



Paul Hopkins, Chair

In this issue

Letter from the Chair	1
Faculty News in Brief	2
A Tale of Two Centers	4
Faculty Introductions	6
Department News in Brief	10
Focus on Research	12
Graduate Student Profile	13
Graduate Fellowships & Awards	14
Doctoral Degrees Awarded	15
Undergraduate Studies Highlights	16
Undergraduate Fellowships & Awards	18
Faculty Awards & Honors	19
Your Support	21
Our Donors	22
Paws on Science	24

Dear Friend of Chemistry,

Greetings from Seattle. I hope you will enjoy this edition of the *ChemLetter*. There is much good news to report, including advances in both our instructional and research programs. It will no doubt come as a relief that this message will on balance be far more upbeat than the last several I have sent to you. But public higher education in our nation is far from out of the woods; I will close with sobering news on that front, including some explanation of why UW undergraduate tuition rates skyrocketed again this past year for Washington residents.

But, first the good news. My past few messages have reported the disturbing news that the disappearing state budget (UW lost fully half of our state-provided budget, dropping some \$200,000,000 per year!) had caused us to reduce the quality and scope of our undergraduate program. As our faculty count dwindled through departures not offset by replacement hires, we had simply stopped offering various upper-level undergraduate (and graduate) course offerings, and we increased class sizes in the courses that remained. A shortage of teaching assistants drove us to reduce laboratory hours for freshmen and sophomores, and to reduce the size of our graduate program.

But in last year's message, I also described to you the report of a committee that reviewed our Chemistry degree programs. That report lauded all aspects of our Chemistry degree programs—except our budgets. The committee recommended significant expansion of our faculty and teaching assistant budgets, not only to allow us to repair the damage caused by budget cuts, but also better to support the large growth in our undergraduate instructional program that had never been reflected in our budget.

It is not uncommon for such a report to call for new investment. What is uncommon is for the call to be heeded. Inspired by this report, our Dean and Provost were able to make a substantial new investment in the Department of Chemistry. With these funds, we are hiring new tenure-line faculty, new lecturers for our undergraduate program, and new graduate teaching assistants. Much of the damage inflicted by the Draconian cuts in 2009 will be reversed. Laboratory work for freshmen and sophomores is being restored in the current academic year, some discontinued courses in specialized areas (such as materials chemistry) are again being offered, and class sizes throughout the program—from freshman to senior courses—are being reduced to more appropriate levels. The new teaching assistant positions will benefit not only undergraduate students, but also graduate education, as these new positions will allow us to restore the size of our graduate program. A similar investment was made in the Department of Biology, which had seen similarly devastating cuts and uncompensated growth. Smaller, but important, new investments were made in other science units. A substantial investment is also being made to increase access to undergraduate degree programs in the College of Engineering in response to student demand and predicted workforce needs.

Some instructional advances, though, cost little or nothing new to implement. For several years now, the rising availability of electronic communication has been changing our instructional programs. Faculty members are assigning work to students through

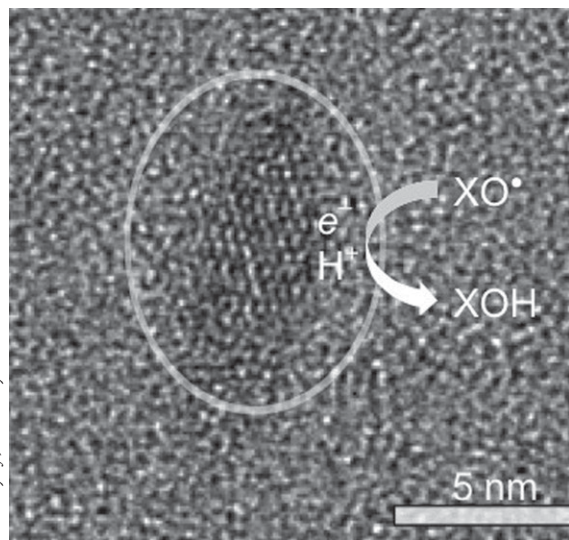
—continued on page 20

Science Paper Explores Proton-Coupled Electron Transfer in Metal Oxide Nanoparticles

A recent publication in *Science* by Professor James Mayer and coworkers explores the transfer of electrons and protons in titanium and zinc oxide nanoparticles. Understanding chemical reactions that occur on the surfaces of such metal oxides is important for applications such as solar cells and the production of fuels from solar energy. Professor Mayer's research indicates that the usual depiction of these reactions as electron transfers is incomplete, and that they are more accurately described as proton-coupled electron transfer reactions.

"As we think about building a better energy future, we have to develop more efficient ways to convert chemical energy into electrical energy and vice versa," said Mayer, the Alvin L. and Verla R. Kwiram Endowed Professor of Chemistry.

Chemical reactions that change the oxidation state of molecules on the surface of metal oxides have been perceived historically solely as a transfer of electrons. The new research shows that, at least in some cases, reactions can occur by the coupled transfer of electrons and protons.



Courtesy of James Mayer

Caroline Sauma



James Mayer

"Research and manufacturing have grown up around models in which electrons move but not atoms," Professor Mayer said. The research suggests a different model for certain kinds of processes, a perspective that could lead to new avenues of investigation, and that, "In principle, this is a path toward more efficient energy utilization," Professor Mayer said. Coupling the transfer of electrons with the transfer of protons could help reduce the energy barrier to chemical reactions important in many technologies, such as the use of solar energy to generate hydrogen from water, a reaction which requires that electrons and protons be coupled.

Co-authors of the paper are Dr. Joel Schrauben, a recent UW postdoctoral researcher; Dr. Rebecca Hayoun, who recently received her doctorate from the UW and is working in the private sector; current UW graduate students Carolyn Valdez and Miles Braten; and Lila Fridley, an undergraduate student from the Massachusetts Institute of Technology and summer researcher in the Mayer group.

The work was funded by the University of Washington, the American Chemical Society Petroleum Research Fund, the National Science Foundation through the UW-based Center for Enabling New Technologies through Catalysis, and the U.S. Department of Energy.

Titanium and zinc oxide nanoparticles participate in proton-coupled electron transfer, rather than simply electron transfer.

Li and Maly Promoted

The Department of Chemistry congratulates Dustin Maly and Xiaosong Li on their promotions to the rank of Associate Professor with tenure, effective September 2012.

Professor Maly's research aims to understand the enzyme families that are involved in cellular signal transduction, with the ultimate goal of identifying new molecular targets for the treatment of human disease. His research group integrates techniques from organic chemistry, biochemistry, structural biology, proteomics, and cell biology to develop new tools that provide a greater understanding of diverse signaling processes.

Professor Li's research focuses on the development and application of electronic structure theories and *ab initio* molecular dynamics to study the properties and reactions, particularly the non-adiabatic reactions that take place in large systems, such as polymers, biomolecules, and clusters. A more thorough understanding of these systems, particularly the non-adiabatic reactions taking place within them, will allow for the rational design of new functional materials.

Welcome New Lecturers

We are delighted to welcome Drs. Jasmine Bryant and Colleen Craig to the Department of Chemistry in their new roles as Lecturers for the 2012–2013 academic year. Enrollment in chemistry courses has been growing for many years, and is once again at an all-time high. As a result, the College of Arts and Sciences provided funding for additional instructional staff to help us to better meet student needs. Drs. Bryant and Craig, who were identified through a national search, join Dr. Andrea Carroll in holding the rank of Lecturer.

Dr. Bryant received her B.S. in chemistry from the California Institute of Technology, her Master's in teaching from Seattle University, and her Ph.D. in inorganic chemistry from the University of Washington with Professor James Mayer. Since 2002, she has held several positions at the UW, most recently serving as the Director of Communications for the NSF-funded Center for Enabling New Technologies through Catalysis (CENTC) and as a temporary instructor for general and inorganic chemistry courses.

Dr. Craig received her B.S. in applied mathematics with a minor in chemistry from the University of Colorado, Denver, and her Ph.D. in physical chemistry from the University of Washington with Professor Oleg Prezhdo. For the past several years, she has taught general chemistry courses at the UW and at Seattle Central Community College, and since 2011 she has worked with the UW in the High School program to develop a version of CHEM 110 (Introduction to General Chemistry) for use in high schools in the State of Washington. Outside of the classroom, Dr. Craig developed web-based content for textbook publisher W.H. Freeman, and has served on several chemistry advisory boards, including for McGraw Hill and WebAssign.

New Chemistry Lecturers
Jasmine Bryant (left)
and Colleen Craig



Andrea Carroll

A TALE OF TWO CENTERS

Two major centers, funded by the National Science Foundation, have been headquartered in the Department of Chemistry for the past several years. CMDITR, established in 2002, is reaching the end of its ten-year grant cycle. CENTC, established in its current state in 2007, is in the mid-point of its ten-year grant period. Here is a look at these two Centers and their impact on the UW and the world of research.

Science and Technology Center on Materials and Devices for Information Technology Research

In 2002, Professor Larry Dalton (with multiple co-investigators) and the University of Washington received a grant from the National Science Foundation (NSF) to establish the Science and Technology Center on Materials and Devices for Information Technology Research (CMDITR). The ten-year grant funded a collaborative research center headquartered at the UW and ultimately involving partner institutions: University of Arizona, Georgia Institute of Technology, University of Maryland Baltimore County, Cornell University, Norfolk State University, California Institute of Technology, University of Central Florida, and New Mexico Highlands University. The Center was established with the vision of becoming “an internationally recognized center of excellence for information technologies through the investigation and development of innovative organic-based and hybrid photonic and electronic materials and devices.” While the Center has changed over the years and it is now directed by Professor Phil Reid, its mission has remained steadfast. That ten-year grant is now drawing to a close and CMDITR is in the final months of official NSF sponsorship. Here is a look back at CMDITR’s contributions to the field of organic electronics, photonics, and scientific education.

CMDITR’s research mission is the rational design of organic-based materials and devices for a variety of photonic applications including telecommunications, on-chip information transfer, solid-state lighting, solar energy conversion, and flexible “plastic” electronics. Partners in the Center use their expertise in fields ranging from theory and molecular modeling to synthesis and materials engineering to design and produce devices with enhanced performance and new

capabilities relative to “traditional” materials. Ultimately, the advances in material performance achieved by CMDITR researchers will impact a variety of everyday activities including increased internet speed, energy-efficient lighting, flexible and ultra-light displays, and increased solar energy conversion efficiency. From a fundamental standpoint, CMDITR’s activities have expanded our understanding of organic electronic and electro-optic materials from the molecular to device length scales.

Research, however, is only one aspect of the Center’s mission. NSF-funded centers also have a strong emphasis on education and diversity enhancement. Over the course of the last ten years, CMDITR has developed a number of efforts in this arena including: the creation of a Research Experience for Undergraduates program that focuses on recruiting community college students; a leadership lunch series in support of women scientists; assistance with the launch of a Ph.D. program in Materials Science and Engineering at Norfolk State University, only the second such Ph.D. program in existence at an historically black university; and the development of new graduate courses on partner campuses.

CMDITR has truly been a multidisciplinary venture, bringing together researchers and educators from chemistry, materials science, and physics to partner with chemical, mechanical, and electrical engineers. Graduate students, postdoctoral fellows, and undergraduate researchers in the Center have had the rather unique experience of seeing new devices developed from theory all the way to functioning technologies licensed by companies. Many of these students have pursued dual degrees—in science and business—uniquely preparing them to compete in the workplace and the academic arena. These students and postdoctoral researchers—more than 300 in the past ten years—have been instru-

mental in helping CMDITR produce research that has been published in more than 1,000 papers, awarded 37 patents, and led to more than 300 patent filings. As NSF funding draws to a close for CMDITR, additional funding from government and private investors assures that its groundbreaking research continues.

Center for Enabling New Technologies through Catalysis

The Center for Enabling New Technologies through Catalysis (CENTC) is a National Science Foundation Phase II Center for Chemical Innovation headquartered at the University of Washington. It began in 2004 as a Phase I Center for Chemical Bonding (then called the Center for Activating and Transforming Strong Bonds, or CATSB). In 2007, CENTC received Phase II funding to expand its research efforts. CENTC's primary goal is to bring together researchers from across North America to collaboratively 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. Through catalysis, CENTC researchers hope to lower the energy costs to transforming chemicals; use inexpensive, abundant, and nontoxic starting materials; and generate less waste.

The NSF Division of Chemistry established the Centers for Chemical Innovation (CCI) Program to nurture innovative approaches to address intellectual challenges in basic chemical research and education with the potential for broad societal impact. CCIs are meant to provide the opportunity for ambitious groups of investigators to share a commitment toward solving a "big problem" in an atmosphere with a high tolerance for risk and within a structure permitting considerable agility. CENTC investigators work together to tackle one of the most urgent and critical issues in the world today—the need for more efficient, inexpensive, and environmentally friendly methods of producing chemicals and fuels.

In addition to its research accomplishments, CENTC has significant activities in education, public science outreach, and broadening participation by individuals from groups underrepresented in the sciences. The



collaborative approach of CENTC offers unique training for undergraduate students, graduate students, and postdoctoral researchers. The CENTC summer undergraduate research program offers research experiences to students from primarily undergraduate and minority-serving institutions. CENTC has also sponsored and organized biannual catalysis summer schools open to graduate students, postdoctoral researchers, and early career professionals from around the country. The Center's high school outreach program brings current graduate students and postdoctoral researchers into classrooms for lectures, lab experiments, and career discussions. CENTC researchers have worked with science museums near CENTC locations to disseminate information about Center research to a broad segment of the public. A CENTC exhibit that focused on catalysis and its role in developing a more sustainable society launched on October 23, 2011 ("Mole Day"), at the Pacific Science Center, and chemistry content is currently being developed with the Liberty Science Center in New Jersey that will open in 2013 as part of its "Energy Quest" exhibit.

Recently, the NSF awarded CENTC a \$20-million grant renewal over the next five years to continue its research and education efforts. The Center, led by Karen Goldberg, the Nicole A. Boand Endowed Professor of Chemistry, brings together 18 investigators and their students in chemistry and chemical engineering at 14 different institutions across North America. Two other UW chemistry professors—James Mayer and D. Michael Heinekey—are involved in CENTC, as well. Under the latest grant renewal, scientists will create and investigate new reactions and catalyst systems transforming various chemical bonds involving carbon, oxygen, and hydrogen. The data will help devise new methods for the chemical industry that could provide consumers with a variety of less-expensive products created in ways that use less energy and produce fewer undesirable byproducts.

Matthew F. Bush

Assistant Professor

Ph.D. 2008

University of California, Berkeley

Bioanalytical and Biophysical Chemistry

Advisors: Evan R. Williams and Richard J. Saykally

B.A. 2003

Carleton College

Chemistry; Environmental & Technology Studies concentration

Matthew Bush was born in Alabama, but as the son of an U.S. Air Force officer-turned-diplomat and through his own career in chemistry, he has lived in a variety of places including Washington, D.C., London, and Finland.

When Matt attended Carleton College in Minnesota, he had the opportunity to spend a summer working with Professor Evan Williams at the University of California, Berkeley. He enjoyed the work they were doing so much, he pursued his Ph.D. at Berkeley in a joint project with Williams and Professor Richard Saykally, combining their approaches in mass spectrometry and spectroscopy. During that time, Matt employed a laser system to study the structure of small biomolecules as well as how water solvates biomolecules and other ions.

Following his Ph.D., Matt continued his research in mass spectrometry as a Waters Research Fellow with Carol Robinson FRS at the University of Cambridge and the University of Oxford. His postdoctoral research focused on much larger molecules, intact proteins, using mass spectrometry.

Matt joined the faculty at the UW in September 2011. His current research efforts aim to develop technologies using mass spectrometry and ion mobility mass spectrometry to understand the structures of biomolecules. Matt explains his interest in using mass spectrometry for this purpose: "NMR and x-ray crystallography of proteins are useful for very pure samples, but mass spectrometry allows us to study heterogeneous samples." Although mass spectrometry does not provide all details, it can

examine systems with heterogeneity in structural elements.

Since they need to use complicated software to analyze their data, his group members have had to

develop their own software. Matt still works with Waters Corp.—the sponsor of his postdoctoral fellowship—on software development: "[Waters has] been good to me over the years." Matt's group also strives to develop its own instrumentation as well as taking advantage of the work that manufacturers have done, but also finding innovative ways to obtain more information on very large ions.

Technology development, however, is only one aspect of his group's research. The group has

developed collaborations with groups in pharmacology, medicinal chemistry, biochemistry, and other chemistry research groups at the UW. Many of these collaborations contribute to research in human aging and disease. Research is ongoing to understand the proteins involved in such processes as cataract development, bacterial toxin secretion, and circadian clock function.

Matt first visited Seattle for his interview in December 2010. He loved the weather (even in December!) and the views of Mt. Rainier. Matt is an avid cyclist and commutes to the UW from Ballard by bike. He has reached the point as a Seattle commuter that he prefers when it rains because the pleasure walkers aren't out, and only the serious runners and commuters are using the trail. He hasn't owned a car since 2003.



Courtesy of the Department of Chemistry

Brandi Cossairt

Assistant Professor

Ph.D. 2010
Massachusetts Institute of Technology
Inorganic Chemistry
Advisor: Christopher C. Cummins
B.S. 2006
California Institute of Technology
Chemistry

I was born and raised in sunny Miami, Florida. My introduction to the sciences truly began in high school at the Maritime and Science Technology Academy in Key Biscayne, Florida. I was given the opportunity to delve deep into chemistry and pursued an internship at the Rosenstiel School of Marine and Atmospheric Science at the University of Miami under the guidance of Professor Anthony J. Hynes. There I studied rotational energy transfer in the hydroxyl radical using laser-induced fluorescence (LIF) spectroscopy as my independent project, but I was also exposed and contributed to a range of other LIF studies in the lab measuring the rate constants of atmospherically relevant reactions. This led to participation in the Siemens Westinghouse Science Talent Search and the INTEL International Science Fair, and set the stage for my acceptance to California Institute of Technology as an undergraduate in 2002. I was the first member of my family to attend college.

I entered Caltech thinking I was a physical chemist, but discovered through lab courses that my true passion was in synthesis. I eventually joined the lab of Professor Jonas Peters and studied the electrocatalytic generation of H_2 using cobaloxime complexes with Dr. Xile Hu, now a professor at the École Polytechnique Fédérale de Lausanne. Both Jonas and Xile were instrumental in teaching me the tools and techniques of inorganic synthesis and helping me to develop as a creative chemist, preparing me for my graduate studies at Massachusetts Institute of Technology, which I started in 2006.

I was fortunate to pursue my Ph.D. dissertation

with Professor Christopher “Kit” Cummins at MIT. Under Kit’s guidance I studied a range of transition metal-mediated transformations of main group molecules, with a particular focus on group XV (P, As). A highlight of this research was the first solution synthesis

of the tetraatomic molecule AsP_3 . My experience at MIT taught me the value of persistence and of thinking outside the traditional synthetic toolbox—skills that were put to immediate use during my postdoctoral work on inorganic nanomaterial synthesis at Columbia University in 2010.

My years at Caltech, MIT, and Columbia have taught me that scientific discoveries of greatest impact will occur at the interfaces of the traditional scientific disciplines. I bring that outlook to my research at the UW. I am thrilled to have joined one of the strongest chemistry departments in the country; I intend to uphold the tradition of

amazing science that this department has established.

The Cossairt lab is a synthetic inorganic chemistry group focused on building up molecules and materials for targeted applications in light harvesting and catalysis. Using the tools and methods of inorganic and main-group synthesis we will synthesize new III-V nanostructures and clusters and design bifunctional electrocatalyst-nanoparticle composites. Along the way we will prepare new molecular precursors, create new synthetic methodologies, and develop a complete toolbox for tailoring nanoparticle surfaces. A diverse array of characterization techniques including optical spectroscopy, electrochemistry, NMR, electron microscopy, and x-ray diffraction will allow us to analyze our new compounds and direct future synthetic strategies.



Courtesy of Brandi Cossairt

Faculty Introductions, continued

Lutz Maibaum Assistant Professor

Ph.D. 2005
University of California, Berkeley
Physical Chemistry
Advisor: David Chandler
Diplom, 2001
University of Düsseldorf
Physics

As an undergraduate at the University of Düsseldorf, German-native Lutz Maibaum participated in an exchange program with the University of California, Davis. Having enjoyed his time in California, he pursued a scholarship to study for a year at the University of California, Berkeley, where he met his future wife. Lutz isn't shy to admit that she had an influence on his decision to return to Berkeley for graduate studies.

Lutz is a chemist as a result of international differences in compartmentalizing science. In Germany, he was a physicist; at UC Berkeley, he joined Professor David Chandler in theoretical physical chemistry. His graduate work focused on creating computational simulations of the statistical behavior of super-cooled fluids as well as simulations of the hydrophobic effect and solvation in simple fluids. Lutz then joined UC Berkeley professors Phil Geissler and Daniel Fletcher as a postdoctoral research associate to model lipid bilayer interactions with actin in the cytoskeleton, fueling his interest in using physical chemistry to solve biological problems.

Lutz continued his postdoctoral research for two more years with Professor Vijay Pande at Stanford University. He developed methods of analyzing large amounts of data generated by Pande's well-known protein folding simulator, Folding@home. This software can be downloaded to any computer, running behind the scenes to form a distributed supercomputer that increases the ability of Pande's group to understand how proteins fold. (Visit folding.stanford.edu to learn more.)

Lutz's impression that Seattle is a cool place was confirmed upon his first visit for the UW interview. Both Seattle and the Department of Chemistry felt like a place he could feel "very much at home," since he knew that the people here were doing very good

science, and the proximity to water and mountains was a natural transition after spending ten years in the Bay Area.

Now entering its second year at the UW, Lutz's research group studies the dynamics of protein aggregation in the lipid bilayers of cell membranes. Using computer simulation, the group intends to learn more about how the interaction of a single protein with the bilayer causes deformations that increase the potential for additional proteins to aggregate there as well—a process vital for the formation of many important cellular structures.

A major accomplishment in Lutz's first year at the UW was that he secured funds from the Student Technology Fee (STF) Committee to double the power of the Department's computer cluster, benefitting all of the students who do computational work. Lutz presented his proposal to the STF Committee of six undergraduate and three graduate students and "was very impressed by the way [the proposal process] is run. It was a very good experience," he recalls.

Lutz and his wife Julieta enjoy day hikes, but are now limited to how far they can go by their one-year-old daughter, Amelie. They have always enjoyed dining at the many restaurants Ballard has to offer, but just like on their day hikes, Amelie seems to be in charge of deciding where they go.



Courtesy of the Department of Chemistry

Stefan Stoll

Assistant Professor

Ph.D. 2003
Eidgenössische Technische Hochschule Zürich
Biophysical, Materials, Physical Chemistry
Advisor: Arthur Schweiger

Diplôme d'Ingénieur, 1998
Technische Universität Graz
Chemical Engineering

Stefan was born and raised in a German-speaking region of northern Italy near the Dolomites, a mountain range in the Eastern Alps famous for skiing. He attended Technische Universität (TU) Graz for his undergraduate work in chemical engineering.

Graz is Austria's second largest city (Vienna is the largest) and has a population about half the size of Seattle. In addition to his studies at TU Graz, Stefan commuted to the Academy of Music to work on a Master's of Performing Arts in Music (flute). There were times when he would set up a chemical reaction, bike to a chamber music rehearsal, and then bike back to the lab to finish his experiment. Keeping that type of schedule, he says, "only works in a small town." Before deciding to start graduate work at Eidgenössische Technische Hochschule (ETH) Zurich, he was a free-lance flautist, playing with the Vienna Philharmonic Orchestra, among others.

Stefan's Ph.D. advisor, the late Professor Arthur Schweiger, was part of a strong magnetic resonance tradition at ETH, evidenced by two Nobel Prize awards to ETH in this field since 1991. For his Ph.D., Stefan developed new methods for simulating and interpreting electron paramagnetic resonance (EPR) data, publishing a freely available and now widely used software package called EasySpin. Stefan then stayed on at ETH as a research associate.

Twice, Stefan took leave from ETH to work at the Weizmann Institute of Science in Israel as a Visiting Scientist. Working and living in Israel was a very valuable cultural experience for Stefan, because the

work environment differed greatly from Switzerland. In his free time, he had the opportunity to explore Israel from the ski resort in the mountains by the northern border with Lebanon to the tropical Red Sea in the south.

For an overseas experience, Stefan joined Professor R. David Britt's lab at University of California, Davis as a postdoctoral researcher where he left behind methods and theory and went into actual practice, using EPR to elucidate structure and mechanisms involving the shuttling of unpaired electrons in proteins and enzymes.

His current research at the UW "revolves" around unpaired electrons. His group works on elucidating structure and function of spin centers in their diverse roles in both natural and human-designed molecular

systems, using EPR spectroscopy as a central tool. The group studies biological materials, such as an enzyme responsible for repairing DNA, as well as materials for energy conversion—both types of compounds utilize unpaired electrons. The group also works to develop improved theory, software, and hardware to gain faster, more detailed, and more robust results through increased sensitivity and resolution of measurements and increased reliability and ease of data interpretation.

In his spare time, Stefan enjoys playing music, dancing, cooking, hiking and mountaineering, and skiing. Since he is still fairly new to the Pacific Northwest, Stefan is still discovering both the Cascades and Olympic Mountains. If you have any suggestions for Stefan for places to hike or ski, he asks that you e-mail him at stst@uw.edu.



Courtesy of the Department of Chemistry

Graduation 2012

The Departments of Chemistry and Biochemistry held their annual graduation celebration on Friday, June 8, 2012, at Daniels Recital Hall in downtown Seattle. Harry B. Gray, Arnold O. Beckman

Professor of Chemistry at the California Institute of Technology and Founding Director of the Beckman Institute, gave the commencement address, urging students to pursue their passion.

A total of 357 students earned Bachelor's degrees in the last academic year—103 in Chemistry (including 15 ACS certified degrees) and 254 in Biochemistry. Of the 2012 graduating class, 54% were male and 46% were female; about one-third of these graduates go on to professional school (dental, pharmacy, medical), about one-fifth plan to attend graduate school, while the balance pursue a wide range of other post-graduate activities.

Courtesy of Kimberly Quigley



Professors Harry Gray (left, Caltech) and Tom Spiro (UW)

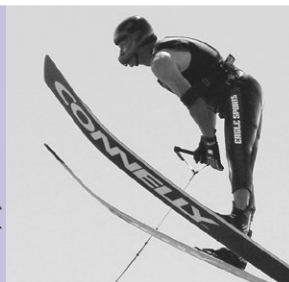
Staff Accolades: Brian Holm

Brian Holm, Program Operations Manager of the Department of Chemistry Facilities and Machine Shop,

recently placed first in the Men's "5 Jump" event of the 70th GOODE Water Ski National Championships. The Championships took place in August in West Palm Beach, Florida. Brian jumped a total distance of 142 feet, out-jumping the second-place finisher by 11 feet. Over the past decade, Brian has placed in the top ten in the National Tournament seven times. He is currently ranked #1 on the National Standings List and #1 on the World Standings List for waterskiing in his age group. Congratulations, Brian!

Scores, daily recaps and photo galleries can be found at www.waterskinationals.com.

Courtesy of Brian Holm



In Memoriam: Yeshayau Pocker, Professor Emeritus

Some Friends of Chemistry may not be aware that Professor Emeritus Yeshayau Pocker passed away in March 2010. Affectionately known as "YP," Professor Pocker was a mechanistic organic chemist who joined the UW Department of Chemistry in 1962. His research dealt with reaction mechanisms, molecular rearrangements, isotope effects, chemical and enzymatic catalysis, and organometallics.

Professor Pocker was best known for his work on carbonic anhydrase, a crucial metalloenzyme involved in interconverting CO₂ and carbonic acid. He reported that carbonic anhydrase II is "promiscuous," as it also has weak esterase activity. This work was done in the early 1960s; Professor Pocker remained interested in this enzyme for the rest of his career. He retired in 1999.

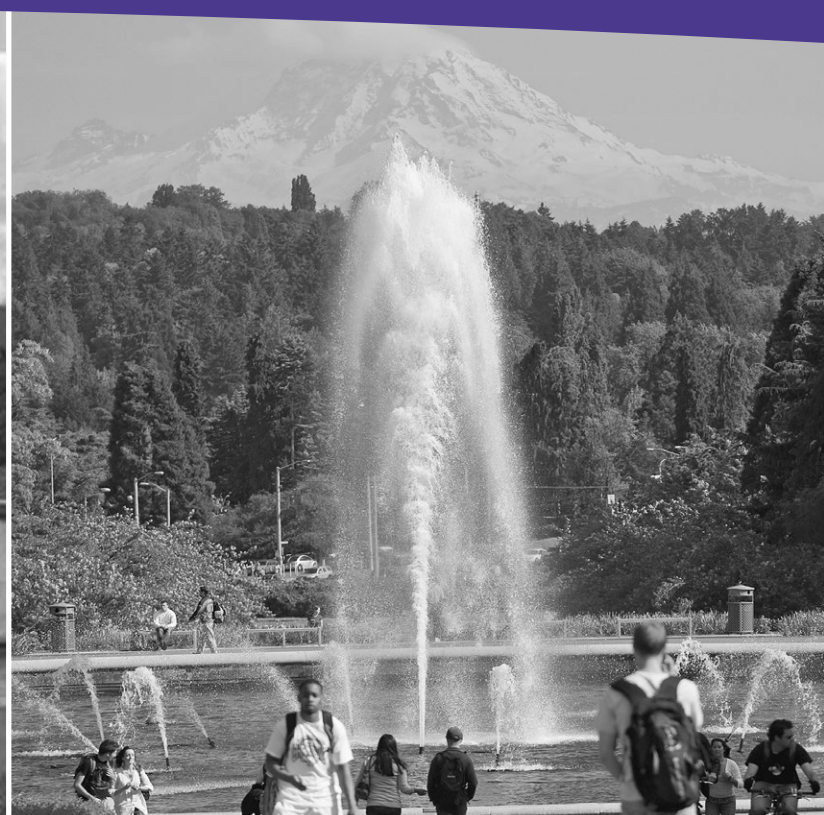
His former students remember him as a "superb lecturer," "perfectionist," and "magnificent teacher and role-model," who gave "crystal clear explanations," and had a sense of humor; one student shared that he "changed my life," another called him a "mensch: an honorable, decent, authentic person." Another student fondly remembers him singing "Don't worry, just study," his personal variation on Bobby McFerrin's tune.

Greg Spyridis expresses the sentiments of many when he shares that he "came out of [Pocker's] research group knowing not only how to do research, but also how to conduct literature searches, write grant proposals, and give presentations." Spyridis recalls that "Professor Pocker did not publish a paper with you; you published a paper with Professor Pocker and in the process learned how to conduct good science."

Bruce Ronald, Ph.D., (Emeritus Professor of Chemistry, Idaho State University) former YP student remembers, "All of us were humbled by the thought often expressed amongst his research group that YP had probably forgotten more chemistry than we would ever hope to know in our lifetimes."

Professor Pocker was a mentor and inspiration to all that he taught over the course of his lengthy career.

THEN & NOW



Drumheller Fountain then and now; left: looking south; right: looking southwest toward Mt. Rainier

Throughout 2012, Seattle has been celebrating the 50th anniversary of the 1962 World's Fair. We thought you might enjoy a look back at what the Department of Chemistry was like then and how it has changed in the last 50 years.

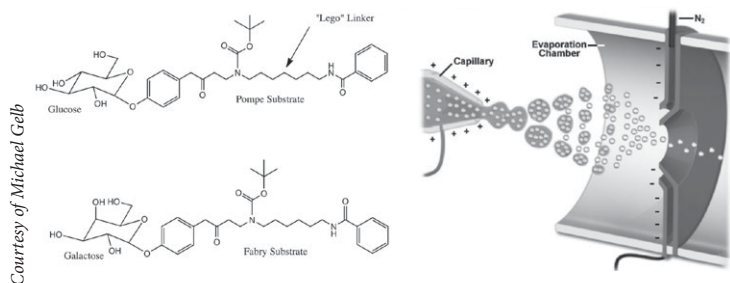
	1962	2012
Full-time faculty	24	34 plus 3 lecturers
Teaching assistants	50+	120
Students enrolled in chemistry courses	2,700	5,200
Undergraduate chemistry majors	180	1,000+
Graduate students	142	178
Postdoctoral research associates	10	65
New faculty hires	Yeshayau Pocker and Leon Slutsky	Brandi Cossairt
Physical space	Bagley Hall, looking to expand to the 4th floor (above the College of Pharmacy)	All floors of Bagley Hall plus the Chemistry Building (built in 1992) and much of the Chemistry Library Building

Newborn Screening

The research groups of Professors Michael Gelb, František Tureček, and C. Ron Scott have developed new techniques for the screening of genetic diseases in newborns. Recently, several states have added these screenings to the list of mandatory tests for newborn children—in large part, due to the efficient and inexpensive nature of the techniques developed by the UW team.

The team's research in medicinal enzymology spans a wide variety of enzymatic systems, but recent developments in the screening for lysosomal storage diseases have been making headlines. Lysosomal storage diseases (LSDs) are a group of about 50 rare inherited metabolic disorders that result from defects in lysosomal function. While each specific disease only affects about 1 in 100,000 people, they occur as a group at an approximate rate of once in every 10,000 to 15,000 people. The cell's lysosome helps to process unwanted materials into substances that the cell can use. Lysosomal disorders trigger when particular enzymes in the lysosome are missing or low and cause unwanted substances to build up in cells. LSDs mostly affect children, who often die at a young and unpredictable age, many within a few months or years of birth. Many other children die of this disease following years of suffering from various symptoms of their particular disorder. Many of these diseases have become treatable either by enzyme replacement therapy or by bone marrow transplantation. Halting the disease progression is most dramatic when treatment is started early in life. Thus, expanding newborn screening programs to include LSDs is on the rise.

The UW team is developing the use of tandem mass spectrometry for the direct assay of several lysosomal enzymes. The advantage of mass spectrometry is that many enzymes can be analyzed in a single infusion. The technique is exquisitely sensitive and rapid, and it is made quantitative by the use of internal standards. The UW team has developed a multiplex assay of nine lysosomal enzymes using dried blood spots on newborn screening cards as the source of enzymes. The assay is now used in New York State for screening for Krabbe disease and is being set up in Illinois, Austria, and Taiwan for screening for Fabry, Gaucher, Krabbe, Niemann-Pick-A/B, and Pompe diseases. Efforts continue in the UW laboratories to develop assays for other lysosomal storage diseases as well as other genetic diseases.



The image shows a newborn screening card with dried blood spots (upper right) taken from a newborn's heel. These dried blood spots are used for detection of serious genetic diseases that can best be treated if caught early in life. Without newborn screening, babies go undiagnosed for months and often die before a cause is determined. The laboratories of Michael Gelb and František Tureček (UW Chemistry) and C. Ron Scott (UW Medicine) have developed newborn screening technology for lysosomal storage diseases using mass spectrometry. Enzyme substrates have been designed (some of which are shown in the lower left panel) that are acted upon by enzymes in the dried blood spot to generate enzyme products that are detected by mass spectrometry (schematically shown in the lower right panel). These new assays are being adopted in newborn screening programs worldwide.

Wenkel Liang

Wenkel Liang recently completed his doctoral studies in chemistry with Associate Professor Xiaosong Li, successfully defending his dissertation and earning his Ph.D. in June 2012.

Wenkel's research in the Li group focused on developing computer simulations to model time-dependent electronic dynamics of molecules. This field of research is particularly challenging because it is difficult to confirm results experimentally, as the work involves modeling the perturbations of molecules such as NO^+ when stimulated using a very strong laser. Wenkel was also working to introduce real-time dynamic calculations for solvation effects and to model the effectiveness of functionalized Bucky balls (C_{60}) for potential application in cost-effective organic solar cells.

"Energy is always a concern, and people want to come up with new materials," says Wenkel, who described the theme of his graduate work as "Solving the World's Energy Problems... Virtually." He is now exploring practical applications of the computational modeling he learned as a graduate student in his job at Simulations Plus, Inc. in Lancaster, CA, where he develops applications using artificial neural network ensembles.

Wenkel is from Chengdu, China, the capital city of the southwestern province Sichuan, a region known in this country for Szechuan cuisine and the giant panda. He graduated from Sichuan University.

In 2006, Wenkel came to the United States for the first time as an exchange student through a program between the UW and Sichuan University. Coincidentally, Washington and Sichuan are twin states, a relationship that was established in 1982.

The four-year exchange program pairs student cohort groups, each visiting the partner university for three to four quarters of study. During his junior year, Wenkel came to the UW to study in the Department of Materials Science and Engineering. After meeting Professor Xiaosong Li, who Wenkel found to be a "bright, talented, energetic, and passionate new junior



Courtesy of Wenkel Liang

Wenkel Liang

faculty member," he decided to pursue his graduate studies in chemistry.

In the fall of 2007, Wenkel joined Li's group. This was Wenkel's first computational research experience. Prior to that time, he had been an experimentalist. "It was a very nice experience," Wenkel says of computational research, "Somehow I didn't continue on the experiment path." Wenkel was happy to trade in the difficulty of booking time on lab equipment for a computer to do his research virtually.

In addition to his research, Wenkel was a TA for a variety of undergraduate courses. Although he was a tutor in China, this was his first classroom teaching experience, from which he learned how to convey his knowledge to a larger group of students.

Wenkel has published 18 papers over the last five years. Last year, he presented a poster at the 242nd American Chemical Society National Meeting in Denver.

Wenkel and his wife, a UW alumna whose family is also from Chengdu, returned to Chengdu in July for a traditional Chinese wedding ceremony. They enjoy travelling around the United States and plan to visit New York and Hawaii. Wenkel is glad he doesn't have to "hurry back" to China. He plans to work in the United States for a few years, and then decide whether moving back to China is the right decision.

GRADUATE FELLOWSHIPS & AWARDS

left to right:
Stephen Oja,
Dane de Quilettes,
Sarah Vorpahl



Courtesy of the Department of Chemistry

Madhumitha Balasubramanian

Usha and S. Rao Varanasi Endowed Fellowship in Chemistry

James Bollinger

2011–2012 Outstanding Teaching Assistant Award

Erika Buckle

Howard J. Ringold Endowed Fellowship in Chemistry

Dane de Quilettes

Advanced Materials for Energy Distinguished Energy Fellowship

Alvin L. Kwiram Council for Chemical Research Fellowship in Chemistry

Megan Duda

2011–2012 Outstanding Teaching Assistant Award

Thomas Edwards

Edwin and Phyllis Motell Endowed Fellowship in Chemistry

Sarah Flowers

George and Agnes Irene Cady Endowed Fellowship in Chemistry

Sonam Ghag

Rowland Endowed Fellowship in Chemistry

Joshua Goings

Natt-Lingafelter Endowed Fellowship in Chemistry

Jonathan Goldberg

David M. Ritter Endowed Fellowship in Chemistry

Christopher Gunderson

Faculty Endowed Fellowship for Graduate Study in Chemistry

Kimberly Hartstein

A. Bruce Montgomery Endowed Fellowship in Chemistry

Chelsea Hess

2011–2012 Outstanding Teaching Assistant Award

Kenneth Laszlo

ARCS Foundation Seattle Chapter Fellowship

Jason Lee

George Hitchings Endowed Fellowship in Chemistry

Patrick Lestrange

Benton Seymour Rabinovitch Endowed Fellowship in Chemistry

David Lingerfelt

Benton Seymour Rabinovitch Endowed Fellowship in Chemistry

Dmitry Liskin

2011–2012 Outstanding Teaching Assistant Award

Heidi Nelson

Ed F. and Clara M. Degering Fellowship in Chemistry

Stephen Oja

Tomas Hirschfeld Endowed Fellowship in Chemistry

A. Bruce Montgomery Endowed Fellowship in Chemistry

Brooke Reaser

Eugene S. Mindlin Endowed Fellowship in Chemistry

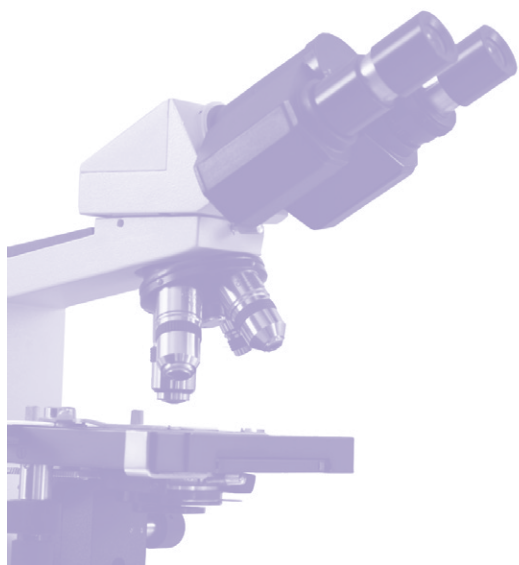
Sarah Vorpahl

Advanced Materials for Energy Distinguished Energy Fellowship

Faculty Endowed Fellowship for Graduate Study in Chemistry

Mark Ziffer

Lewis R. and Joan M. Honnen Endowed Fellowship



DOCTORAL DEGREES AWARDED

September 2011–August 2012

Simeon Andrews, Ph.D. Chemistry

Label Transfer Reagents for the Investigation of Protein Kinase Complexes
(Associate Professor Dustin Maly)

Eric Bott, Ph.D. Chemistry

Unraveling Dispersed Kinetics within Single Organic Dye Molecules in Crystal Hosts
(Professor Philip Reid and Professor Bart Kahr, New York University)

Natalia Doubina, Ph.D. Chemistry

Synthesis of Externally Initiated Poly (2-alkylthiophene) via Kumada Catalyst Transfer Polymerization
(Professor Alex Jen, Materials Science & Engineering)

Matthew Durban, Ph.D. Chemistry

N-Type Naphthalene Diimide Copolymers: Synthesis, Characterization, and Device Studies
(Associate Professor Christine Luscombe, Materials Science & Engineering)

David Essaka, Ph.D. Chemistry

Ultrasensitive Analysis of Single Neurons Using Capillary Electrophoresis with Laser Induced Fluorescence
(Professor Norman Dovichi, University of Notre Dame)

Lewis Johnson, Ph.D. Chemistry and Nanotechnology

Multi-scale Modeling of Organic Electro-Optic Materials
(Professor Bruce Robinson)

Ilya Kosilkin, Ph.D. Chemistry

Organic Materials for Electro-Optic and Optoelectronic Applications: Understanding Structure—Property Relationships
(Professor Emeritus Larry Dalton)

Ratika Krishnamurty, Ph.D. Chemistry

Chemical Probes to Investigate Protein Kinase Function and Dynamics
(Associate Professor Dustin Maly)

Yihan Li, Ph.D. Chemistry

Capillary Electrophoresis-Electrospray Mass Spectrometry Based Proteomic Analysis
(Professor Norman Dovichi, University of Notre Dame)

Wenkel Liang, Ph.D. Chemistry

From Geometry Optimization to Time Dependent Molecular Structure Modeling: Method Developments, ab initio Theories and Applications
(Associate Professor Xiaosong Li)

Dmitry Liskin, Ph.D. Chemistry

Oxidative Difunctionalizations of Alkenes
(Associate Professor Forrest Michael)

Bradley MacLeod, Ph.D. Chemistry and Nanotechnology

Probing Buried Interfaces within Organic Diodes Using Electromodulated Transmittance Spectroscopies
(Professor David Ginger)

Jennifer Maki, Ph.D. Chemistry

Chemical Strategies to Enrich Malarial Proteins from Wheat Lysate
(Professor Pradipsinh Rathod)

Joshua Patterson, Ph.D. Chemistry

Time-Resolved Absorption Studies of the Environmental Dependent Photochemistry of Chlorine Dioxide and Nitrosyl Chloride
(Professor Philip Reid)

Gayani Perera, Ph.D. Chemistry

Chemical Proteomic Tools for Studying Protein Kinase Active Sites
(Associate Professor Dustin Maly)

Carolyn Rosewall, Ph.D. Chemistry

Palladium-catalyzed Oxidative Fuctionalization of Alkenes, Arenes and Alkanes; Reactivity, Scope, and Mechanistic Insights into the Palladation of Aminoalkenes and Activation of sp^2 and sp^3 C-H Bonds
(Associate Professor Forrest Michael)

Katherine Schultz, Ph.D. Chemistry

Investigations of Iridium Pincer Complexes Towards Alkane Activation
(Professor D. Michael Heinekey)

Anthony St John, Ph.D. Chemistry

Dehydrogenation of Boron-Nitrogen Bonds and anti-Markovnikov Hydroamination Studies
(Professor Karen Goldberg)

Cynthia Stanich, Ph.D. Chemistry

Coarsening Dynamics of Domains in Lipid Membranes
(Professor Sarah Keller)

Tristan Tronic, Ph.D. Chemistry

Understanding Proton Shuttling with Pendent Bases in Catalyzing the Interconversion of Dioxygen and Water
(Professor James Mayer)

Stephanie Vasko, Ph.D. Chemistry and Nanotechnology

Exploring Atomic Force Microscope Induced High Field Chemistry for Semiconductor Direct Write
(Associate Professor Marco Rolandi, Materials Science & Engineering)

Michael White, Ph.D. Chemistry

Electronic Structure and Auger Interactions in Semiconductor Nanocrystals
(Professor Daniel Gamelin)

Ryan Wilson, Ph.D. Chemistry

Novel Injection Techniques to Enable Fast, High Peak Capacity Gas Chromatography Separations
(Professor Robert Synovec)

Brian Wolfe, Ph.D. Chemistry

The Diagnosis of Lysosomal Storage Disorders by Measuring Enzyme Activity Using Tandem Mass Spectrometry
(Professor František Tureček)

Diane Zhong, Ph.D. Chemistry

Solar Water Oxidation by Composite Cobalt-Based Catalyst/Oxide Semiconductor Photoanodes
(Professor Daniel Gamelin)



UNDERGRADUATE STUDIES HIGHLIGHTS

The undergraduate programs in chemistry and biochemistry have produced a bumper crop of award-winning students this year. We would like to take this opportunity to highlight their successes!

Amgen Scholars

The Amgen Scholars Program provides hundreds of undergraduate students nationally with the opportunity to engage in a hands-on summer research experience at some of the world's leading institutions. **Chinonso Opara** is a junior in the Department of Biochemistry. Over the summer, he worked in the Medicinal Chemistry lab of Professor William Atkins on developing a novel method of quantifying the concentration of quantum dots, using various biophysical techniques. Quantum dots are small nanoparticles that fluoresce under ultraviolet light, and have several applications ranging from enhancing LED lighting to cellular imaging and drug delivery. **Guillermo Romano** is a senior working on a double degree in public health and biochemistry. This summer, he worked in the chemistry lab of Professor Dustin Maly to synthesize a small molecule capable of profiling sarcoma family kinases. **Denis Smirnov** is a junior studying biochemistry and neurobiology. He is working with Assistant Professor Champak Chatterjee to investigate the ubiquitin-like protein degradation pathway in *Mycobacterium tuberculosis*, through mechanistic studies of the ligase enzyme PafA. His research is aimed at determining the substrate scope of PafA using novel chemical tools to monitor enzyme activity.

Top Graduating Seniors 2012

Congratulations to **Michael Choi**, **Jacob Baudin**, **Tim Janetos**, **Benjamin Matson**, and **Elizabeth Carlson** for being the Department of Chemistry's top graduating seniors in June 2012!

Goldwater Scholars

Congratulations to senior **Michael Bocek** who was awarded the prestigious Barry M. Goldwater Scholarship. Michael is a biochemistry major who has done

research in the Department of Bioengineering involving the design and evaluation of polymer-based vectors to deliver therapeutic genes to neurons. After graduating in 2013, Michael plans to pursue a Ph.D. in bioengineering, focusing on engineering bio-materials. Afterwards, he hopes to go on to a scientific research career, either in academia or industry. We would also like to congratulate **Evan Boyle '11** and senior **Derek Nhan** who received honorable mention for the Goldwater Scholarship.

Timeless Future Award

Congratulations to Biochemistry major **Kenji Fujitani** who received a Timeless Future Award from the UW College of Arts & Sciences. As part of the UW 150th anniversary celebration, the College of Arts & Sciences recognized outstanding undergraduate and graduate students with Timeless Future Awards. These awards are designed to honor graduating A&S students who have made outstanding contributions to society through their academic achievements, leadership, excellence in the arts and sciences, and service to the greater community.

Rhodes Scholarship

Cameron Turtle '12, who conducted research in the Keller chemistry group and in bioengineering, was selected for the prestigious Rhodes Scholarship. The scholarship provides full financial support for scholars to study at the University of Oxford in the United Kingdom. Cameron majored in bioengineering. His research in the Keller group involved studying the two-dimensional phase separation in lipid membranes. Cameron's project was to incorporate charged lipids into the membranes and study the membranes' miscibility transition temperatures. Among his various accolades, Cameron is a Mary Gates Scholar as well as a Goldwater Scholar. He co-founded Bioengineers Without Borders, and is also founder and CEO of Point of Care Technologies.

Washington Research Foundation Fellowships

Michael Choi '12, Benjamin Horst, and Kwang Kim have each won a Washington Research Foundation Fellowship.

Michael Choi has been investigating embryonic stem cells and stem cell maintenance in the Ruohola-Baker laboratory, focusing on the metabolism of embryonic stem cells and how it relates to their function. Stem cells play a critical role in development and disease; by better understanding how these cells function in both normal and pathological conditions, scientists can learn how to control, treat, and cure disorders.

Benjamin Horst works in the Keller chemistry group refining a new fabrication technique for the formation of vesicles. He will be starting a new project aimed at determining how the miscibility temperature of lipid membranes varies with lipid composition as the surface pressure is held constant.

Kwang Seob Kim's project with Dr. Ludo Max aims to better understand the central nervous system function in speech and non-speech movements, as well as the neural mechanisms underlying stuttering. The goal of his project is to design a protocol to quantify the ability of the speech sensorimotor systems to learn a completely novel sensorimotor mapping. This protocol has the potential not only to enhance our knowledge of motor learning, but also to improve the rehabilitation of individuals with movement disorders.

iGEM Competition

A team of 23 UW undergraduate science majors won the grand prize at the international Genetically Engineered Machine (iGEM) Foundation competition held in November 2011. This win, which followed a first-place finish at the Americas regional competition, marks the first time a U.S. team has won this international competition in synthetic biology. The UW team comprised students from a variety of science and engineering disciplines, including seven biochemistry and chemistry students: **Casey Ager, Ju Hye An, Sydney Gordon '12, Elaine Lai, Austin Moon, Seth Sagulo '11, Sarah Wolf, Sean Wu, and Lei Zheng.** Team members spent several months designing and developing genetically engineered components for use in living systems to produce the primary components of diesel fuel and improve gluten degradation in the digestive system, resulting in a presentation titled "Make It or Break It: Diesel Production and Gluten Destruction, the Synthetic Biology Way." The team was mentored by UW students and faculty members from several disciplines, including graduate students Justin Siegel, Jeremy Mills, and Chris Eiben and Professor David Baker, all from the Department of Biochemistry.

Teach for America

A handful of recent chemistry majors have made post-graduation commitments to teach in under-resourced public schools for two years through the Teach for America program. **Gedion Yitref '12** just started his first year teaching in Chicago, while 2011 graduates **Alexandra Herndon** and **Rudy Sharar** are entering their second year of teaching in Chicago and Oakland, respectively. Other recent Teach for America alumni include **Chris Eide '02** and **Vanessa Palmer '08**. Thanks, Huskies, for effecting change in American schools.



Mona Pitre-Collins



Mary Levin



Mona Pitre-Collins



Mona Pitre-Collins

left to right: Michael Bocek, Cameron Turtle, Evan Boyle, Derek Nhan

UNDERGRADUATE FELLOWSHIPS & AWARDS

Casey Ager

iGEM World Championship

Ju Hye An

iGEM World Championship

Jacob A. Baudin

Merck Index Award

Michael J. Bocek

Amgen Scholar

Barry M. Goldwater Scholarship

Elizabeth A. J. Carlson

American Institute of Chemists Foundation Award

Michael A. Choi

Merck Index Award

Washington Research Fellowship

Sarah Jane Egler

Hyp Dauben Award

Kenji Fujitani

Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry
Timeless Future Award

Sydney Gordon

iGEM World Championship

Mary Gates Research Scholar

Angela Hess

Mary Gates Research Scholar

ACS Outstanding Analytical Student Award

Benjamin Horst

Washington Research Fellowship

Tim M. Janetos

Merck Index Award

Robert W. Johns

Nanotechnology Research Award

ACS Outstanding Inorganic Student Award

Kwang Seob Kim

Washington Research Fellowship

Elaine Lai

iGEM World Championship

Calvin Le

CRC Freshman Achievement Award

Jason Lyou

Mary Gates Research Scholar

Benjamin D. Matson

American Institute of Chemists Foundation Award

Abigail Mazon

Mary Gates Research Scholar

Mathini Mohanachandra

Mary Gates Research Scholar

Austin Moon

iGEM World Championship

Marvin Nayan

Levinson Emerging Scholar

Chinoso Opara

Amgen Scholar

Galen Pizzorno

Amgen Scholar

Mary Gates Research Scholar

Brett Plancich

P.C. Cross Award

Seth Sagulo

iGEM World Championship

Max Schumm

Mary Gates Research Scholar

Rudy Sharar

Arts & Sciences Undergraduate Research Award

Hunter J. Sismaet

Hypercube Scholar

Denis Smirnov

Amgen Scholar

Hyp Dauben Award

Mary Gates Research Scholar

Matt Sonnett

Mary Gates Research Scholar

Alexandra Taipale

Levinson Emerging Scholar

Lancy Mimi Tan

Mary Gates Research Scholar

Andrew Tiegen

Mary Gates Research Scholar

Keiko Weir

Mary Gates Research Scholar

Sarah Wolf

iGEM World Championship

Sean Wu

iGEM World Championship

Roger Ying

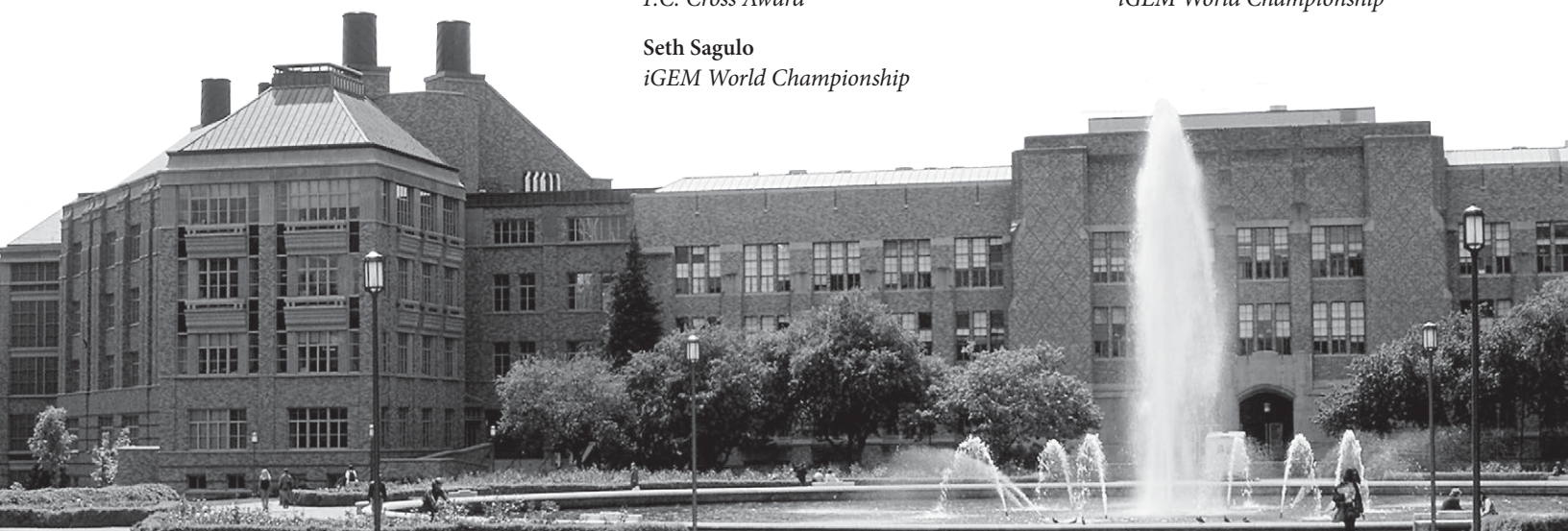
Mary Gates Research Scholar

Gedion Yitref

Amgen Scholar

Lei Zheng

iGEM World Championship



FACULTY AWARDS & HONORS



AJ Boydston

*Young Investigator Program Award,
U.S. Army Research Office*

Daniel Chiu

*Fellow, American Association for the
Advancement of Sciences*

Larry Dalton

*Elected Member, Washington State
Academy of Sciences*

Daniel Gamelin

*2011–2012 Dalton Lecturer, University
of California, Berkeley*

*2012 Inorganic Nanoscience Award,
ACS Division of Inorganic Chemistry*

*Fellow, American Association for the
Advancement of Sciences*

*Scialog Solar Energy Conversion Award,
Research Corporation*

Michael Gelb

*Elected Member, Washington State
Academy of Sciences*

David Ginger

*Burton Award, Microscopy Society
of America*

*Scialog Solar Energy Conversion
Award, Research Corporation*

*Fellow, American Association for the
Advancement of Sciences*

Karen Goldberg

*Fellow, American Association for
the Advancement of Sciences*

*Elected Member, Washington State
Academy of Sciences*

**top row, left to
right: Munira
Khalil, Daniel
Gamelin; right:
Bo Zhang**



Courtesy of the Department of Chemistry

D. Michael Heinekey

*Fellow, American Association for
the Advancement of Sciences*

Alex Jen

Fellow, Materials Research Society

Sarah Keller

Fellow, American Physical Society

*Fellow, American Association for
the Advancement of Sciences*

Munira Khalil

*Sloan Research Fellowship,
Alfred P. Sloan Foundation*

Alvin Kwiram

Fellow, American Chemical Society

Xiaosong Li

*ACS COMP OpenEye Outstanding
Junior Faculty Award*

*Sloan Research Fellowship,
Alfred P. Sloan Foundation*

Dustin Maly

Camille Dreyfus Teacher-Scholar

*Sloan Research Fellowship,
Alfred P. Sloan Foundation*

Bruce Robinson

*Fellow, American Association for
the Advancement of Sciences*

František Tureček

*Fellow, American Association for the
Advancement of Sciences*

*2012 Thomson Medal Award,
International Mass Spectrometry
Foundation*

Usha Varanasi

*Seattle Aquarium Conservation
Research Award*

Bo Zhang

*Sloan Research Fellowship,
Alfred P. Sloan Foundation*

Chair's Message, continued from page 1

the web before the quarter even begins! Misconceptions are corrected by student-to-student electronic connections, with the faculty member intervening only as needed when the students become stumped. This past year, Assistant Professor AJ Boydston experimented in his undergraduate sophomore organic course with online office hours. Large numbers of students were able to simultaneously video-chat with Professor Boydston, to ask him questions, and to see him work problems on an e-tablet. This allowed students to participate from home or Starbucks, avoiding a trip to campus. The program was a huge hit; I expect other faculty to adopt this technology soon.

Again this year our faculty and students won awards for their work. In December 2011, after the *ChemLetter* had gone to press, six members of the UW faculty were elected Fellows of the American Association for the Advancement of Science. Four of these were Chemistry faculty: Professors Daniel Chiu, Daniel Gamelin, Karen Goldberg, and Bruce Robinson. In March, three UW science faculty members were awarded prestigious Sloan Research Fellowships, and two of these were Chemistry faculty members: Assistant Professors Munira Khalil and Bo Zhang. In August, three members of our faculty, Professors Larry Dalton, Michael Gelb, and Karen Goldberg, were elected to the relatively new Washington State Academy of Sciences. Twenty-three of our UW undergraduate students, including many biochemistry and chemistry majors, enjoyed a particularly impressive victory last fall, taking first place out of more than 160 teams from around the world that competed in the field of synthetic biology. The UW team engineered two new organisms, one able to produce alkane components of diesel fuel and another that created a protease with high gluten-degrading activity, the latter potentially suitable for digesting gluten in the digestive track when taken in pill form. Even our staff were in the act this past year, with master machinist Brian Holm taking first place in his age category in the 70th annual GOODE Water Ski National Championships held in West Palm Beach, Florida, this past summer.

And finally, our center that specializes in the development of new homogeneous catalysts, the Center for Enabling New Technologies through Catalysis (CENTC) was recently renewed for a second five-year period by an allocation of an additional \$20,000,000 from the National Science Foundation. This center links UW faculty and postdoctoral and student researchers in this field with

their counterparts at partner institutions around the world. Professor Karen Goldberg, who leads the center, is joined in this activity by UW Chemistry faculty members D. Michael Heinekey and James Mayer. The Department continues to be home to two other major centers, the NSF-funded Center on Materials and Devices for Information Technology Research (CMDITR) and the NIH-funded International Center of Excellence for Malaria Research for South Asia.

It is exhilarating to laud the individual and collective accomplishments of our faculty and students, which are an indicator of the quality of our programs. But it is also important to remember the scale of our instructional programs. UW Chemistry has slightly more undergraduate students majoring in chemistry or biochemistry (over 1,000) than the entire undergraduate population of Caltech! Again last year we awarded an astonishing 350+ baccalaureate degrees in chemistry or biochemistry. The ceremony at which we honored these graduates was again held in downtown Seattle, in a venue able to accommodate the nearly 1,500 students and guests. We are extraordinarily proud of both the quality of what we do, and the scale on which we do it.

One theme of my recent messages has been the rising price of public higher education for students. At this institution the problem is not out-of-control spending, but rather the failure of the state-provided instructional budget to keep pace. The total UW instructional budget (composed of both tuition funds and the state contributions), on a per student basis, has grown at about the rate of inflation in the broader economy for the last 20 years. Because the state budget did not grow at this rate, tuition had to rise at a much higher rate. Students are thus paying a higher fraction of the total cost of their education, from about 20% a few decades ago to nearly 80% today. Nationally, about two-thirds of undergraduate students borrow money to complete a baccalaureate degree; among those who do, the average debt at graduation was about \$24,000. For UW students, the debt is somewhat lower. The interested reader will find a number of informative briefs on this general subject at the UW Office of Planning and Budgeting website (<http://opb.washington.edu/content/opb-issue-briefs>).

For the current academic year, undergraduate resident tuition rose by about 16%, bringing total mandatory tuition and fees at the UW to about \$12,500 per academic

year for resident undergraduates. This total remains below the average of our public peers, and just a small fraction of the tuition charged by elite private schools. The UW continues to provide an excellent education for a below-average price to students. Some of the new funds from the tuition increase will be used to cover inflationary costs: just like you, the UW has utility bills that rise with time. But some of the increase in this round is being invested as I described earlier, to improve the quality of undergraduate education, correcting damage inflicted in recent budget cuts.

Again this year I would like to close by thanking our many friends whose generous gifts are helping to support our programs. Your annual gift of even \$10 makes a difference for today's students. Your gift helps us to recruit and retain the outstanding faculty members who guide our students. Your gift helps us to support graduate students who participate in the instructional program as teaching

assistants, and who discover new knowledge in their role as research assistants. And your gift can help an undergraduate student cover the cost of tuition, perhaps reducing or eliminating the debt with which that student might otherwise have graduated. If you are already a donor, thank you! If you have never given, I hope you will ask yourself why that is, and choose to make that first gift. It's easy to do. Go to <http://depts.washington.edu/chem/>, then click on "Make a Gift" in the upper right corner, or use the form below and the enclosed envelope to mail us your check or credit card gift. Thanks for your support.

With very best wishes,



Paul B. Hopkins
Professor and Chair

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Your gift is critical to the success of Department of Chemistry programs. Public institutions increasingly rely upon gifts from alumni and friends that support excellence. With your help, we recruit and retain faculty and staff who provide an outstanding education to our students. Gift funds reward excellent students, and help them to cover the costs of higher education. Please consider supporting your Department of Chemistry.

—Paul B. Hopkins, Professor and Chair



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Use the enclosed envelope or send checks or money orders to:

Department of Chemistry
University of Washington
Box 351700
Seattle, WA 98195-1700

OUR DONORS, SEPTEMBER 2011–JUNE 2012

In recent years, we have seen a remarkable transition in publicly funded higher education. A decade ago, gift-derived funds played a small role in our programs, funding the occasional student fellowship or lecture. Today, we and other public universities are heavily reliant upon gift funds, with annual gifts and endowment-derived funds providing critical support for every aspect of our baseline teaching and research programs. Students, faculty, and staff are the beneficiaries of your gifts.

The Department of Chemistry is extraordinarily fortunate to have literally thousands of friends and alumni, a large fraction of whom contribute generously to our programs. We are deeply indebted to the donors named below. With your help, we are providing state of the art education to the current generation of students. Thank you! If your name is missing or misspelled we apologize and hope you will let us know.

If you are among our chemistry or biochemistry alumni who have never given back to the Department of Chemistry, we hope you will reconsider that choice. Our ability to help the current generation of students to achieve their dreams depends upon your gift. Thank you in advance for thinking of our students.

\$10,000 and above

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Dr. Joseph Bouknight (*D*)
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Professor Larry Dalton &
Dr. Nicole Boand
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Professor B. Seymour &
Mrs. Flora Rabinovitch
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Washington Research Foundation

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06-0418



ChemLetter

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UW Chemistry faculty, staff, students, and research associates share the excitement of chemistry with children and families each year during "Paws-on Science" Husky Weekend at the Pacific Science Center held this year on March 30–April 1, 2012. The Center for Enabling New Technologies through Catalysis (CENTC) and the Center on Materials and Devices for Information Technology Research (CMDITR) each organized booths for this event where the public can learn directly from scientists about their research.