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Paul Hopkins, Chair

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Dear Friend of Chemistry,

Greetings from UW Chemistry! I hope this edition of the ChemLetter finds you and yours well. It is my pleasure to provide this update on our activities.

In this era of rising student demand for science coursework, each successive year brings record-breaking enrollment levels in our courses. To provide a sense of scale, a few more than 6,000 students started as freshmen this year at the UW; our fall quarter enrollment in freshman-level chemistry classes was over 3,000! Nearly 2,000 students are presently enrolled in just one course, CHEM 142, first quarter chemistry for those who enter with a high school-level chemistry background. When I began as department chair, enrollment in this course was just half this number. I am glad no one told me that on my watch enrollment in this resource-intensive course, which was already our largest, would double.

At the other end of this "student pipeline" are the many students who complete bachelor's degrees in chemistry or biochemistry, or both. The size of this program has now stabilized at about 400 degrees per year, an unusually large number even for a large public university.

I am pleased to report a landmark event. Longtime readers will know that it has been an institutional goal for a great many years to renovate to modern standards the rooms in which our freshmen do their laboratory work. We have four large rooms on the second floor of Bagley Hall dedicated to this purpose. About a decade ago, we received funding to renovate the first of these four rooms. This past summer, we learned that funding has been approved to renovate the fourth and final lab. Our quest to modernize these spaces, called "something out of Dickens" by a former dean of Undergraduate Education, thus appears to have come to a successful close. This leaves just one final undergraduate laboratory space in Bagley Hall (for students beyond the freshman year) in need of renovation. Before leaving this subject, I will note a longer term goal concerning our facilities, the construction of a new building to replace the now outdated research space in Bagley Hall. Pursuing this goal will no doubt provide a healthy challenge to one or more future chairs.

Another new development of the past few months has its origin in the state budget that began on July 1, 2013. At the urging of Governor Inslee, whose interest in and support for affordable clean energy is longstanding, our state legislature allocated funds earmarked for the creation of a Clean Energy Institute at the UW. The center will focus on advancing the science and engineering of the capture and storage of solar energy. Many of our current chemistry faculty members are expected to contribute to and benefit from the existence of this new institute. I presume that articles on this subject will appear in future editions of this publication.

Earlier this year, it was our sad duty to report to you the December 2012 passing of Professor Emeritus Bruce R. Kowalski. Bruce was a luminary, who served for many years on our analytical faculty. He was a pioneer in the field of chemometrics, and a person of great vision, energy, and creativity. We were all saddened to see his life cut short. Bruce was to me more than an outstanding analytical chemist and a friend; he was also a valued advisor. Long after his retirement from our faculty, I would call him



Letter from the Chair, continued from page 1

at his new home in Durango to seek his advice on difficult issues. To honor Bruce's life, and to further his lifelong goal of excellence and innovation, I am pleased to announce that in October the Department established an endowment bearing his name, the Bruce R. Kowalski Endowed Fund in Chemistry. Like all other endowed funds, this one will exist in perpetuity. The proceeds of this fund can be spent flexibly by the Department to support students, faculty, or staff. As a founding leader of the Center for Process Analytical Chemistry, Bruce understood the extraordinary value to leaders of funds like this one that can be spent flexibly. To encourage you to consider giving to this fund, I am committing the Department to match dollar-for-dollar gifts to this fund during 2013 and 2014, up to a total match of \$25,000. Gifts to this fund can be sent to my attention. If you were among the many that knew and admired Bruce, I hope you will consider making a gift.

It is my very great pleasure to thank Duane and Barbara LaViolette, who have pledged an extremely generous planned gift to the Department. An article about them and their gift is included in this edition. Duane and Barbara have been regular attendees of department events, especially our annual awards dinner at which we honor student awardees, among others, and at occasional scientific lectures. Their friendship and support have been exemplary; their gift will have great impact.

As this calendar year draws to a close, I feel that I can in good conscience report to you that the state of the Department of Chemistry at the UW remains strong. We are fortunate to have an outstanding current group of both faculty and students, and to receive applications every year from those who aspire to be the next generation of faculty and students. We have weathered a stunning period in which we witnessed breathtaking declines in the level of stateprovided financial support that funds the core of our instructional programs, and perhaps turned a corner in the current fiscal year with about 20% of the lost state funding restored. The latter made possible—for the first time in many years-not one, but two years in which we do not need to raise tuition levels for undergraduate students who are state residents. That said, we live in a competitive world, nationally and even internationally, and the pressure is high to be at the top of our game. Your gifts help us to be outstanding in both our educational and research programs. If you are not already a regular contributor, please consider joining the many friends of Chemistry who value what we do, and help to keep us strong.

As always, I hope you enjoy this edition of the *ChemLetter*. Please accept my best wishes and please stay in touch.

Sincerely,

Paul BHol.

Paul B. Hopkins Professor and Chair



Spotlight on Chemical Sciences

- Professors David Ginger
 and Alex Jen, along
 with other researchers,
 recently reported on the
 role of electron spin
 in creating efficient
 organic solar cells.
 Their findings were
 published in the
 journal Nature.
- Professor Sarah Keller and Affiliate Professor of Bioengineering Roy Black have helped to unravel some of the mystery surrounding the origin of cells in Earth's ancient oceans. Their work describes the unexpected selectivity of interaction of the chemical components of RNA with fatty acids, which may play a role in stabilizing the precursors to cellular membranes.

New Directions in Energy Research

Earlier this year, Governor Jay Inslee and the State of Washington announced the creation of the Clean Energy Institute at the University of Washington. The Clean Energy Institute "aims to accelerate the creation of a scalable clean energy future by advancing the next generation solar energy and electrical energy storage materials and devices, and their integration with systems and the grid. The Institute is an interdisciplinary initiative focused on developing innovative people and programs in the areas of Advanced Materials for Energy and Energy Systems & Integration." A number of Chemistry faculty members at the UW are engaged in energy research to further these goals. Here are some highlights:

Professor Daniel Gamelin's group is involved in the development of new inorganic nanocrystal-based luminescent solar concentrators (LSCs). LSCs are inexpensive and flexible plastic waveguides that collect solar energy and concentrate it onto photovoltaics. Made by inexpensive solution processing, they can lower the cost of solar energy conversion by reducing the photovoltaic cell areas needed and by increasing cell efficiencies. Gamelin says, "Luminescent solar concentrators are basically just big sheets of plastic that funnel photons to solar cells—they are cheap, robust, and work equally well under diffuse or direct sunlight, qualitatively expanding the possibilities for solar deployment." The group is also developing composite semiconductor/cata-

lyst photoelectrodes for solar water splitting. This process bypasses photovoltaic energy conversion by storing solar energy directly in the form of hydrogen (H_2) .

In Professor James Mayer's lab, researchers explore the fundamental science behind the interconversion of electrical and chemical energies as well as the catalysis of the production and utilization of chemical fuels. The efficient and inexpensive interconversion of chemical and electrical energies is one of the great challenges of our century. This would enable, for instance, much more efficient fuel cell vehicles and the storage of energy from intermittent sources such as solar or wind. The materials for these processes need to be "earth-abundant" (not rare) in order to meet the high demand. They must also be non-toxic, benign materials. Research in the Mayer group is approaching this challenge in a variety of ways. Simple new catalysts have been discovered for the oxidation of water to O_2 , 2 $H_2O \rightarrow O_2 + 4 H^+ + 4 e^-$. These are the first examples using copper. This reaction is key to the formation of chemical fuels, since it provides the electrons (reducing equivalents) to make H₂ from H⁺ or organic fuels from CO₂. The Mayer group is also developing new electrochemical iron catalysts for the reduction of O₂ to water, which is the cathode reaction in a fuel cell. These studies indicate that it will be valuable to control the proton flow to the O₂ as well as the electron addition. In parallel with these molecular

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Wide-band gap (ZnS, ZnSe) Mn²⁺-doped semiconductor nanocrystals can exhibit sensitized Mn²⁺ photoluminescence due to rapid energy transfer from excitonic to Mn²⁺ excited states. When these excited states are closer in energy (ZnCdMnSe, ZnMnTe), thermal repopulation of the excitonic states from the Mn²⁺ excited state can occur, resulting in luminescence from both states. This phenomenon, first discovered in the Gamelin lab, results in the photo-luminescence spectra pictured here. Complete population transfer between the excitonic and Mn²⁺ excited states results in a dramatic change in peak intensities that is highly selective and sensitive to temperature. Below the graph, a photograph of a sample illustrates the transition from excitonic luminescence (left) to Mn²⁺ luminescence (right) as temperature decreases.

Courtesy of Daniel Gamelin

New Directions in Energy Research continued from page 3

studies, students in the Mayer group are also developing the fundamental proton/electron transfer chemistry of metal oxide materials such as titanium dioxide, which are used in a variety of energy applications.

Professor David Ginger's group is developing the next generation of solar cells which are inexpensive, flexible, and efficient. On the materials science and engineering side of research, Professor Alex Jen's group develops low-cost and efficient polymer solar cells and highly efficient white-light polymer LEDs. These researchers recently reported their collaborative findings in the journal Nature. Organic solar cells that convert light to electricity using carbonbased molecules have shown promise as a versatile energy source but have not been able to match the efficiency of their silicon-based counterparts. These researchers have discovered a synthetic, high-performance polymer that behaves differently from other tested materials and could make inexpensive, highly efficient organic solar panels a reality. The polymer, created at the University of Washington and tested at the University of Cambridge, appears to improve efficiency by wringing electrical current from pathways that, in other materials, cause a loss of electrical charge.

In Assistant Professor Brandi Cossairt's lab, solar energy research is focused on the development of new light-harvesting materials and on solar energy storage in the form of energy-dense molecules such as hydrogen. The first focus area hopes to maximize the energy output from cheap materials such as nanocrystalline zinc phosphide. The research is challenging, however, because traditional methods for making these materials do not work well; new methods will need to be developed.

Other members of the Department of Chemistry faculty explore areas of catalysis for fuel conversion, hydrogen storage methods, novel materials for solar cells, and conversion of biomass to chemicals and fuels.



The images on the left show UV-Vis traces monitoring zinc phosphide formation over time showing growth in absorption across the visible spectrum along with inset images showing the resulting particles by transmission electron microscopy and their bright luminescence. The images on the right show our general approach to designing hybrid photoelectrochemical systems for the hydrogen evolution reaction that focuses on the construction of inorganic interfaces between the molecular and semiconductor components.

Courtesy of Brandi Cossairt

Understanding Malaria Mutagenesis

Malaria infects more than 250 million people and kills more than 500,000 per year. Eradication of this disease will be greatly assisted by an understanding of how the malaria parasite mutates at extraordinary rates and thus presents a "moving target." It is of particular interest to learn how the parasite mutates rapidly and acquires beneficial traits in a given gene (i) without destroying the function of that gene in parasites that have only one copy of most genes or (ii) without accidentally damaging other parts of their single-copy genome. Professor Pradip Rathod and co-workers have shown that malaria parasites can acquire localized beneficial traits via a populationbased two-step strategy.

Using novel organic molecules with antimalarial activity as tools, Rathod's research group captured Plasmodium falciparum cells in the act of altering their DNA at the position in their genome necessary to confer drug resistance. Individual parasite cells in a large population of infected red blood cells, first, randomly duplicated 0.1-0.5% of their genome. Most cells amplified irrelevant parts of the genome and died under drug pressure. One in a million lucky parasite cells fortuitously duplicated the gene for the drug target and inherited partial resistance. In a second step, at higher drug pressures, the initial DNA duplication at the beneficial locus was further amplified, this time with exquisite precision and favorable kinetics. Since each cell was performing such acts at only one place in the genome of that particular cell, the rest of the genome in the surviving parasites remained undisturbed.

It is now clear how parasite populations "direct" mutagenesis to the correct locus in their single-copy genome, how they set the stage for further mutagenesis by creating multiple copies of genes at that high value location, and avoid collateral damage at distant genomic sites that are not relevant. The findings bring together many scattered known facts about malaria genomics and make some strong predictions about how the parasites may use such mechanisms for evolutionary advantages beyond drug resistance. In the future, these insights will lead to identification and blocking of enzymes promoting malaria mutagenesis and will help prioritize global control strategies against malaria. This work was published in PLoS Pathogens and cited as editor's choice in Science. The lead author, Dr. Jennifer Güler, began an independent faculty position at the University of Virginia this fall.

Further Reading

- Guler, J. L.; Freeman, D. L.; Ahyong, V.; Patrapuvich, R.;
 White, J.; Gujjar, R.; Phillips, M. A.; DeRisi, J.; Rathod,
 P. K. Asexual Populations of the Human Malaria Parasite, *Plasmodium falciparum*, Use a Two-Step Genomic Strategy to Acquire Accurate, Beneficial DNA Amplifications. *PLoS Pathog*, 2013, 9 (5), e1003375.
- Ash, C. Editor's Choice: Tuning Haploid Happenstance. *Science*, **2013**, *340* (*6139*), 1377.

For More Information on the Rathod Laboratory

Please visit: http://depts.washington.edu/chem/people/ faculty/rathod.html



FACULTY AWARDS & HONORS

Matthew Bush

Research Award, American Society for Mass Spectrometry

Charles Campbell

B. Seymour Rabinovitch Endowed Chair in Chemistry

Elected Member, Washington State Academy of Sciences

Gerhard Ertl Lecture Award, Fritz Haber Institute, Max Planck Society

Robert Burwell Lectureship in Catalysis, North American Catalysis Society

Michael Gelb

Gustavus John Esselen Award for Chemistry in the Public Interest, Northeastern Section of the American Chemical Society

Karen Goldberg Paul B. Hopkins Faculty Award

Presidential Entrepreneurial Faculty Fellow, UW Center for Commercialization

Samson Jenekhe

Elected Member, Washington State Academy of Sciences

Sarah Keller

Thomas E. Thompson Award, Biophysical Society, Membrane Structure & Assembly Subgroup

Visiting Scholar, Phi Beta Kappa Society

Mentor Award, UW Postdoctoral Association

Munira Khalil

Camille Dreyfus Teacher-Scholar Award, Camille & Henry Dreyfus Foundation

Gojko Lalic CAREER Award, National Science Foundation

David Masiello CAREER Award, National Science Foundation

OpenEye Outstanding Junior Faculty Award, American Chemical Society, Computers in Chemistry Division

James Mayer Dow Lecturer in Inorganic Chemistry, University of California, Berkeley

Distinguished Lecturer in Inorganic Chemistry, Northwestern University



top row, l to r: David Masiello, Charles Campbell bottom row, l to r: František Tureček, Sarah Keller

William Reinhardt *Outstanding Referee, American Physical Society*

Bruce Robinson Larry R. Dalton Endowed Professor of Chemistry

Jaromir Ruzicka Miegunyah Distinguished Visiting Fellow, University of Melbourne

Robert Synovec *GC*×*GC Scientific Achievement Award, California Separation Science Society*

František Tureček

Gustavus John Esselen Award for Chemistry in the Public Interest, Northeastern Section of the American Chemical Society

Klaus and Mary Ann Saegebarth Endowed Professor of Chemistry

Bo Zhang Young Investigator Award, Society for Electroanalytical Chemistry Chemistry graduate students Alisha Jones and Joan Bleecker were selected to represent the UW last July at the 63rd annual meeting of Nobel Laureates in Lindau, Germany. This year's meeting featured recipients of the Nobel Prize in Chemistry.



top to bottom: Joan Bleecker with Nobel Laureate Steven Chu and Nobel Laureate Edmond Fischer

> left to right: Alisha Jones at the 63rd Lindau Nobel Laureate Meeting: attending a lecture, dancing at Bavarian evening, and "throwing dukes" with Nobel Laureate Richard Ernst

The Lindau Nobel Laureate Meeting is "science Disneyland"; there is always something to do or see and it's a lot of fun. I attended small discussion sections, lunches, dinners, and evening events with Nobel Laureates including Steven Chu, Nobel Prize winning physicist and former secretary of energy for the Obama administration. Chu talked about how difficult it is for scientists to effect changes in Congress because "all they wanted was a sound bite and video footage of an angry physicist." I asked him if he ever felt hopeless interacting with Congress, to which he replied, "No, I'm too feisty!" He stressed that more professors at the top of their fields need to leave the lab and serve in the government. There is a real need for scientists who can serve as the "go between" of research and the public.

> I left the meeting more hopeful and excited than I ever have been about science. I would recommend this meeting to any UW graduate student who wants to meet his/her science heroes and see the impacts of science on the greater community. I am incredibly grateful to several organizations at the UW, including the Dean's Office, the Department of Chemistry, and the Molecular Biophysics Training Grant for funding my travel after the sequester caused the NIH to cancel my funding.

> > —Joan Bleecker



Words of wisdom from Nobel Laureate Edmond Fischer (Courtesy of Alisha Jones)

I was one of the approximately 625 young researchers from 78 countries selected to attend the 63rd Lindau Nobel Laureate Meeting in southwestern Germany. While the application process was a bit onerous (there were three rounds of the application process, each one requiring essays, letters of intent, etc.), it was most certainly worth it.

> The week-long meeting consisted of formal lectures and informal discussions with the Nobel Laureate scientists, as well as with fellow students from around the world. I had the opportunity to get to know some of the most important people in our field on both a professional and personal level. The Laureates were impressive people to be around and gave us this advice: If you want a Nobel Prize, don't seek it. Just do what you love, and if what you love turns out to be Nobel Prize worthy, you haven't lost friends or family in the process. I recommend that any student who has the opportunity should apply. Meeting young researchers from so many different backgrounds definitely enhances one culturally. I made quite a few new friends.

> > -Alisha "Jonesy" Jones



Christian Flemming © Lindau Nobel Laureate Meetings and Courtesy of Alisha Jones



GRADUATE FELLOWSHIPS & AWARDS



Shoshanna Barnett Martin P. Gouterman Endowed Fellowship in Chemistry

Joan Bleecker Paul H. and Karen S. Gudiksen Endowed Fellowship in Chemistry

Liam Bradshaw Arthur G. Anderson Endowed Fellowship in Chemistry

Stephen Carlin Arthur G. Anderson Endowed Fellowship in Chemistry

Andrew Chanez Lewis R. and Joan M. Honnen Endowed Fellowship in Chemistry

Advanced Materials for Energy Distinguished Energy Fellowship

Tyler Chozinski Mary K. Simeon and Goldie Simeon Read Endowed Fellowship in Chemistry Early Bird Research Assistantship funded by the Gary and Sue Christian Graduate Fellowship in Chemistry

Samantha Connelly 2012-13 Outstanding Teaching Assistant

Jonathan Cox S. P. Pavlou & D. E. Strayer Endowed Fellowship in Chemistry 2012-13 Outstanding Teaching Assistant

Abhinav Dhall Marilyn Werby Rabinovitch Memorial Fellowship in Chemistry **Yunshan Fan** Gary and Sue Christian Graduate Fellowship in Chemistry

Hannah Feldman Rowland Endowed Fellowship in Chemistry

Early Bird Research Assistantship funded by the Mickey and Karen Schurr Endowed Graduate Fellowship in Chemistry

Brian Fitz Amy Scott and Stephen C. Alley Endowed Fellowship in Chemistry

Jonathan Goldberg Honorable Mention, National Science Foundation Graduate Research Fellowship

Joshua Guerrette Basil G. and Gretchen F. Anex Endowed Fellowship in Chemistry

Kimberly Hartstein National Science Foundation Graduate Research Fellowship

Shushan He Howard J. Ringold Endowed Fellowship in Chemistry

Stephanie Hemmingson Honorable Mention, National Science Foundation Graduate Research Fellowship

Chelsea Hess Brian R. Reid Endowed Fellowship in Chemistry Alisha Jones Irving and Mildred Shain Endowed Fellowship in Chemistry

Troy Kilburn Basil G. and Gretchen F. Anex Endowed Fellowship in Chemistry Advanced Materials for Energy

Distinguished Energy Fellowship Travis Lekich

Natt-Lingafelter Endowed Fellowship in Chemistry

Patrick Lestrange Honorable Mention, National Science Foundation Graduate Research Fellowship

Jonathan Litz Leon J. Slutsky Endowed Fellowship in Chemistry

Sophia Masi Achievement Rewards for College Scientists Seattle Chapter Fellowship

Laura Murphy Alvin L. Kwiram/Council for Chemical Research Endowed Fellowship in Chemistry

Advanced Materials for Energy Distinguished Energy Fellowship

Heidi Nelson National Science Foundation Graduate Research Fellowship

Huong (Ivy) Nguyen Eugene S. Mindlin Endowed Fellowship in Chemistry



left to right: Andrew Chanez, Abhinav Dhall, Shushan He, Ivy Nguyen, Scott Rayermann, Jennifer Stein, Lauren Wugalter, Yunqi Yan

Gregory Peterson Norman and Lillian Gregory Endowed Fellowship in Chemistry

Timothy Pollock *David M. Ritter Endowed Fellowship in Chemistry*

Scott Rayermann George and Agnes Irene Cady Endowed Fellowship in Chemistry

Lloyd E. and Florence M. West Endowed Fellowship in Chemistry

Martin Roskoff Klaus and Mary Ann Saegebarth Endowed Fellowship in Chemistry

Margaret Scheuermann Mickey and Karen Schurr Endowed Graduate Fellowship in Chemistry

Nicholas Senger Paul H. and Karen S. Gudiksen Endowed Fellowship in Chemistry

Jennifer Stein George Hitchings Endowed Fellowship in Chemistry

Advanced Materials for Energy Distinguished Energy Fellowship

Dana Sulas National Science Foundation Graduate Research Fellowship

Niket Thakkar National Science Foundation Graduate Research Fellowship

Benjamin Van Kuiken Klaus and Mary Ann Saegebarth Endowed Fellowship in Chemistry

Sarah Vorpahl

Honorable Mention, National Science Foundation Graduate Research Fellowship

Caroline Weller National Science Foundation Graduate Research Fellowship

Aaron Whittaker Gary and Sue Christian Graduate Fellowship in Chemistry

David Williams-Young Benton Seymour Rabinovitch Endowed Fellowship in Chemistry Early Bird Research Assistantship funded by the Basil G. and Gretchen F. Anex Endowed Fellowship in Chemistry

Lauren Wugalter Irving and Mildred Shain Endowed Fellowship in Chemistry Bernard and Claudine Nist Endowed Fellowship in Chemistry

Early Bird Research Assistantship funded by the Arthur G. Anderson Endowed Fellowship in Chemistry

Yunqi Yan Reinhardt Family Endowed Fellowship in Chemistry

Mengxia Zhao Larry R. Dalton Fellowship in Chemistry

2012–13 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.

Samantha Connelly University of Iowa (Iowa City, IA)

Joshua Guerrette University of Hawaii at Manoa (Honolulu, HI)

Sanjay Hari The Ohio State University (Columbus, OH)

Yue Huang Beijing Institute of Technology (Beijing, China)

Erica Ingalls Gordon College (Wenham, MA)

Michael Lynch University of British Columbia (Vancouver, Canada)

Erin Riley University of New Mexico (Albuquerque, NM)

Margaret Scheuermann Scripps College (Claremont, CA)

Guozheng Shao *Peking University (Beijing, China)*

Andreas Tillack Humboldt University of Berlin (Berlin, Germany)

Jessica Wittman Montana State University (Bozeman, MT) UNDERGRADUATE FELLOWSHIPS & AWARDS

Nicholas H. Aldredge Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry

Yasaman Azodi Zalia Jencks Rowe Scholarship

Michael Bocek Distinguished Scholarship in Biochemistry

Evan A. Boyle Washington Research Foundation Fellowship Distinguished Scholarship in Biochemistry

Margaret E. Bruce Zalia Jencks Rowe Scholarship

Jon Chu Mary Gates Research Scholar

Natacha Lou Comandante CRC Freshman Achievement Award

Michelle Drews Distinguished Scholarship in Biochemistry President's Medal

Marissa Fletcher Mary Gates Research Scholar

Kenji Fujitani Marilyn Werby Rabinovitch Memorial Fund in Chemistry Award

Carolyn Gunthardt ACS Outstanding Student in Inorganic Chemistry Distinguished Achievement in Chemistry Research

Caroline Hassan Marilyn Werby Rabinovitch Memorial Fund in Chemistry Award

Vicky Herrera Zalia Jencks Rowe Scholarship Angela R. Hess Earl W. Davie Endowed Scholarship in Chemistry

Sean Higgins Mary Gates Research Scholar

Benjamin G. Horst Hypercube Scholar Distinguished Scholarship in Chemistry Earl W. Davie Endowed Scholarship in Chemistry Levinson Emerging Scholar

Emily Hsieh Levinson Emerging Scholar Bonderman Travel Fellowship

Wei Huang P. C. Cross Award

Eric Janke Distinguished Achievement in Chemistry Research

Ismail Jatta Mary Gates Research Scholar Marilyn Werby Rabinovitch Memorial Fund in Chemistry Award Anand Kaul Mary Gates Research Scholar

Mitchell Krawczyk CRC Freshman Achievement Award

Calvin Le Hyp Dauben Award

Timothy Livingston Large *Distinguished Achievement in Chemistry Research*

Kelly L. MacWhorter Donald J. Hanahan Endowed Scholarship in Biochemistry

Mathinia Mohanachandran Distinguished Scholarship in Biochemistry

Alyssa K. Mueller Berkelhammer Book Award

Marvin E. Nayan H. K. Benson Undergraduate Tuition Scholarship Washington Research Foundation Fellowship

Derek T. Nhan Washington Research Foundation Fellowship

left: Matthew Sonnett in the Gelb group lab; right: Marvin Nayan presents a poster.



Adam D. Officer H. K. Benson Undergraduate Tuition Scholarship ACS Outstanding Student in Analytical Chemistry

Chinonso C. Opara Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry UNCF-Merck Undergraduate Science Research Scholarship Award

Michelle N. Parks Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry

Jack Phillips Mary Gates Research Scholar

Margaux Pinney Amgen Scholar

Guillermo S. Romano Amgen Scholar

top row, I to r: Ally Mueller, Emily Hsieh; bottom row, I to r: Michelle Drews, biology & biochemistry double major George Ueda and chemistry & biochemistry double major Amanda Tanadinata proudly don their graduation regalia, Kelly MacWhorter (B.S. Biochemistry) with UW alumna Amanda Evans. Denis Smirnov Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry

Matthew M. Sonnett Washington Research Foundation Fellowship Distinguished Achievement in Chemistry Research

Carla M. Stapleton Berkelhammer Senior Book Award Mary Gates Research Scholar

Alex Su Mary Gates Research Scholar

Alexandra Taipale Bonderman Travel Fellowship Jeremy Tran Hyp Dauben Award

Sally Turner P. C. Cross Award

Alex Vaschillo Rex J. and Ruth C. Robinson Endowed Scholarship in Chemistry Mary Gates Research Scholar

Sean Wu Mary Gates Research Scholar

Anna Zemke Dean's Medal in the Arts

Jenny Zhou Mary Gates Research Scholar

Aaron Zomback Mary Gates Research Scholar











DOCTORAL DEGREES AWARDED **Courtesy of Maxwell Zeigler**

September 2012-**August 2013**

Kate Allen, Ph.D. Chemistry Exploration of Iridium and Rhodium for Alkane C-H Functionalization (Professor Karen Goldberg)

Shoshanna Barnett, Ph.D. Chemistry The Discovery and Mechanistic Study of Copper-Based Water Oxidation Catalysts (Professor James Mayer)

James Bollinger, Ph.D. Chemistry

Development and Application of Novel Methodologies for the Characterization of Phospholipase A, Activity: Targeted Lipidomic Profiling and Interfacial Binding Analysis (Professor Michael Gelb)

Jennifer Brigham, Ph.D. Chemistry Novel Protein Enrichment Strategies for **Proteomic Studies** (Associate Professor Dustin Maly)

Aimee Byrne, Ph.D. Chemistry NMR Studies of Polypeptide Structuring and Aggregation (Professor Niels Andersen)

John Choiniere, Ph.D. Chemistry

The Clinical Diagnosis of Porphyrias by Tandem Mass Spectrometry (Professor František Tureček)

Michael Coggins, Ph.D. Chemistry

Small Molecule Activation Studies Involving Biomimetic Thiolate-Ligated Manganese(II) Complexes (Professor Julia Kovacs)

Jonathan Cox, Ph.D. Chemistry

New Electrochemical Methods for Studying Nanoparticle Electrocatalysis and Neuronal Exocytosis (Assistant Professor Bo Zhang)

Sean Fischer, Ph.D. Chemistry

Hopping Around: Development of Methods for the Simulation of Non-Adiabatic Dynamics in Large Molecular Systems (Associate Professor Xiaosong Li)

Noel Fitzgerald, Ph.D. Chemistry

Measurement of Dissolved Oxygen in Highly Restricted (Picoliter) Volumes Utilizing Thin Film Luminescent Sensors (Research Professor Emeritus Lloyd Burgess)

Jennifer Gadd, Ph.D. Chemistry Single-Molecule Studies for the Characterization of Synaptic Vesicles (Professor Daniel Chiu)

Morgan Gleaves, Ph.D. Chemistry

Thiolate Containing, N-heterocyclic Amine Ligands; Investigation Into Intermediates of O⁻, and O₂, Reactivity, Application Toward New Ligands for Modeling the Active Site of Superoxide Reductase (Professor Julia Kovacs)

Joshua Guerrette, Ph.D. Chemistry

Fluorescence-Enabled Electrochemical Microscopy and Nanoscale Electrochemical Analysis (Assistant Professor Bo Zhang)

Sanjay Hari, Ph.D. Chemistry

Investigating Inactive Conformations of Protein Kinases (Associate Professor Dustin Maly)

David Lao, Ph.D. Chemistry Development of Catalytic Processes for the Transformation of Low Value Chemical Feedstocks to Value Added Chemicals (Professor James Mayer)

Michael Lynch, Ph.D. Chemistry

Correlating Electronic and Nuclear Motions in Ultrafast Photoinduced Charge Transfer Reactions with Femtosecond Multidimensional Spectroscopies (Assistant Professor Munira Khalil)

Luke Marney, Ph.D. Chemistry

Metabolomics and the Development of Nontarget Discovery Analysis Methods for Two-dimensional Gas Chromatography *Time-of-Flight Mass Spectrometry* (Professor Robert Synovec)

Thomas Oates, Ph.D. Chemistry A Broadband Optical Ring Resonator for Absorption and Refractive Index Detection (Research Professor Emeritus Lloyd Burgess)



I to r: Maxwell Zeigler, Kevin O'Malley

Kevin O'Malley, Ph.D. Chemistry

Investigating Device Physics in Bulk-Heterojunction Organic Solar Cells through Materials Engineering of Interfaces (Professor Alex Jen, Materials Science & Engineering)

Theran Riedel, Ph.D. Chemistry

Constraints on Reactivity and Components of Nocturnal Nitrogen Oxides (Associate Professor Joel Thornton, Atmospheric Sciences)

Erin Riley, Ph.D. Chemistry

Single Molecule Photoluminescence Intermittency: The Role of the Host (Professor Philip Reid)

Margaret Scheuermann, Ph.D. Chemistry Investigations of the Reactivity of Pd and Pt Complexes with Molecular Oxygen and Characterization of a Gold(III)-Alkene Complex (Professor Karen Goldberg)

Thomas Schneider, Ph.D. Chemistry

Studies of Sample Compartmentalization by Microfluidic Methods (Professor Daniel Chiu)

Aaron Whittaker, Ph.D. Chemistry New Copper-Catalyzed Reactions of Organoboron and Organosilicon Compounds (Assistant Professor Gojko Lalic)

Ariel Zane, Ph.D. Chemistry Solid-State NMR Characterization of **Biosilicification Peptides** (Professor Gary Drobny)

Maxwell Zeigler, Ph.D. Chemistry Highly Sensitive Quantitative Microscopy for Cellular and Subcellular Analysis (Professor Daniel Chiu)

Mengxia Zhao, Ph.D. Chemistry Sensitive and High-throughput Detection, Separation and Analysis of Circulating Tumor Cells (Professor Daniel Chiu)

GIVING PROFILE

Leaving a Legacy through UW Chemistry: Duane & Barbara LaViolette Endowed Fund in Chemistry

We are pleased to announce that Duane and Barbara LaViolette have committed a major estate gift to the Department of Chemistry, to establish the Duane & Barbara LaViolette Endowed Fund in Chemistry. This fund will be used to provide student scholarships, as well as to support excellence throughout our department.

Duane LaViolette was an undergraduate student in chemistry at the UW, earning his bachelor's degree in 1947. Duane recounts that though his passion was the study of chemistry, he was urged by a family member to attend medical school, which he did for a brief period in the Midwest. But in the end, he was drawn back to chemistry, returning to Seattle, where he took a research position in the UW School of Medicine.

In his younger years, Duane was a man of considerable athletic ability, avidly pursuing the opportunities afforded by the Northwest for mountain climbing, bicycling, and boating. He met his future spouse Barbara while docking his boat in Portage Bay when she was working in the UW oceanography laboratories through a U.S. naval program.

The LaViolettes have been regular participants in Department of Chemistry activities for many years, attending colloquia and the annual awards dinner. Department Chair Paul Hopkins believes that the



Barbara and Duane LaViolette

LaViolettes have been among our department's most devoted friends. When asked why they have chosen to make such a generous planned gift to the Department, composed of almost all of their estate including their home, Duane says, "The Department of Chemistry was very good to me after I returned from the war, so now I just want to help the Department."

We thank the LaViolettes for their gift and for making the choice to give back to the UW to help others. We hope their gift highlights the huge impact higher education can have on an individual, and in turn on how an individual can have huge impact on higher education.

HIGHLIGHTS FROM OUR PUBLISHED RESEARCH



Surface Structure of a Biomineralization Protein

The extracellular matrix proteins found in mineralized tissues are Nature's crystal engineers, controlling the growth of inorganic composites such as hydroxyapatite (Hap), the mineral component of bones and tissues. Statherin, the 43 amino acid phosphoprotein that regulates both the primary and secondary nucleation of Hap, is disordered in solution but folds into a well-defined structure on mineral surfaces. This figure shows the structure of statherin adsorbed onto the 001 facet of Hap, obtained using distances and torsion angles (from Professor Gary Drobny's group), to constrain a molecular modeling algorithm. Structures of proteins adsorbed onto biomaterial surfaces will be useful in the development of calcification inhibitors and promoters of potential use in human medicine. A better understanding of how these proteins recognize and assemble in bioactive fashion on inorganic mineral phases could also aid in the development of surface coatings to improve the biocompatibility of implantable biomaterials and tissue engineering scaffolds.

OUR DONORS, JULY 2012-AUGUST 2013

During the past decade, 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. A decade later, we and other public institutions of higher education are heavily reliant upon gift funds for support of our baseline program. Today, annual gifts and endowment-derived funds are critical to every aspect of our teaching and research. Students, faculty, and staff are the beneficiaries of your gifts.

The UW 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 you are among our chemistry or biochemistry alumni who have not 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.

If your name is missing or misspelled, we apologize and hope you will let us know.

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NEW CHEMISTRY ENDOWMENT

Endowed Fund established in memory of Bruce Kowalski

The Department of Chemistry is pleased to announce the establishment of the Bruce R. Kowalski Endowed Fund in Chemistry. The fund will be used to foster innovations in research or educational programs in the chemical sciences. In honor of its namesake, the Department will match gifts made to the fund until December 31, 2014, totaling up to \$25,000 of matching funds.

Bruce R. Kowalski was a luminary in the field of analytical chemistry. He served on the faculty of the Department of Chemistry at the University of Washington, Seattle, from 1974 until his retirement in 1999. Kowalski is best known for his contributions as a pioneer in the field of chemometrics, a technique that uses multivariate analysis for the characterization of chemical processes. He was the founding Director of the National Science Foundation-funded Center for Process Analytical Chemistry, a highly successful university–industry cooperative venture.

You may recall reading of Kowalski's passing in the Spring *ChemLetter*. Kowalski is deeply missed by his faculty colleagues in the Department of Chemistry. He is remembered as a person of great ability, creativity, and enthusiasm.

The fund launched on October 1, 2013.



Bruce Kowalski

Make a gift to this fund in one of two ways:

1. Complete the form on the enclosed envelope with your credit or debit card number. Write "Kowalski Endowed Fund" anywhere on the form.

2. Mail a check or money order in the enclosed envelope. Write "Kowalski Endowed Fund" on the memo line.