for serious business with no place for general excursions and the interest of all was evinced by an almost prompt and complete attendance at all of the sessions."[65] In 1967, the 20th symposium was the first to offer free time in the afternoons to attendees, and the seemingly ubiquitous poster sessions did not start until twenty years later at the 30th symposium.[4] The frequency of the NOS was debated in 1925. Early promotional notices stated that "it would be an excellent thing for the organic chemists of the country to assemble once a year,"[66] and several dispatched news reports noted that the symposium would meet again in 1926 in Columbus,[67] probably in June.[68,69]

Table 2. Top Eleven NOS Academic Family Trees

	generation skips allowed				contiguous lineage		
NOS family tree	no. of chemists	no. of talks	avg[b]	gen[c]	no. of chemists	no. of talks	gen[c]
James B. Conant	38	75	1.97	7	32	67	6
Robert B. Woodward[61]	31	59	1.90	5	23	47	4
Roger Adams	24	55	2.29	5	20	47	5
Reginald P. Linstead	22	35	1.59	6	22	35	6
Moses Gomberg	19	30	1.58	6	18	29	6
Reynold C. Fuson	10	15	1.50	4	10	15	4
William G. Young	7	15	2.14	4	7	15	4
William Lloyd Evans	5	13	2.60	3	5	13	3
Marston T. Bogert	5	10	2.00	3	4	8	2
Rudolph J. Anderson	5	9	1.80	3	5	9	3
Peter Yates	5	9	1.80	4	4	7	3
sum[a]	**168**	**321**	**1.91**		**149**	**292**	
% of NOS total	**51**	**58**			**45**	**53**	

[a]Three chemists who gave four talks appear on two trees.[7] [b]Average number of talks per chemist. [c]Number of generations in the tree.

However, the 1926 February issue of the *Journal of Chemical Education* correctly posted the date of the next symposium as December 1927.[70]

Location, Location, Location. The first NOS was held in Rochester because of a desire to make it accessible "to organic industrial enterprises".[66] Rochester hosted the NOS again in 1935 and 1957, making it one of only three sites to host three symposia. The other two were Ann Arbor (1941, 1953, 1971)

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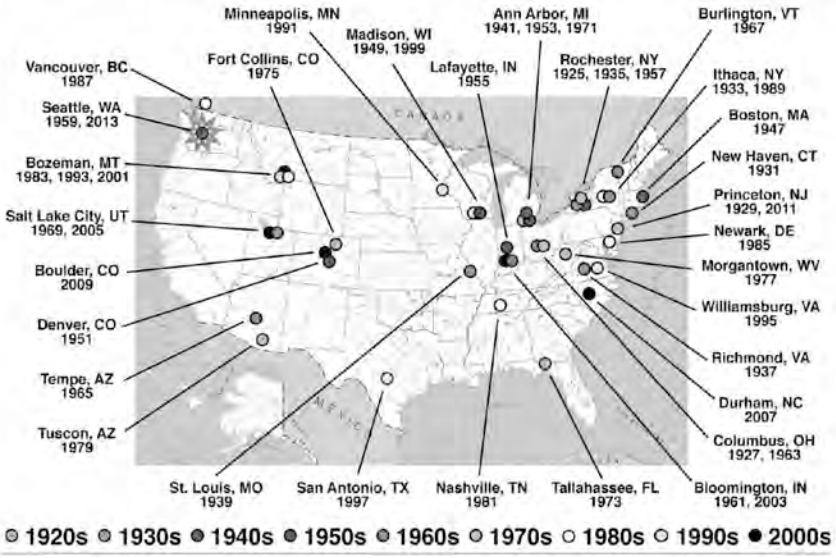

Figure 19. NOS locations from 1925 to 2013. Diagram courtesy of Scott McN. Sieburth. Underlying map from the National Atlas of the U.S., 2004.[71]

Figure 20. Speakers (S) and organizers (O) at the 30th NOS held in 1987 in Vancouver, British Columbia, Canada, the only NOS ever held outside the U.S. and the first to have a poster session. L to R: Larry Weiler (O), Gilbert Stork (S), Paul Gassman (S), Jerry Berson (S), David Dolphin (S), Dale Poulter (S), Ron Breslow (S), Jeremy Knowles (S), Peter Lansbury (S, substituting for E. T. Kaiser, see text), K.C. Nicolaou (S), Stuart Schreiber (S), Paul A. Bartlett (O), and Sam Danishefsky (S) in the totem pole. Photograph courtesy of P. A. Bartlett.

and Bozeman (1983, 1993, 2001); see Figure 19. In the 1960s, a general rotation was established wherein the meeting site would alternate between an eastern site for one symposium and a western site for the next. The symposium was held outside the continental U.S. only one time, in Vancouver, British Columbia, in 1987 (Figure 20). Surprisingly, sites in California and Illinois have never hosted the NOS despite the relatively large populations and numerous potential host institutions in these states.

History of the NOS Program Books. Modern NOS have a program book with a schedule, abstracts of plenary lectures, and poster titles. Correspondence[72] between ORGN Secretary Ralph L. Shriner and speaker Max Bergmann (Figure 21) indicate that these programs were first produced in 1937. The exchanged letters include a set of instructions for the speakers that describes Executive Committee deliberations on how to meet requests by ORGN members to make the material presented available to attendees. As an aside, Bergmann's talk on *Protein Structure in Relation to Biological Problems* generated significant interest from the scientific and popular press.[73,74] After the symposium, in a letter dated January 5, 1938, Shriner wrote to Bergmann, "I also wish to thank you personally for your cooperation in the preparation of the material for the printed program. Everyone has commented favorably on this experiment."[72]

At the ORGN website, portions of the programs from the 7th–42nd NOS, as well as the complete program for the first NOS, are available.[4] This latter volume is not a true program

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Figure 21. Ralph L. Shriner (L) and Max Bergmann (R). Correspondence between Organic Division Secretary Shriner and NOS speaker Bergmann provides insights into early NOS protocols. Photograph of R. L. Shriner courtesy of the Frederick W. Kent Collection, University of Iowa Libraries, Iowa City, Iowa. Photograph of M. Bergmann courtesy of the Rockefeller Archive Center.

but instead a series of full papers. It is hypothesized that it was assembled after the symposium, as it lacks a schedule of events and other typical information found in program books.[75] Additionally, papers from Morris Kharasch, Lauder W. Jones, and Frank C. Whitmore are missing from its contents even though they all spoke.[67,69,76] Ironically, the only known copy of the first NOS program book belonged to Whitmore. He donated it the Eastman Kodak Company Research Library in the 1920s, and it was later given to the University of Rochester Library and is currently in their rare book collection.[77]

Behind the Scenes. The work required to organize a NOS is tremendous. At present, the ORGN Executive Committee selects a SEO for a 2.5-year term. The SEO, Executive Committee, and local committee work closely throughout to plan and execute the symposium.

Historically, ORGN members have provided input for choosing future speakers.[10,78] In the past, this was done with paper ballots handed out at the NOS or mailed to members; more recently, email and social media sites have been used to solicit input. The organizers also arrange the Roger Adams Award Dinner that is held on the Sunday evening before the symposium. A photograph from the 1973 dinner is shown in Figure 22, and many additional photographs from 1973 and the other NOS can be found on the ORGN website.[79]

In addition to the Adams dinner, there is a banquet for all attendees that is typically held on Wednesday evening, and entertainment is often provided. In 1989, the attraction had a chemical connection as the *Borodin Ensemble*, a chamber music group composed largely of chemists, played a concert after the banquet. Three of the ensemble members are organic chemists: clarinetist Frank Mallory, flutist Jerry Meinwald, and pianist David Schuster. The other members of the group are pianist and harpsichordist Charlotte Greenspan (Meinwald's wife) and violist Melissa Stucky. Appropriately, the ensemble takes its name from the Russian organic chemist and composer Alexander Borodin.[80] The group's encore performance was a Brahms Hungarian Dance in honor of George Olah, the 1989 Adams Awardee who was born in Budapest.

The organizers often must deal with unforeseen circumstances, sometimes at the last minute. For example, in 1969 Jerry Meinwald tripped on his patio and broke both arms shortly before the symposium.[81] SEO Jerry Berson asked Fred Bordwell to give a replacement lecture, which he did despite the very short notice.[82] This was not the first example of substitute lectures at the NOS, at the previous symposium in

Figure 22. The 1973 NOS Adams Award banquet. Foreground, clockwise from left: Orville L. Chapman, Werner Herz, Edward C. Taylor, George M. Whitesides, John D. Roberts, and William S. Johnson; these chemists have given a total of 18 NOS talks. Photograph courtesy of Jack Saltiel and created by Steve Leukanech. The Board of Trustees of the Florida State University. Permission to use this material was granted by FSU, which reserves all rights in the material.

1967 (in Burlington, VT), Myron L. Bender had been scheduled to give a talk entitled *Enzyme Models and Model Enzymes*[83] but instead E. Thomas Kaiser and William Jencks shared a timeslot and each gave a talk about enzymes in his place. It is not known why the substitution occurred in this case. Interestingly, Kaiser was also involved in another substitution 20 years later when he was too ill to give his presentation so Peter Lansbury, a postdoctoral fellow in his group, gave the talk instead (see Figure 19).[84]

Ken Wiberg, SEO for the 1959 symposium in Seattle, recalled another instance of troubleshooting on the fly, "on the day the participants were arriving, a water main to the dormitory building at which they were staying decided to break and for the rest of that day I was involved with trying to get someone to fix it. The physical plant people were able to make a temporary but workable repair. There also were problems with the audio system and with one projector. I don't remember much about the talks at that meeting, but I remember being quite busy."[85]

THE HUMAN SIDE OF SCIENCE

Conflicts and Controversy. The NOS has been intertwined with some of the most heated debates in organic chemistry over the past century. When Moses Gomberg proposed free radicals in 1900 one of strongest voices of opposition came from James F. Norris.[16] According to John D. Roberts, during the after-dinner NOS presentation in 1941, Gomberg discussed "his life and enduring the criticism heaped on him from those who were sure free radicals would be far too reactive to exist for an extended time in solution."[8c] Similarly, a clash between Homer Adkins and Morris Kharasch occurred on the opening day of the 1949 symposium. After Adkins' talk about hydroformylation, Kharasch spoke about mechanisms of free radical reactions. Adkins "had little patience with mechanisms, and the Adkins–Kharasch exchanges became quite pointed."[86] Directly afterward, Adkins gave a tour of his hydrogenation laboratory, suffered a heart attack, and was taken to the hospital. Andy Streitwieser recalled that all of the attendees discussed Adkins' fate.[87] After a month in the hospital his condition improved and he was sent home. But then on August 10 he suddenly died; he was only 57 years old.[88]

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Twenty years later, another historic battle played out in Salt Lake City. The last talk of the symposium was *Neighboring Groups and Nonclassical Ions* by Saul Winstein. H. C. Brown and Winstein had a decade-long disagreement over the existence of nonclassical carbocations (Figure 4d).[22,49] An intense discussion period was anticipated by SEO Jerry Berson (and many others) so Jerry asked George Olah to serve as the moderator. Jerry recalls "this drew a big laugh when I introduced him, because George was at least a foot taller than either of the combatants and looked as though he could be a good referee."[50] The argument that ensued was indeed heated, but the tension was broken somewhat by the relative heights of the three chemists.

Tragedies and Triumphs. Troubled genius Wallace Carothers is perhaps the best-known tragic figure among the speakers. Carothers was a Ph.D. student of Roger Adams and counted Adams, John Raven Johnson, and Carl Marvel among his closest friends.[14] Carothers suffered from alcoholism and depression for many years. He disliked public speaking, as he wrote to his friend Wilko Machetanz in January 1932, "I did go up to New Haven during the holidays and made a speech at the organic symposium. It was pretty well received but the prospect of having to make it ruined the preceding weeks and it was necessary to resort to considerable amounts of alcohol to quiet my nerves for the occasion."[89] Carothers was being modest; the *New York Times* reported "the 400 chemists present applauded his address, and the discovery was hailed as a great triumph for American chemistry."[90] There is evidence he considered suicide for over a decade before he took his own life by cyanide poisoning on April 29, 1937, two days after his 41st birthday.[14]

A contemporary of Carothers was Raemer Rex Renshaw who spoke at the first two NOS and was Secretary and Chair of ORGN in 1923 and 1924, respectively. At the fall 1937 ACS meeting, he proposed using acetyl choline as a more humane agent for warfare because it would cause enemy soldiers to faint.[91] From 1937−1939, his work appeared in *J. Am. Chem. Soc.* ten times, some of which were published posthumously; on September 23, 1938, he and his second wife died after falling 19 stories from the window of their Tudor City Place apartment in Manhattan.[92,93] The circumstances surrounding the fall are unclear, and conflicting theories were posited.[94] Renshaw was 58 years old when he died. Ironically, Renshaw's first wife also died as the result of a fall at Bash Bish Falls in Taconic Tri-State Park in 1930.[95]

Fortunately, there are also many personal triumphs associated with the NOS. E. J. Corey recalls, "after my 1955 NOS talk at Purdue, Richard Arnold, a long-time professor at U. Minn. came up to me and asked me my age. When I answered 26, and just about to become ineligible for the military draft, he smiled and said: 'good, you will be hearing from me.' A few months later I received a letter from him with the good news that I had been selected as an Alfred P. Sloan Fellow and would receive a $3,000 research grant."[96] Arnold, who spoke at the NOS in 1947, had just become a program administrator with the Foundation.[97]

The 1993 NOS proved pivotal for Cindy Burrows' career. As she recalls, "Peter Stang said to me after my talk that I 'wouldn't last long at Stony Brook,' implying that some other department would make me an offer." Burrows explained to Stang that her husband was also a chemist and this would make such a move more difficult. She said Stang, who was the chairman at the University of Utah at the time, replied that this was "not a problem for a good administration".[98] By January 1995, Burrows and her husband had joined the faculty at Utah.

The Stories We Will Tell. Although the main focus of attending a chemical conference is to learn and discuss science, it is also an opportunity to have fellowship with colleagues and to explore a different part of the country. We do not have space to pass on all the wonderful human interest stories that we have heard regarding the NOS, but one event relayed by E. J. Corey about the 1959 symposium highlights the memorable experiences that can occur at these meetings:

> *"I had never been to Seattle before, so I took advantage of the trip to get acquainted. The Sunday before the meeting there was a great boat trip to the north of Seattle along the islands with a stop to enjoy absolutely delicious fire-grilled fresh-caught salmon. Of course, I enjoyed hearing all the different chemical talks at the meeting... [and afterwards] my University of Illinois colleague, the late Ken Rinehart, and I together with a few others climbed Mount Rainier, which was great fun. We were lucky that the snow was firm all the way going up. We used crampons, but did not need to chop steps in the ice. The return was very fast, glissading most of the way − so the whole descent took only about 2.5−3 h."*[99]

This month, the 43rd NOS will again be held in Seattle with a truly world-renowned group of speakers selected by the SEO Scott Sieburth and the Executive Committee.[100,101]

■ CONCLUSIONS

Biennially the NOS has showcased the tremendous progress of organic chemistry over the past four score and eight years. The knowledge and capabilities of the modern chemist would surely astound James F. Norris and E. Emmet Reid. Over this time, the demographic profile of speakers has changed. In the Modern Era, the emergence of women speakers and the increase in the number of speakers from international institutions mirrors the demographic changes in the attendees and ORGN membership. During the Modern Era the emphasis of the field has shifted, with a sharp rise in the number of bioorganic presentations and a steep decline in physical organic presentations. History demonstrates that the NOS is a terrific venue to see cutting-edge research of up-and-coming chemists; after all, 16 of the 18 Nobel Laureates who spoke at the NOS did so prior to winning the Prize.

In the larger view we can examine why the history of chemistry is important. Perhaps the best answer to this question comes from the inimitable Glenn T. Seaborg, who, as ACS President during the 100-year anniversary of the Society said, "The real purpose of looking back is not, of course, merely to obtain satisfaction from reflecting on past triumphs; rather, it is to discover as many clues as possible to the likely developments of the future."[102] So, what does the future hold for the NOS? Well, looking to the past we note that the celebration of the 10-year anniversary of the NOS was marked by holding the symposium in Rochester. So, perhaps, the 100-year anniversary of the symposium, in June 2025, will be held in its birthplace once again.

■ ASSOCIATED CONTENT

Supporting Information

The demographic data for ORGN members and NOS speakers, speaker name, affiliation, title, and category assignment for all talks; description of the talk classification system; Ph.D. advisor, postdoctoral advisor, birthplace, and birthdate for each speaker; top 13 NOS academic family trees; major awards won by NOS

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speakers; host, attendance, and organizer data; citation list and references for Speakers' information and NOS announcements and reports. This material is available free of charge via the Internet at http://pubs.acs.org.

AUTHOR INFORMATION

Corresponding Author

*Tel: 717-291-4201. E-mail: edward.fenlon@fandm.edu.

Notes

The authors declare no competing financial interests.

Biography

Edward E. Fenlon (L) earned his Ph.D. in 1995 from the University Illinois, Urbana−Champaign with Steven C. Zimmerman. He became an Associate Professor at Xavier University in 2003 and currently holds that rank at Franklin & Marshall College. His research interests include synthesizing nucleoside analogues, stable carbon radicals, molecular knots, new musks, and the history of organic chemistry. Brian J. Myers (R) earned his Ph.D. from Indiana University, Bloomington in 2000 with David R. Williams. After a postdoctoral appointment with James H. Rigby at Wayne State University, he joined Ohio Northern University where he now holds the rank of Associate Professor. Since 2002, he has served as the Webmaster for the ACS Organic Division.

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(38) The first ORGN poster session at an ACS National Meeting was at the 195th conference in Toronto: *Chem. Eng. News* **1988**, *66*(13), 39−148.
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(40) The data for the number of 1921 ORGN members comes from a 1919 roster that had been updated through 1921. The original is part of the Julius A. Nieuwland Papers, box 4, folder 31, University of Notre Dame Archives, Notre Dame, IN 46556. The Nieuwland collection index can be viewed at archives.nd.edu/findaids/ead/html/NIE.HTM (accessed Mar 24, 2013).
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(43) Redacted data for current ORGN members and 2007, 2009, and 2011 NOS (all self-reported) provided by the ACS Division of Organic Chemistry.
(44) Data for additional years (1939, 1941, 2007, 2009) is available in the Supporting Information (Table S1).
(45) The four ORGN members at international addresses in 1921 were Prof. F. B. Allan, Toronto, Canada; Dr. Frank L Pyman, London, England; Prof. R. F. Ruttan, McGill University, Montreal, Canada; and Mr. Stanley D. Wilson, Peking Union Medical College, China; see ref 40.
(46) The five women who were ORGN members in 1921 were Miss Anne W. Davis, Princeton, NJ; Prof. Dorothy Hahn, Mt. Holyoke College, MA; Miss Emma L. Kemp, Lincoln HS, Jersey City, NJ; Miss Katharine Ogden, Ithaca, NY; and Mrs. W. T. Read, New Haven, CT; see ref 40.
(47) *Women in the Chemical Workforce: A Workshop Report to the Chemical Sciences Roundtable*; National Academy Press: Washington, D.C., 2000; pp 18−23. The book is available free online: www.nap.edu/catalog/10047.html (accessed Mar 24, 2013).
(48) Wilson, A. M. *Bull. Hist. Chem.* **2009**, *34*, 21−29.
(49) For example, see the description of "the problem of the non-classical ion" on the Nobel website: www.nobelprize.org/nobel_prizes/chemistry/laureates/1994/illpres/problem.html (accessed Mar 24, 2013).
(50) Berson, J. Yale University, New Haven, CT. Personal communication, Nov 29, 2011.
(51) Jerrold Meinwald was scheduled to speak at the 1969 NOS but broke his arms shortly before the symposium; see discussion in text.
(52) Seven NOS speakers were affiliated with Rockefeller Institute, which was a research institution prior to 1955 when it became a university with graduate students. One NOS speaker has been affiliated with Rockefeller University.
(53) Melanie Sanford was also 33 when she spoke in 2009, but she was approximately 200 days older than Schepartz.
(54) Colarossi, A. Professor Charles D. Hurd, 101. *Chicago Tribune* Sep 23, **1998**.
(55) Baldwin, R. S. *J. Nutr.* **1975**, *105*, 1−14.
(56) Davis, D. R.; Hackert, M. L.; Reed, L. J. *Biog. Mem. Natl. Acad. Sci.* **2009**, *91*, 319−331.
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(58) Letter from Linus Pauling to Warren Weaver dated Jun 1, 1937. Ava Helen and Linus Pauling Papers at Oregon State University Library. Available online from the National Library of Medicine: http://profiles.nlm.nih.gov/ps/retrieve/ResourceMetadata/MMBBBG (accessed Mar 24, 2013).
(59) Johnson, C. R. Wayne State University, Detroit, MI. Personal communication, Jun 15, 2012.
(60) Familial connections could not be found using genealogy records on Ancestry.com.
(61) The Woodward tree could have been constructed as a James Flack Norris tree, as he was Woodward's academic grandfather and spoke at the NOS. However, Woodward's academic father (Avery A. Ashdown) did not speak at the NOS. Ashdown is considered by most to be Woodward's Ph.D. advisor, but he is not acknowledged in Woodward's dissertation, whereas Norris and Avery A. Morton are. For these reasons, and Woodward's extraordinary number of NOS academic children (see ref [101]), we believe it is more appropriate to classify this as a Woodward tree.
(62) The system used only allows skipping to connect grandparent to grandchild, not skipping of a parent to connect siblings, that is, the head of the tree must be an NOS speaker.
(63) *Chem. Eng. News* **1943**, *21* (8), 584.
(64) For example, The Council of the American Association of Textile Chemists and Colorists meeting was canceled in 1943 to be in compliance with restrictions on traveling imposed by the Office of Defense Transportation; see: *Chem. Eng. News* **1943**, *21* (10), 793−796.
(65) *Ind. Eng. Chem., News Ed.* **1928**, *6*(2), 1−2.
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(68) Better Gasoline Is Slogan of Chemists. *The Schenectady Gazette*, Dec 31, **1925**, 2.
(69) Chemists Told of Synthesis by Acetylene. *Rochester Democrat and Chronicle*, Jan 1, **1926**, (page number unreadable).
(70) *J. Chem. Educ.* **1926**, *3*, 165.
(71) Public domain map from the U.S. Department of the Interior and the U.S. Geological Survey available at http://www.nationalatlas.gov/printable/images/pdf/outline/rivers_lakes.pdf (accessed Mar 30, 2013).
(72) Max Bergmann Papers (Mss.B B445, Box 19: Folder 30), American Philosophical Society, Philadelphia, PA 19106. Collection index can be viewed at www.amphilsoc.org/mol/view?docId=ead/Mss.B.B445-ead.xml (accessed Mar 24, 2013).
(73) Robert D. Potter, a staff writer for Science Service, requested a copy of Bergmann's talk for a news story he was writing on it. Likewise, Dr. Louise Kelley of Goucher College (and *Chem. Rev.*) requested and received copy of Bergmann's talk so a student could write a report on it. See ref 72.
(74) Bergmann's address was published the next year: Bergmann, M. *Chem. Rev.* **1938**, *38*, 423−435.
(75) Further support for this hypothesis is found in ref 66, which, when referring to the first NOS, states that "the papers presented might profitably be assembled in a monograph similar to that which has followed each of the Colloid Symposiums." Additionally, only *after* 1937 do the *Chem. Eng. News* reports on the NOS mention the possibility of purchasing the event program from ORGN for $1.00.
(76) Organic Chemists Here To-Day for Symposium. *Rochester Democrat and Chronicle*, Dec 29, **1925**, (page number unreadable).
(77) University of Rochester Rush Rhees Library has the only known copy of the first NOS Program Book (call no. QD244.N27 1925) on file in their Rare Books Collection.
(78) *J. Chem. Educ.* **1927**, *4*, 1454.
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(101) Two of the 2013 speakers (William R. Roush and Lawrence Scott) are R. B. Woodward academic children, which will increase the number of Woodward direct descendants who spoke to a record nine. Erick M. Carreira will provide a missing link for the Conant academic tree, which will be the first to have a seven-generational contiguous NOS lineage.
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Hospital Emergency Entrance
University Link Light Rail Station (2016)
Oceanography Dock
Oceanography Storage
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