UNIVERSITY of WASHINGTON

CHEMLETTER

SUMMER 2019 / VOLUME XXXVII NO.1

LETTER FROM THE CHAIR

Dear Friend of Chemistry,

There is much to share with you since my last letter! We are gearing up for autumn quarter and we welcome Assistant Professors Dianne Xiao and Matt Golder. Dianne's research program in inorganic chemistry will include synthesis of novel materials with applications to electrochemical energy conversion, molecular separations, and bio-inspired chemical catalysis. Matt's research will address the increasing interplay between physical organic chemistry and material science driving the preparation of new advanced polymers. There are many promising applications for these materials in biomedicine and engineering. More about Dianne and Matt will follow in our yearend issue.

As a department with 44 faculty members, 215 graduate students, and about 800 undergraduate students majoring in chemistry or biochemistry, I am pleased that we always have new accolades to announce. Graduate students Ben Mitchell and Ben Poulter were awarded 2019 National Science Foundation Graduate Research Fellowships, and Paige Gannon, Lauren Koulias, and Alexis Woodward Mills received honorable mentions. More about the funded projects are on pages 6-7. Doctoral candidate Jeffrey Buenaflor was recognized with the UW's Excellence in Teaching Award and named to the Husky 100. Jeffrey is featured on page 8.

Undergraduate students Thomas Khuu and Katie Mostoller were also named to the Husky 100! Thomas has since graduated and is featured on page 10 in an alumnus profile. Donya Derakshani made us proud as a gonfaloniere at the UW Commencement ceremony in June, as did all of the 375 chemistry and biochemistry graduates in the Class of 2019! Photos from the Departments of Chemistry and Biochemistry's Graduation and Awards Recognition Celebration are on pages 4–5.

Professor Anne McCoy was elected to the Washington State Academy of Sciences, Professor Julie Kovacs was elected Chair of the ACS Division of Inorganic Chemistry, Professor Sarah Keller received the 2019 Cottrell Scholars STAR Award, and Assistant Professor Cody Schlenker received an NSF CAREER Award. Professors David Ginger and Daniel Gamelin were selected by the U.S. Department of Energy Solar Energy Technologies Office to receive nearly $1.5 million in funding for two separate endeavors in solar photovoltaic research. We also congratulate Associate Professor David Masiello on his promotion to professor and Assistant Professor Matt Bush on his promotion to associate professor with tenure, effective September 16, 2019. More about David's and Matt's research is on page 2. I invite you to visit our website http://depts.washington.edu/chem/ to read more about the aforementioned awards.

Continued on back page

IN THIS ISSUE

PROMOTIONS

Matt Bush Promoted to Associate Professor with Tenure; David Masiello Promoted to Professor

The Department of Chemistry congratulates Matt Bush and David Masiello on their promotions, effective September 16, 2019. Assistant Professor Matt Bush was promoted to associate professor with tenure. Associate Professor David Masiello was promoted to professor.

MATT BUSH

Research in the Bush group is focused on the development of new mass spectrometry technologies and their application to cutting-edge problems in structural biology. The field of native mass spectrometry, in which proteins and protein complexes are transferred to the gas phase in a way that retains many of the structural features of the proteins, has become one of the hottest areas in mass spectrometry. The Bush group has focused on some of the more fundamental aspects of ion mobility mass spectrometry (IM-MS) in order to elucidate and understand the types of information that can be gleaned from this approach and leverage it for application to biological problems. They are developing ion mobility methods and instrumentation and using advanced modeling approaches to improve understanding of the relationship between biomolecular structures in solution and biomolecular structures in the gas phase in order to achieve a fundamental insight of ion behavior critical for data interpretation. These efforts support the Bush group's long-term goal of developing fast, sensitive, and general technologies that will enable a quantitative understanding of how the quaternary organization and structures of proteomes respond to disease, stress, and therapy.

To learn more about Professor Bush and his research, please visit his faculty page (http://depts.washington.edu/chem/people/faculty/bush.html), research group website (http://depts.washington.edu/bushlab/), or contact him directly at 206.543.7835 or mattbush@uw.edu.

DAVID MASIELLO

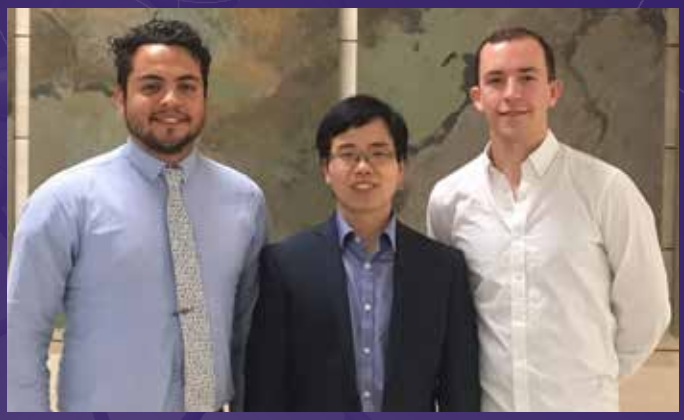
Professor Masiello is a theoretical chemist specializing in developing models to understand the interaction of light with solids—particularly metal surfaces and nanoparticles—characterized by collective excitations known as plasmons. The fundamental science of light manipulation is of specific interest, especially in metamaterials capable of directing light towards desired pathways (e.g., optical-frequency magnetism, spatially-directed thermal patterning, room temperature quantum information processing, enhanced solar-energy conversion). A widely recognized expert in electron spectroscopy, particularly in the area of plasmonics, Professor Masiello has made a number of important breakthroughs to provide theoretical insights where experimental results were not well understood. This is exemplified in his development of theory to explain the results of cutting-edge experiments in electron spectroscopy such as Electron Energy Loss Spectroscopy, which offers significant insight into the optical-frequency responses of metallic and semiconducting nanoparticles. His theoretical approaches are being used by the community to direct the design of advanced materials with unprecedented functionalities.

To learn more about Professor Masiello and his research, please visit his faculty page (http://depts.washington.edu/chem/people/faculty/masiello.html), research group website (http://faculty.washington.edu/masiello/Masiello_Group_Website/Home.html), or contact him directly at 206.543.5579 or masiello@chem.washington.edu.

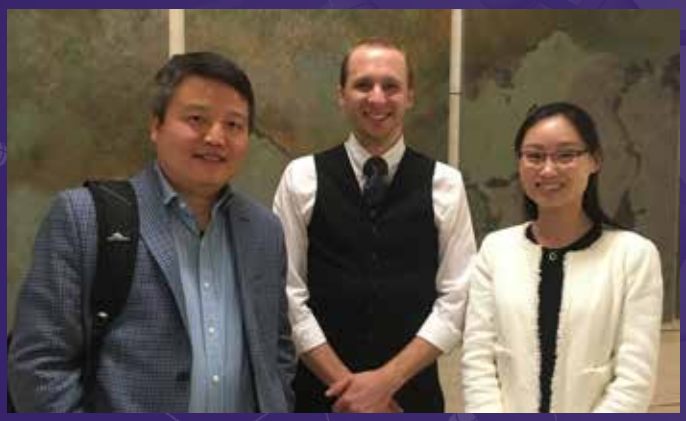
2019 CHEMISTRY AWARDS DINNER

At our 28th annual Awards Dinner in April, the Department of Chemistry celebrated numerous awardees from among our students, postdocs, and faculty with many of the alumni and friends who so generously support our program through student awards and endowed scholarships, fellowships, professorships, and chairs.

LIXIN LU AND FLORENCE DOU, PHOTO BY DANIEL BROCK



BENJAMIN FIGUEROA, PROFESSOR DAN FU, AND ANDREW FRANCIS



PROFESSOR BO ZHANG WITH TODD ANDERSON AND YUNSHAN FAN

IRIKA SINHA WITH DRS. USHA AND RAO VARANASI, PHOTO BY DANIEL BROCK

PROFESSOR ALVIN KWIRAM AND BEN POULTER, PHOTO BY DANIEL BROCK

GRADUATE AND UNDERGRADUATE STUDENTS IN THE GROUP OF PROFESSOR CODY SCHLENKER: EMMA CAVE, KATIE CORP, RYAN FLORES, EMILY RABE, AND SABRINA ESTES

2019 **GRADUATION** AND **AWARDS RECOGNITION** CELEBRATION

We are tremendously proud of the 375 students who graduated with bachelor's degrees in chemistry and biochemistry as part of the Class of 2019. Two hundred fifty students earning bachelor's, master's, and doctoral degrees celebrated with us at the Alaska Airlines Arena at Hec Edmundson Pavilion on June 13, 2019. We wish all our graduates congratulations! Please stay in touch with us!


1


2


3

1. PROFESSOR STEFAN STOLL CONGRATULATES ANTHONY VARGAS. PHOTO BY TYLER MILSTEIN
2. CATHERINE SCHILLACI RECEIVES HER CERTIFICATE FROM PROFESSOR SUE BROCKERHOFF.
3. STEFAN STOLL AND NATHAN PAUL. PHOTO BY TYLER MILSTEIN
4. SONAM GHAG RECEIVES HER HOOD FROM HER ADVISER PROFESSOR PRADIP RATHOD, WITH THE ASSISTANCE OF PROFESSOR ROB SYNOVEC.
5. MICHAEL ENRIGHT WITH HIS ADVISER PROFESSOR BRANDI COSSAIRT AND ROB SYNOVEC.
6. MANY OF OUR UNDERGRADUATE ALUMNI MATRICULATE INTO PROFESSIONAL HEALTH PROGRAMS SUCH AS PHARMACY, MEDICINE, AND DENTISTRY.
7. SAMANTHA PASKVAN DELIVERS A COMMENCEMENT ADDRESS TO THE CLASS OF 2019.
8. DOCTORAL CANDIDATE KIRA HUGHES.
9. KRISHMA BEDI RECEIVES HER CERTIFICATE FROM PROFESSOR SUE BROCKERHOFF.

PHOTOS BY CHARLIE BARROWS UNLESS OTHERWISE NOTED.


4


7


5


8

6


9

GRADUATE STUDENTS AWARDED NSF GRADUATE RESEARCH FELLOWSHIPS

NSF GRADUATE RESEARCH FELLOWSHIP RECIPIENTS:

Ben Mitchell is beginning his second year as a graduate student in the research group of Assistant Professor Alexandra Velian. A central research theme in the Velian group is the discovery of efficient catalysts for the transformations of small molecules, using clusters of inexpensive and abundant transition metals as replacements for noble metals. Heterometallic clusters display rich and programmable physical and chemical properties, with applications ranging from single molecule magnetism to cofactors in enzymes. Tailoring their properties through synthetic methodologies allows for rational design of reaction centers and functional materials.

Ben's work in the group builds on the synthetic efforts of Jon Kephart, who developed a new class of core-expanded clusters with a three-blade propeller geometry, $M_3Co_6Se_8L_6$ (M = Mn, Fe, Co, Zn; L = aminophosphine ligands). These are chiral inorganic clusters that exhibit distinct and tunable optical, electronic, and magnetic properties compared to the parent Co_6Se_8 cluster.

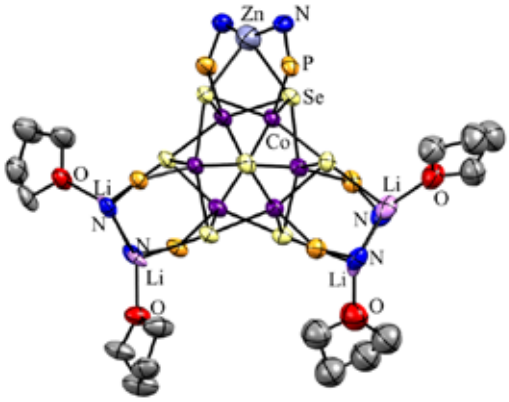
Ben's current work targets the synthesis of the site-differentiated core-expanded clusters (MM'M"Co_6Se_8, see Figure 1). Installing different metals at each binding site on the cluster surface will allow for synergistic reactivity, and the potential for cascade catalysis. In a parallel project, Ben uses ditopic ligands to connect these clusters, forming molecular di- and tetra-cluster species. He plans to study the emergent electronic and magnetic properties of these products, informing on potential cluster-cluster communication within extended two-dimensional lattices.

In his GRFP application, Ben proposed the use of similar Co_6Se_8 clusters as building blocks for self-assembling molecular wires.

As was predicted by Feynman's "There's plenty of room at the bottom" paper, increased interest in molecular-scale electronics has been spurred by the demand for smaller and more efficient electronic devices. Currently, there is a scarcity of methods to control both structure and function of molecular wires. Through Ben's proposed bottom-up synthesis, tunability of the electronic and geometric structure could be achieved by simply varying components of the wire.

Ben grew up in San Diego, and he earned a B.A. in chemistry from Pitzer College in Claremont, California. As an undergraduate student, Ben briefly worked for Professor Jefferey Gustafson at San Diego State University, developing catalysts for the kinetic resolution of atropisomers in small molecule kinase inhibitors. Through this work Ben found his passion for inorganic chemistry, leading him to Professor Adam Johnson's research group at Harvey Mudd College. His undergraduate thesis in the Johnson lab was on the synthesis of early transition metal complexes and their application as asymmetric hydroamination catalysts. Ben aims to pursue postdoctoral research opportunities after graduate school, with the end goal of becoming a professor. Outside of the lab, Ben enjoys soccer, climbing, and exploring the Seattle brewery scene.

FIGURE 1. SINGLE CRYSTAL X-RAY DIFFRACTION STRUCTURE OF SITE-DIFFERENTIATED $ZNLI_4(THF)_4CO_6SE_8L_6$. HYDROGENS, CO-CRYSTALLIZED SOLVENT MOLECULES, AND AMINOPHOSPHINE RELATED CARBONS ARE HIDDEN FOR CLARITY.



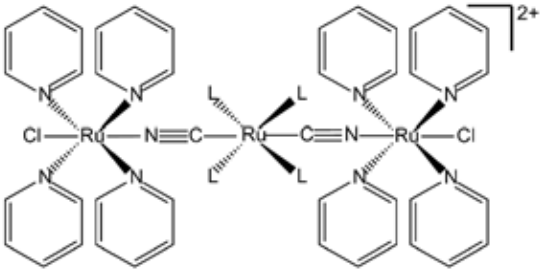
Congratulations to the graduate students in the Department of Chemistry who were awarded 2019 National Science Foundation Graduate Research Fellowships, and to the three graduate students who received honorable mentions. The NSF Graduate Research Fellowship Program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees at accredited U.S. institutions.

Ben Poulter is beginning his second year as a graduate student in the research group of Professor Munira Khalil. Ben studies ruthenium mixed valence dimer and trimer complexes with transient x-ray spectroscopy. When these complexes are photoexcited, they become strongly electronically coupled and charges are delocalized across the metal centers; the degree of this coupling can be controlled by varying ligands on the complexes. These mixed valence complexes are of interest for their applications in photochemical energy conversion. Understanding how charge flows in these compounds after photoexcitation will be vital when creating the next generation of photochemical energy conversion and light harvesting materials.

Ben plans to use transient x-ray spectroscopy to investigate the excited state dynamics of these complexes as it directly probes the electronic and atomic structure of the metal. In particular, he plans to first photoexcite the complexes and then probe the ruthenium M-edge (3p → 4d) using resonant inelastic x-ray scattering (RIXS). M-edge RIXS is a process where a 3p electron is excited to the 4d valence orbitals and then a different valence electron fills the core hole, emitting a photon. The energy difference between the absorbed and emitted photons will report on how the d orbitals participate in and facilitate charge transfer. These experiments will be done at various synchrotron and x-ray free electron laser sources in collaboration with Dr. Robert Schoenlein's group at Stanford. Ben will also use quantum mechanical/molecular mechanical simulations in collaboration with Dr. Niri Govind at Pacific Northwest National Laboratory to simulate the ground and excited state properties of these molecules and how they evolve over time.

Ben grew up in Pocatello, Idaho and went to Idaho State University where he received a B.S. in chemistry. During his undergraduate studies, Ben worked with Professor Rene Rodriguez where he used plasma enhanced chemical vapor deposition to create metal chalcogenide thin films for use in conductive bridging random access memory devices. Ben's project focused on how introducing tin sulfide into germanium sulfide films improved the performance of these devices. Outside of chemistry, Ben enjoys being outdoors doing activities such as backpacking, rock climbing, and skiing.

FIGURE 1. ONE OF THE RU MIXED VALENCE COMPLEXES TO BE STUDIED BY TRANSIENT X-RAY SPECTROSCOPY.



L= 4-dimethylaminopyridine (3^{2+})
L=pyridine (4^{2+})

Jeffrey BUENAFLOR

Recognized for Excellence in Teaching

JEFFREY ENJOYS FENCING AND ORGANIC CHEMISTRY. PHOTOS COURTESY OF: UNIVERSITY OF WASHINGTON

Congratulations to Jeffrey Buenaflor who was honored for his achievements in teaching, mentoring, and public service with an Excellence in Teaching Award at the 2019 Awards of Excellence ceremony on June 13! Jeffrey, a doctoral candidate in the group of Professor Christine Luscombe, is also a member of the Husky100—students who are recognized for making the most of their time at the UW.

PROVOST MARK RICHARDS PRESENTS JEFFREY WITH THE EXCELLENCE IN TEACHING MEDAL AT THE 2019 AWARDS OF EXCELLENCE CEREMONY IN MEANY HALL.

Jeffrey is a devoted teacher, mentor, and advocate of underrepresented minority participation in STEM. He served as a leader for the UW chapter of the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) to promote diversity and careers in science through outreach and also participates in outreach with UW student groups Women in Chemical Sciences at UW (WCS) and Diversity in Clean Energy (DICE). Jeffrey's success as a teaching assistant is evident in his high reputation among our undergraduate students. He is known to bring a lot of energy as an instructor, stemming from his passion for organic chemistry. His student evaluations emphasize his ability to precisely coordinate content between the lectures and his quiz sections—a critical asset for a TA in Chemistry—and students praise his ability to engage with them and provide clarity to the course content.

Jeffrey has shown himself to be a tremendous asset whose impact extends beyond the Department. He goes above and beyond as a TA, making a difficult subject approachable to his students. Jeffrey is unique and embodies excellence in teaching, selflessly putting himself "out there" to provide a strong and vibrant voice that reflects very positively on the Department and the University. Jeffrey was an Excellence in Teaching Award finalist in 2018 and is a deserving recipient of the 2019 award. Congratulations, Jeffrey!

Chemistry Alumna Janet Kavandi

JOINS U.S. ASTRONAUT HALL OF FAME

MEDIA CREDIT: NASA

Growing up in small-town Missouri, Janet Kavandi had a fascination with the night sky. She dreamed of being an astronaut but never thought it would happen. "When I was young, space flight was a cold war competition between two world powers, and the only astronauts were male military test pilots," she explains.

By the time Kavandi (Ph.D., chemistry, 1990) finished college, more opportunities had opened up and in 1994, she was selected as a member of the 15th class of U.S. astronauts. Earlier this year she was inducted into the U.S. Astronaut Hall of Fame, joining two previous honorees from the UW College of Arts & Sciences, Richard F. Gordon Jr. (B.S., Chemistry, 1957) and George Pinky Nelson (M.S., Ph.D., Astronomy, 1974, 1978).

In a 1998 story for *Perspectives* newsletter, Kavandi recalled her first launch, on a space shuttle headed for space station Mir. "I had been told by other astronauts not to assume you were going anywhere until the solid rocket boosters ignited, so as the countdown was proceeding, I was almost expecting a hold or an abort," she said. "When the main engines ignited six seconds before liftoff, I was thinking, `Hey, this might just happen!' Then the solid rocket boosters went and shot us off the pad. I just started laughing and crying all at the same time. It was a very special moment."

"When the main engines ignited six seconds before liftoff, I was thinking, `Hey, this might just happen!' Then the solid rocket boosters went and shot us off the pad. I just started laughing and crying all at the same time. It was a very special moment."

JANET KAVANDI

Kavandi would go on to fly into space two more times and log more than 13.1 million miles in 535 orbits of Earth. She then took on a leadership role at the Johnson Space Center in Houston, serving as the director of Flight Crew Operations. She currently serves as director of NASA's John H. Glenn Research Center in Cleveland.

Being inducted into the astronaut hall of fame is "a huge honor," says Kavandi. Of course, so was flying on three NASA missions. "I had the best job in the world flying into space," she says. "Nothing compares to that."

This article is excerpted from a February 27, 2019 Columns *magazine story by Jon Marmor and an October 1998* Perspectives *newsletter story.*

TRYING IT ALL, for HEALTH CARE

When Thomas Khuu arrived at the UW as a pre-med student, he thought he might try working in a UW research lab or clinical setting. He also considered working with children, or immigrants, or the elderly. In the end, he did all of the above before graduating in June.

Khuu (B.S., Biochemistry, 2019), a first-generation student and the second member of his extended family to attend college, knew by high school that he wanted to be a doctor. "As a doctor, you can be so involved in people's lives at a time when they really need it," Khuu says. "You can make a really great impact on the people you treat."

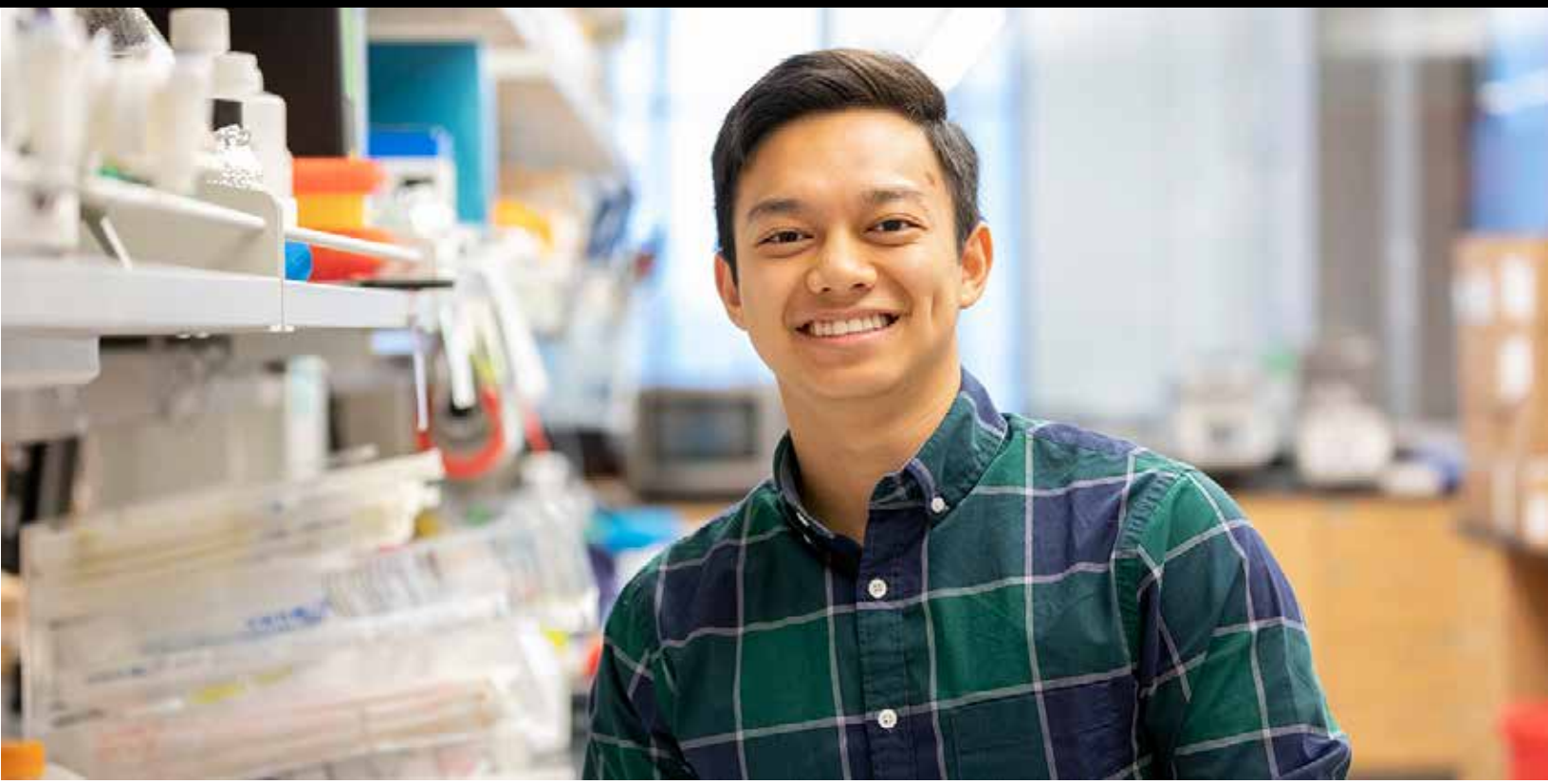
His freshman year, Khuu shadowed a physician in private practice to learn more about the profession. Fascinated by the physician's focus on retinal disease, Khuu then contacted UW faculty doing related research. He landed a position as an undergraduate researcher in the lab of Jennifer Chao, an ophthalmologist at the Eye Institute at Harborview and an associate professor of ophthalmology.

Chao studies degenerative retinal diseases, with a particular focus on cells that support the retina. Khuu has worked in her lab for nearly four years, receiving mentoring throughout. Beyond teaching Khuu countless lab techniques, Chao offered to introduce him to her extensive network of colleagues. "Jen has been a great, great mentor," Khuu says. "Lab manager Abbi Engel too. They've done so much to support my growth as a scientist and my pursuit of medicine."

Because Khuu hopes to work in a clinical setting, he also sought opportunities to work directly with patients. He became a certified nursing assistant (CNA), covering the weekend shift at an assisted living facility during his junior year. It was a tough schedule: seventeen hours at the assisted living facility each weekend, working in Chao's lab three afternoons a week, and managing a challenging course load. Yet Khuu has no regrets.

"It was definitely eye-opening to work with a geriatric population," he says. "In an assisted living facility, the CNA is the primary caretaker for many of the residents, helping them with the activities of daily living. Every resident has different needs, so you have to think on your feet and really get to know each person as an individual to take care of them the best that you can. It's a hard but rewarding job."

Most of Khuu's assisted living patients were elderly, but he balanced that work with a youth-focused activity, Camp Kesem. (His senior year, Khuu also volunteered at the Seattle World School, a Seattle public school for refugee and immigrant children.) Camp Kesem is a summer camp for children who have lost a parent to cancer, have a parent undergoing cancer treatment, or whose parent is a cancer survivor. Khuu heard about the camp his freshman year and immediately began volunteering. His junior and senior years, he was one of three co-coordinators of Camp Kesem's annual fundraising gala.



THOMAS KHUU. PHOTO CREDIT: CORINNE THRASH

> **"I realized that as a physician, you need to make sure that whatever you're doing for your patient is also helping their family, and that everybody is okay with the course of action."**
>
> **THOMAS KHUU**

During Camp Kesem's week-long overnight camps, offered twice each summer, Khuu served as a counselor. The experience provided another perspective on health care. "I saw firsthand how a disease like cancer has far-reaching impact beyond the person with the disease," he says. "It affects the people around them too. I realized that as a physician, you need to make sure that whatever you're doing for your patient is also helping their family, and that everybody is okay with the course of action."

The lessons Khuu learned through his many health care-related activities will come in handy this fall when he begins medical school at Washington State University's Elson S. Floyd College of Medicine. But first Khuu will head to central Vietnam in July with the Vietnam Health Clinic (VHC). The two-week mobile clinic serves rural populations, with UW students assisting VHC health care professionals. Khuu spent the past year raising funds for VHC and mastering the clinical services he'll be supporting.

"Vietnam Health Clinic focuses on sustainable care," says Khuu. "You're not just prescribing medication and then you're out of there. A lot of it is educating people about preventative care while remaining culturally sensitive to how Vietnamese people may perceive health." Khuu will serve as an optometry lead for the clinic, handling non-invasive procedures with optometrists supervising. He and other students with Vietnamese backgrounds will also serve as translators.

DEPARTMENT OF CHEMISTRY
UNIVERSITY of WASHINGTON

BOX 351700, SEATTLE, WA 98195-1700

06-0418

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

FSC
RECYCLED
FSC® C103916

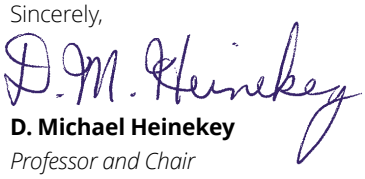
LETTER FROM THE CHAIR *continued from page 1*

Speaking of our website, it is an important tool for many of our constituents, within the Department and at the UW, as well as external audiences, especially prospective students. I have charged an *ad hoc* committee of faculty and staff to redesign our website to update it and bring it in line with University branding. We met recently with the College of Arts & Sciences web services team, and our new website will go live in 2020.

Despite our size and wide ranging areas of research, we truly have a sense of collegiality and community here. You are a part of it as well, and it's no exaggeration to say that our students are aware of and appreciate this community. You support us with gifts for fellowships and scholarships, networking opportunities, and as simple as it sounds, your interest in our current students and work. We are fortunate that so many of you are nearby and can join us for events on campus. For those of you now in other regions, you are just as much a part of our community, and if you get the opportunity to visit Seattle, I hope you let me know so that we can host you on campus for a tour. Thank you for your support.

I am excited about the work we do here in both research and teaching, and I hope you are too. If you have a specific interest that isn't featured in the *ChemLetter* or on the Department of Chemistry's Facebook page, webpage or in UW News, please let me know at 206.543.1613 or chemdept@uw.edu. I'll be happy to tell you more.

Sincerely,



D. Michael Heinekey
Professor and Chair

PUBLISHED BY
Department of Chemistry, University of Washington

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

CONTRIBUTORS
Diana Knight, Assistant to the Chair
Kimberly Quigley, Associate Administrator
Creative Communications

Printed on recycled paper using vegetable-based inks.

BECOME OUR FAN!
www.facebook.com/UWChem

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

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