

CHEMISTRY NOTATIONS

WASHINGTON STATE UNIVERSITY DEPARTMENT OF CHEMISTRY NEWSLETTER

**Keck Foundation
Awards WSU
Chemists One
Million Dollars**

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Renovation**

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2018

A MESSAGE FROM THE CHAIR

Greetings Cougar chemists! This current newsletter was two years in the making, so we hope you will enjoy the new look, as well as all the additional content. A lot has happened since the last newsletter. This spring we welcomed our newest faculty member, Dr. Xiaofeng Guo. His expertise is in the high temperature calorimetry of materials and minerals with an emphasis on those containing lanthanide and actinide elements. Three new instructional faculty were added in 2016: Dr. Krista Nishida (Clinical Assistant Professor, WSU Pullman), Dr. Nelmi Devarie-Baez (Clinical Assistant Professor, WSU-TC), and Dr. Elsa Silva-Lopez (Instructor, WSU-TC). We also bid a fond farewell to several faculty members. Last spring, both Dr. Herb Hill and Dr. Scot Wherland retired from WSU after 41 and 38 years in the WSU Chemistry Department, respectively. In 2017, Dr. Jeanne McHale also retired from the Department after being at WSU since 2004. Just this spring, Dr. Ken Nash retired as well, after spending a total of 15 years helping to educate the next generation of nuclear/radiochemists and separation scientists. Last, two faculty members left WSU to seek new opportunities - Dr. Ursula Fittschen returned to Germany to take on a faculty position there, while Dr. Paul Benny is now a staff scientist at Oak Ridge National Laboratory. As you'll see in the next few pages, we've had several staff changes in the department, including welcoming Lauren Hatley, Kenneth Spicer, and Jadya Spong, and saying goodbye to Debbie Arrasmith, Carrie Giovannini, and Robert Jackson. One thing stays constant though - the team that keeps everything running in Chemistry continues to be outstanding.

I definitely want to mention several important promotions over the last 2 years: Dr. K.W. Hipps to Regents Professor (2017), Dr. Aurora Clark to Professor (2016), Dr. Brian Clowers, tenure and promotion to Associate Professor (2018), Dr. Greg Crouch to Clinical Professor (2016), Dr. Louis Scudiero to Clinical Professor (2017), and Dr. Jeremy Lessmann to Clinical Associate Professor (2017). Several of our Instructors also transitioned to Clinical Assistant Professor positions in 2017: Dr. Amy Nielsen (Pullman), Dr. Elsa Silva-Lopez (Tri-Cities), and Dr. Adenike (Nike) Otoikhian (Vancouver).

The newly renovated Troy Hall is open for business! Besides a new Chemistry classroom on the ground floor, the next two floors house fantastic synthetic space with 8-foot fume hoods galore. Two inorganic (Drs. Heiden and Zhang) and two organic (Drs. Xian and Mancini) faculty with all their students and postdocs now call Troy Hall home. Those of us next door in the Fulmer complex are quite envious.

You'll see as you go through this newsletter that our faculty and students have continued to be very productive, both in research and teaching. New grants totaling nearly \$14 million dollars have been awarded to Chemistry faculty over the last two years, and this has been accompanied by grant expenditures of over \$12.5 million over that same period. The research enterprise in the department is certainly alive and well.

I would be remiss if I didn't say something about the current university budget crisis I'm sure many of you have already heard about. As part of the fiscal recovery plan being implemented from the central administration, the Department currently took a budget cut of 2.5% this year and will face additional 2.5% cuts in each of the next two years. This has resulted in a gloomy outlook for new searches for much needed faculty positions in the immediate future (see my notes on retirements and such above), and we continue to tighten our belts any way we can. We are very fortunate, however, to actually have one new faculty search underway, a joint position between WSU and Pacific Northwest National Laboratory (PNNL) that will include taking on the role of the Director of the new (joint with PNNL) Institute for Nuclear Science and Technology. This position is currently held by Prof. Aurora Clark in the Department. I hope to be introducing a new faculty member in the next newsletter!

I continue to be amazed by the generous donations of our alumni and friends. One of the activities supported by our Chemistry Excellence Fund is maintaining a vibrant Departmental seminar program. These talks are held each week during the academic year and feature a distinguished speaker, generally a faculty member from another top-ranked Chemistry Department in the US (both near and far), who spends the day visiting with Chemistry faculty and students and delivers a lecture on the cutting-edge research they are carrying out. This is an invaluable experience for our students (attendance is mandatory for our graduate students, so the audience is always 90+), particularly given how geographically isolated Pullman is. If you are interested in contributing to our Excellence Fund, you can find a donation link on the bottom right side of our departmental webpage (www.chem.wsu.edu). We are also able to award a large number of scholarship funds each year to our undergraduate and graduate students from the various endowed funds that generous friends like you have designated to Chemistry. Being able to reward excellence in our students each year is truly amazing.

I hope you enjoy catching up on all the goings-on here in the Chemistry Department. Stay in touch by writing us (PO Box 644630 · Pullman, WA · 99164-4630), sending an email (chemistry@wsu.edu), visit us on Facebook (Department of Chemistry at Washington State University), or if you happen to find yourself in Pullman, the invitation is always open to drop by for a visit.

Go (Chem) Cougs!

Kirk Peterson
Department Chair
Edward R. Meyer Distinguished Professor



DEPARTMENT OF CHEMISTRY DIRECTORY

FACULTY

Kirk Peterson - Department Chair & Edward R. Meyer Distinguished Professor - Computational, Physical
Ming Xian - Associate Chair of Graduate Studies & Ralph G. Yount Professor - Biological Systems, Organic

Cliff Berkman - Professor - Biological Systems, Organic
James Brozik - Associate Professor - Analytical, Biological Systems, Materials, Physical
Aurora Clark - Professor - Computational, Materials, Physical and Radiochemistry
Sue Clark - Regents Professor - Analytical, Environmental, Radiochemistry
Brian Clowers - Associate Professor - Analytical
Phil Garner - Professor - Organic
Xiaofeng Guo - Assistant Professor - Physical, Radiochemistry
Zachariah Heiden - Assistant Professor - Environmental, Inorganic, Organic
KW Hipps - Regents Professor - Materials, Physical
Jeff Jones - Professor - Biological Systems
ChulHee Kang - Professor - Biological Systems, Organic, Physical
David Lee - Assistant Professor - Analytical, Materials, Physical
Alex Li - Professor - Analytical, Biological Systems, Organic
Rock Mancini - Assistant Professor - Biological Systems, Organic
Ursula Mazur - Professor - Materials, Physical
Ken Nash - Professor - Inorganic, Radiochemistry
Peter Reilly - Associate Professor - Analytical
Rob Ronald - Professor - Organic
Nathalie Wall - Associate Professor - Analytical, Environmental, Radiochemistry
Choong-Shik Yoo - Professor - Materials, Physical
Qiang Zhang - Assistant Professor - Inorganic

CLINICAL FACULTY

Paul T. Buckley - Director of General Chemistry & Clinical Associate Professor
Greg Crouch - Associate Chair for Undergraduate Studies & Clinical Professor

Michael Finnegan - Instructor
Jeremy Lessmann - Clinical Associate Professor
Amy Nielsen - Clinical Associate Professor
Krista Nishida - Clinical Assistant Professor
Louis Scudiero - Clinical Professor

**To see our current Affiliate and Emeritus Faculty, visit our website at www.chem.wsu.edu*

INSTRUCTIONAL STAFF

Nikki Clark - Undergraduate Academic Coordinator
Ryan Rice - General Chemistry Laboratory Supervisor
Jackie Zhu - Instructor, Organic Chemistry

SUPPORT STAFF

Trent Amonett - Assistant Director
Lori Bruce - Principal Assistant, Grant Proposals
Lauren Hatley - Fiscal Analyst, Grants
Yoshi Kodama - IT Manager
Stacie Olsen - Graduate Coordinator
Molly Spain - Fiscal Specialist, Purchasing
Kenneth Spicer - Program Coordinator
Jennica Stiff - Fiscal Technician, Personnel

STOCKROOM STAFF

John Sullivan - Stockroom & Safety Manager
Naomi Hyner - Stockroom Attendant
Andrea Kirchner-Loewus - Lab Supervisor, Organic Chemistry
Jayda Spong - Instruction & Classroom Support Technician, General Chemistry

WSU receives \$1 million from Keck Foundation to develop self-replicating materials

Will Ferguson, College of Arts and Sciences

Washington State University scientists have been awarded \$1 million from the W.M. Keck Foundation to develop molecular machines that self-replicate, producing pounds of 100-percent pure material.

You read that right.

Their research is the first step towards a new paradigm in manufacturing where everything from smartphones to life-saving cancer drugs could be designed one atom at a time to exact specifications and then grown out of a vat.

“In the end, the product of this research is going to be a new field of science where we can make literally almost anything in a way only seen in nature,” said James Brozik, the Donald and Marianna Matteson Distinguished Professor of chemistry at WSU. “This is the kind of research I dreamt about doing when I was an assistant professor 20 years ago and being able to actually do it is the opportunity of a lifetime.”

The two principal investigators for the Keck grant, Brozik and Kerry Hipps, Regents Professor of chemistry, have decades of experience in molecular spectroscopy, single-molecule research and material science. Their team will include two postdoctoral fellows and two graduate students who will work full time on the interdisciplinary project for the next three years.

“This cutting-edge research is a prime example of the innovative work being done by our faculty in chemistry, as well as in units all across the WSU system, and contributes to our goal to be among the top 25 public research universities in the nation

by 2030,” said Larry Hufford, interim dean of the College of Arts and Sciences.

“This cutting-edge research is a prime example of the innovative work being done by our faculty in chemistry...”

Building from the ground up

All life on Earth is made up of groups of atoms that form simple molecules, or monomers, that then band together to form larger, more complex molecules, or polymers.

For the last 30 years, scientists have been fascinated by the idea of using scanning probe microscopy, a technique to visualize and manipulate objects at the atomic level, to build precisely designed synthetic polymer materials and devices from the ground up, one atom at a time.

However, the challenge with this approach is that it takes far too long to build anything useful. Atoms are extremely small. Around five million of them can fit side by side on the tip of a pin. At current rates, it is estimated it would take 31-trillion centuries to build even the simplest real-world devices with current technology.

“There is currently no way in chemistry or engineering to make any kind of material 100-percent pure,” Hipps said. “The notion of being able to create unlimited quantities of polymer materials with exactly the same lengths and exactly the same atomic sequences is nothing less than revolutionary.”

Carving glyphs into stone

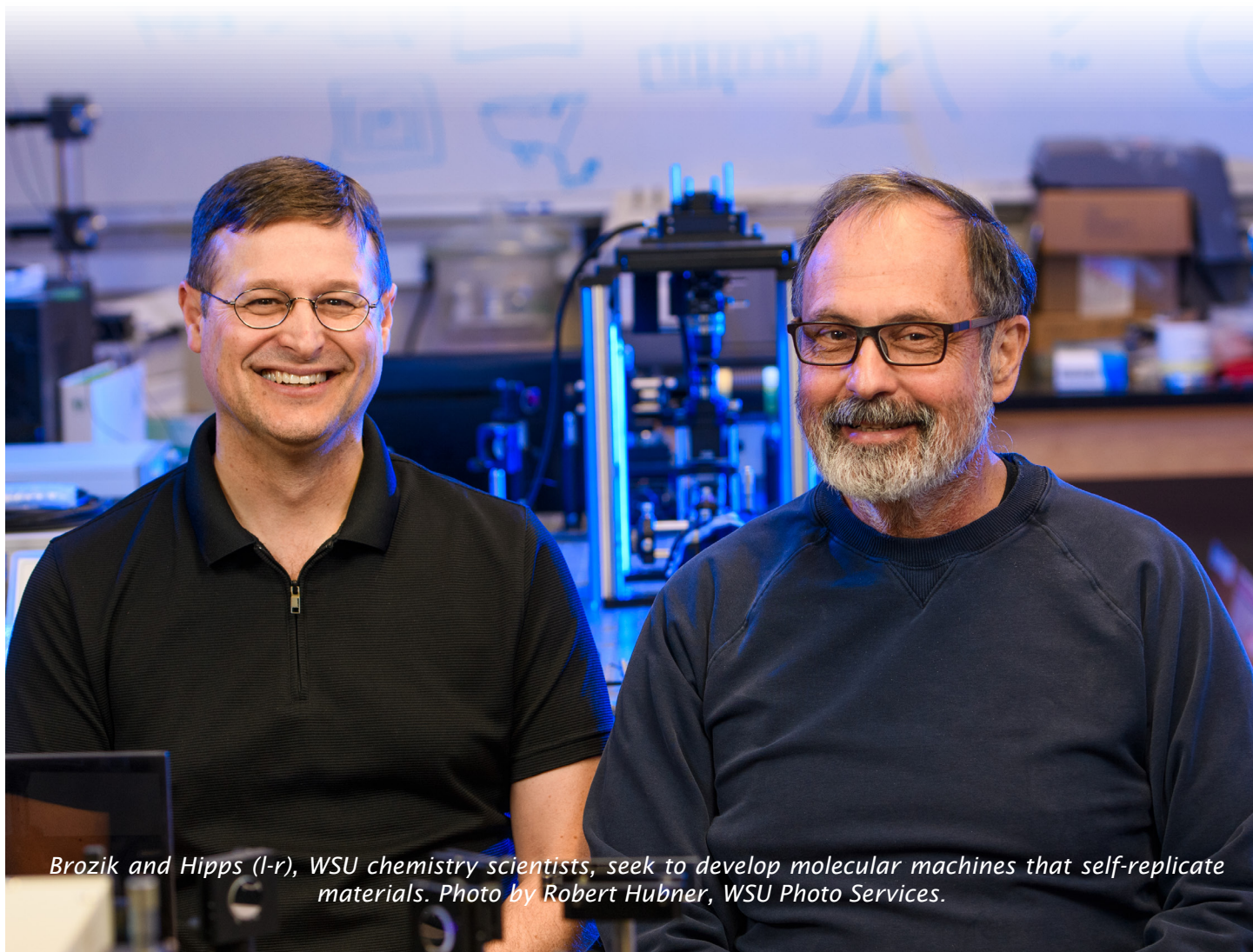
Hipps and Brozik have come up with a unique solution. The researchers plan to use scanning tunneling microscopy to painstakingly arrange individual molecules onto specially designed metal surfaces, forming templates for simple, self-replicating polymers. Their goal is to make around 1,000 of these templates, which will be designed to exponentially reproduce exact copies of themselves from chemical feed stock, resulting in very large quantities of material quickly.

“Making the templates is literally going to be like carving glyphs into stone, but once that is done the templates can be replicated over and over again using standard chemical processes,” Hipps said. “In the long run, we envision our technology being linked up to something like a 3D printer. An operator

would select a material or device to make on a computer and then an automated program would start replicating whichever templates are needed, building the device to exact specifications one atom at a time.”

Supporting high-impact research

Based in Los Angeles, the W. M. Keck Foundation was established in 1954 by the late W. M. Keck, founder of the Superior Oil Company. The foundation’s grant making is focused primarily on pioneering efforts in the areas of medical research, science and engineering and undergraduate education. The Foundation also maintains a Southern California Grant Program that provides support for the Los Angeles community, with a special emphasis on children and youth. For more information, please visit the W.M. Keck Foundation website. <http://www.wmkeck.org/>

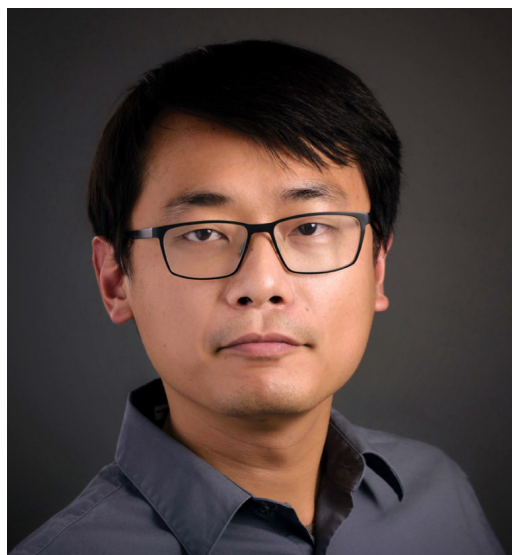


Brozik and Hipps (l-r), WSU chemistry scientists, seek to develop molecular machines that self-replicate materials. Photo by Robert Hubner, WSU Photo Services.

FACULTY

WELCOME OUR NEWEST FACULTY MEMBER

Assistant Professor, Xiaofeng Guo



I moved to Pullman in January of 2018 and started as an assistant professor. I have studied Ce-, Th-, and U-containing materials since my graduate study at the University of California, Davis and extended the studies to Pu oxides at Los Alamos National Laboratory National Laboratory. My research lab at WSU lies in the integration of structural investigation and thermodynamic study of synthetic and natural material systems. My current interests include: i) thermodynamics of lanthanides, actinides-containing phases, nuclear fuels and wastes; ii) nanosized materials in the nuclear technology application; iii) actinide-containing minerals crystallization and speciation under hydrothermal conditions; and iv) the behaviors of minerals and materials under high-temperature, high-pressure, and other extreme conditions.

In my free time, I like fishing, running and flying a drone.

FACULTY AWARDS AND ACHIEVEMENTS

Cliff Berkman

- GCS Principal Investigator of the Year, 2017-18

Paul Buckley

- Received an Excellence in Teaching Award for Chemistry's undergraduate program at WSU's 2017 Celebration of Assessment Excellence Event. The program was recognized for its high quality assessment practices.

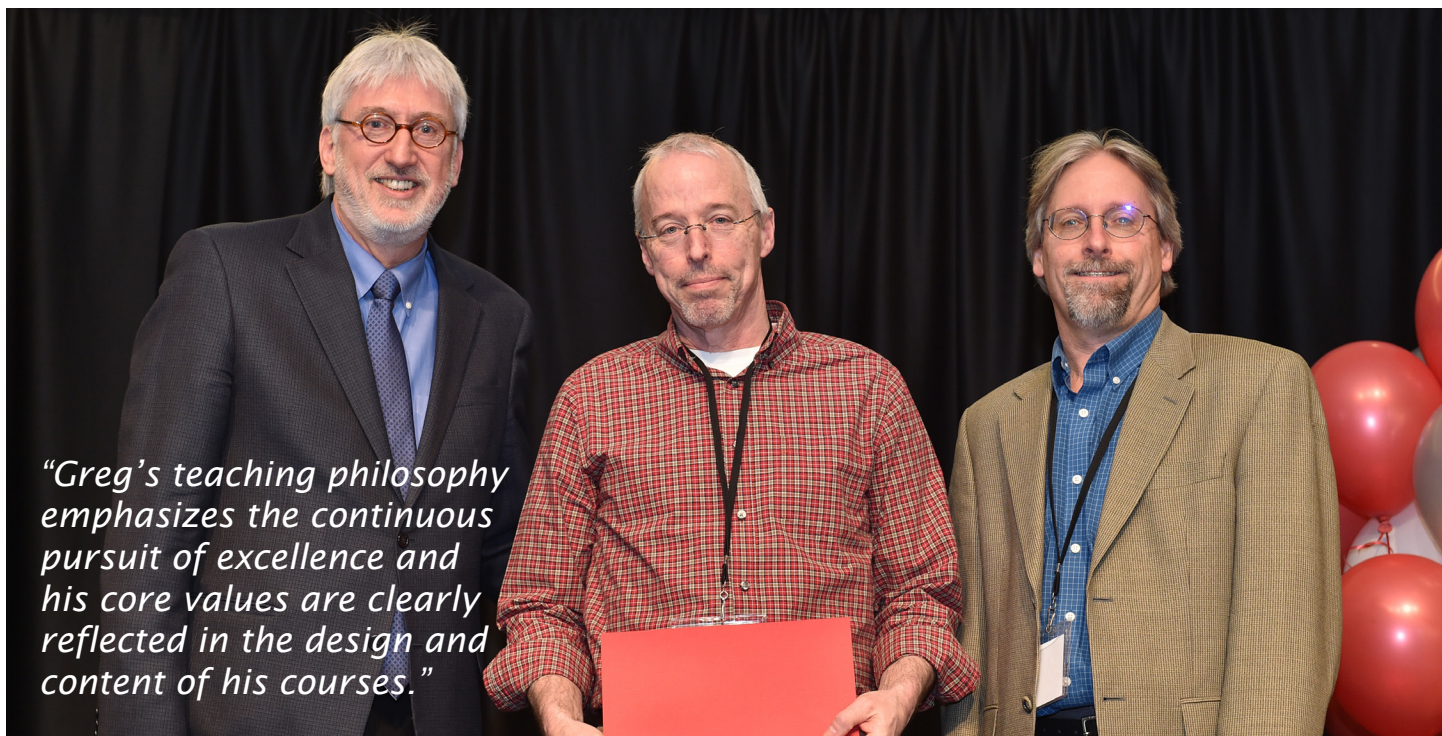


Paul Buckley receives his Excellence in Teaching Award



Brian Clowers

- Tenure and Promotion - Associate Professor, 2017
- Named an Emerging Investigator by the American Society for Mass Spectrometry, 2017



“Greg’s teaching philosophy emphasizes the continuous pursuit of excellence and his core values are clearly reflected in the design and content of his courses.”

Greg Crouch (pictured above with Larry Hufford and Kirk Peterson, photo by WSU Photo Services)

- Selected as the new Chair-elect of the Faculty Senate for Fall 2018. This is the first time ever that a non-tenure-track faculty member will hold this position.
- Led the effort behind a proposal to the Student Tech Fee Committee to completely upgrade the wireless service throughout the Fulmer Complex - this totaled nearly \$150k at no cost to Chemistry. This will have an immediate impact for how we teach our large service courses in the department, 2018
- Awarded the CAS Thomas E. Lutz Teaching Excellence Award, 2018

KW Higgs (pictured below with Kirk Peterson (left) and Larry Hufford (right) , photos by WSU Photo Services)

- Awarded the CAS Distinguished Faculty Award for his 45 years of service at WSU, 2018

Pete Reilly

- GCS Professor of the Year, 2017-18



RETIREMENT



HILL - WHERLAND

Dr. Herb Hill and Dr. Scot Wherland ended their tenure at WSU in the spring of 2017. A celebration was held in May at the Brelsford WSU Visitor Center honoring their service to the Department of Chemistry for 38 years and 41 years, respectively.

Dr. Hill obtained his Ph.D. degree in chemistry in 1975 from Dalhousie University of Halifax, Nova Scotia, under the direction of W.A. Aue. While at Dalhousie, he was a member of the Trace Analysis Research Centre and was awarded the Izaak Walton Killam Memorial Scholarship for advanced study. Before joining the chemistry faculty at WSU in 1976, he spent a year as a postdoctoral fellow in the laboratory of F. W. Karasek at the University of Waterloo, working on a project sponsored by the Ontario Ministry of the Environment.

Professor Wherland received his Ph.D. from the California Institute of Technology, where he worked with Harry Gray on the kinetics of metalloprotein electron transfer reactions. He then did postdoctoral work on protein-protein electron transfer reactions at the Weizmann Institute of Science. He came to WSU in 1979, after working at the Kettering Research Laboratory on reactions catalyzed by the purified components of the nitrogenase enzyme system.

Professor Jeanne McHale retired from WSU in 2017. Dr. McHale joined the Chemistry faculty in 2004, coming across the border from the University of Idaho where she had been a faculty member since 1980. As a member of the Physical Chemistry faculty, Dr. McHale carried out a very productive research program employing vibrational and electronic spectroscopy, particularly resonance Raman spectroscopy, for the study of electron transfer, solvent dynamics, chromophore aggregation, and solar photoconversion.



NASH

Professor Ken Nash retired from WSU in May 2018 after being with the Department of Chemistry since 2003. He joined the faculty at WSU to bring some of this extensive practical experience to the task of helping to educate a new generation of nuclear/radiochemists and separation scientists.

Dr. Nash completed his Ph.D. in Inorganic Chemistry at Florida State University in 1978. In the early years of his career, his research emphasized the application of separations techniques to the elucidation of actinide solution chemistry in environmental and geological systems. At that time, he did some of the earliest work characterizing actinide interactions with naturally-occurring humic and fulvic acids. For the past 17 years, his research has focused principally on chemical separations science and the basic coordination chemistry of actinides and important fission products (mainly lanthanides). Professor Nash has published extensively on the fundamental solution chemistry of actinides, solvent extraction and ion exchange, environmental chemistry, and on applications of basic science to solving real-world problems associated with the use of radioactive materials. He is active in the Nuclear Chemistry and Technology Division and in the Separations Science and Technology Subdivision of the Industrial and Engineering Chemistry Division of the American Chemical Society, Co-editor in Chief of the journal *Solvent Extraction and Ion Exchange*, Associate Editor of the journal *Radiochimica Acta*, on the Editorial Board of the journal *Separation Science and Technology* and coeditor of two symposium series books. Dr. Nash was a visiting scholar at the Japan Atomic Energy Research Institute at Tokai-mura in 2000, and is the 2003 recipient of the Glenn T. Seaborg Award for Actinide Separations.

Ken plans to move to Florida to be closer to his family. His retirement was honored at the Elson S. Floyd Cultural Center among his family, friends and colleagues.



*Ken Nash reminisces about his time at WSU during his retirement event
Photo by: Guy Dutéché*



2017 also saw the departure of Profs. Ursula Fittschen and Paul Benny from our faculty. After spending nearly 3 years at WSU as an assistant professor, Dr. Fittschen decided to return to her native Germany, where she accepted a position as a professor in the Chemistry Department at the Clausthal University of Technology. Dr. Benny was a faculty member at WSU since 2004 and built a strong synthetic research

program involving the development of new techniques and compounds utilizing radioactive nuclides for diagnostic and therapeutic applications in nuclear medicine. In June of 2017, Dr. Benny accepted a position as a staff scientist at Oak Ridge National Laboratory.

STAFF

MEET OUR NEW STAFF MEMBERS



KENNETH SPICER
Program Coordinator
Aurora Clark Group

Kenneth Spicer is thrilled to serve as Program Coordinator for Dr. Aurora Clark's group, and looking forward to the many

joys and challenges associated with the position. Kenneth studied at the American Academy of Dramatic Arts - West Coast, and appeared on stage in Los Angeles beside Jack Black and Broadway's Belle, Susan Egan. While producing theatre in the San Francisco Bay Area, Kenneth was proud to include among his production casts the future stars of Broadway's Aladdin, Adam Jacobs and Tony Award winner James Monroe Iglehart. Kenneth has produced over 100 live stage productions.



LAUREN HATLEY
Fiscal Analyst

Hello, my name is Lauren Hatley and I joined the Chemistry staff in January. My role is working on grants and I am learning State and

Gift funds. I have a background in grants and previously worked in Sponsored Programs Services and CAHNRS. I grew up in Vancouver, WA, however, my family roots are in Pullman. I enjoy reading and spending time with family. I look forward to working with everyone.



JAYDA K. SPONG
Instruction and
Classroom Support
Technician

Jayda took over Robert Jackson's position after he retired in 2016

I joined the WSU Chemistry Department in January 2017. I

manage the stockroom on the 3rd floor of Fulmer and prepare instructional laboratories for the general chemistry students. My work has been loads of fun, and I have really enjoyed getting to know the faculty, staff and students here at WSU. Prior to coming here, I studied Chemistry

and Biology at California State University San Marcos and obtained a Master's in Analytical Chemistry from Oregon State University in 2016. Having moved around quite a bit, Washington is the 4th state I have called my home. I grew up in hot sunny weather, so I am enjoying living here in Pullman and getting to experience four seasons. When I am not working, I enjoy being in the great outdoors (camping, hiking, etc.), reading, gardening, crocheting, and hanging out with my cat, Elroy. Everything that is good in me I owe to the love and endless support I have been given from my parents and siblings.



Jayda Spong is the recipient of the 2018 CAS Classified Staff Early Career Achievement Award

“Jayda’s dedication and congeniality have improved moral and instilled a sense of teamwork among the staff and faculty.”

MOVING ON

Longtime staff members, Debbie Arrasmith (26 years) and Carrie Giovannini (21 years), both said farewell to the Department of Chemistry in early 2017.

Debbie is now a Fiscal Officer/ Management Analyst in the Dean’s Office at WSU College of Arts and Sciences.

Carrie left her Graduate Coordinator position in 2015 to attend classes, during that time she continued to work part time for Sue Clark, Nathalie Wall and Ken Nash. She finally bid adieu to Fulmer Hall to become a full time nursing student.



Kirk Peterson and Stacie Olsen outside of the Troy Hall renovation in December 2016
Photo by Jennica Stiff



The Chemistry Crew at the 2018 CAS Awards
l-r: Amy Nielsen, Rock Mancini, John Sullivan, Stacie Olsen, Aaron Whiteman, Jayda Spong, Paul Buckley and Naomi Hyner
Photo by Molly Spain



Krista Nishida and Peyton Nosbusch take time out to witness the eclipse in August 2017
Photo by Jennica Stiff

FUNDED AWARDS

January 2016 through April 2018

CLIFF BERKMAN

\$196,267

MMP-14

Chimeric Ligands for Targeted Imaging of Metastatic Tumor

\$31,250

METHEOR

Synthesis of DPdZ Compounds

\$188,750

HHS-NIH

Inactivating Inhibitors of Mycobacterium tuberculosis beta-lactamase BlaC

AURORA CLARK

\$269,397

DOE-OFC SCIENCE(BES)

SISGR: Interfacial Chemistry of Actinide Solvent Extraction

\$131,505

BATTELLE - PNNL - DOE-EERE

Interfacial Diffusion and Crud Formation at the Liquid:Liquid Interface of Solvent Extraction

SUE CLARK

\$882,114

DOD-DTRA

Electroanalytical Method Development to Support Post-Detonation Debris Analysis

\$300,000

DOE - NNSA UNIV OF NOTRE DAME

Actinide Center of Excellence

BRIAN CLOWERS

\$225,000

DOD-ARMY

Kinetics of High Pressure Ionization Mechanisms to Enable Real-Time Ultra-Trace Detection of Organics from Environmental Matrices

\$86,733

DOD-ARMY

Purchase and Assemble Ion Mobility Spectrometer System (IMS), manufactured by Washington State University

PHIL GARNER

\$465,000

NSF

Glycoproteins via Chemoselective Ligation of Proteins and Glycans

\$10,000

ABBVIE

Non-Clinical Laboratory Services Agreement

JEFFREY JONES

\$1,134,206

HHS-NIH(NIGMS)

Understanding the Metabolic Impact of Aldehyde Oxidase on New Drug Design

CHULHEE KANG

\$239,029

NIH RUSH UNIV

Roles of calsequestrin in the control of calcium signals in health and disease

ALEX LI

\$300,000

NSF

Investigating the Origin of Molecular Signature Emissions

KIRK PETERSON

\$322,910

DOE-OFC SCIENCE(BES)

Accurate ab Initio Thermochemistry and Spectroscopy of Molecules Containing f-block Elements

PETER REILLY

\$184,825

NSF-(DBI)

IBDR: Development of a Digital Ion Trap Mass Spectrometer for Resolved Mass Analysis of Intact Singly-Charged Proteins, Complexes, RNA, DNA

NATHALIE WALL

\$500,000

DOE NNSA

Determination of Thermodynamic and Kinetic Parameters for Complexation of Tc(IV) with F-, Cl-, Br-, I-, SO42- and PO43-, acetate, citrate and EDTA

MING XIAN

\$896,872

HHS-NIH(NHLBI)

Novel sulfide releasing agents for ischemic injury

\$326,904

HHS-NIH(NIGMS)

Chemical Tools for Understanding the Redox Biology of Reactive Sulfur Species

\$300,000

NSF

D3SC: EAGER: Data-driven development of fluorescent sensors for bio-imaging 2017

JACOB DAY (XIAN)

\$70,228

HHS-HRSA(NHLBI)

Novel Sulfur Dioxide Donors and Their Cardioprotective Effects

CHOONG-SHIK YOO

\$500,000

DOE-NNSA

Planetary Materials under Extreme Conditions

COLLABORATIONS

AURORA CLARK/ SUE CLARK/ KW HIPPS

\$1,239,000

PMU: Energy Frontier Research Center: IDREAM - Interfacial Dynamics in Radiation Environments and Materials

BRIAN CLOWERS/ NATHALIE WALL

\$525,000

DOD-DTRA (CWMD)

Field detection and quantification of inorganic species from surfaces

JAMES BROZIK/ CHULHEE KANG

\$20,000

OFFICE OF COMMERCIALIZATION WSU GAP FUNDS

Development of ultrasensitive luminescent RECAL probe for biological imaging and diagnostics

JAMES BROZIK/ JEFF JONES

\$522,751

HHS-NIH TEMPLE UNIV

Improving Prediction of Drug Interactions Mediated by Time-Dependent Inhibitors

NATHALIE WALL/ SUE CLARK/ KEN NASH

\$2,918,078

DOE-OFC NUCLEAR ENERGY

DOE Traineeship in Nuclear and Radiochemistry at Washington State University and Colorado School of Mines

JAMES BROZIK/ KW HIPPS

\$1,000,000

KECK FOUNDATION

PMU: Proto-Replication and Self-Replicating Molecular Machines

\$13,699,086

TROY HALL RENOVATION COMPLETE

Trent Amonett - Assistant Director, Contributor

In our last newsletter, we published a short piece indicating that Troy Hall was under renovation, and with this newsletter, we are happy to report that the project is complete, and Troy Hall is once again occupied. Because of the age of the building and its historical importance on campus, the decision was made to retain the brick shell, largely preserving the exterior look of the building, but inside the old, brick veneer, Troy Hall is a new building. The north side received a facelift with a modern addition that provides offices for faculty and students.

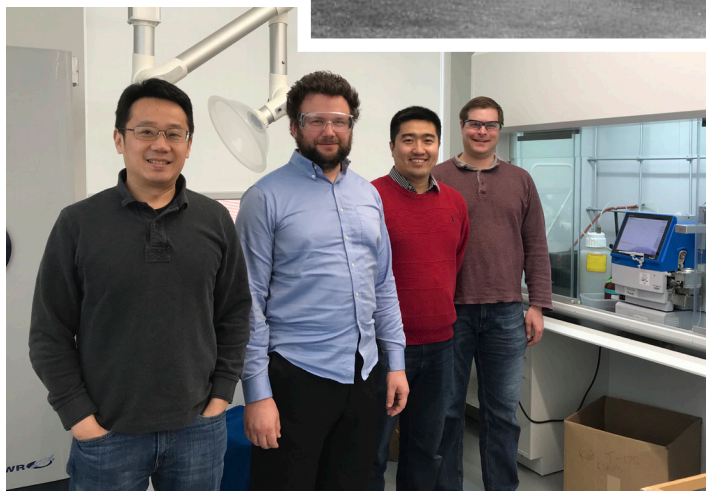
Four chemistry research labs now occupy Troy Hall on the first and second floors. Asst. Professors Zach Heiden and Jack Zhang, inorganic chemists, occupy labs on the first floor, and Professor Ming Xian and Asst. Professor Rock Mancini, both organic chemists, occupy labs on the second floor.

Many people were involved in the Troy Hall project, but two were particularly helpful from the Department of Chemistry's perspective: Jeff Lannigan, Project Manager, and Jason Harper, Construction Manager. Both work in WSU's Facilities Services, Capital office, and both have been accommodating with last-minute changes and working through the bugs after occupancy. The project spanned two departmental chairs, both of whom were involved in the project. Dr. K.W. Hipps was instrumental in helping to get the project off the ground, providing guidance from a researcher's perspective, and Dr. Kirk Peterson managed end-of-project issues and christened the building as our current Chair.

Photo right: Old Troy Hall in 1933. Photo courtesy of WSU Libraries



Bottom photo: The Troy Hall Fab Four research faculty. From left to right, Ming Xian, Rock Mancini, Jack Zhang, and Zach Heiden. Photo by Trent Amonett



More information about the project and the history of Troy Hall, including a short video of the brick shell, can be found at the links below.

<https://news.wsu.edu/2016/06/16/ws-u-troy-hall-construction-1924-re-construction-2016/>

<https://news.wsu.edu/2017/10/27/renovated-troy-hall-wins-prestigious-architectural-award/>

<https://www.youtube.com/watch?v=plsOaSGw9eM>

STUDENTS

ACHIEVEMENTS AWARDS SCHOLARSHIPS

Kirsten Adams (Wall)

Received a DOE Traineeship, 2016-17

Received a National Security Internship at PNNL, 2017-18

Morteza Adinhenia (Hipps)

GCS Research Assistant of the Year, 2017-18

Nate Buzitis (Clowers)

GSC Teaching Assistant of the Year, 2017-18

Dan Collins (Garner)

Stacy Gardner Research Endowment Fund, 2017-18

Jacob Day (Xian)

American Heart Association Predoctoral Fellowship, 2016-17

GCS Research Assistant of the Year, 2016-17

Gardner Stacey Fellowship, 2016-17

CAS Three Minute Thesis winner, 2016-17

Albrecht Scholarship, 2016-17

Frank A. Fowler Endowed Graduate Fellowship, 2017-18

Devon Dodd (Nash)

Frank A. Fowler Endowed Graduate Fellowship, 2016-17

Sakun Duwal (Yoo)

Outstanding Poster 2017 Stewardship Science Academic Programs (SSAP) Symposium

Awarded by US-DOE, National Nuclear Security Administration (NNSA), 2016-17

Frank A. Fowler Endowed Graduate Fellowship in Chemistry, 2016-17

Awarded by Department of Chemistry, WSU

Outstanding Graduate Seminar Award, Awarded by Physical Chemistry Department, WSU, 2016-17

E.L. Wagner Graduate Endowment, 2017-18

Cecilia Eiroa Lledo (Wall)

Edward L. Wagner Memorial Scholarship, 2016-17

G. T. Seaborg Institute Research Fellowships at Los Alamos National Laboratory, 2017-18

Invited by Stanford Center for International Security and Cooperation to participate to the Young Professionals Nuclear Forum (YPNF) with MEPHI-Stanford University. Moscow, Russia, April 2017

Rulin Feng (Peterson)

Frank A. Fowler Endowed Graduate Fellowship in Chemistry, 2016-17

James P. and Lee Ella Ruck Graduate Fellowship, 2017-18

Mitchell Friend (Wall)

Edward L. Wagner Memorial Scholarship, 2016-17

CAS Doctorate Student Achievement in Sciences, 2017-18

Received funding from Lawrence Livermore National Laboratory (LLNL) to conduct plutonium chemistry at LLNL, 2017-18

Awarded a First Place prize in the Innovation in Nuclear Technology R&D Awards sponsored by the U.S. Department of Energy, 2017-18

James P. and Lee Ella Ruck Graduate Fellowship, 2017-18

Joe Hantho (Mancini)

Stacy Gardner Research Endowment Fund, 2017-18

Matthew Hurlock (Zhang)

Frank A. Fowler Endowed Graduate Fellowship, 2017-18



CAS Interim Dean, Larry Hufford, presents Mitchell Friend with his Doctorate Student Achievement in Sciences Award with Nathalie Wall and Kirk Peterson, April 2018
Photo by WSU Photo Services

Kristen Johnson (Hipps)

Dodgen Award for Outstanding Graduate
Physical Chemistry Seminar, 2016-17

Se-Young Sam Jun (Kang)

Donald S. Matteson Endowed Graduate
Fellowship in Chemistry, 2016-17

Boeing Graduate Fellowship in Environmental
Studies, 2016-17

Frank A. Fowler Endowed Graduate Fellowship,
2017-18

Ruhnaz Kashfi (Gang)

RA from College of Arts and Sciences, 2016-17

Ashleigh Kimberlin (Nash)

Jim and Lee Ella Ruck Graduate Fellowship,
2016-17

Jianming Kang (Xian)

Donald S. Matteson Graduate Fellowship,
2017-18

Thibaut Martin (Nash)

GCS Teaching Assistant of the Year, 2016-17

Dr. TJ Chow Endowed Fellowship Award, 2017-
18

First recipient of the Jann and Herb Hill Travel
Scholarship, 2018 (*see sidebar*)

GPSA Travel Award, 2018

Ernesto Martinez Baez (A. Clark)

PNNL-WSU Distinguished Graduate Research
Program, 2016-17

Dr. TJ Chow Endowed Fellowship Award, 2017-
18

Michael Martinez (Brozik)

Internship with ORISE, 2016-17

Frank A. Fowler Endowed Graduate Fellowship,
2017-18

Tenisha Meadows (S. Clark)

GEM Full Fellow, 2016-17

Kelsey Morrison (Clowers)

James P. and Lee Ella Ruck Graduate
Fellowship, 2016-17

J Ivan Legg Fellowship in Chemistry 2017-18

Tim Moural (Kang)

Frank A. Fowler Endowed Graduate Fellowship,
2017-18

Cameron Naylor (Clowers)

Abelson Fellowship, 2016-17

Truong-Son Nguyen (Peterson)

GCS Outstanding Teaching Assistant, 2016-17

Bojana Opacic (Reilly)

Frank A. Fowler Endowed Graduate Fellowship
in Chemistry, 2016-17 and 2017-18

Peyton Nosbusch (Clowers)

Gen. Chem Teaching Assistant of the Year,
2017-18

Erickson Paragas (Jones)

Travel and Registration Award, 2016-17

Gordon Research Conference on Drug
Metabolism

Donald S. Matteson Graduate Fellowship,
2016-17

Dan Pope (A. Clark)

Glenn A. Crosby Outstanding Graduate
Seminar Award, 2016-17

Michael Pun (Berkman)

Gardner Stacy Graduate Research Endowment,
2016-17

Departmental Research Assistantship, 2016-17

Donald S. Matteson Graduate Fellowship,
2017-18

Joelle Reiser (Wall)

PhD Internship awarded at Pacific Northwest
National Laboratory, 2016-17

Frank A. Fowler Endowed Graduate Fellowship,
2017-18

John Rodgers (Jones)

Donald S. Matteson Graduate Fellowship,
2017-18

**JANN AND HERB HILL
TRAVEL SCHOLARSHIP**

When Regents Professor Herb Hill retired in 2017, a travel scholarship was established for students in Chemistry to present their research at National and International scientific meetings. The first Jann and Herb Hill Travel Scholarship was awarded this past spring to Thibaut Martin, enabling him to attend the National American Chemical Society meeting in New Orleans, LA. His presentation was on the effect of diluents on the extraction of trivalent f-elements. **Congratulations to Thibaut!**

If you would like to assist WSU Chemistry students in presenting their research at scientific conferences, please go to https://foundation.wsu.edu/give/?fund=75427d78-c794-4b79-8776-0294b0d314e7&utm_source=drs-herb-and-jannette-hill-travel-scholarship&utm_medium=wsu-link&utm_campaign=arts-and-sciences and make a contribution. Thank you.

GRADUATES

SUMMER 2016

Rolf Hermanson, MS (Peterson)
Morgan Kelley, PhD (S. Clark)
Elizabeth Krahn, PhD (Nash)
Christopher Leishman, PhD (McHale)
Corrine Ley, PhD (Berkman)
Benjamin Tokheim, PhD (Nash)
Nicholas Treat, PhD (McHale)
Nicolas Uhnak, PhD (Nash)

FALL 2016

Carlo Barnaba, PhD (Jones)
Elisa Held, MS (Peterson)
Da Lu, MS (Lewis)
I. Abrey Monreal, PhD (Berkman)
Jamie Weaver, PhD (Wall)
Baoming Paul Zhao, PhD (Li)

SPRING 2017

Jeffrey Berry, PhD (Nash)
Tyler Biggs, PhD (Xian)
Brandan Cook, PhD (Berkman)
Ian deJoode, MS (Nash)
Heather Felmy, PhD (S. Clark)
Larissa Gribat, MS (Wall)
Forrest Heller, MS (Nash)
Ian Kieffer, MS (Heiden)
Qing Lu, PhD (Peterson)
Max Minnig, MS (Lewis)
Lindsey Neill, PhD (Wall)
Trevor Omoto, PhD (Wall)
Kevin Swearingen,
PhD (Wall)

SUMMER 2017

Nicholas Treich, MS
(Heiden)
Emily Campbell, MS
(Nash)

Ashley Kimberlin, PhD (Nash)
Armando Pacheco, PhD (Xian)
Herana Kamal Seneviratne, PhD
(Berkman)
Emily Witthuhn, MS (Benny)

FALL 2017

Devon Dodd, PhD (Nash)
Katherin Donahoe, MS (Reilly)
Bonita Goh, MS (S. Clark)
Nathan Hoffman, PhD (Reilly)
Se-Young Sam Jun, PhD (Kang)

SPRING 2018

Chris Dugan, MS (Zhang)
Sakun Duwal, PhD (Yoo)
Zachary Gotlib, MS (Peterson)
Jianming Kang, PhD (Xian)
Ruhnaz Kashfi, PhD (Gang)
Alex McCue, MS (A. Clark)
Timothy Mournal, PhD (Kang)
Peyton Nosbusch, MS (Clowers)
Joelle Reiser, PhD (Wall)
Madison Soth, MS (Mancini)



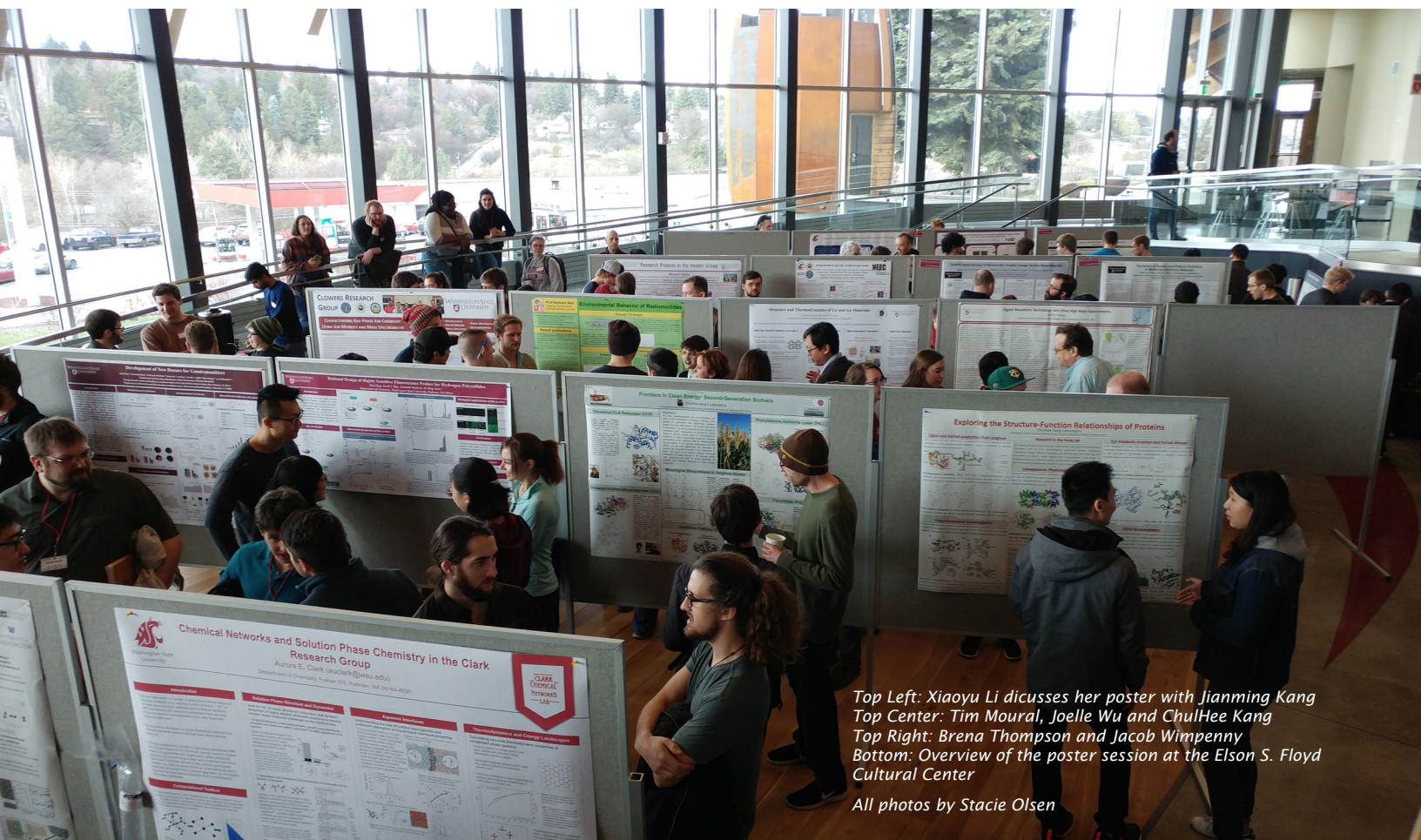
Spring 2017 l-r: Trevor Omoto, Lindsey Neill, Nathalie Wall, Kevin Swearingen and Larissa Gribat



WSU VISITATION WEEKEND 2018

Stacie Olsen - Graduate Student Coordinator, Contributor

In March 2018, we hosted 25 prospective students during the graduate recruitment weekend in hopes to recruit future Cougar Chemists. Prospective students had dinner with Chemistry Professors, attended the Chemistry/Physics Group Poster Session in the new Elson S. Floyd Cultural Center, met with individual professors they could potentially work for, took a tour of the nuclear reactor and had dinner with the current graduate students.



*Top Left: Xiaoyu Li discusses her poster with Jianming Kang
 Top Center: Tim Moural, Joelle Wu and ChulHee Kang
 Top Right: Brena Thompson and Jacob Wimpenny
 Bottom: Overview of the poster session at the Elson S. Floyd Cultural Center
 All photos by Stacie Olsen*

GRADUATE CHEMICAL SOCIETY NEWS

Peyton Nosbusch - GCS President, Contributor

OFFICERS

	2016-2017	2017-2018
President	Kelsey Morrison	Peyton Nosbusch
Vice President	Elise Held/ Guy Dutech	Zac Gotlib
Secretary	Lelee Ounkham	Michael Martinez
Treasurer	Peyton Nosbusch	Bradley Roberts
Public Relations	-----	Guy Dutech

The Graduate Chemical Society has brought about many new and exciting changes over the last two years. We raised the maximum amount for travel grants from \$300 to \$500, helping relieve students from some of the burden of travel expenses for attending conferences. The biggest and most exciting change this year was the recent move of the GCS Library from Johnson back to Fulmer. The newly renovated room offers a comforting environment for graduate students to gather for studying and hanging out.



The Annual Fall Picnic has been held at Klemgard Park the last two years, allowing for a great space for students and faculty to come together. People have enjoyed eating good food, playing outdoor games, and socializing. The holiday potluck held in Fulmer every December has been a hit with people bringing their favorite dishes from all over the world. The end of the year luncheon and awards ceremony, now held in Fulmer, is an event attended by all to celebrate those who have graduated as well as the students and professors who stood out during the school year.

GCS End of the Year Awards

	2016-2017	2017-2018
Principal Investigator of the Year	Choong-Shik Yoo	Cliff Berkman
Professor of the Year	Ken Nash	Pete Reilly
Research Assistant of the Year	Jake Day	Morteza Adinhenia
Teaching Assistant of the Year	Thibaut Lécrivain-Martin	Nate Buzitis
Gen Chem Teaching Assistant of the Year	-----	Peyton Nosbusch



*Left: Undergrad Jordan Mahoney shows his poster to Clinical Associate Professor, Louis Scudiero
Middle: Peyton presents Professor Pete Reilly with the GCS Professor of the Year Award
Right: Peyton is the recipient of the General Chemistry TA of the Year Award*

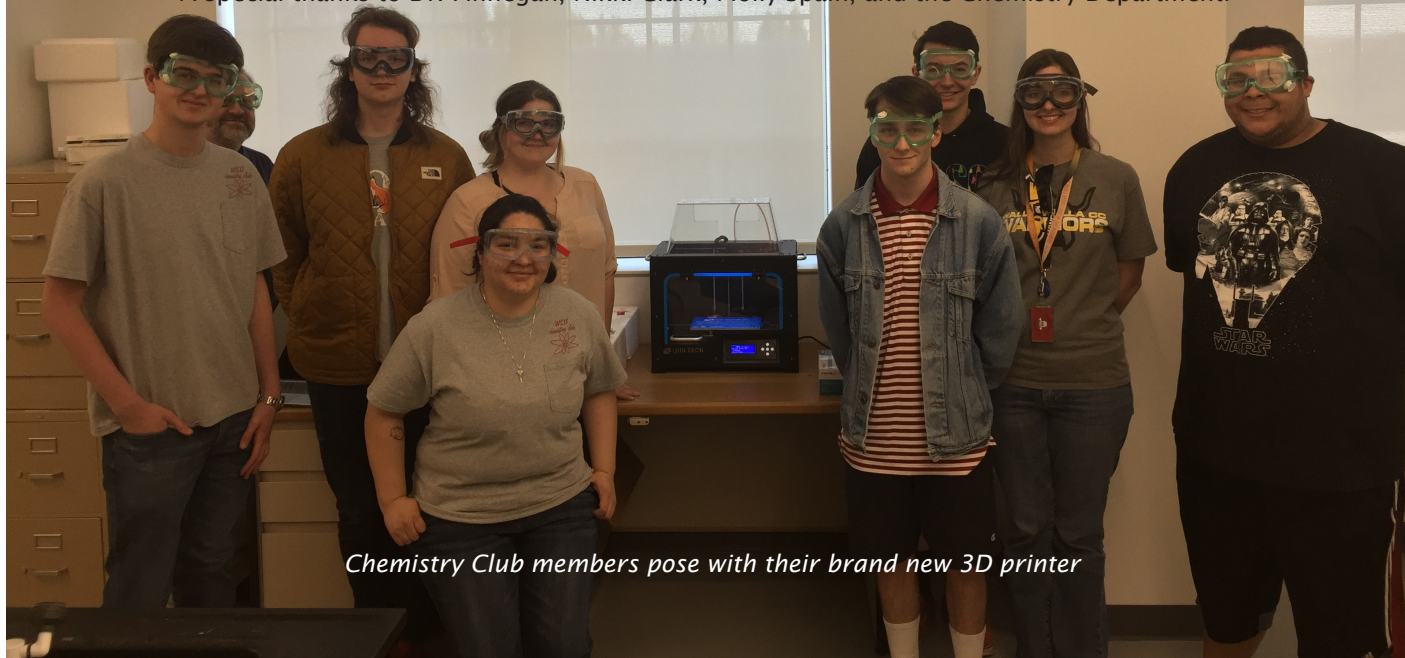
CHEMISTRY CLUB

Abigail Bravo - Chemistry Club President, Contributor

The Chemistry Club has been quite active this year with fundraising and outreaches. Our fundraising goal was to provide free t-shirts for members and continue to purchase materials for outreaches. We are excited to announce that the club has achieved our goal via SEB Films, treats, coffee and donut cart, and our annual Valentine's Flower Bouquets with Biology Club.

The outreaches this year involved gak at SEB Films, Cartesian Divers at Future Scientists and Engineers Day, and our annual Dad's/Mom's Weekend demonstrations. Each outreach allows members to learn and teach chemistry outside the classroom. The Chemistry Club plans to end the year learning how to build a 3-D printer.

A special thanks to Dr. Finnegan, Nikki Clark, Molly Spain, and the Chemistry Department!

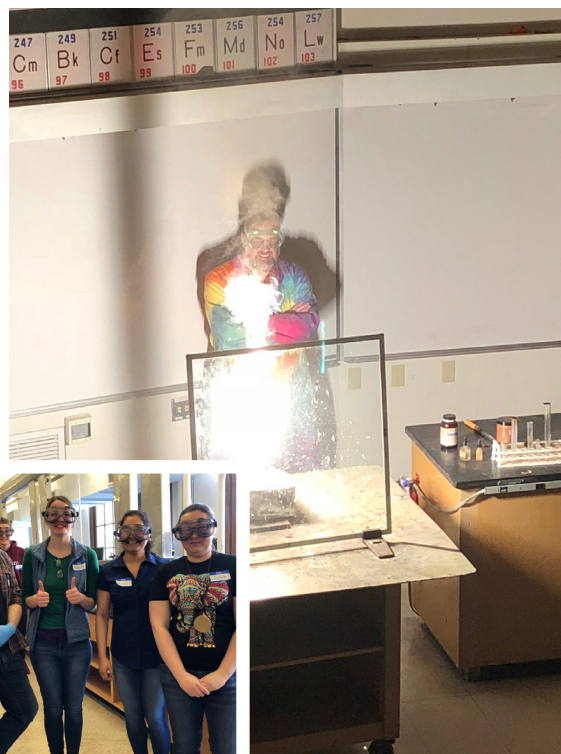


Chemistry Club members pose with their brand new 3D printer

CHEMICAL OLYMPICS

Amy Nielsen - Clinical Associate Professor, Contributor

WSU Chemistry hosted the second annual Washington-Idaho Border Section ACS Chemical Olympics on March 3rd, with help from their chair, Amy Nielsen, and loads of amazing volunteers from WSU and University of Idaho. The event, which helps prepare high school students for the national exam, also included gold medal awards, labs, loads of pizza, and a Las Vegas-style chemistry show put on by our own Mike Finnegan and the WSU Chemistry Club! The cherry on top? Pullman High School won the medal count for 2018! Nice work everyone! See you next year on the U of I campus!



ALUMNI NEWS

Stephen Fodor, BS Biology '78 & MS Biochemistry '82, in 1993, Dr. Fodor co-founded Affymetrix, where his group's DNA chip technology has been used to synthesize many varieties of high-density oligonucleotide arrays containing hundreds of thousands of DNA probes. These DNA chips have broad commercial applications and are now used in many areas of basic and clinical research, including the detection of drug resistance mutations in infectious organisms, direct DNA sequence comparison of large segments of the human genome, the monitoring of multiple human genes for cancer associated mutations, the quantitative and parallel measurement of mRNA expression for thousands of human genes, and the physical and genetic mapping of the human genome. In 2016, Thermo Fisher Scientific acquired Affymetrix for approx. \$1.3 billion.



Christopher Hartshorn, PhD Physical Chemistry '09, (Pictured with James Brozik), worked with Dr. Brozik and is now the Program

Director at the National Cancer Institute. Chris returned to WSU this spring to present a P Chem seminar titled "Driving Cancer Research and the National Clinical Ecosystem Forward at the NCI".

Andrew Maddison, PhD Chemistry '01, worked with Sue Clark, began working for Nawah Energy Company in September 2016, as a Laboratory Specialist in the

Environmental Radiochemistry Laboratory. Nawah is the operator for the Barakah Nuclear Power Plant in the UAE (United Arab Emirates).

Gary Pielak, PhD Biochemistry '83, worked with J. Ivan Legg in Biochemistry on the characterization of sulfanilazo and arsanilazo proteins. Dr. Pielak is currently the Kenan Distinguished Professor of Chemistry at University North Carolina-Chapel Hill. He was recently awarded a UNC Tanner Mentor Award for Lifetime Achievement. In 2016 he received the Carl Brändén Award from The Protein Society. This award honors researchers who have distinguished themselves with significant achievements in protein research and those who have made outstanding contributions in leadership, teaching, and service.

Matt Sigman, PhD Chemistry '96, in 2017 received the ACS Award for Creative Work in Synthetic Organic Chemistry. This award is given to those who have accomplished outstanding creative work in synthetic organic chemistry. Matt's thesis advisor at WSU was Bruce Eaton.

James A. Wells, PhD Biochemistry '79, researched protein engineering at Genentech, was a founder, president and chief science officer at Sunesis Pharmaceuticals and is professor and former chair of pharmaceutical chemistry at the University of California, San Francisco. He was awarded the WSU Regents' Distinguished Alumnus Award in early 2017.

IN MEMORIAM

Dr. Harold Dodgen

Physical Chemistry Faculty Member, 1948-1986. He established the Nuclear Science Center and in 1968 he joined with Dr. William Band to create the Chemical Physics Program at WSU. Harold retired from WSU in 1986. He passed away November 26, 2017 at the age of 96.



Harold in 1960



Photo left, taken in 2013: (l-r) Donald Wall, Gary Bennett, Harold Dodgen (seated), Rich Huggins, Wally Hendrickson, Roger Brown and Richard Stout. Gary and Rich worked here in the late 60s and early 70s. After his Ph.D. Gary went on to work at NASA. Rich still serves on the WSU Emergency Management Advisory Committee. Harold, Wally and Roger were three of the original five reactor licensees in 1961.

David J. Huettner, 78, PhD Chemistry '66
March 31, 2016 in Appleton, WI

Annabel J. "Sandy" Leach, 91,
BS Chemistry '48
March 25, 2017, Vancouver

Karin Maretens, 75, Faculty
Biological Chemistry 1969-1983
May 19, 2017 in Clarkston, WA

Ronald L. Casebier, 83, BS Chemistry '55
September 25, 2017 in Lacey, WA

William Kallen, 78, PhD Chemistry '68
October 15, 2017 in Rochester, New York

IN MEMORIAM

WE'D LOVE TO HEAR FROM YOU!

It's always wonderful receiving news from our alumni. Please keep in touch with us and let us know how you're doing, what you're up to or to notify the WSU Chemistry Community of the passing of a colleague.

Send updates to:
chemistry@wsu.edu



NEWS & NOTES

CARL M. STEVENS LECTURESHIP

November 6, 2017

The Carl M. Stevens Lectureship was established in honor of Professor Stevens' outstanding contributions to teaching, research, university governance at WSU, and especially for his contributions as chairman, to the development of the Department of Chemistry from 1960-71. Professor Stevens retired in 1980, the year the lectureship fund was established, after 35 years at WSU.

Dr. William B. Tolman, Distinguished McKnight University Professor at University of Minnesota, was our featured speaker. He presented his talk titled, "Formally Copper(III) Complexes Relevant to Oxidizing Intermediates in Enzymes".



Qiang Zhang, Dr. William B. Tolman and Kirk Peterson

Teaming up with collaborators from Scripps, Professor Phil Garner and graduate student, Dan Collins gave the thioester its debut as an amino acid side chain via site-specific incorporation of a non-natural amino acid into proteins. This work sets the stage for the controlled chemical introduction of a variety of protein modifications, including glycosylation, which is an ongoing project in the Garner group.

To read more about this, go to:

<https://pubs.acs.org/doi/abs/10.1021/acscchembio.7b00998>).

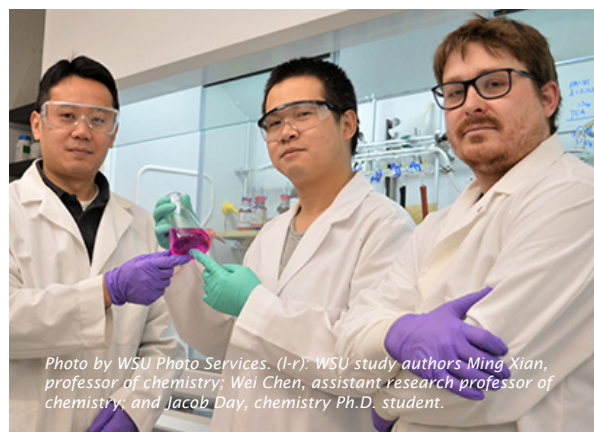


Photo by WSU Photo Services. (l-r): WSU study authors Ming Xian, professor of chemistry; Wei Chen, assistant research professor of chemistry, and Jacob Day, chemistry Ph.D. student.

Washington State University scientists have created an injectable dye that illuminates molecules with near-infrared light, making it easier to see what is going on deep inside the body.

The new dye will help medical researchers track the progression of a wide array of diseases, such as cancer.

Ming Xian, the Ralph G. Yount Distinguished Professor of chemistry, calls the new dye Washington Red. He and Wei Chen, an assistant research professor in the WSU Department of

Chemistry, published a study detailing the dye's unique properties and how it is made in *Angewandte Chemie*, one of the top chemistry journals in the world.

To read more of this story by Will Ferguson, CAS, go to: <https://news.wsu.edu/2017/12/11/bioimaging-dye-breakthrough/>

The Mancini Group recently converted their Bystander-Assisted Immunotherapy patent and established the field of enzyme-directed immunostimulants. Mancini, RJ et al., United States Patent, 15/722,018, October 2, 2017

In 2017, Professor Aurora Clark spearheaded an effort to acquire a powerful new \$1.7 million x-ray microscope which will help WSU scientists develop specialized materials for technologies such as self-healing roads, printable batteries and super-efficient solar cells.

WSU is the first university in the United States to have the Zeiss Xradia Ultra 810's state-of-the-art, 3D imaging capabilities. The microscope is located in the Engineering Teaching & Research Laboratory (ETRL) building.

To read more: <https://news.wsu.edu/2017/06/26/1-7-million-x-ray-microscope-coming-wsu/>

DONOR SPOTLIGHT: DR. ALEXANDRA NAVROTSKY

Kirk Peterson - Department Chair, Contributor



Photo (l-r): Ribbon cutting ceremony for the AlexInstitute. Jim Peterson - Director of the Voiland School of Chemical Engineering and Bioengineering, Mary Rezac - Dean of the College of Engineering and Architecture, Alexandra Navrotsky - Distinguished Professor of Chemistry - UC Davis, WSU President Kirk Schultz, Christopher Keene - Vice President for Research and Kirk Peterson - Chair for the Department of Chemistry. Photo by WSU Photo Services

Dr. Alexandra Navrotsky, currently a Distinguished Professor of Chemistry at the University of California-Davis, has enjoyed a lifetime of science with a research program using high temperature reaction calorimetry that relates the microscopic features of structure and bonding to macroscopic thermodynamic behavior in minerals, ceramics, and other complex materials. She has published over 700 scientific papers. She has received many top honors, including the Benjamin Franklin Medal in Earth Sciences, the Harry Hess Medal, the Goldschmidt Medal, and the Kingery Award. She is a member of the National Academy of Sciences, a Fellow of the American Ceramic Society, Mineralogical Society, the American Geophysical Union, and the Geochemical Society, and a member of the American Philosophical Society.

To enable Dr. Navrotsky's enduring legacy in the education of Ph.D. students and postdoctoral scholars, in serving as an exemplar for generations of female physical scientists, and in leading fundamental, innovative, experimental based thermodynamic (calorimetric) research, Dr. Navrotsky has provided a transformative gift to WSU. Her gift enables an endowment for a new research institute, the AlexInstitute, which will serve as an aegis for experimental thermodynamics research and will enhance the careers of aspiring scientists, including two of her former Ph.D. students who recently joined the WSU chemical engineering (Dr. Di Wu) and chemistry faculty (Dr. Xiaofeng Guo).

If you would like to make a gift to the WSU Department of Chemistry, please visit the donation page on our website: <https://chem.wsu.edu/donor/>

CHEMISTRY NOTATIONS

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North Side Addition of Troy Hall
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Photo Courtesy of Perkins+Will



Prof. Nathalie Wall with graduate student, Mitchell Friend

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