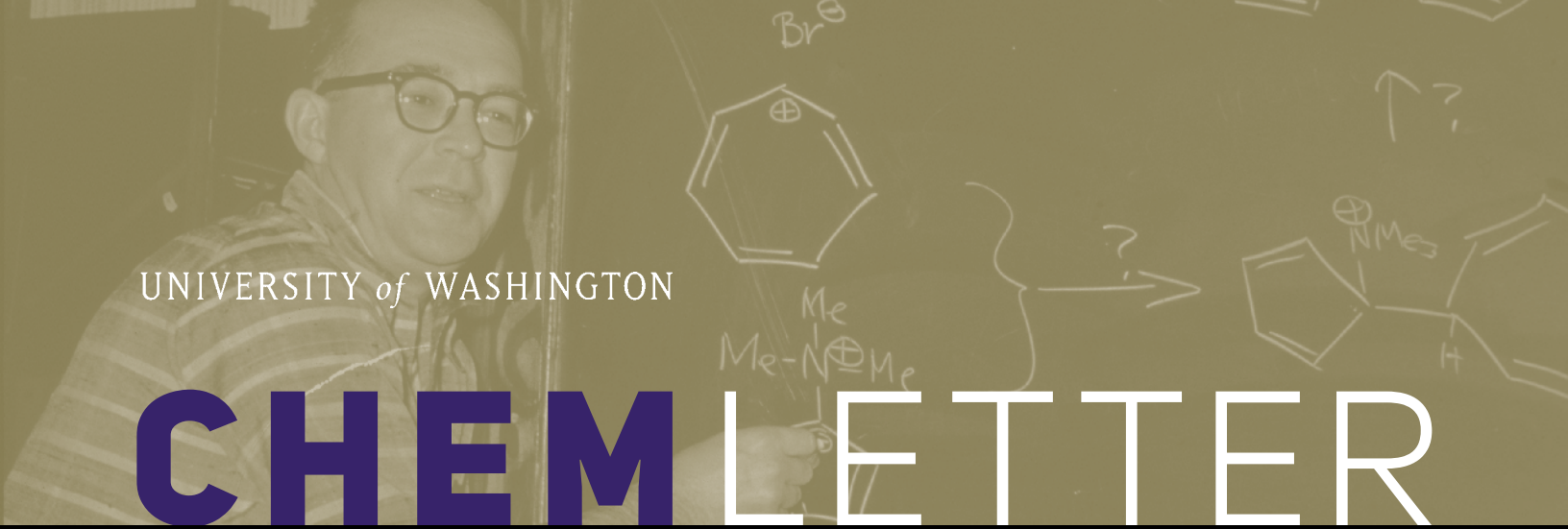


UNIVERSITY of WASHINGTON

CHEMLETTER

SPRING 2016 / VOLUME XXXIV NO. 1

LETTER FROM THE CHAIR

Dear Friend of Chemistry,

After recruiting four new faculty members last year, our faculty now numbers 44, with 39 on the tenure line and five lecturers. This count is unlikely to change, since for the first time in two decades, we were not authorized to search for new faculty members this year. We are a very young group, with 14 assistant professors. I am pleased to report that the promotions of AJ Boydston, Gojko Lalic, and David Masiello to associate professor with tenure have been approved. Lecturers Jasmine Bryant and Colleen Craig have been promoted to senior lecturer. Senior lecturer Debbie Wiegand has been promoted to principal lecturer. The latter is a rare distinction; there are only 35 principal lecturers at the University of Washington, including the campuses in Bothell and Tacoma.

Our faculty members continue to win awards and recognition for their accomplishments. We are particularly proud of our award winning junior faculty members. Assistant Professor Brandi Cossairt won a CAREER award from the National Science Foundation. David Masiello has received the very prestigious Presidential Early Career Award in Science and Engineering.

I am pleased to announce the establishment of a new endowed fund, the Boris and Barbara L. Weinstein Endowed Fund in Chemistry, made possible by the generosity of Barbara Weinstein. This fund will help support graduate students, replicating a previously established fund which ultimately became the Weinstein Chair in Chemistry. Barbara Weinstein wished to honor the wishes of the late Professor Boris Weinstein, who felt that supplemental support for our graduate program was vital.

Our operating budget continues to be lean. The legislature has directed that tuition for state resident students be reduced, a welcome change after many years of brisk increases. Unfortunately, this revenue has not been fully replaced in the allocation from the state. The current legislative special session has not provided the funds requested by the UW for renovations of our aging facilities. This has left our project to create an additional modern lab for sophomore organic chemistry on hold—temporarily, we hope.

We continue to rely on the generosity of our friends, whose donations provide an essential supplement to our state funding. Your gifts directly impact the quality of the instruction that we can offer our students. Thank you for giving back.

Sincerely,

D. M. Heinekey

D. Michael Heinekey
Professor and Chair

IN THIS ISSUE

KAREN GOLDBERG RECEIVES THE 2016 ACS AWARD IN ORGANOMETALLIC CHEMISTRY

Karen Goldberg joined the University of Washington just over twenty years ago, in 1995, as an assistant professor. In the intervening years she has built a body of research in organometallic chemistry that has been called "pioneering" and "groundbreaking." The American Chemical Society recently awarded her the 2016 Award in Organometallic Chemistry.

This national award recognizes outstanding research in the preparation, reactions, properties, or structure of organometallic substances that is having a major impact on research in organometallic chemistry, with special consideration for demonstrated creativity and independence of thought. Professor Goldberg was nominated for her groundbreaking work in developing mechanistic understanding of fundamental reactions in organometallic chemistry and for her application of this understanding in organometallic catalysis. Her pioneering studies of reductive elimination reaction mechanisms have become textbook examples of fundamental research guiding catalyst design. Professor Goldberg has been described as a world leader in the activation and functionalization of C-H bonds in hydrocarbons, where her work may lead to better utilization of fossil resources such as natural gas. On March 15, she was honored in an awards ceremony at the 251st ACS National Meeting in San Diego.

Professor Goldberg, now the Nicole A. Boand Endowed Professor of Chemistry, is also the director of the Center for Enabling New Technologies Through Catalysis, a National Science Foundation Phase II Center for Chemical Innovation. CENTC's grand challenge is to develop the basic science to enable powerful transformative catalytic reactions that impact issues of U.S. and global significance. This challenge is met by enabling a diverse team of talented researchers located across North America to effectively collaborate in research. These researchers work to address the economic, environmental, and national security needs for more efficient, inexpensive, and environmentally friendly methods of producing chemicals and fuels from a variety of feedstocks.

Specifically, researchers work toward 1, the development of new methods for the production of chemicals and fuels that will substantially reduce environmental impact by lowering energy use and reducing waste streams; and 2, the development of efficient means to use a variety of feedstocks such as methane, CO_2, and biomass in order to ensure that we are making the best use of our nation's carbon resources. While the University of Washington serves as the lead institution, CENTC has 20 senior investigators at 15 locations across the U.S. and Canada, along with several industrial affiliates.

When asked "What gets your creative juices flowing?" Professor Goldberg responded:

> *Working with students and postdoctoral associates is the most energizing and creative part of my job. Reading the literature and coming up with new ideas based on what others are doing is exciting for me, but when students come into my office with their own ideas and we can grow them into projects together, well that is a really fun and exhilarating part of the job. Each student has an individual way at looking at science and I find that diversity in their creativity inspiring.*

Pursuing these creative and diverse new ideas has been possible due, in major part, to the generosity of Professor Emeritus Larry Dalton, who endowed the Nicole A. Boand Professorship of Chemistry that Professor Goldberg holds. The support from the endowment has allowed her an additional degree of academic freedom that has played an invaluable role in her achievements.

To learn more about Professor Goldberg's research, please visit her faculty page and group website using links found at http://depts.washington.edu/chem/people/faculty/goldberg.html. To learn more about the Center for Enabling New Technologies through Catalysis, visit nsfcentc.org.

IN MEMORIAM

GEORGE D. HALSEY, JR.

PROFESSOR EMERITUS

MAY 28, 1925–JANUARY 15, 2016

George Dawson Halsey, Jr., a distinguished scientist and professor emeritus of the Department of Chemistry, passed away peacefully on January 15. He was born in Washington, D.C. in 1925. His family moved to Pelham, New York when he was a child, and his trips with his mother to New York City cultivated his love of music, architecture, art, and literature. He was reluctant to leave New York, but during the Depression, his family moved to Columbia, South Carolina.

He graduated *magna cum laude* from the University of South Carolina in 1943 at the age of 17 and went on to Princeton University, earning his Ph.D. in 1948 under the supervision of Henry Eyring and Hugh Stott Taylor. He had eleven research papers by the age of twenty. He was a junior fellow at Harvard University where he worked with George B. Kistiakowsky from 1948 to 1951, at which time he joined the faculty of the University of Washington Department of Chemistry. His research interests were surface adsorption phenomena and catalysis.

Professor Halsey taught and pursued research as a UW faculty member for 32 years. He served on the editorial boards of the *Journal of Chemical Physics* and the American Chemical Society's *Journal of Physical Chemistry*. In the early 1950s, Professor Halsey, along with Hyp J. Dauben, Jr., William T. Simpson, and Donald J. Hanahan, led the movement to have course teaching loads in the Department reduced to be more in line with those at comparable departments in other universities. In 1955 he received a Guggenheim Fellowship. His textbook *Physical Chemistry*, written with David F. Eggers, Jr., Norman W. Gregory, and B. Seymour Rabinovitch, was published in 1964. In 1965 he won the American Chemical Society Kendall Company Award in Colloid Chemistry, at which time the *Puget Sound Chemist* wrote, "Professor Halsey is not only an outstanding research worker, he is also an excellent lecturer with a splendid sense of humor."

His colleagues here remember his humor and colorful nature. He was known for always riding his bicycle and for the daily lunches he had with friends and colleagues at the Faculty Club (now University of Washington Club) and various restaurants on the Ave.

Professor Emeritus Alvin Kwiram remembers Professor Halsey as very articulate and with a penetrating intelligence. Kwiram recalls reviewing faculty publications in connection with merit increases when he came across a rather substantive article on musical intervals by Halsey and Professor Edwin Hewitt. "I don't know whether George was a musician himself or whether this was largely a mathematical exercise. Nevertheless, I was quite impressed and, as I recall, added a modest additional percentage to his merit increase!" Professor Halsey did have a love of music and his family requests that donations in his memory be made to Music4Life.org.

Professor Halsey retired as professor emeritus in 1993. He is survived by the mother of his three children, Yadviga; his children, Bill, Julia Baker, and Sarah; four grandchildren and two great-grandchildren. The family plans a simple memorial on May 28, 2016, his birthday, at Ravenna Park.

ALUMNUS PROFILE

JULIAN STEENBERGEN, B.S. 1938

Julian Steenbergen earned a B.S. in chemistry from the University of Washington in 1938 and is a life member of the UW Alumni Association. He attended a few Chemistry events recently, and in addition to his good company, made an impression on us as a centenarian as well as the distance he traveled from Yakima to visit us on the Seattle campus. For these reasons, he is our featured alumnus and we are pleased to share his story in the *ChemLetter*.

From Yakima Valley to Seattle and back

Julian sought a degree in chemistry to pursue a career outside of farming, as he grew up on a ranch in Yakima where his family made a living on their apple orchard. Farming at that time was not mechanized and the work was very labor intensive. The apple trees were much taller than is common to see in orchards today, requiring the use of 12- and 14-foot ladders. Julian and his father used horses to pull equipment through the orchards, including large tanks of insecticides. Formulating the insecticide was a process that required many adjustments. Julian measured the insecticide per acre and experimented with how much to use. He would have to research control methods for insects that presented new problems. Sadly, one horse died from ingesting arsenic and lead by grazing through the orchard where insecticide fell to the ground. After that, the horses were muzzled to prevent them from grazing in the orchard. There was too much hardship in farming, and Julian did not want to spend his life in that way.

He began his post-secondary education at a junior college and transferred to the UW in 1936. In Seattle, he paid a dollar a day for room and board to a landlady who cooked for the dozen male students she boarded. Julian had trouble sleeping there at first, due to the noisy streetcar, which they called "rattlers." A storm dropped six inches of snow during his first winter in Seattle, and Julian was unprepared because he had no boots. Truth be told, Seattle wasn't ready for it, either!

In addition to his chemistry studies, Julian took a side course in papermaking with the hope of gaining employment at a pulp mill, but at the time he graduated, the pulp mills weren't hiring. He graduated in 1938 and married Julia, who would be his wife for 74 years until her death at the age of 98 in 2012. Thanks to a recommendation from the dean of a local college, Julian Steenbergen was immediately hired by a vintner named Erich Steenborg who needed an assistant at the four-year old Upland Winery. Julian built a home in Sunnyside, Washington where he and Julia had three sons.

Julian's winemaking career

When prohibition was repealed in 1934, William B. Bridgman opened Upland Winery at the vineyard he planted in 1917. Julian ran the winery's lab, and due to his adeptness in understanding the business, his role grew to include cellar master within six months. His duties as chemist involved testing the sugar level and measuring the volatile acidity of the wine, and culturing and propagating yeast.

Steenborg and Steenbergen were not only first to commercially produce unfortified table wine in the state of Washington, but also decades ahead of their time. They were successful in both their sales and education of the public of this European style wine that did not gain popularity in the U.S. until after World War II when men returned from the war having had French and Italian table wines. Until that time, Americans were accustomed to fortified wine that

had an alcohol content upwards of 20%, similar to the amount of alcohol in a cocktail. Steenborg and Steenbergen also produced higher alcohol, sweet dessert wines by fortifying their table wine to suit American tastes; they installed a still at the winery to do so.

In 2009, Upland Estates Winery named a Rhone style blend after Julian, calling him, "instrumental in crafting Washington's first table wines."

Steenbergen Ranch

Julian worked at the winery for ten years until his father retired and offered him the ranch. Although moving their family to Yakima wasn't in Julian and Julia's original plan, it turned out well as they enjoyed farm life together. (Coincidentally, it wasn't a bad time to leave the winery since two harsh winters back-to-back in 1948-49 and 1949-50 took a toll on the vineyard.)

By 1948, farming practices had changed: Julian's family had a steam-powered tractor and they were growing smaller trees which only required ten-foot tall ladders. With the use of a tractor, they were able to pick in apple bins, which were equivalent to 25 of the boxes they used to use. Everything had been motorized and it was a whole new world to Julian.

Over the years, they changed the variety of apple they grew. When Julian was young, they grew red delicious; currently, his son is growing honeycrisp and Julian suspects that will change again when the next cultivar is developed. The current trees are even smaller than the ones Julian grew and they are planted closer together.

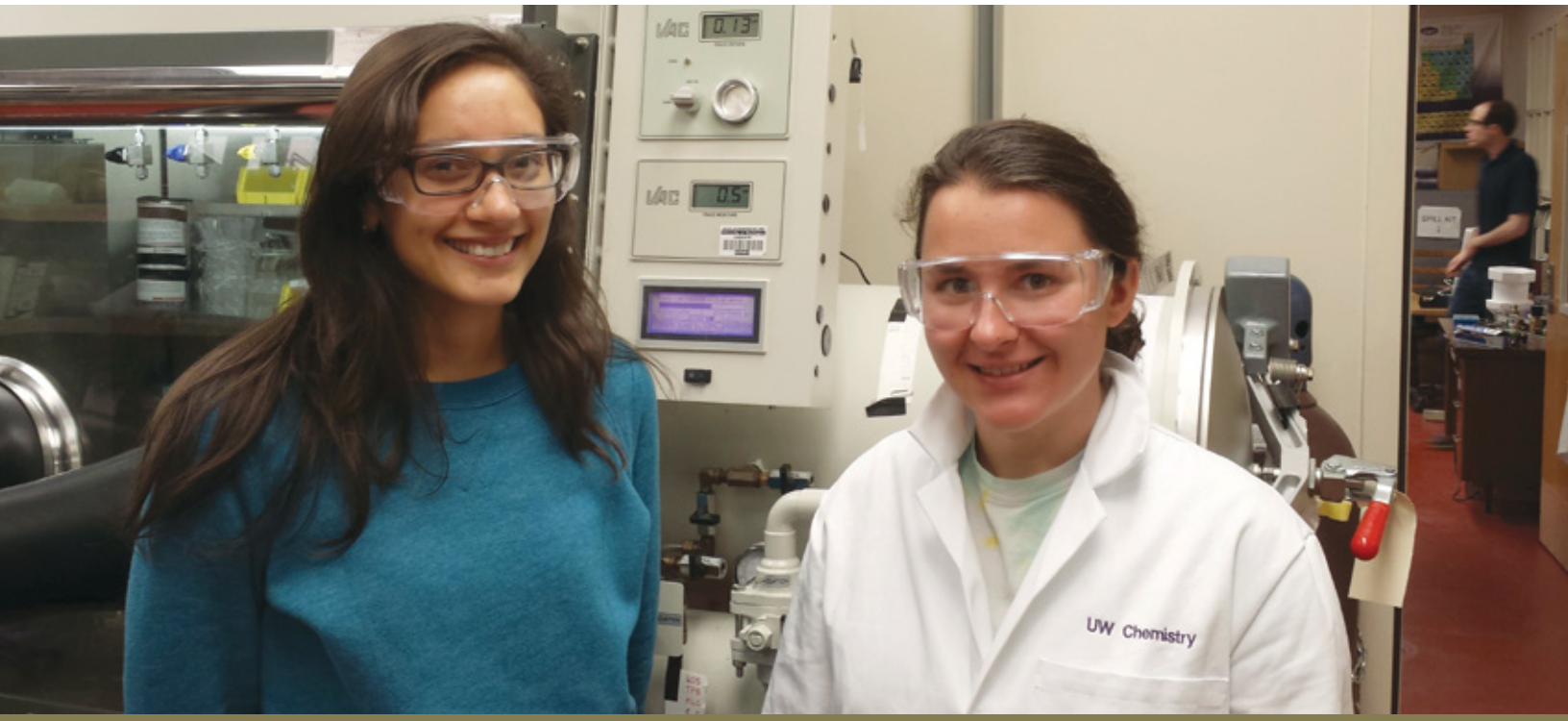
In 2011, the Steenbergen family celebrated the orchard's 100th year of family operation. (In 2015, they celebrated Julian's 100th birthday!) Julian's oldest son runs the ranch now, but it is yet to be determined if any grandchildren or great-grandchildren will take the leap of faith that Julian and Julia did to assume the family operation. Although Julian's oldest great-granddaughter may not follow Julian into the family orchard business, she did follow in his footsteps to the UW; she is currently an undergraduate student interested in premed.

PHOTOS ABOVE: JULIAN AND HIS WIFE, JULIA, IN 2008—THE YEAR THEY CELEBRATED THEIR 70TH ANNIVERSARY; JULIAN ON A RECENT HUNTING TRIP.

PHOTOS BELOW: JULIAN'S GRADUATION FROM THE UNIVERSITY OF WASHINGTON, 1938; STEENBERGEN RANCH; JULIAN ON THE GROUNDS OF UPLAND WINERY; 100TH BIRTHDAY CELEBRATION; JULIAN (LEFT) AT UPLAND WINERY; DRIVING THE APPLE TRUCK AT 89; BACKGROUND IMAGE: AMELIORATIONS ARE COMPUTED TO PRODUCE A WINE OF NOT MORE THAN 13% ALCOHOL, A TOTAL ACIDITY NOT LESS THAN 0.5 GR. PER 100 C.C. OF ACID EXPRESSED AS TARTARIC, AND A VOLUME INCREASE OF NOT MORE THAN 35%.

MANY THANKS TO KATHY STEENBERGEN FOR HER HELP IN COLLECTING AND SENDING THESE FAMILY PHOTOS!

NSF GRADUATE RESEARCH FELLOWSHIPS



Last year, seven graduate students in the Department of Chemistry were awarded 2015 National Science Foundation Graduate Research Fellowships and nine graduate students received honorable mentions. The large number of successful proposals from our students is, in part, due to the proposal writing course instituted by Assistant Professors AJ Boydston and David Masiello.

The NSF Graduate Research Fellowship Program supports outstanding graduate students with a three-year annual stipend, a cost of education allowance for tuition and fees, and opportunities for international research and professional development.

We hope you will enjoy learning about these gifted and hardworking students. In this issue, we introduce you to Tyler Chozinski, Zuzana Culakova, and Karena Smoll. You can read more about the other fellows in the previous two issues of the *ChemLetter*, available online at http://depts.washington.edu/chem/

PHOTO ABOVE: NSF FELLOWS KARENA SMOLL AND ZUZANA CULAKOVA POSE IN THE CHEMISTRY LAB WHERE THEY WORK WITH PROFESSOR KAREN GOLDBERG'S GROUP.

NSF GRADUATE RESEARCH FELLOWSHIP RECIPIENTS:

Zuzana Culakova

Advisor: Professor Karen Goldberg

Zuzana Culakova is a third-year graduate student in Professor Karen Goldberg´s research group. She focuses on developing new organometallic catalysts for the hydrogenation of carbonyl-containing substrates. This work is in the broader context of searching for new pathways for the synthesis of methanol and other value-added products via CO_2 hydrogenation, as part of a multi-institutional collaboration through the Center for Enabling New Technologies Through Catalysis.

The conversion of CO_2 to other products, even something as simple as methanol, requires the making and breaking of numerous bonds. The complexity of this basic transformation is a great opportunity for tandem catalysis—harnessing a combination of catalysts to carry out the reaction in sequential, simpler steps. For example, to convert CO_2 to methanol, CO_2 could be hydrogenated by one catalyst to make formic acid which could then be esterified to a formate ester with a second catalyst and then finally hydrogenated with a third catalyst to yield methanol. Catalyst compatibility is often a limiting factor in these systems and Zuzana is working with collaborators at the University of Michigan and the University of North Texas to identify systems of co-compatible catalysts for such a catalytic cascade.

Of particular interest to Zuzana is the hydrogenation of the intermediate carbonyl-containing substrates. Hydrogenation of substrates such as esters, amides, carboxylic acids, and carbonates is challenging relative to other carbonyl substrates due to reduced electrophilicity of the carbonyl carbon. The most efficient homogeneous catalysts in the literature for these reactions are incompatible with CO_2, are air-sensitive, and will not perform in acidic conditions. These incompatibilities make reported catalysts challenging to use in tandem systems. The development of alternative hydrogenation catalysts will facilitate more effective schemes for synthesizing methanol from CO_2 and will also add to the toolbox of available chemical transformations.

Zuzana is currently spending six months abroad, studying at the Institute Charles Gerhardt at the University of Montpellier in southern France, with support from a Chateaubriand Fellowship. Under the supervision of Professor Odile Eisenstein, she is learning how to use computational chemistry as a tool for understanding the behavior of transition metal catalysts. In Zuzana's lab work at the UW, the stainless steel autoclaves that allow the use of high pressures of hydrogen at elevated temperatures also limit

in situ monitoring and make traditional kinetic studies challenging. Computational studies, she hopes, will shed light on reaction mechanisms as well as catalyst deactivation pathways (especially inhibition by CO_2). This understanding will inform the design of future tandem systems and form the basis for the design of next-generation catalysts.

Zuzana is originally from Rochester, New York, and moved to New Haven, Connecticut, where she earned a B.S. in chemistry from Yale University in 2011. She conducted her senior thesis research under the guidance of Associate Professor Nilay Hazari, studying pincer-supported Pt and Ni complexes for CO_2 activation. Zuzana is grateful for numerous other research opportunities, including a summer spent in Germany studying a Ru(triphos) catalyst for high pressure hydrogenation of bio-derived acids to liquid fuels with Professor Walter Leitner's research group (RWTH Aachen), investigating a Pt/TiO_2/fluorescent dye system for hydrogen generation by splitting of water with Professor Richard Eisenberg's group (University of Rochester), and working on the development of chemical treatments and coatings for high-power laser optics at the Laboratory for Laser Energetics (University of Rochester). Prior to beginning graduate school, she worked as a teacher/naturalist at Echo Hill Outdoor School through the Chesapeake Conservation Corps, and explored the world of science policy through an internship at the Environmental and Energy Study Institute in Washington, D.C. Outside of the lab, Zuzana enjoys biking, sailing, hiking, baking, and exploring the Pacific Northwest.

Karena Smoll

Advisor: Professor Karen Goldberg

Karena Smoll is a third-year graduate student whose current projects both involve the functionalization of hydrocarbons to higher value chemicals. Hydrocarbons make up 90% of the carbon feedstock used in the chemical industry. However, despite their abundance, selectively activating and functionalizing C-H bonds of hydrocarbons remains a challenge. One example of the desired transformation is the conversion of C-H bonds to C-OH bonds using molecular oxygen as the oxidant—an ideal oxidant on account of it being abundant, cheap, and environmentally friendly (Figure 1). Despite its advantages, knowledge about how oxygen reacts with organometallic complexes remains limited. Karena's first project focuses on exploring the reactivity of various pincer-type Pd(II)-Me complexes with molecular oxygen. The goal is to insert molecular oxygen into Pd-Me bonds to eventually result in a functionalized C-H bond (Figure 1, red step). Her research mainly involves the complexes [($^{t\text{Bu}}$PNP)PdMe]Cl and ($^{t\text{Bu}}$PCP)PdMe. It was found that the PNP pincer complex reacts differently than the PCP system: [($^{t\text{Bu}}$PNP)PdMe]Cl reacts at the pincer arm to add oxygen across the arm rather than react at the Pd-Me bond. ($^{t\text{Bu}}$PCP)PdMe, on the other hand, reacts at the Pd-Me bond to form a fully functionalized product. However, full oxidation of the methyl bond may be problematic when trying to control the reactivity.

In Karena's second project, she works on alkane dehydrogenation using molecular oxygen. The goal of this project is to convert abundant alkanes to alkenes using molecular oxygen as the hydrogen gas acceptor (Figure 2). To accomplish this, Karena

hopes to use an iridium catalyst that is stable at high temperatures (200°C) under an oxygen atmosphere. She is currently in the process of synthesizing a new Ir catalyst that can then be used in studies on alkane dehydrogenation.

Karena grew up in Fontana, California, and received a B.S. in chemistry at the University of California, Irvine in 2013. Outside of lab, Karena loves working out, hanging out with friends, and exploring the great outdoors.

FIGURE 1: PROPOSED CATALYTIC CYCLE FOR C-H FUNCTIONALIZATION

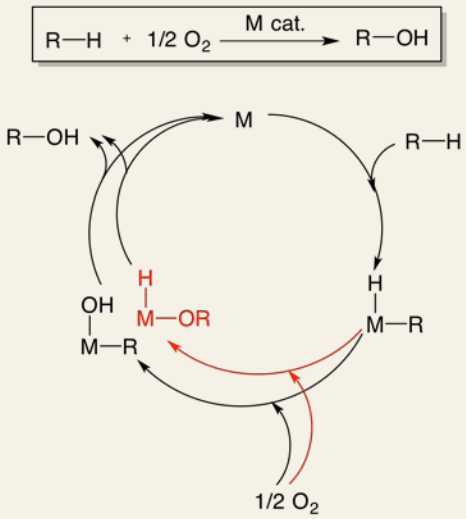
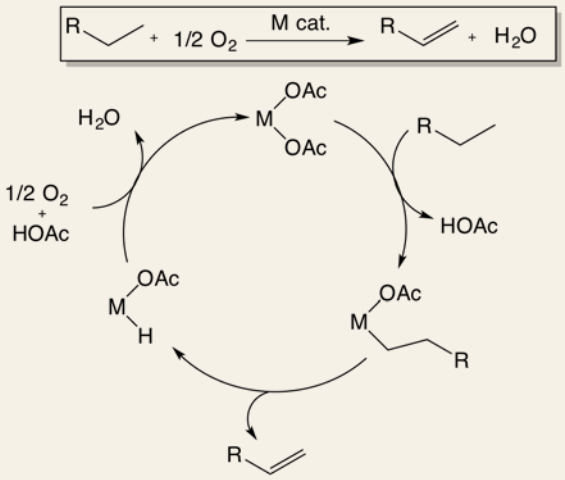


FIGURE 2: PROPOSED CATALYTIC CYCLE FOR ALKANE DEHYDROGENATION



Tyler Chozinski

Advisor: Assistant Professor Joshua Vaughan

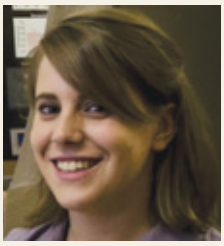
Tyler Chozinski is a third-year graduate student in the research group of Assistant Professor Joshua Vaughan. Tyler received a B.S. in chemistry from the University of Arizona in 2013 where he worked on molecular biomarker detection with Associate Professor Katrina Miranda and synthetic biosurfactant characterization with Professor Jeanne Pemberton. Tyler is currently working on simplifying and improving the performance of expansion microscopy, a newly developed method by Associate Professor Edward Boyden's group at the Massachusetts Institute of Technology.

Expansion microscopy enables super-resolution imaging to be performed with standard fluorescence microscopes (e.g., wide field, confocal, light sheet, etc.) by physically expanding the specimen so that diffraction limited features are enlarged to a spatially resolvable regime. Currently, the method is capable of ~65 nm resolution in cultured cells and is also compatible with larger, more complex tissues such as brain slices and retina. By allowing laboratories with only conventional imaging capabilities to perform 3D super-resolution imaging on many different sample types, expansion microscopy is poised to make an enormous impact on the scientific imaging community. Tyler hopes to aid other research groups to become familiar with the method so that super-resolution imaging is no longer a niche technique. He also hopes to apply expansion microscopy to model systems and organisms that have typically been excluded from super-resolution imaging due to the methods' difficulty imaging these specimens. For more information, please feel free to contact Tyler at tylerc22@uw.edu or visit the Vaughan group website at https://sites.google.com/a/uw.edu/the-vaughan-group/home.

Emily Dieter

Advisor: Associate Professor Dustin Maly

"I intend to continue emphasizing solving tangible world problems in my future research."



Marco Howard

Advisor: Assistant Professor Joshua Vaughan

Current research topic: Photo-switching mechanism of cyanine dyes.

Rachel (Rae) Eaton

Advisor: Assistant Professor Matthew Bush

Current project: Working with new technology to build ion mobility instrumentation that expands the complexity of native-like protein and protein complex analysis.

Johanna Schwartz

Advisor: Assistant Professor AJ Boydston

Current project: Synthesis of novel 3D-printing resins, as well as the development of novel methods of 3D printing.

HONORABLE MENTIONS:

Maike Blakely

Advisor: Professor Julie Kovacs

Career aspiration: To become a university professor where I would have the opportunity to teach and be an ambassador for chemistry to students just starting out in the field.

Caitlin Cornell

Advisor: Professor Sarah Keller

Recent accolade: Caitlin won a Biophysical Society Student Research Achievement Award for her work studying the effects of general anesthetics on physical properties of model cell membranes.

Andy Dang

Advisor: Professor František Tureček

Current project: Using lasers and mass spectrometry to study new light-driven reactions with transition metal complexes in the gas phase.

Lauren Gagnon

Advisor: Assistant Professor Joshua Vaughan

Career aspiration: To work for the Applied Science, Engineering and Technology division of the FBI.

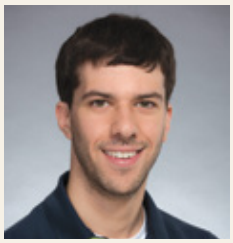
Michael De Siena

Advisor: Professor Daniel Gamelin

"I feel that furthering education and the expansion of our collective knowledge is a pillar of our society and I want to have the pleasure of teaching the next generation of scientists and researchers while pursuing my own interests in sustainability and green energy materials."

Michael Enright

Advisor: Assistant Professor Brandi Cossairt



Career aspiration: To perform chemical research as a university professor, where I will be able to share my passion for science with new cohorts of scientists while continuing to be actively engaged in research.

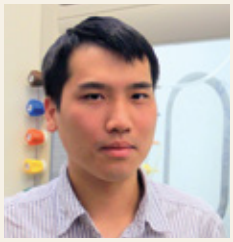
Troy Kilburn

Advisor: Professor Daniel Gamelin

Career aspiration: Research in the private sector.

Francis (Ray) Lin

Advisor: Professor Alex K.-Y. Jen



"It's interesting to know, and even more interesting to know why."

Chloe Lombard

Advisor: Associate Professor Dustin Maly

Career aspiration: To conduct chemical biology research that will aid in our understanding of cellular signaling.

ENDOWED FUNDS

The Department of Chemistry has 78 endowed funds that support our teaching and research programs. Each and every fund is vital to our continued success. Here we present a complete list of all of our endowed funds. Behind each of these funds is a unique story, but together they tell the tale of the Department of Chemistry's long and rich history of excellence in science, service to the community, and devotion to family and friends, mentors and students, and colleagues and associates. We continue to rely on the generosity of our friends, whose donations provide a vital supplement to our state funding. Your gifts directly impact the quality of the instruction that we can offer our students and play a critical role in helping us to continue to explore our field at the cutting edge. Thank you for giving back.

Fund Name *Year Est.*

Anderson, Arthur G. Endowed Fund *2001*

Anex, Basil G. and Gretchen F. Endowed Fund *2005*

Bendix, Gretchen and Richard Endowed Fund *1990*

Benson, Henry K. Scholarship in Chemistry *1955*

Berkelhammer, Gerald and Sheila Endowed Fund *1999*

Boand, Harry and Catherine Jayne Endowed Professorship in Chemistry *2007*

Boand, Nicole A. Endowed Professorship in Chemistry *2010*

Boand, Nicole A.–ARCS Foundation Endowed Fellowship in Chemistry *2013*

Borden, Weston and Shelia Endowed Fund in Chemistry *2015*

Bouknight, Joseph Endowed Fund for Chemistry *2012*

Cady, George and Agnes Irene Endowed Fund in Chemistry *1995*

Cady, George H. Endowed Lectureship in Chemistry *1994*

Chemistry Common Room Endowed Fund *2000*

Chemistry Department Staff Fund *2007*

Chemistry Graduate Alumni Fund *1998*

Christian, Gary and Sue Graduate Student Support Fund in Chemistry *2009*

Cross, Paul C. Endowed Fund *2002*

Dalton, Larry R. Endowed Professorship in Chemistry *2012*

Dalton, Larry R. Graduate Fellowship *2009*

Dauben, Hyp J., Jr., Memorial Fund *1968*

Davie, Earl W. Endowed Scholarship in Chemistry or Biochemistry *2009*

Degering, Ed F. and Clara M. Trust Fund *1963*

Early '60s Ph.D. Alumni Endowed Fund in Chemistry *2002*

Faculty Endowment for Graduate Study in Chemistry *2000*

Feinberg, Herman and Zelda Endowed Fund *1987*

Gilmer, Dorothy Shimasaki Endowed Student Support Fund *2014*

Gouterman, Martin P. Endowed Fund *2006*

Gregory, Norman and Lillian Endowed Fund in Chemistry *2004*

Gudiksen, Paul H. and Karen S. Endowed Fund *2002*

Hamm, Randall and Vivian Endowed Chemistry Fund *2003*

Hanahan, Donald J. Endowed Scholarship in Chemistry or Biochemistry *2009*

Harris, Bruce S. Endowed Fund *1995*

Hicks, John F. G. Endowed Fund *2002*

Hirschfeld, Tomas Endowment *1991*

Hitchings, George H. Endowed Scholarship Fund *1990*

Honnen, Lewis R. and Joan M. Endowed Fellowship in Chemistry *2009*

Honnen, Lewis R. and Joan M. Endowed Fund in Chemistry *2004*

Hopkins, Paul B. Endowed Faculty Award Fund in Chemistry *2004*

Jensen, Lyle H. Graduate Fellowship *2009*

Johnson, Leon C. Chemistry Endowment *2001*

Jones, Mark A.–ARCS Foundation Endowed Fellowship in Chemistry *2013*

Kowalski, Bruce R. Endowed Fund in Chemistry *2013*

Kwiram, Alvin L. and Verla R. Endowed Professorship in Chemistry *1999*

Kwiram/CCR Fellowship *1987*

Lawton, Raymon E. and Rosellen M. Endowed Professorship in Chemistry *2012*

Mindlin, Eugene S. Endowed Fellowship Fund *1995*

Montgomery, A. Bruce Professorship in Chemistry *2008*

Motell, Edwin and Phyllis Endowed Fund in Chemistry *2002*

Natt-Lingafelter Endowed Fund in Chemistry *2000*

Nist, Bernard and Claudine Research Fund *1993*

Pavlou, S. P. and D. E. Strayer Endowed Fund in Chemistry *2007*

Paxton, Raymond and Sally Endowed Fund in Chemistry *2014*

Pohl, Christopher and Karen Endowed Fund in Chemistry *2015*

Professorship in Analytical Chemistry *1989*

Rabinovitch, B. Seymour Endowed Chair in Chemistry *2005*

Rabinovitch, Benton Seymour Endowed Fellowship *2000*

Rabinovitch, Marilyn Werby Memorial Fund for Chemistry *1996*

Reid, Brian R. Endowed Fellowship in Chemistry *2005*

Reinhardt Family Endowed Fund in Chemistry *2001*

Ringold, Howard J. Endowed Fellowship *1986*

Ritter, David M. Endowed Scholarship Fund *1990*

Robinson, Rex J. and Ruth C. Scholarship Fund in Chemistry *1995*

Rowe, Zalia Jencks Scholarship Fund *1971*

Rowland Endowed Fellowship in Chemistry *2006*

Saegebarth, Klaus and Mary Ann Endowed Professorship *1993*

Schomaker Endowed Fund in Chemistry *2001*

Schurr, Mickey and Karen Endowed Graduate Support Fund *2008*

Scott, Amy and Stephen C. Alley Endowed Fellowship in Chemistry *2009*

Shain, Irving and Mildred Endowed Fund in Chemistry *1995*

Simeon, Mary K. and Goldie Simeon Read Chemistry Research Endowment *2002*

Slutsky, Leon J. Endowed Fund *2003*

Tartar, Herman V. Endowed Fund *2000*

Varanasi, Usha and S. Rao Endowed Diversity Scholarship in Chemistry *2004*

Washington Research Foundation Endowed Professorship in Chemistry *2011*

Weinstein, Boris and Barbara L. Endowed Chair in Chemistry *1985*

Weinstein, Boris and Barbara L. Endowed Graduate Fellowship in Chemistry *2016*

West, Lloyd E. and Florence M. Fellowship in Chemistry *1993*

West, Lloyd E. and Florence M. Endowed Fund in Chemistry *1999*

DEPARTMENT OF CHEMISTRY
UNIVERSITY of WASHINGTON

BOX 351700, SEATTLE, WA 98195-1700

Return Service Requested

Nonprofit Org.
U.S. Postage
PAID
Seattle, WA
Permit No. 62

ChemLetter via Email

This year, we will be transitioning our distribution of the *ChemLetter* to e-mail. The paper copy will still be available for those who prefer it. Make sure you are included on our e-mail list and update your contact preferences at http://bit.ly/UWChemNews, or call Diana Knight at 206-543-1611.

CORRECTION: In the Autumn 2015 issue's list of Graduate Fellowships & Awards (pages 21 to 23), we unintentionally switched the fellowships awarded to Alexander Santiago and Sam Barlow: Alexander received the Mark A. Jones–ARCS Foundation Endowed Fellowship in Chemistry and Sam received the ARCS Foundation Endowed Fellowship. We apologize for the error and thank both Mark Jones and the ARCS Foundation for their support.

New Chemistry Education Research Journal Club

The Chemistry Education Research Journal Club focuses on best practices in teaching and learning chemistry. The club meets weekly to read and discuss articles covering a wide range of research areas including chemistry education, learning sciences, and cognitive science research literature. The topics have included the differences between novices and experts, best practices in clicker use, and comparisons of study skills. The group is comprised of graduate students, postdocs, faculty, and staff from Chemistry and Biology, and is open to anyone inside and outside of the campus community. Snacks are provided thanks to Howard Hughes Medical Institute and the STEM Dawgs program. Please contact Cynthia Stanich at stanich@uw.edu to be added to the email list for dissemination of papers and topics. The group meets Fridays, 3:30-4:30 p.m. in Mary Gates Hall room 058.

PUBLISHED BY
Department of Chemistry, University of Washington

D. Michael Heinekey, Chair
Robert E. Synovec, Associate Chair for Graduate Education
Gary Drobny, Associate Chair for Undergraduate Education
Deborah Wiegand, Director of Entry-Level Programs

CONTRIBUTORS
Jasmine Bryant, Lecturer
Diana Knight, Assistant to the Chair
Creative Communications

Printed on recycled paper using vegetable-based inks.

BECOME OUR FAN!
www.facebook.com/UWChem

We want to know what you've been up to!

Please send your comments and updates to:
chemdept@uw.edu