ChemLetter

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Nancy Wade

Paul Hopkins, Chair

In this issue

Dear Friend of Chemistry,

I hope this edition of the *ChemLetter* finds you and yours well.

Since I last wrote to you we have experienced an historic loss. Professor Emeritus Benton Seymour Rabinovitch ("Rab"), who began his career at the University of Washington in the late 1940s, passed in early August at the age of 95. You will find a brief description of his life in this issue. Rab continued to be a presence in the Department long after his retirement in the mid-1980s, until very recently when his health declined. About a decade ago, I began referring to Rab as our "patriarch." Through contribution, compounded by longevity, he gently exerted a powerful and extremely positive influence over this department. His kind and thoughtful manner, and commitment to diversity, contributed to the welcoming environment that we all enjoy and benefit from to this day. Rab is gone, but his contributions and influence live on.

Just a week or so ago, I received an e-mail trumpeting yet another ranking of educational programs, this one from *graduateprograms.com*. Anyone who has studied the methods by which educational programs are ranked, be they attempts to quantify outcomes, or purely reputational, takes these rankings with a sizeable grain of salt. Nevertheless, I could not resist clicking on the link to reveal the rankings of U.S. chemistry graduate programs. Imagine my surprise at finding the Department of Chemistry at the University of Washington in the number one spot. What is significant is that this particular ranking derives from surveys of current graduate students, gauging their level of satisfaction with their graduate experience. It is extremely gratifying that our students rate their experience so favorably. Our faculty and staff deserve kudos for creating a supportive environment.

In previous issues, I have noted that the fourth of four freshman instructional laboratories is at last being renovated. This coming winter, for the first time since about 1940, all undergraduate students taking freshman chemistry at the University of Washington will perform their laboratory work in nearly new laboratory spaces. And what a difference the renovations have made: dark, noisy, crowded rooms have given way to bright, quiet, and spacious work spaces. With just one instructional laboratory left to renovate (until recently the home of our junior/senior level inorganic laboratory course), the question of what to do about the rest of Bagley Hall looms large. Our dean's office has recently agreed to work with us to explore the creation of a master plan for the Department's future space needs. We need to determine whether the better strategy is to continue with piecemeal renovations of now nearly 80-year old Bagley Hall, or to move some of our activities to newer spaces. Answering that question, and then acting on the plan, will no doubt take a decade or more, given financial realities.

The Chemistry faculty met recently to discuss the identity and order of topics we teach in freshman chemistry. The importance of choosing what we teach is obvious. It is perhaps less obvious why the order in which we teach it is important. Some constraints of topic ordering are straightforward: for example, a discussion of ionic and covalent bonding is necessary before one can understand the ions that exist in an aqueous solution of sodium nitrate. A less obvious, but equally important consequence

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IN MEMORIAM

Courtesy of the Rabinovitch family

B. Seymour Rabinovitch, Professor Emeritus
February 19, 1919–August 2, 2014

Benton Seymour Rabinovitch, Professor Emeritus of the Department of Chemistry, passed away peacefully on August 2. He was a distinguished scientist, beloved husband, father and grandfather, and a remarkable man. He was born in Montreal, Canada in 1919. His mother, Rochelle, came as a teenager from Botosani, Romania, and in Montreal met her future husband Samuel, who himself emigrated from Bessarabia. The youngest of Rochelle and Samuel's seven children, he attended McGill University, earning both his baccalaureate and doctoral degrees by the early age of 23. He immediately volunteered to join the Canadian Army, serving as captain in the Chemical Warfare Defence Laboratory from 1942 to 1946. He led a team of young scientists on the European Front, studying German munitions factories and battlefields as the Axis powers retreated and looking for violations of the Geneva Convention on Weaponry.

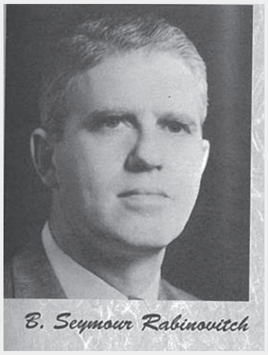
After the War, Dr. Rabinovitch was awarded a Milton Fellowship and a Royal Society of Canada Fellowship enabling him to conduct postdoctoral studies in physical chemistry at Harvard University. Dr. Rabinovitch joined the Department of Chemistry at the University of Washington in 1948. He married Marilyn Werby of Boston in 1949, and they made their home in Seattle. They had 24 years of joyful marriage, raising four children. After Marilyn's untimely death in 1974, Professor Rabinovitch married Flora Reitman of Montreal, Canada in 1980, and together they enjoyed more than 34 years of loving marriage, pursuing many mutual interests, including extensive travel.

Professor Rabinovitch taught and pursued research as a UW faculty member for nearly four decades. In his research career, he was a virtuoso of experimental physical chemistry; his work provided the first experimental verification of important theories of molecular dynamics and energy transfer within molecules in the gas phase. He received numerous prestigious awards for his scientific contributions, including the Peter Debye Award of the American Chemical Society and the Polanyi Medal of the Royal Society. He was a member of the American Academy of Arts and Sciences and a Fellow of the Royal Society, London. In 1991, he received an honorary doctorate of science from the Technion–Israel Institute of Technology. He served as an editor for the *Journal of the American Chemical Society*, and was chairman of the Division of Physical Chemistry of the American Chemical Society. Forty-one students earned the Ph.D. under his guidance. In 2005, the University established the B.S. Rabinovitch Endowed Chair of Chemistry in his honor.

After his retirement in 1986, Professor Rabinovitch explored a passion for silver serving pieces (especially fish slices) and their chemistry, publishing three authoritative volumes on this subject. In 2000, he was inducted into the Worshipful Company of Goldsmiths, London—a rare honor for someone not born in England. His personal collection of contemporary commissioned silver serving slices is now part of the permanent collection of the Victoria and Albert Museum in London. In recent years, he authored a children's storybook, *Higgledy Piggledy: A Tale of Four Little Pigs*, based on an original tale he told his children when they were young. Professor Rabinovitch was a continual inspiration to his family and to all who knew him. His generosity, kindness, warmth, philanthropy, and charm will be cherished. He is survived by his beloved wife Flora, children Peter (Jacqueline), Ruth (Thomas), Judith (Tim), Frank (Karen), stepchildren Howard (Ramona) and Ellen Reitman, as well as 12 grandchildren and three great-grandchildren. ■

B. S. Rabinovitch authored several books.

Rabinovitch Posthumously Honored with 2014 Paul Hopkins Faculty Award



B. S. Rabinovitch, as pictured in "History of the Department of Chemistry" by Arthur G. Anderson, Jr.

A decade ago, the late Professor Emeritus B. Seymour Rabinovitch generously established an endowment to honor "outstanding accomplishments made by a member of the Chemistry department faculty in any area of professional responsibility." He honored Chair Paul Hopkins by establishing that award in his name.

The Hopkins awardee is regularly selected by an *ad hoc* committee of three highly respected Chemistry faculty members. Following the recommendation of the most recently appointed committee, Hopkins is pleased to announce that the late Professor Emeritus B. Seymour Rabinovitch has been selected to receive the 2014 Paul B. Hopkins Endowed Faculty Award.

Hopkins says, "There is no precedent for bestowing this award posthumously. It may never happen again. But in this case, given the extraordinary contribution of this man to our department, I agree with the selection committee that it is appropriate."

A symposium in memory of Rab will be held this coming spring and the comments of invited speakers will serve as the lecture that is required of this award. ▪

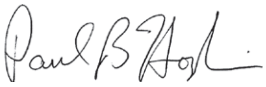
Letter from the Chair, continued from page 1

of topic ordering derives from the reality that most of the students who take freshman chemistry do not persist through to the third quarter, because the degrees they are studying toward don't require it. As a consequence, one thousand of our freshmen per year are exposed only to the topics discussed in the first quarter, and another thousand see only the topics presented during the first two quarters. Just a third of the three thousand students who take the first quarter of freshman chemistry must fulfill degree requirements that lead them to continue for the academic full year. What did we decide? Our faculty decided that a student who takes just one quarter of chemistry should learn about molecular bonding, chemical reactions, stoichiometry, kinetics, and the laws that describe the behavior of gases. Not revolutionary, but subtly different from the past decade. These changes will trigger significant faculty and staff activities to implement.

Because fixing things that are wrong so dominates the life of an academic department chair, it is all too easy to overlook the things that are going well. Many of my messages have focused on these challenges. I would like to close by noting some things that are going very well for our department. Our undergraduate program is bursting with a growing number of students who choose to study chemistry. We receive applications annually from hundreds of talented students wishing to study toward the Ph.D. in chemistry, and we recruit many of these to our growing graduate program. Our competitively won grant and contract resources that support research place us among the top dozen chemistry departments in the U.S., a list that includes the very best private and public institutions. The financial turbulence of the great recession is fading (though there are some storm clouds on the horizon as we head into another state biennial budget cycle) and the budget that supports our instructional programs has been relatively stable for the past few years. We can afford to schedule enough classes to meet the demand of students who need to enroll. Our faculty and staff are working in a highly collegial environment. Things could be much worse! But we will not rest on our laurels. Striving to be better is necessary just to hold even in our competitive world, so we'll keep at it.

I close again with thanks to the all of you who regularly send contributions to us. Your gifts impact everything we do. We operate with many fewer dollars per student than nearly all of our quality-matched peers in chemistry across the nation. Thank you for giving back to today's students!

Sincerely,



Paul B. Hopkins
Professor and Chair

Michael Gelb Appointed as the Inaugural Boris and Barbara L. Weinstein Endowed Chair in Chemistry

We are pleased to announce that Professor Michael Herman Gelb, formerly the Harry and Catherine Jayne Boand Endowed Professor of Chemistry, has been appointed as the first Boris and Barbara L. Weinstein Endowed Chair in Chemistry. An endowed chair is the highest academic title for faculty members at the University of Washington. His appointment to this position recognizes outstanding accomplishment during his many years on our faculty and the promise of his future contributions.

Gelb joined the UW nearly 30 years ago, after earning his Ph.D. at Yale University in the laboratory of Professor Steven Sligar and studying as a postdoctoral associate at Brandeis University under the late Professor Robert Abeles. His education prepared him to contribute as an enzymologist. Not surprisingly, the behavior of enzymes has been a unifying theme in his work during the past three decades. As described in more detail below, his work in recent years has taken a decidedly practical and medically beneficial turn.

Professor Boris Weinstein was a member of the Chemistry faculty from 1967 until his death in 1983. He was a dedicated and talented teacher and researcher, whose expertise, like Professor Gelb's, was in the area of biological chemistry. Weinstein was particularly interested in the chemistry of organic natural products and peptides. He provided outstanding service to the broader community through his editorship of a number of "Organic Reactions" monographs and as a councilor in the Puget Sound Section of the ACS. He was awarded the Bronze Medal from the University of Padua, Italy, Europe's oldest university. Soon after Professor Weinstein's untimely death, his friends and family established the Department of Chemistry's first endowed graduate fellowship in honor of him and his surviving widow, Barbara L. Weinstein. The family collaborated with the Department and University to elevate this endowment to an endowed chair. Professor Gelb is the inaugural appointee.

Professor Gelb is an internationally recognized expert in the field of biological chemistry. In the late 1980s, soon after he came to the UW, Gelb discovered protein prenylation and determined the structure of prenyl groups attached to proteins in eukaryotic cells. This fundamental discovery had far-reaching consequences, including attempts by the pharmaceutical industry to exploit the enzymes associated with prenylation for the treatment of cancer. Over the past 25 years, Gelb has been a world leader in the study of a class

Professor Boris Weinstein

Professor Michael Gelb

of enzymes called phospholipase A2 that play critical roles in inflammatory diseases including asthma and arthritis. Workers at Pfizer have used this work to develop novel new anti-inflammatory agents. During the past decade, Gelb and co-workers have developed novel reagents and methods to quantify proteins by mass spectrometry. One accomplishment is the development of Isotope-Coded Affinity Tags (ICAT Reagents) that are now used by thousands of laboratories worldwide to quantify the abundance of proteins in complex biological samples. An indication of the widespread use of the method is that the paper describing it has been cited more than 3,000 times since its publication in 1999 in *Nature Biotechnology*.

A turning point in Gelb's career came in the 1990s, when he and his family prepared for the birth of their second child. In conversation with a medical care provider, Gelb learned that, at the time, it was the norm to perform prenatal screening only for Down syndrome and spina bifida. Gelb was then left to wonder whether it might not be possible to develop practical assays for other congenital diseases that if diagnosed early might improve the lives of afflicted babies. Gelb recalls being further inspired by the movie *Lorenzo's Oil*, in which a father seeks to find a cure for his own child's rare congenital metabolic disorder.

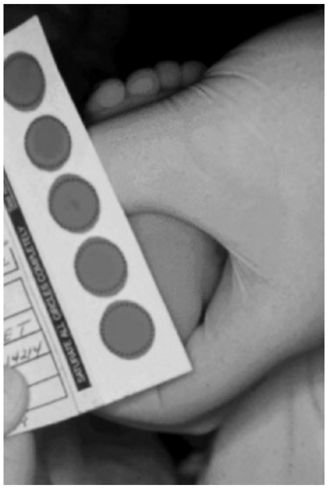
About five years passed before Gelb acted on the notion that he might bring his knowledge of enzymology to the challenge of screening newborns for diseases caused by aberrant levels of enzymes. It occurred to Gelb that it might be possible to use mass spectrometry, a field that was then experiencing a renaissance as an exquisitely sensitive technique for detection and quantitation of biomolecules, to assay the levels of important enzyme activities in infants.

Gelb's vision was for an assay that could assay many different enzyme activity levels at once—a multiplex assay.

Gelb contacted an expert in newborn screening, Dr. Ronald Scott at Children's Hospital in Seattle, to discuss his idea to expand prenatal or newborn screening using mass spectrometry. Scott recommended that Gelb consider developing assays for a set of diseases associated with the function of a cellular organelle called the lysosome, nature's intracellular waste bin. These lysosomal storage diseases occur in just a few newborns per hundred thousand born. Examples include Fabry, Gaucher, Krabbe, Hunter, Hurler, Niemann-Pick-A/B, Pompe, and Tay-Sachs syndromes. The consequences of these diseases can be catastrophic for the afflicted infants, and in severe cases, fatal. Importantly, the lives of the afflicted can in some cases be improved by therapies, the outcomes of which are improved if there is an early diagnosis. The motivation to develop a practical assay was thus obvious.

Gelb next convinced UW Chemistry Professor Frank Tureček, the Klaus and Mary Ann Saegebarth Endowed Professor of Chemistry and a world leader in the field of mass spectrometry, to collaborate on the project. This completed a team with the combined expertise in infant screening, mass spectrometry, and enzymology needed to tackle the problem.

Many obstacles were overcome in devising a practical screen for lysosomal storage diseases in newborns. Designer enzyme substrates needed to be developed and synthesized that would release unique, quantifiable products when acted on by their respective enzymes. The preparation of the microscopic blood sample taken from the newborn needed to be simple, inexpensive, and foolproof. A "cocktail" (the aqueous buffer in which the enzymatic reactions were allowed to occur) needed to be developed in which all nine of the enzymes being assayed would function, despite differing optimal conditions required by each. It was extremely important, particularly given the rarity of these diseases, that there not be an appreciable number of "false positives," which would have caused enormous and unnecessary stress on parents whose newborns received such a diagnosis. The incidence of false negatives needed to be very low if the assay were to catch the rare afflicted newborn, reliably finding a needle in a haystack.



A newborn screening card with dried blood spots taken from a newborn's heel.

And there are additional, and ongoing, obstacles of a political nature. Infant screening in this country is controlled at the state level: the decision concerning whether to require a newborn test is in most cases in the hands of the legislatures and governors of the 50 states. At this time, the states of Illinois, Missouri, New Jersey, and New York mandate that all newborns be screened for lysosomal storage diseases, as is the case in the country of Taiwan. Discussions are underway in other states and countries to add various lysosomal storage diseases to their newborn screening panel.

Professor Gelb has received a number of awards through the years for his outstanding contributions. He received an American Cancer Society Postdoctoral Fellowship (1983–1985), NIH Career Development Award (1990–1995), Sloan Fellowship (1991–1993), the ICI Pharmaceuticals Group 1991 Award for Excellence in Chemistry, the Pfizer Award in Enzyme Chemistry (1993), the Medicines for Malaria Venture Project of the Year (2003), an NIH Merit Award, a fellowship in the American Association for the Advancement of Science (2009), and the Gustavus J. Esselen Award for Chemistry in the Public Interest (2013). He has served on a wide variety of committees and as a consultant to about a dozen pharmaceutical companies. He has delivered some 350 talks at meetings, universities, and industrial laboratories. He has published more than 350 original scholarly papers in peer-reviewed journals. These papers are presently being cited in the scientific literature at a rate of about 1,000 times per year. He has contributed some two dozen articles in monographs, and is a co-author on some two dozen patents. He has supervised the thesis research of numerous Ph.D. students, who have gone on to successful independent careers.

We congratulate Professor Gelb on his successes in nearly 30 years on the faculty at the University of Washington, and particularly on his appointment as the inaugural holder of the Weinstein Endowed Chair in Chemistry. Gelb notes that honors of this kind provide more than just a reward for past accomplishment, additionally providing motivation for continued outstanding contribution, and even some of the financial help to make that possible. ■

Cody Schlenker
Assistant Professor

Ph.D. 2010
University of Southern California
Organic Solar Cells
Advisor: Mark E. Thompson

B.S. 2004
Linfield College
Chemistry
Advisor: Thomas J. Reinert

Cody was born in Jamestown, North Dakota. He received his B.S. in chemistry from Linfield College in Oregon in 2004. At Linfield, Cody studied structure-function relationships in porphyrins with Professor Thomas J. Reinert. He also worked with Professor Claude Cohen in Cornell University's Center for Materials Research through the NSF Research Experience for Undergraduates program.

At Cornell, Cody synthesized and characterized nanoparticle hydrogels for soil remediation. From these experiences, Cody became intrigued with understanding electron transfer processes in heterogeneous systems. He also began to understand the critical importance of developing sustainable and scalable alternative energy platforms.

During his graduate work, Cody synthesized small molecule dyes and charge transport materials to develop advanced device concepts for thin film photovoltaics with Professor Mark E. Thompson at the University of Southern California. Cody earned his Ph.D. in chemistry in 2010 as an Anton B. Burg Foundation Endowed Fellow in Chemistry. Cody has made a number of notable advances in understanding materials design concepts for suppressing charge recombination rates and controlling exciton migration in thin film solar cells.

During his postdoctoral appointment as a National Science Foundation Fellow, Cody worked with Professor David S. Ginger here in the Department of Chemistry at the UW to characterize recombination mechanisms in solar cell materials and to better understand issues of sustainability related to the life cycle of various energy conversion devices.

Cody's current research interests center on using synthetic chemistry and physical chemistry to explore advanced materials design concepts for low-cost, high-efficiency energy conversion and storage devices. Cody is particularly interested in understanding fundamental principles and dynamic interfacial processes that control the efficiency losses in thin film photovoltaic materials and rechargeable battery electrodes. The common scientific goal of his research group is to more deeply understand how electronic dynamics at interfaces and within heterogeneous solids are controlled by molecular and mesoscale organization. Advancing energy science and technology to scale sustainably to global demand requires that we predictively bridge bottom-up molecular behavior to meet top-down device engineering. At present, there is no such bridge. To overcome this challenge, Cody's group uses chemical functionality to modulate the charge dynamics of model organic, organic/inorganic, and biogenic composites for devices such as thin-film photovoltaics and next-generation rechargeable batteries. The Schlenker group uses the tools of physical chemistry, such as pump-probe and luminescence spectroscopy, electrochemistry, time-domain and frequency-domain electronic measurements, and *in situ* structural characterization methods, to help close the materials development loop, yielding better informed materials design strategies.

Professor Gary Drobny, chair of the search committee for the Physical Division, is pleased to welcome Cody to the Chemistry faculty: "We had been searching for quite a long while for a P-chem candidate with expertise in solar energy and materials. Cody's abilities in material fabrication were viewed as a perfect complement to the work of Ginger and [Daniel] Gamelin."

Cody's interests
Outside of chemistry, Cody enjoys cycling in the rain, hiking, snowshoeing, gardening, and writing music.

Cody's most notable research achievement to date
Cody feels that his most notable research achievement so far has been to clarify the role that interfacial excited states play in governing the rates of charge recombination in thin film solar cells. He is very excited about the new direction that his group is taking to characterize the interfacial electrochemistry of materials relevant for next-generation Li-ion battery electrodes. ■

Jesse Zalatan
Assistant Professor

Ph.D. 2008
Stanford University
Chemistry
Advisor: Daniel Herschlag

A.B. 2002
Harvard University
Biochemical Sciences

Jesse was born and raised in coastal San Diego, CA. During the summer after his junior year in high school, Jesse was diverted from the beach by an opportunity to intern at The Scripps Research Institute in La Jolla. While working in an immunology lab under the direction of Daniel Salomon, Jesse became captivated by how molecular biology could be used to understand complex biological systems. He later spent a summer working with Phil Dawson, also at Scripps, where he learned solid phase protein synthesis and applied this approach to study protein folding.

As an undergraduate at Harvard, Jesse performed structural biology research with Stephen Harrison. At the same time, his coursework in physical organic chemistry motivated him to think about applying chemical tools to understand the behavior of enzymes and other protein machines in biology. He pursued graduate research with Daniel Herschlag at Stanford, hoping to understand the fundamental question of how enzymes catalyze chemical reactions with such incredibly large rate enhancements. He focused on phosphoryl transfer reactions and used a variety of approaches to map transition state structures and to identify important catalytic interactions that tune reactivity and specificity.

As a postdoc with Wendell Lim at UCSF, Jesse continued to study how biological systems control chemical reactions, this time in the context of a complex signaling protein network. His work resolved a long-standing question in the field about how signaling pathways prevent crosstalk. By analyzing the kinetics of signaling pathway reactions, Jesse demonstrated how a scaffold protein can act as a molecular switch to choose between two possible outputs of a kinase pathway.

In his independent research, Jesse will continue to pursue the broad question that has motivated his prior research: how are biological systems organized to ensure that specific reactions occur at the right place and the right time? He is particularly interested in how signaling pathways are physically organized to control reactivity and the regulatory mechanisms that direct signals through complex networks. In parallel with mechanistic studies on biological systems, Jesse is also interested in using tools from synthetic biology to control and rewire biological networks, both as a test of our understanding and as a tool to engineer devices for biosynthesis and cell-based therapeutics.

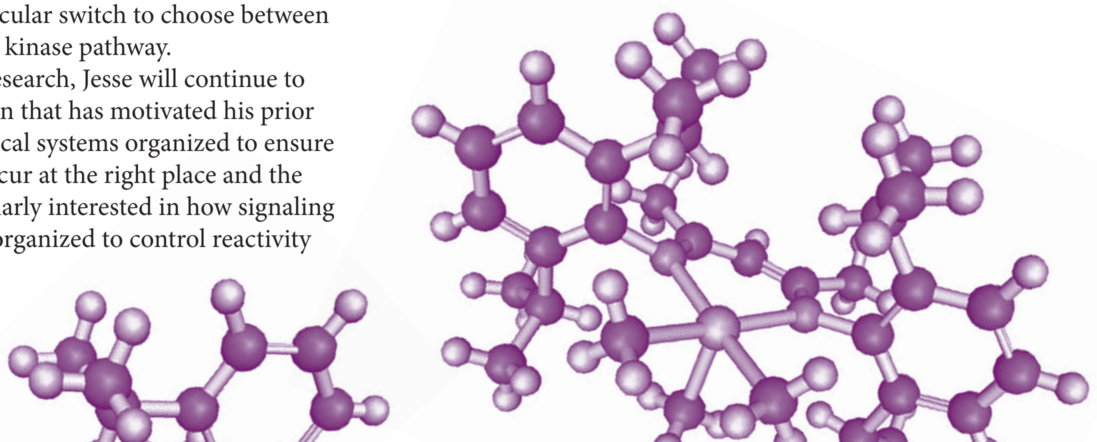
Jesse first visited Seattle in July 2003 to hike and snowboard on Mt. Rainier. Since that trip, Jesse has visited Seattle many times and was thrilled when the opportunity arose to come to the UW. Jesse, his wife Jennifer, and their two-year-old daughter Cora live in a house with a big backyard in Ravenna. They look forward to exploring the city and surroundings.

Jesse's interests

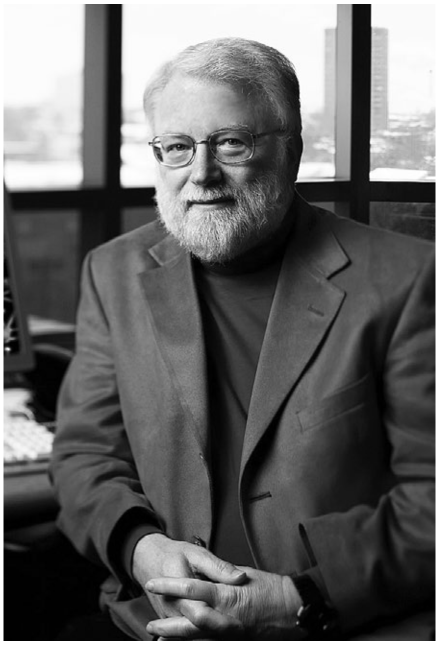
Outside of lab, Jesse enjoys snowboarding, surfing, biking, and swimming. Jesse also likes to cook and is currently working to learn some of his favorite family recipes.

Jesse's most notable research achievement to date

Jesse's most notable achievement to date was providing a complete molecular mechanism to explain how signals are routed through a complex MAP kinase signaling network. This work was important for resolving a long-standing question in the MAP kinase field. It was also notable in that he used relatively simple biochemical methods to interrogate individual chemical steps in a signaling network, which allowed him to address a question that cell biologists and geneticists had struggled with for more than a decade. ■



Thom H. Dunning, Jr. Returns to the Faculty of Chemistry



Co-Director of NIAC and Affiliate Professor Thom Dunning

High performance computing has changed nearly every aspect of our lives, including the way knowledge is advanced in many areas of science, engineering, and medicine. Access to cutting-edge computational tools and the experts who know best how to deploy them have become a key element of a modern research environment. To maximize the ability of investigators to use modern computation to advance their research programs, the University of Washington recently joined with Pacific Northwest National Laboratory (PNNL) to create the Northwest Institute for Advanced Computing (NIAC). NIAC will endeavor to ensure that researchers at the UW, PNNL, and in our region have access to the most advanced computational tools. The UW and PNNL are extremely fortunate to have recruited Thom Dunning, Jr., a theoretical and computational chemist, to return to the northwest as co-director of NIAC, and as affiliate professor of chemistry.

Thom has had a long and illustrious career as both a scientist and scientific administrator. His prior positions include: director of the National Center for Supercomputing Applications (NCSA) at the University of Illinois at Urbana-Champaign; founding director of the Joint Institute for Computational Sciences (Oak Ridge National Laboratory and the University of Tennessee); and director of the Environmental Molecular Sciences Laboratory at PNNL. During his time at PNNL, Thom held a faculty appointment in the Department of Chemistry at the UW. Thom's research accomplishments have been recognized by the E. O. Lawrence Award in Chemistry (1997) for "seminal contributions to the advancement of molecular electronic structure theory and computations; for applications to fundamental problems in chemical laser development, combustion chemistry, and environmental chemistry; and for leadership in the utilization of high performance computing for solving chemical problems." And, in 2011 he received the ACS Award in Computers in Chemical and Pharmaceutical Research, being cited for "developing techniques for electronic structure calculations; applications to molecular structure, energetics and reactivity; and leadership of institutions at the forefront of computational science."

Thom's most widely acknowledged scientific contribution to date has been the development of techniques for solving the electronic Schrödinger equation, namely, Gaussian basis sets that systematically approach the complete basis set limit. These basis sets are used in essentially all modern electronic structure programs, including the Gaussian suite of programs. When combined with the most advanced computational methods, they have led to a new era in computational chemistry—quantitative quantum chemistry—enabling computational chemists to reliably predict the structure, spectra, energetics and many other properties of molecules. With these advances, computational chemistry has become a full partner with experimental chemistry in the exploration of chemical phenomena. The first paper in the correlation-consistent basis set series, published in the *Journal of Chemical Physics* in 1989, is among the top 100 most cited research papers of all time.

Thom grew up in the Midwest where he acquired his love for science at an early age. His parents and brother were constantly subject to "experiments," but happily tolerated and even encouraged them (although his mother was less tolerant of snakes loose in the house). The turning point occurred in junior high school when the high school chemistry teacher retired and gave Thom his most prized possession, one of the early editions of Linus Pauling's *General Chemistry*. Suddenly, chemistry became the science of molecules—a fascinating world of interacting three-dimensional objects that lay beyond our perceptions—and Thom was hooked.

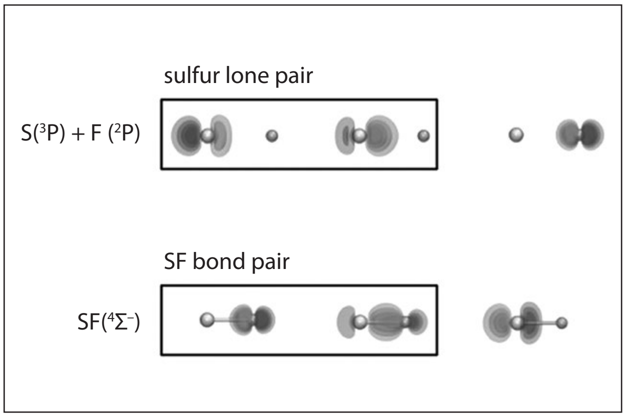
As a chemistry undergraduate at the Missouri University of Science and Technology, then known as the University of Missouri at Rolla, in the early 1960s, Thom was fascinated by the ability of organic chemists to rationalize the course of chemical reactions by shuttling electrons around in the molecules. However, he was also somewhat skeptical—this seemed too good to be true. The following year he took a physics course in quantum mechanics and realized that quantum mechanics was the means to answer these questions in organic chemistry. Further, in the course, he encountered the differential equation for the harmonic oscillator. Since he had just had a course in numerical analysis and the university was touting its new, "very powerful" computer (an IBM 1620!), Thom decided to solve the harmonic oscillator equation on the computer. After teaching himself the new programming language developed by IBM—FORTRAN—and coding the problem, he was amazed to find that his numerical solution agreed perfectly with that obtained analytically. He was now hooked on both quantum mechanics and scientific computing.

In graduate school at the California Institute of Technology, Thom tackled one of the most pressing problems in organic chemistry at the time—the inability of theory and computation to predict the energies of the excited states of unsaturated compounds—with Professor Vincent McKoy. In contrast to the triplet $\pi \rightarrow \pi^*$ excited state, he found that the corresponding singlet excited state was far more complex than the simple description provided by molecular orbital theory suggested. In addition, harkening back to his studies of Pauling's ideas, he was intrigued by the work of Professor William Goddard on the generalized valence bond (GVB) method. Here, he thought, was the means to address the shortcomings of valence bond theory and place it on the same quantitative footing as the Hartree-Fock (HF) method did for molecular orbital theory. Unfortunately, the GVB equations are far more complex than the HF equations and the limitations of the computing technology available at that time required the imposition of restrictions on the solution of the resulting equations. Nonetheless, this work provided many invaluable insights into the electronic structure of molecules.

Since the completion of his graduate studies, Thom has focused on solving the electronic Schrödinger equation to study a wide range of molecular phenomena: the properties of the exotic species involved in laser action, the thermo-chemistry and kinetics of the reactions involved in combustion, the structure and energetics of aqueous clusters, and so on. In this work he strived to understand both the conceptual basis of molecular science (chemical theory) and to reliably predict the properties of molecules (quantitative quantum chemistry).

In recent years, Thom's passion for understanding molecular phenomena through the lens of GVB theory returned when he decided to focus the capabilities of modern computational chemistry on understanding the electronic structure of hypervalent molecules. These species defy the normal rules of valence laid down by G. N. Lewis nearly a century ago and there has been much speculation on the nature of the bonding in these molecules. Much to his surprise, Thom and his collaborators found that GVB calculations, now possible with new computing capabilities, provided a simple explanation of the bonding in hypervalent molecules, namely, the presence of a new type of bond—the recoupled pair bond.

Recoupled Pair Bonding



The ability of the atoms beyond the first row to form these new types of bonds was responsible for much of what inorganic chemists refer to as the first row anomaly—the fact that the chemistry of the first row elements (Li-Ne) differs, often significantly, from that of the corresponding elements in later rows of the Periodic Table. Thom and his research group are now exploring the many different ways that this new type of bond impacts the chemistry of the elements of the second row (Si–Cl).

We welcome Thom back to the northwest, and look forward to both his future scientific contributions and, more generally, to the profound impact he and NIAC will have as they increase the availability of advanced computing in a wide range of fields at the UW. ■

Instructional Team Grows

The Department of Chemistry recently rounded out its instructional team with the hiring of Dr. Lawrence Goldman as a lecturer in the field of organic chemistry. This brings the total number of dedicated chemistry lecturers to five as he joins Drs. Jasmine Bryant, Andrea Carroll, Colleen Craig, and Deborah Wiegand.

Over the past several years, the Department of Chemistry has seen incredible growth in its undergraduate program, requiring an increase in the number of faculty to teach our courses. This growth, coupled with the desire to keep class sizes manageable, necessitated the hiring of a core group of experienced teaching faculty. The Department of Chemistry currently offers each quarter of the general chemistry course (142, 152, and 162) all four quarters of the year, serving approximately 3,000 students annually. Similarly, the organic chemistry course (237, 238, and 239) is offered year-round with almost 1,500 students enrolled. Lecturers work closely with each other and other faculty in the department to coordinate lectures, laboratories, and course content as well as to develop new material and resources. This collaborative atmosphere was mentioned in the recent Provost's report on teaching and learning: *Innovators Among Us: Using Technology to Enhance Student Learning*. Of the 20 educators highlighted in the report, five were chemistry faculty members—two of those were lecturers Colleen Craig and Jasmine Bryant. The report describes innovations in classroom technology use that improve student learning—often in large classes such as the general and organic chemistry series. You can find the report (and others) at *www.washington.edu/provost/reports/*.

Lawrence Goldman is excited to start his first year at the UW. He has had a long-standing interest in teaching, starting with his undergraduate studies at Rutgers University. His graduate studies on the mechanisms of complex organic reactions spanned two continents—beginning at Cornell University (with Professor Barry Carpenter) before the group hopped across the pond to Cardiff University in Wales. After completing his graduate studies, he worked as a postdoctoral fellow with Professor John Richard at the University at Buffalo studying the mechanisms of enzymatic reactions. Larry completed two additional visiting positions, at Colgate University and Whitman College in Walla Walla, before starting at the UW in fall 2014.

left to right: Larry Goldman, Colleen Craig, Andrea Carroll, and Jasmine Bryant (not pictured: Debbie Wiegand)

Larry found time to teach during all of these positions, including being a teaching assistant in introductory math courses at Rutgers and teaching an organic lecture during his postdoctoral fellowship. He plans to bring that passion to his teaching at the UW. In particular, Larry hopes to make the organic lab sequence modern and memorable for students.

Larry's husband, Damian, also works in chemistry, and is currently a postdoctoral research associate in Assistant Professor AJ Boydston's research group. In their free time, they're getting to enjoy Seattle and the many perks (and parks!) that come with living here. ▪

Call For Help—Find The Postdocs!

The Department of Chemistry is hoping to reestablish contact with our former postdoctoral research associates. We have contact information for just a small number of the hundreds of postdocs who have studied with us through the years. Can you help us? Do you know the whereabouts of any postdocs you knew or worked with when you were at the UW? We would appreciate hearing from you if you know the address or current employer of any former UW Chemistry postdoc. E-mail us at *chemdept@uw.edu* and spread the word!

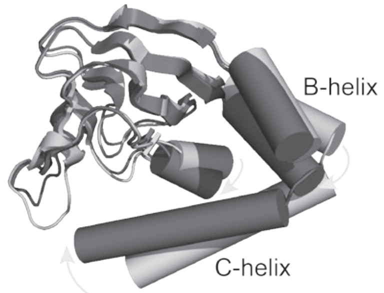
Funding Received to Renovate 4th Freshman Lab

As mentioned in the "Letter from the Chair," the fourth of four freshman laboratories in Bagley Hall (Room 236) is undergoing renovation and will be open to students when the new quarter starts in January.

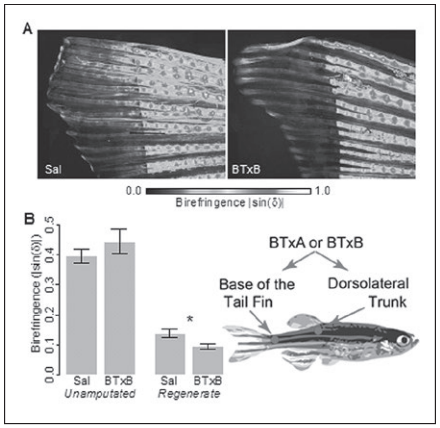
top to bottom: The dark, crowded entry-level lab before renovation; Construction in progress; The new, bright, spacious work stations.

Spotlight on Chemical Sciences

Assistant Professor Stefan Stoll along with Professor of Physiology and Biophysics William Zagotta and co-workers have used double electron-electron resonance spectroscopy to determine the structural origins of the regulatory function of cyclic AMP on an important ion channel. Their work reveals that the binding of cyclic AMP induces a large structural change in the intracellular part of the channel. The ion channel studied, a hyper-polarization-activated cyclic nucleotide-gated ion channel, is critical to the function of the heart, as it is part of the heart's natural pacemaker. The work, reported in the *Proceedings of the National Academy of Sciences*, could form the basis for better drug design for disorders of electrical signaling in the heart.



Research Associate Professor Werner Kaminsky contributed to a research project recently highlighted in *Nature* investigating the effects of BOTOX treatment on bone mineralization. Kaminsky used his patented microscopy technology to determine bone mineralization with a custom-built automated polarized light microscope to sequentially acquire images under a stepwise rotating polarizer. The article reported that BOTOX treatment had a negative impact on bone formation during zebrafish fin regeneration. The project involved a diverse multi-discipline co-operation between members of three departments at the UW: Orthopaedics and Sports Medicine, Pharmacology, and Chemistry.



The following is reprinted from Perspectives, *the College of Arts & Sciences newsletter:*

A Solar Solution, on the Dot

Scientists have spent decades developing technology that harvests sunlight and converts it to electricity. Yet existing solar energy solutions remain cost prohibitive for many applications. Brandi Cossairt hopes to change that.

Cossairt, assistant professor of chemistry, is developing more efficient solar materials that should be significantly less expensive to produce, resulting in low-cost solar power. In May 2014, she received an Innovation Award from the UW to support her research. Innovation Awards provide $500,000 in private support to enable young faculty to pursue higher risk projects that could lead to important breakthroughs.

Why has solar energy been so expensive? It has to do with the manufacturing process. Conventional solar cells are made of silicon, a semiconductor that is abundant but not particularly efficient at absorbing light. "With silicon, the efficiency of a solar cell is about 25 percent," explains Cossairt, "and to get it to that level of efficiency you need the starting silicon to be very, very pure and then you need to purposefully add impurities in a controlled way. It's also best if the whole solar cell is a single crystal." Purifying silicon and growing crystals large enough for a solar panel are both costly processes.

Cossairt is exploring a lower cost alternative using quantum dots—nano-sized crystalline semiconductor particles that could be spray-painted on a surface in layers. "With quantum dots, we don't need a single large crystal and the chemistry used to make them is inherently self-purifying," she says. "The costs would be limited to the actual materials, where with silicon the major cost is the manufacturing process."

To appreciate quantum dots, it helps to understand the process by which sunlight is converted to energy in semiconductors. When light—sunlight for example—shines on a semiconductor, the energy of that light excites an electron in the material, allowing it to become free to conduct electricity. The excited electron is negatively charged; the hole it leaves behind is positively charged. "In a big piece of silicon, the electron will quickly move away from the hole," explains Cossairt. "But we make quantum dots so small that the electron and hole can't get away from each other. They are always bound to one another."

Brandi Cossairt received a UW Innovation Award to help fund her research on efficient harvesting and storage of solar energy.

The confinement of the electron and hole gives rise to one of the most exciting aspects of the quantum dot—its ability to absorb different colors of light. Changing the size of the quantum dot changes the energy, or color, of light absorbed by the material. Given that sunlight is a combination of all the colors in the spectrum, the ability to make a single material that can absorb different colors would translate to far greater efficiency in harvesting solar energy. (The silicon used today is fixed in terms of the color of light it can absorb.) Cossairt envisions one day being able to paint layers of quantum dots on top of each other, each layer absorbing a different color of light.

Of course, harvesting the sun's power is just one part of the solar energy equation. There's also the challenge of storing solar energy for future use. This is a separate but related area of research for Cossairt, who is hoping that quantum dots can provide a solution. The goal is to store energy in a chemical bond that could later be broken to release the energy when needed. The same idea powers gasoline, which releases energy when its carbon-carbon bonds are broken through burning. But while gasoline releases polluting CO_2 along with energy, the solutions Cossairt is exploring would release harmless water as the only byproduct.

"That's really on the frontiers of research," says Cossairt. "We're not the only people thinking about

using quantum dots for energy storage, but the research into storage is not nearly as far along as it is for collecting light." Cossairt believes that we may see quantum dots used to make solar cells within 10 years, but the use of quantum dots for storage is "more like a 20- to 30-year problem. There's a lot of science that has to happen before we'll see sunlight used to make fuel on a commercial scale."

The Innovation Award is certainly a step in the right direction. Cossairt is using the award to help fund her laboratory team—currently seven graduate students, one undergraduate, and a postdoc—as they tackle these difficult questions, which could dramatically alter how we think about energy.

"Focusing on using completely renewable resources that will never be exhausted, that will never go away, just makes good logical sense," says Cossairt. "If we can find a way to harvest and store energy that is cheap and efficient, it will be transformational." ■

Photos on this page: Isaiah Brookshire

Assistant Professor Brandi Cossairt

FACULTY AWARDS & HONORS

FACULTY

AJ Boydston
Cottrell Scholar Award, Research Corporation for Science Advancement

Jasmine Bryant
Most Engaging Lecturer, UW Panhellenic Association and Interfraternity Council

Matthew Bush
Sloan Research Fellowship, Alfred P. Sloan Foundation

Gary Christian
Fellow, American Chemical Society
The Analytical Scientist Power List 2013: The 100 Most Influential People in the Analytical Sciences

Brandi Cossairt
UW Innovation Award

Daniel Gamelin
Debye Chair Professor, Debye Institute for Nanomaterials Science, Utrecht University
Jonathan L. Sessler Distinguished Alumni Lecturer, Stanford University

Michael Gelb
Boris and Barbara L. Weinstein Endowed Chair in Chemistry

Samson Jenekhe
Charles M. A. Stine Award, American Institute of Chemical Engineers

Munira Khalil
Journal of Physical Chemistry B Lectureship Award, American Chemical Society Physical Chemistry Division

Sarah Keller
Closs Lecturer, University of Chicago

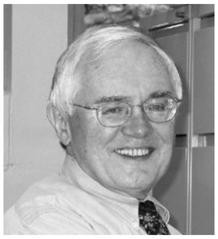
Alvin Kwiram
Elected Member, Washington State Academy of Sciences

B. Seymour Rabinovitch
2014 Paul B. Hopkins Endowed Faculty Award

František Tureček
Visiting Professorship, Royal Society Kan Tong Po

Bo Zhang
The Analytical Scientist Power List 2014: The Top 40 Under 40


l to r: Assistant Professor AJ Boydston, Assistant Professor Matt Bush



Professor Emeritus Gary Christian

Professor Emeritus Alvin Kwiram

Professor Sam Jenekhe

POSTDOCTORAL RESEARCH ASSOCIATES

Miriam Bowring
Ruth L. Kirschstein National Research Service Award, National Institutes of Health

Pradip Chakraborty
Swiss National Science Foundation Postdoctoral Fellowship

Hannah DeBerg
The Raymond and Beverly Sackler Scholars Program in Integrative Biophysics

Maraia Ener-Goetz
Irving S. Sigal Postdoctoral Fellowship, American Chemical Society

Kathryn Knowles
Energy Efficiency and Renewable Energy Postdoctoral Research Award, U.S. Department of Energy

Stephen Leonard
Ruth L. Kirschstein National Research Service Award, National Institutes of Health

Thomas Portet
Honorable Mention, 2013 UW Postdoctoral Mentor Award

Ivan Santos Lopez
CONACyT-México Postdoctoral Research Fellowship, National Council of Science and Technology

Emily Tsui
Ruth L. Kirschstein National Research Service Award, National Institutes of Health

Derek Wasylenko
2013 Young Investigator Award, American Chemical Society Division of Inorganic Chemistry

Miriam Bowring

Hannah DeBerg

DOCTORAL DEGREES AWARDED

September 2013–August 2014

Mariana Barcenas, Ph.D. Chemistry
Detection of Lysosomal Storage Disorders Using Tandem Mass Spectrometry
(Professor František Tureček)

Mark Cheng, Ph.D. Chemistry
Application and Development of 2D IR Spectroscopy for the Study of Complex Biological Systems
(Associate Professor Munira Khalil)

Alicia Cohn, Ph.D. Chemistry
Photodoping of Colloidal Nanocrystals
(Professor Daniel Gamelin)

Samantha Connelly, Ph.D. Chemistry
Preparation & Reactivity of Sigma-Complexes
(Professor D. Michael Heinekey)

Nick Cox, Ph.D. Chemistry
Development of Practical Synthetic Tools Using Copper and Gold Catalysis
(Assistant Professor Gojko Lalic)

Joseph Fowble, Ph.D. Chemistry
Localization of the Human Malaria Parasite's Dihydrofolate Reductase-Thymidylate Synthase and Examining Its Role in Proguanil and Atovaquone Drug Synergy
(Professor Pradipsinh Rathod)

Peter Hsu, Ph.D. Chemistry
Structural and Biochemical Studies of the Transcription Termination Machinery
(Professor Gabriele Varani)

Yue Huang, Ph.D. Chemistry
Surface Acoustic Wave Nebulization as a Mass Spectrometry Ionization Source, Characterization, Refining and Application
(Professor František Tureček)

Erica Ingalls, Ph.D. Chemistry
Enantioselective Diamination of Alkenes, Hydroamination of 1,3-Dienes, and the Development of NHC Palladium Complexes
(Associate Professor Forrest Michael)

Benjamin Kehimkar, Ph.D. Chemistry
Fundamental Studies of Rocket Propellant Fuel Using GC GC-TOFMS Instrumentation with Chemometric Data Analysis
(Professor Robert Synovec)

Kristina Knesting, Ph.D. Chemistry and Nanotechnology
Polymer/Transparent Electrode Interface Studies with Applications for Organic Solar Cells
(Professor David Ginger)

Joseph May, Ph.D. Chemistry
Theoretical Insight into the Manipulation of the Optical and Magnetic Properties of TM2+-doped II-VI Semiconductor Quantum Dots
(Associate Professor Xiaosong Li)

Alicia McGhee, Ph.D. Chemistry
Development of Palladium and Hypervalent Iodine (III) Catalyzed Alkene Difunctionalization Reactions; Hydroamination, Carboamination, Aminofluorination & Diamination
(Associate Professor Forrest Michael)

Meghana Rawal, Ph.D. Chemistry
Cross-Conjugated Moieties as Design Motifs for a Class of Novel Electro-Optic Chromophores
(Professor Emeritus Larry Dalton)

Michael Roberto, Ph.D. Chemistry
Continuous Flow Reactor Optimization via Informed Reactor Design and Real-Time Raman Modeling
(Professor Philip Reid and Dr. Brian Marquardt)

Richard Rucker, Ph.D. Chemistry
Copper-Catalyzed Reactions of Organoboron Compounds
(Assistant Professor Gojko Lalic)

Jason Sellers, Ph.D. Chemistry and Nanotechnology
Adsorption and Thin-Film Adhesion on Single-Crystalline Surfaces: Enthalpies, Entropies, and Kinetic Prefactors for Surface Reactions
(Professor Charles Campbell)

Guozheng Shao, Ph.D. Chemistry and Nanotechnology
Studying Internal Processes in Organic Photovoltaics through Atomic Force Microscopies
(Professor David Ginger)

James Sharp, Ph.D. Chemistry
Metal/Organic and Metal/Inorganic Interfaces: Interfacial Bond Energies, Structure and Energy-Level Alignment
(Professor Charles Campbell)

Elisabeth Strein, Ph.D. Chemistry
Probing Photocurrent Generation Mechanisms in Hybrid IR-Sensitive Quantum Dot/Conjugated Polymer Solar Cells
(Professor David Ginger)

Amanda Thorsen, Ph.D. Chemistry
Electronic Doping and Trap Reduction of Quantum Dots
(Professor Daniel Gamelin)

Benjamin Van Kuiken, Ph.D. Chemistry
Investigations of the Electronic Structure and Photochemistry of Molecules by X-ray Spectroscopy
(Associate Professor Munira Khalil)

Vladimir Vlaskin, Ph.D. Chemistry
Manganese in Semiconductor Nanocrystals
(Professor Daniel Gamelin)

Jessica Wittman, Ph.D. Chemistry
Proton-Coupled Electron Transfer Reactivity of Ruthenium Complexes with Separation Between the Proton and Electron Transfer Sites
(Professor James Mayer)

Chang Xue, Ph.D. Chemistry
Method Development for Qualitative and Quantitative Study in Mass Spectrometry
(Professor František Tureček)

Gloria Yen, Ph.D. Chemistry
Analytical Techniques for Microscale Analysis
(Professor Daniel Chiu)

David Zeigler, Ph.D. Chemistry
From Energy Generation to Storage: The Exploration of Unusual Architectures and Functions of Conjugated Organic Molecules
(Associate Professor Christine Luscombe)

GRADUATE FELLOWSHIPS & AWARDS

Samuel Allen
ACS Division of Analytical Chemistry Graduate Fellowship
Rowland Endowed Fellowship in Chemistry

Jose Araujo
Clean Energy Institute Fellowship

Chadd Armstrong
Gary and Sue Christian Graduate Fellowship in Chemistry

Nicholas Bigelow
S.P. Pavlou and D.E. Strayer Endowed Fellowship in Chemistry

Maike Blakely
David M. Ritter Endowed Fellowship in Chemistry

Mark Cheng
Marilyn Werby Rabinovitch Memorial Fellowship in Chemistry

Erica Chong
2013–14 Outstanding Teaching Assistant

Samantha Connelly
Natt-Lingafelter Endowed Fellowship in Chemistry

Caitlin Cornell
S.P. Pavlou and D.E. Strayer Endowed Fellowship in Chemistry

Kathryn Corp
Mickey and Karen Schurr Endowed Graduate Fellowship in Chemistry

Phillip Cox
Larry R. Dalton Fellowship in Chemistry

Emma D'Ambro
National Science Foundation Graduate Research Fellowship

Dane de Quilettes
Clean Energy Institute Exploratory Fellowship
National Science Foundation Graduate Research Fellowship

Feizhi Ding
Norman and Lillian Gregory Endowed Fellowship in Chemistry

Megan Duda
Clean Energy Institute Exploratory Fellowship

Rachel Eaton
John W. and Elaine A. Zevenbergen, Sr. ARCS Foundation Endowed Fellowship

Michael Enright
Paul H. and Karen S. Gudiksen Endowed Fellowship in Chemistry

James Gaynor
Clean Energy Institute Fellowship
National Science Foundation Graduate Research Fellowship

Sonam Ghag
2013–14 Outstanding Teaching Assistant

Joshua Goings
National Science Foundation Graduate Research Fellowship

Stephanie Hemmingson
Mickey and Karen Schurr Endowed Graduate Fellowship in Chemistry

Kira Hughes
Benton Seymour Rabinovitch Endowed Fellowship in Chemistry

Durmus Karatay
Clean Energy Institute Exploratory Fellowship

Troy Kilburn
Clean Energy Institute Recruiting Fellowship

Michael Larsen
Eastman Chemical Student Award in Applied Polymer Science
Paul H. and Karen S. Gudiksen Endowed Fellowship in Chemistry

Chloe Lombard
Rowland Endowed Fellowship in Chemistry

Pengtao Lu
Lewis R. and Joan M. Honnen Endowed Fellowship in Chemistry

Donald Mannikko
Larry R. Dalton Fellowship in Chemistry

Brigit Miller
Clean Energy Institute Recruiting Fellowship

Nicholas Montoni
Norman and Lillian Gregory Endowed Fellowship in Chemistry

Marja (Beth) Mundy
Clean Energy Institute Fellowship
National Science Foundation Graduate Research Fellowship

left to right: Jose Araujo, Caitlin Cornell, Kathryn Corp, Michael Enright, Donald Mannikko, Nicholas Montoni, Mary Nguyen, Nihit Pokhrel

Mary Nguyen
Basil G. and Gretchen F. Anex Endowed Fellowship in Chemistry

Kelli Ogawa
Brian R. Reid Endowed Fellowship in Chemistry

Jarred Olson
Amy Scott and Stephen C. Alley Endowed Fellowship in Chemistry

Michael Pegis
Clean Energy Institute Exploratory Fellowship

Stephen Percival
Leon J. Slutsky Endowed Fellowship in Chemistry

Nihit Pokhrel
Usha and S. Rao Varanasi Endowed Fellowship in Chemistry

Scott Rayermann
Teaching Excellence Award, Alpha Epsilon Delta

Julian Rees
DAAD German Graduate Study Scholarship, German Academic Exchange Service

John Rose
Ruth L. Kirschstein National Research Service F30 Award, National Cancer Institute at the National Institutes of Health

Kayla Sapp
Edwin and Phyllis Motell Endowed Fellowship in Chemistry

Alina Schimpf
Clean Energy Institute Exploratory Fellowship
Martin P. Gouterman Endowed Fellowship in Chemistry

Johanna Schwartz
Alvin L. Kwiram/Council for Chemical Research Endowed Fellowship in Chemistry

Mycah Uehling
Amy Scott and Stephen C. Alley Endowed Fellowship in Chemistry

Carolyn Valdez
Usha and S. Rao Varanasi Endowed Fellowship in Chemistry

Benjamin Van Kuiken
2014 College of Arts & Sciences Dean's Graduate Medal in the Natural Sciences

Matthew Walker
Boris and Barbara L. Weinstein Fellowship in Chemistry

Caroline Weller
Klaus and Mary Ann Saegebarth Endowed Fellowship in Chemistry

David Zeigler
Clean Energy Institute Exploratory Fellowship

2013–14 Alma Mater Travel Awards

Recipients of these travel awards receive funds to present a seminar on their Ph.D. research at their undergraduate alma mater.

Jennifer Brookes
University of Portland (Portland, OR)

Abhinav Dhall
Indian Institute of Technology Bombay (Mumbai, India)

Feizhi Ding
University of Science and Technology of China (Hefei, China)

Alisha Jones
Miami University (Oxford, OH)

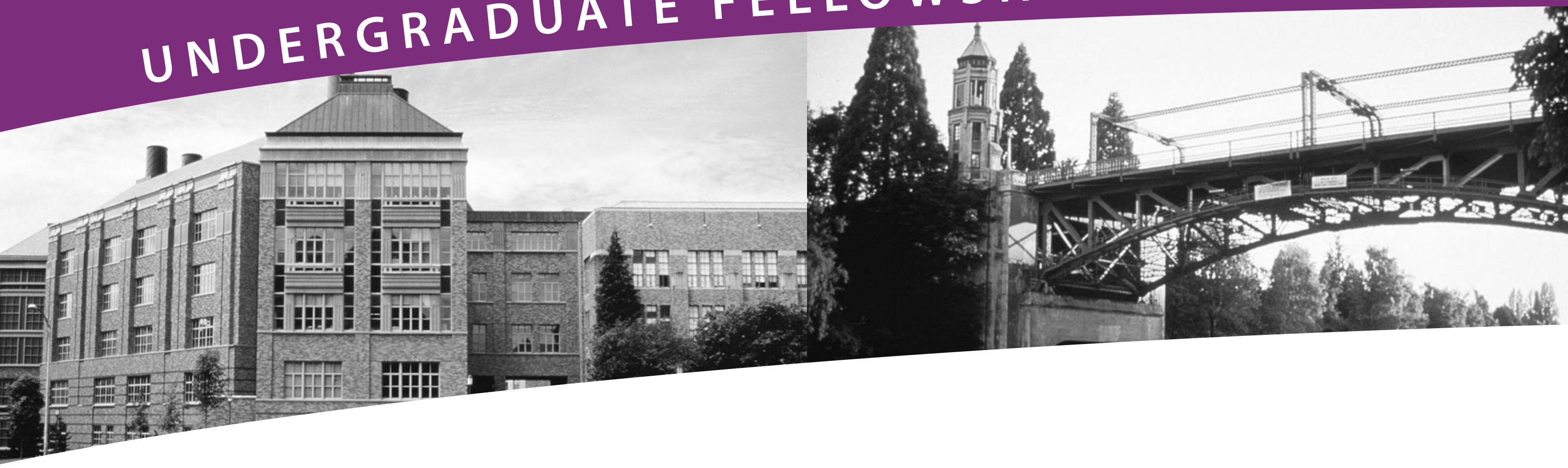
Michael Larsen
Colorado College (Colorado Springs, CO)

Kelli Ogawa
University of Hawaii at Manoa (Honolulu, HI)

Stephen Percival
University of Nevada, Reno (Reno, Nevada)

Yitong (Jenny) Zhang
The Hong Kong University of Science and Technology (Hong Kong, China)

UNDERGRADUATE FELLOWSHIPS & AWARDS



Christoffer Amdahl
Donald J. Hanahan Endowed Scholarship in Chemistry or Biochemistry
Levinson Emerging Scholar

Todd Anderson
ACS Outstanding Student in Analytical Chemistry
Earl W. Davie Endowed Scholarship in Chemistry or Biochemistry

Aaron Azose
P. C. Cross Award

Shiv Bhandari
Washington Research Foundation Fellowship

Derek Britain
Levinson Emerging Scholar

Alice Chu
Mary Gates Research Scholar

Meghan Cowan
P. C. Cross Award

Sibani Das
Usha and S. Rao Varanasi Endowed Diversity Scholarship in Chemistry

Matthew Ellis
Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry

Nicolle Esparo
Bonderman Travel Fellowship 2013

Laura Estergreen
Distinguished Achievement in Chemistry Research

Tianyuan Fu
Mary Gates Research Scholar

Xingyee Gan
ACS Outstanding Student in Inorganic Chemistry
Mary Gates Research Scholar

Kevin Green
Hyp Dauben Award

Victoria Hildreth
Berkelhammer Book Award

Farhan Himmati
Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry

Andrew Ho
H. K. Benson Undergraduate Tuition Scholarship
Mary Gates Research Scholar

Hanna Hong
Mary Gates Research Scholar

Jeremy Housekeeper
Washington Research Foundation Fellowship

Jessica Huang
Distinguished Achievement in Chemistry Research

Jessica Hui
Mary Gates Research Scholar

Adiba Khan
Mary Gates Research Scholar

Kristin Kontogianis
Zalia Jencks Rowe Scholarship

Lindsey Kornowske
Mary Gates Research Scholar

Mitchell Krawczyk
Hyp Dauben Award

Po-Ni Lai
Distinguished Achievement in Chemistry Research

Malte Lange
Amgen Scholar

Seungbeen Lee
Mary Gates Research Scholar

Mencius Leonard
CRC Freshman Achievement Award

Linda Lu
CRC Feshman Achievement Award

Yifan Lu
Berkelhammer Book Award

David Mahoney
Distinguished Scholarship in Chemistry or Biochemistry

Ji-Hong Min
Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry
Mary Gates Research Scholar

Photo: Doug Plummer

UW campus scenes, left to right: the Chemistry Building, Montlake Cut, the Quad.

Chinonso C. Opara
Boeing Scholarship

Harlan Pietz
Mary Gates Research Scholar

Margaux Pinney
Distinguished Achievement in Chemistry Research
Levinson Emerging Scholar
National Science Foundation Graduate Research Fellowship

Chaau Poon
ACS Outstanding Student in Inorganic Chemistry

Kevin Pratap
CRC Freshman Achievement Award

Sarah Redmond
Zalia Jencks Rowe Scholarship

Jordan Rixon
Zalia Jencks Rowe Scholarship

Allison Sheen
CRC Freshman Achievement Award

Denis Smirnov
Distinguished Scholarship in Chemistry or Biochemistry
Levinson Emerging Scholar

Chrissy Stachl
DAAD German Graduate Study Scholarship, German Academic Exchange Service
Pfizer Academic-Industrial Relations (AIR) Diversity in Chemistry Research Fellowship 2013–2014

Lindsey Theda
Mary Gates Research Scholar

Jeremy Tran
Goldwater Scholar
H. K. Benson Undergraduate Tuition Scholarship

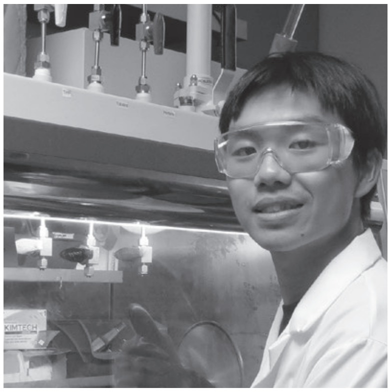
Alex Vaschillo
Astronaut Scholarship Foundation Scholarship
Distinguished Scholarship in Chemistry or Biochemistry
National Science Foundation Graduate Research Fellowship
Washington Research Foundation Fellowship

Stephanie Wang
Zalia Jencks Rowe Scholarship

Miriam Williamson
Donald J. Hanahan Endowed Scholarship in Chemistry or Biochemistry

James Yan
Mary Gates Research Scholar

Jaimei Zhang
Mary Gates Research Scholar



top down: Chrissy Stachl, Jeremy Tran

Photo: agencyby/istock/Thinkstock

Grateful Alumni Give Back: Paul H. and Karen S. Gudiksen Endowed Fund

Courtesy of the Gudiksens

Paul and Karen Gudiksen dressed for a formal occasion aboard the Queen Mary 2 cruise ship.

Between them, Paul and Karen Gudiksen received five degrees from the University of Washington. Karen earned a B.S. in 1962 and an M.D. in 1965; Paul earned a B.S. in 1959, an M.S. in 1962, and his Ph.D. in chemistry in 1967.

Paul and Karen both have humble beginnings. Karen's family lived in Bellevue when she was born, which at the time was a rural place that was not connected to Seattle by any bridges. When she was in kindergarten, the family moved away to become farmers near Rochester, WA. She went through the Rochester school system graduating from high school in a class of 36 students. Her dad finished his working career as a Boeing machinist; her mom was a librarian in a public library. At the age of 13, Paul emigrated with his parents from Denmark where they settled in Renton as dairy farmers. Paul graduated from Renton High School.

Both families immensely valued education. Paul's parents emigrated to give Paul the opportunity to further his studies in science. Paul says, "It was almost automatic that I ended up at the UW." For Karen, there was never any discussion about not going to college in her family. Her mother graduated from the UW in 1929, and Karen and two of her three siblings also graduated from the UW.

Paul and Karen met at Karen's dormitory's winter dance while they were both students at the UW. When first married in 1963, they lived west of campus on lower Broadway near the water. After Paul finished his graduate studies in 1967, they moved to the San Francisco Bay area where Paul began his 30-year career at the Lawrence Livermore National Laboratory. Karen's entire career was as a community mental health psychiatrist, where she finished her career working in the Alameda County jails evaluating the mental state of prisoners and treating their mental illnesses. Paul and Karen's education and experiences at the University of Washington were important building blocks in their lives.

They have one son, Mark, who earned his Ph.D. in chemical physics at Harvard University. Karen jokes, "We even produced a chemist!" However, they were unable to convince him to go to the UW because he was turned off by Seattle rain. Mark's love of California no doubt comes from his father who says, "I have a great fondness for my Danish heritage even though I live in California. It is warmer here." Mark is now a venture capitalist in San Francisco; his wife, Katie, who he met at Harvard, is a physical chemist. They have two daughters.

The Gudiksens established an endowment to provide student support, maintenance, and improvement of the infrastructure for teaching and research in chemistry, and to offset the faculty salary inequities that result from a shortfall of state funds. When first asked why they give to the UW, Karen's immediate response was "education is extraordinarily important." As proud UW alumni, they want to help other students have the educational experience they had. Karen says, "We couldn't have gotten to where we are today if we didn't have our education from the UW. We began giving 12 years ago at a time when student expenses were not as steep as they are now. Now, it is even more important to give to help today's students have the opportunities that we had."

Paul's reasons for giving cite more specific experiences. "I had interests that were beyond chemistry and, in those days, there were no multidisciplinary choices like there are today. I worked on a lot of projects that were broader than the area of chemistry and the Department supported me just the same; I really appreciated that flexibility in those days." The Department of Chemistry "was before their time in that area."

"The chemistry department as a whole was very supportive in my getting through and without that I wouldn't have been able to continue on with a career at the University of California Lawrence Livermore National Lab and that is the main reason we are supporting the Department today."

The Gudiksens did not establish this endowment through a single gift. Rather, for the past 12 years, they have been making annual gifts to their fund and it has added up! Paul and Karen are truly an inspiration in their generosity and loyalty to the Department and the UW. Chemistry Chair Paul Hopkins is extremely grateful for these gifts, saying that the proceeds of endowments like these "make all the difference" in assuring that we can provide a high quality program that maximizes the accomplishments of our current students. ■




Recent recipients of the Gudiksen Endowed Fellowship in Chemistry (clockwise from top left): Mike Larsen, Nicholas Senger, Joan Bleecker, and Jordan Anderson. Michael Enright is this year's recipient of the Gudiksen Fellowship and is pictured on page 16.

In their words…

Paul

We immigrated to the U.S. in 1950 to enable my parents to learn more about farming in another part of the world and to give me the opportunity to further my education in science.

It was almost automatic that I ended up at the UW.

The Department supported me in so many ways to help me get through…without that, I wouldn't have been able to continue on with a career at the Lawrence Livermore National Lab. That is the main reason we are supporting the Department today.

I actually worked on a lot of projects that were broader than the area of chemistry and the Department supported me just the same; I really appreciated that flexibility in those days.

My research interests included a wide range of experimental and numerical modeling studies related to environmental impacts associated with the use of nuclear energy for both peaceful and military uses.

I was involved with the development of a real-time nuclear emergency response system that currently operates 24/7, to assess the impacts of any nuclear accident that involves the release of radioactivity into the atmosphere.

I have a great fondness for my Danish heritage even though I live in California. It is warmer here.

Karen

Education is extraordinarily important.

We want to help out other kids. We couldn't have gotten to where we are today if we didn't have our education from the UW.

Medical students have to do chemistry and I did well in chemistry. It is a necessary foundation for my understanding and use of medicine. (I'm a psychiatrist.)

Family is very important to me…and the fact they got degrees from the UW.

In my family—I was one of four—there was never any discussion about not going to college. All four of us have at least bachelor's degrees.

[Paul] was the only guy with a car—a lovely old '56 Chevy—which at first he loved more than me.

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Fluorescence-Enabled Electrochemistry

Bo Zhang

Fluorescence-enabled electrochemical microscopy (FEEM) is a new analytical technique which allows for direct visualization of electrochemical kinetics at >10^6 parallel microelectrodes with optical microscopy. A unique feature of FEEM is that it uses a bipolar electrode mechanism to electrically couple a fluorogenic redox reaction to a separate redox reaction of interest, such as the oxidation of dopamine. The above scheme illustrates the use of FEEM to screen electrocatalysts. An analyte molecule, ***R***, is oxidized at certain locations of a bipolar electrode array where it is modified with an electrocatalyst. This reaction is coupled to a cathodic reaction in which molecule, ***S***, is reduced to a fluorescent product, ***P***.

Guerrette, J. P.; Percival, S. J.; Zhang, B. Fluorescence coupling for direct imaging of electrocatalytic heterogeneity. *J. Am. Chem. Soc.*, **2013**, 135, 855–861.