Badger **Chemist**

University of Wisconsin-Madison Department of Chemistry

Established 1953, No. 59, 2016

DEPARTMENT OF
Chemistry
UNIVERSITY OF WISCONSIN–MADISON

Milestones

We find ourselves in a busy season in the Department of Chemistry. In addition to the usual teaching, research, and outreach activities in the department, we are pleased to report that the design phase of the Chemistry Building Project is well underway. We plan to have the 35 percent design report — a big milestone — completed this summer. You can learn more about this high-impact project and how it will help one of every two undergraduate students on campus on page 9.

We are also getting ready to launch our latest group of graduates out into the workforce and the world — a big milestone in the lives of our newest alumni. Today, our graduate students experience collaborative research in ways that may have been uncommon when you were a student. For a behind-the-scenes look at one graduate student's experience working across institutions as part of a large research center, read the story on page 13.

With this issue of the Badger Chemist, we hope to provide a snapshot of the many elements that continue to make the Chemistry Department a special place today. Whether you're interested in reading about where your fellow alumni have landed (page 4), what students say when they receive scholarships given by alumni and friends (page 17), or the outreach programs and events introducing Wisconsin middle and high school students to chemistry (page 5), we hope that you will find this issue interesting and informative.

We look forward to seeing you the next time you visit campus or at a department reception at an upcoming ACS National Meeting.

With very best regards,

Robert J. McMahon
Helfaer Professor and Chair
chair@chem.wisc.edu

PS: You can sign up for our quarterly alumni e-newsletter at go.wisc.edu/alumnienews.

CONTENTS

Badger Chemist is an annual publication for alumni and friends of the Department of Chemistry at the University of Wisconsin-Madison.

Executive Editor
Matthew Sanders, matthew.sanders@wisc.edu

Managing Editor
Libby Dowdall, libby.dowdall@wisc.edu

To update your contact information, visit myuwconnect.org.

Send items for Badger Chemist to badgerchemist@chem.wisc.edu.

1101 University Ave., Madison, WI 53706

Cover photo: Graduate students Mimi Hang (left) and Arielle Mensch work with nanoparticles as part of the NSF-funded Center for Sustainable Nanotechnology headquartered at UW-Madison. More on page 13.

DEPARTMENT OF
Chemistry
UNIVERSITY OF WISCONSIN–MADISON

New Badger Chemists

Ph.D.

DECEMBER 2014

Elizabeth Blaesi (Brunold)
Spectroscopic and computational investigation of cysteine dioxygenase: active site structure and mechanistic insights

Erin Boyle (Wright)
New mixed vibrational-electronic methods in fully coherent multidimensional spectroscopy: progress toward metal active site characterization

Jaclyn Brown (Moore)
Transition metal-catalyzed aerobic dehydrogenation of heterocycles and development, and evaluation of a student-generated chem wiki and its impact on student performance

Saswata Chakraborty (Gellman)
Effects of diverse subunits on the biological properties of nylon-3 polymers

Shakeel Dalal (Ediger)
High-throughput characterization of vapor-deposited organic glasses

Tyler Greer (Li)
Advancing mass spectrometry methods for quantification and characterization of peptides and proteins in complex biological samples

Amber Jain (Sibert)
Timescales of large amplitude motions-classical and quantum considerations

Julia Kennedy-Darling (Smith)
Hybridization capture of chromatin associated proteins for proteomics

Ryan Kieda (Crim)
Avobenzane photoisomerization dynamics and solvent dependent dynamics in supercritical carbon dioxide

Diane Lancaster (Nathanson)
Inert gas scattering and evaporation from jet fuel surrogates using liquid microjets

Aaron McCoy (Mecozzi)
Synthesis and physicochemical characterization of highly fluorinated polymeric amphiphiles for intravenous drug delivery applications

Jesse McDaniel (Schmidt)
Development and application of physically motivated, first-principles force fields for complex chemical systems

David Mortenson (Gellman)
X-ray crystallographic methods for the study of native and non-native protein structure

Christopher Rose (Coon)
Improvements to the identification and quantification of peptides and proteins

Daniel Sweat (Gopalan)
Materials design for block copolymer lithography

Vivian Trang (Strieter)
Tools to study ubiquitin signaling

Di Zhu (Hamers)
Photoelectron emission from diamond

MAY 2015

Miguel Cabán-Acevedo (Jin)
Enabling iron pyrite and related ternary pyrite compounds for high-performance solar energy applications

Sucheewin Chotchatchawankul (Landis)
Mechanistic studies of diphosphine-catalyzed methanol reductive carbonylation

Audrey Forticaux (Jin)
Tailoring the screw dislocation-driven growth of nanomaterials and their heterostructures towards complex architectures

Joanne Harmata (Stahl)
Aerobic oxidative functionalization of alkenes catalyzed by palladium: methods, mechanisms

Shishi Lin (Yoon)
Radical cation Diels–Alder cycloaddition reactions by visible light photocatalysis

Ranran Liu (Smith)
The development and characterization of ion detectors and levitated ion sources for time-of-flight mass spectrometry

Stacy Maynard (Gellman)
The development of beta-sheet promoting amino acid residues and fundamental studies of peptide structure

Catherine Minogue (Coon)
Development, application of methods for the large-scale identification and quantification of proteins using mass spectrometry

Younghee Shin (Gellman)
Development of alpha-helix-like alpha-beta-delta foldamers

Frank Speetjens (Mahanthappa)
Influence of architecture on the behavior of microphase separated block copolymers

Ellen Valkevich (Strieter)
Analytical methods to study ubiquitin signaling

Ge Yu (Keutsch)
Small molecules as tracers of atmospheric secondary organic aerosol

AUGUST 2015

Christopher Adams (Schomaker)
Modular and stereocontrolled synthesis of aminated sterotriads via aziridination: Development and application to complex molecule synthesis

Wesley Brogden (Berry)
Synthetic, spectroscopic, and computational studies of bimetallic and trimetallic 2,2'-diprydylamide complexes

James Checco (Gellman)
Designing alpha/beta-peptide foldamers to target diverse protein surfaces

Ross Cheloha (Gellman)
Exploration of alpha/beta-peptides as parathyroid hormone receptor ligands and recognition of alpha/beta-peptides by the immune system

Jamie Chen (Stahl)
Alkaline electrochemical water oxidation by NiFe-based oxide electrocatalysts

Megan Cismesia (Yoon)
Synthetic and mechanistic investigations into photoredox catalysis

Sarah Decato (Mecozzi)
Semifluorinated theranostic nanoparticles: development of stabilized colloidal drug delivery vehicles

Anna Dunn (Landis)
Lactide polymerization kinetic studies and development of flow NMR instrumentation

Elliot Farney (Yoon)
Synthesis and characterization of enzyme-activatable magnetic resonance imaging contrast agents

Joshua Fishman (Kiessling)
Polyoxazinones from ROMP

Christopher Jordan (Brunold)
Spectroscopic and computational investigation of adenosylcobalamin-dependent enzymes and a membrane-bound fatty acid desaturase

Linsen Li (Jin)
Enable iron fluoride conversion electrode materials for high-energy-density lithium-ion batteries

Joseph Moore (Blackwell)
Development and optimization of chemical tools for modulating quorum sensing in *pseudomonas aeruginosa*

Tracey Oudenhoven (Zanni)
Advances in 2-D IR spectroscopy and applications to sensitized thin films

Dominic Perroni (Mahanthappa)
Tuning the stability and structure of lyotropic liquid crystals derived from gemini surfactants

HongNgoc Grace Pham (Strieter)
Connecting topology to function: conformational dynamics of ubiquitin signals

Ankit Pokhrel (Jin)
Synthesis, phase selection and measurement technique development studies in 1-D metal silicide and metal sulfide nanostructures

Travis Powell (L. Yu)
Crystallization and fracture of pure and polymer-doped molecular glasses

Janelle Steves (Stahl)
Copper (I)-catalyzed aerobic alcohol oxidation with bicyclic nitroxyl cocatalysts

William Tucker (Mecozzi)
Design, synthesis, and physicochemical characterization of semifluorinated triphilic surfactants with applications for hydrophobic drug delivery

Ryan Van Hoveln (Schomaker)
Copper(I)-catalyzed 1,3-halogen migration

Cale Weatherly (Schomaker)
I. Stereoselective synthesis of 1,3-diamion-2-ols via allene oxidation. II. Tunable chemoselective silver (I)-catalyzed nitrene transfer reactions

Alison Wendlandt (Stahl)
Design and development of o-quinone catalysts for aerobic C–N bond dehydrogenation reactions

Chenxi Yang (Li)
Revealing differential proteomic events by mass spectrometry

M.S.

DECEMBER 2014

Allison Balloon (Coon)
Dan Baum (Gellman)
Brandi Bonfert (Coon)
Yi-Chen Chen (Ge)
Christopher Hughes (Cavagnero)
Peter Koslosky (Burke)
Christopher Papa (Choi)
David Skoff (Zanni)

MAY 2015

Dong Gyun Ha (Zanni)
Burton Mandrell (Berry)
Jacob Van Oosterhout (Burke)
Ethan Volpa (Crim)
Neno Vuksanovic (Mahanthappa)
Allen Wang (Mahanthappa)
Tao Wu (Roden)

AUGUST 2015

Steven Larson (Gopalan)
Arelys Rosado (Cavagnero)
Kimberly Tyler (Gellman)

B.S. and B.A.

DECEMBER 2014

Allen, Eric
Asplund, Mitchell
Becker, Jenna
Bennett, Scott
Berger, Seth
Brooks, Eric
Burge, Joseph
Center, Jake
Chitwood, Tia
Cornille, Brian
Detlor, Jennifer
Ding, Yuanhao
Ehlen, Eugene
Fowler-Watters, Matthew
Freidberg, Michael
Jahzerah, Jahaziel
Johnson, Alexander
Juyal, Shobhit
Lu, Qin
Montgomery, Michael
Mueller, Blaine
Ralston, Kisha
Slattery, Sean
Stagg, Melissa
Steffel, Andrew

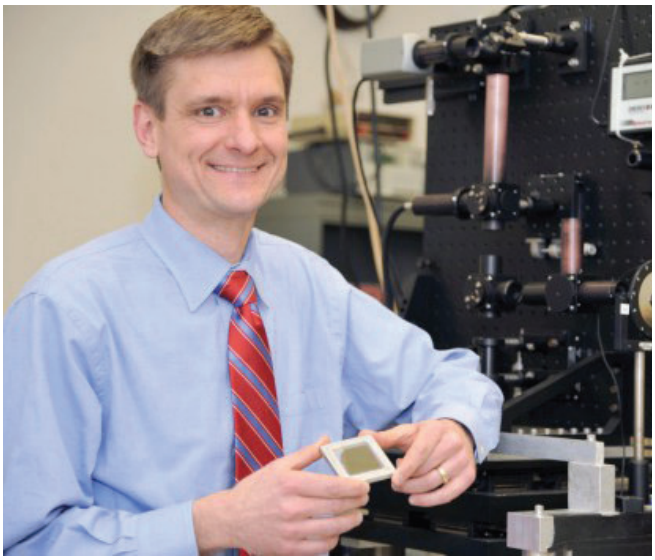
MAY 2015

Baranczyk, Ben
Becker, Linsey
Chandra, Alvin
Christian, Jessica
Ewel, Megan
Fulton, Mark
Ge, Yicong
Gibbs, Benjamin
Goh, Jane
Hahn, Rachel
Horvat, William
Huppert, Matthew
Jun, Hyunji
Kollmeyer, Julian
Larson, Megan
Leung, Brian
Martin, Arielle
Miller, Christopher
Osterbauer, Andrew
Panger, Jesse
Phillips, Samuel
Pleva, Casey
Roscizewski, Lauren
Ruffolo, Benjamin
Schreiber, Cynthia
Schwarz, Cara
Slade, Tyler
Sorenson, Brett
Tsao, Chun-see
Underwood, Steven
Wang, Tong
Wen, Yinghao
Wolfe, Joshua

AUGUST 2015

Bakken, Mindy
Ehrhardt, Jeffrey
Ellis, Ryan
Gelman, Alessandra
Hemmersbach, Alex
Kinzy, Katherine
Krantz, Elizabeth
McCutcheon, Luke
Monroe, Alexander
Paul, David
Sawicki, Joseph
Utterback, David
Wong, Matthew
Yon, Chun Mei

Alumni News



DIRKE WILLIAMS

In December, Bradley Ringeisen (Ph.D. '00, Nathanson) was named Department of Defense Scientist of the Quarter for his breakthrough 3-D cell printing process, Biological Laser Printing (BioLP). The technology is a patented laser-printing tool for creating 2-D and 3-D patterns of biomaterials such as living cells, soils, hydrogels, and biomolecules. BioLP shows promise for future applications such as antibiotic drug discovery, improved biofuel production, and artificial 3-D organ and tissue printing. Ringeisen leads an 11-person research group within the Bioenergy and Biofabrication Section of the U.S. Naval Research Laboratory's Chemistry Division.

Cathy Murphy (Ph.D. '90, Ellis), a chemistry professor at the University of Illinois at Urbana-Champaign, was elected to the National Academy of Sciences.

Two alumni were named to the 2015 class of American Chemical Society (ACS) Fellows. Brian Coppola (Ph.D. '84, Trost) is a chemistry professor at the University of Michigan. Steven Fleming (Ph.D. '84, Zimmerman) is a professor of chemistry instruction and learning at Temple University.

Peter Dorhout (Ph.D. '89, Ellis) has been named vice president for research at Kansas State University. He also is a candidate for ACS president for 2017.

Lee Latimer (Ph.D. '76, Trost) has been elected director-at-large of ACS. The head of chemistry at NeurOp, Inc. began his three-year term with the board in January.

Luke Lavis (Ph.D. '08, Raines) was among Chemical & Engineering News' inaugural Talented 12, a list of "young researchers and entrepreneurs who are using chemistry to solve global problems." Lavis serves as group leader at Howard Hughes Medical Institute's Janelia Research Campus. He was highlighted for his work with fluorescent dyes.

Heather Schenck (Ph.D. '98, Gellman) is one of five UW System Regent Scholar award recipients for 2015. An associate professor of chemistry at the University of Wisconsin-La Crosse, Schenck will receive a grant for research on hydroxamic acids. The Regent Scholar program rewards innovative faculty-student research and provides support for projects that benefit Wisconsin business and industry.

Helen (Dauer) Yan (M.S. '11) is among the 34 high school STEM teachers named 2015 Knowles Science Teaching Fellows. The comprehensive five-year professional development program provides support and development for beginning high school math and science teachers.

Mary Beth Anzovino (Ph.D. '13, Moore) is a visiting assistant professor of chemistry at Miami University in Oxford, Ohio.

Kristin Briney (Ph.D. '10, Crim) has published a book titled *Data Management for Researchers: Organize, Maintain and Share Your Data for Research Success* (Pelagic Publishing). Briney is a data services librarian at the University of Wisconsin-Milwaukee.

Valeria Guzmán Luna, a recent postdoctoral fellow in the Cavagnero group, received the Best Oral Presentation award at the fourth International Workshop on the Frontiers in Protein Folding, Evolution and Function.

Mark Konings (Ph.D. '87, Casey) recently was named to the faculty of the Bioclear Learning Center in Tacoma, Wash. The Center is dedicated to advancing dentistry through improving products and procedures in composite tooth restorations.

Jim Maynard (B.S. '00) is in his fifteenth year as the lecture demonstrator at the UW-Madison Department of Chemistry, where he has compiled more than 450 hours of video classroom content to date. In his spare time, Maynard plans to start a new business.

Doug Sillars (Ph.D. '03, Landis) helps developers study the performance of their mobile apps as a principal architect for application performance with AT&T. He recently published a book, *High Performance Android Apps* (O'Reilly).

Chemistry News

Shain Chair in Chemistry

The newly endowed Irving Shain Chair in Chemistry will endow the position of department chair in the Department of Chemistry. Made possible through the generosity of the Shain family, the chair serves to honor the career accomplishments and legacy of Irving Shain. Shain joined the faculty of the UW-Madison Department of Chemistry in 1952 and served as chair of the department from 1967-70. He was named chancellor of the university in 1977 and continued in this role until 1986. Shain's leadership legacy at UW-Madison inspired the Shain family to create a faculty chair in the department. A faculty luncheon in October honored the Shain family (see photo above, left; L to R: Professor Bassam Shakhashiri, John Shain, Dean Karl Scholz, Chancellor and Professor Emeritus Irving Shain, Professor and Chair Robert McMahon, Paul Shain). Attendees also included Chancellor Rebecca Blank, Provost Sarah Mangelsdorf, and L&S Dean Emeritus Phil Certain.

UW System Chemistry Faculties Meeting

In October, the department hosted the UW System Chemistry Faculties Meeting. The conference drew faculty and staff participants from all UW System campuses. The 13 campuses take turns organizing and hosting the annual event, which is now in its 42nd year. Conference attendees shared promising teaching practices, discussed the latest chemistry research, and networked with one another — all in an effort to strengthen the bonds among the campuses. UW-Madison Chemistry Professors Fleming Crim and Bassam Shakhashiri were the keynote speakers.

Carter Wins Hirschfelder Prize

Professor Emily Carter, a theorist and computational scientist from Princeton University, received the 2015-16 Hirschfelder Prize in Theoretical Chemistry, administered by the Theoretical Chemistry Institute (TCI). She visited Madison in October and delivered three lectures. She is the first woman to receive the award. At the award banquet,

Professor James Skinner, who directs the TCI, noted that while some theorists work to develop methods and others work to apply these methods to real-world problems, Carter has been successful on both fronts. The Hirschfelder Prize was established in 1991 through a gift from Professor Joseph Hirschfelder, a noted theoretical chemist, and Dr. Elizabeth Hirschfelder.

Dervan Receives UW-Madison Honorary Degree

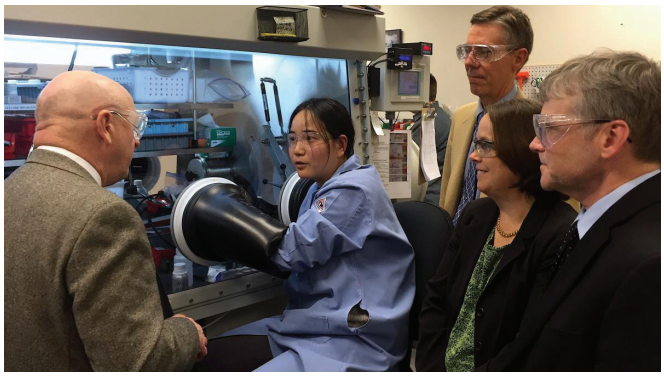
In May, Peter Dervan, who has helped develop novel pharmaceutical methods based on DNA sequencing, received an honorary doctorate from UW-Madison (see photo above, right). Dervan is the Bren Professor of Chemistry at the California Institute of Technology and scientific co-founder of Gilead Sciences, Inc. He was a pioneer in devising means to control the decoding of DNA sequences and thereby unlocked a potent new approach to treating previously uncontrollable illnesses. Dervan began his graduate career as a chemistry graduate student at UW-Madison in the Berson group and moved with Professor Jerome Berson to Yale in 1969. He has trained many of the country's leading young researchers, and has championed the advancement of women in scientific careers. Dervan served as postdoctoral advisor to Professors Samuel Gellman and Laura Kiessling.

Second Annual Middle School Science Bowl Competition Comes to Campus

Led by Lecturer Matthew Bowman (Ph.D. '06, Blackwell) and ICE Outreach Specialist Francisca Jofre, chemistry staff and students organized and hosted the second annual Wisconsin Regional Middle School Science Bowl in January. The winner of the regional competition competes in a national competition, organized by the U.S. Department of Energy. Teams from throughout Wisconsin participated in this year's event.

Statewide Crystal Growing Competition Expands

The Department of Chemistry's Molecular Structure Laboratory, directed by Dr. Ilia Guzei, organized its second



annual crystal growing competition among Wisconsin high school students in 2015. The contest, which is inspired by the Wisconsin Idea, involved more than 550 students and teachers from 25 schools throughout the state. For the first time, the competition also included an art category that featured 11 crystal-inspired drawings and mixed media pieces. More than 70 of the participating students and teachers, along with parents, toured the UW-Madison campus, the Chemistry Department, and the Molecular Structure Laboratory as part of an award ceremony in May (see photo of the student and teacher award winners above, left). The event allowed the Wisconsin students and teachers first-hand exposure to crystallography at a research institution. During the event, Professor Mark Ediger spoke about the teaching and research role of the department, Professor John Moore gave a talk that included engaging chemistry demonstrations, and University of North Carolina Professor Dan Rabinovich spoke about the history of crystallography on postage stamps. Several graduate students and staff members gave tours of the teaching and research facilities.

Staff Retirements

In January, Bill Ault, electronics shop technician, retired after 15 years with the department. Phill Bloedow, mail room attendant, retired after more than 10 years with the department in January.

Staff Additions

Michael Schwartz (Ph.D. '03, Hamers) joined the Center for Sustainable Nanotechnology as managing director. Elizabeth Reynolds joined the Wisconsin Initiative for Science Literacy as associate editor. Former chemistry graduate students Allice Dang (M.S. '13) and Tracey Reitz (Ph.D. '15, Zanni) now are on staff as instructors with the Chemistry Learning Center.

Partners in Giving

Kristi Heming, chemical biology and inorganic chemistry path coordinator, and April Sonnentag, former physical chemistry path coordinator, led the department's participation in the 2015 Partners in Giving campaign, a charitable campaign for State of Wisconsin employees. In cooperation with the Graduate Student-Faculty Liaison Committee, the department hosted a silent auction to raise money for the campaign and participated in a campus-wide food drive to benefit Dane County residents.

Faculty News

In November, Professor Silvia Cavagnero presented a plenary lecture on the mechanism of protein folding in the cell at the fourth International Workshop on the Frontiers in Protein Folding, Evolution and Function in Oaxaca, Mexico.

Professor Robert Hamers was appointed as a senior editor of Accounts of Chemical Research, an ACS journal. He presented the Giddings Lectures at the University of Utah. He also was a keynote speaker for the Sustainable Nanotechnology Organization meeting, where he reconnected with alumni Tami Lasseter Clare (Ph.D. '05, Hamers), associate professor of chemistry at Portland State University, and Brian Clare (Ph.D. '05, Abbott), vice president of technology and product innovation at HemCon Medical Technologies, Inc. Researchers at Silatronix, the startup company founded by Hamers and Professor Robert West in 2007, have developed a series of improved organosilicon-based electrolytes for use in lithium-ion batteries. In addition to receiving a $1.3 million grant from the U.S. Department of Energy, the company's organosilicon electrolytes have now passed through several stages of evaluation and are in a pilot plant of a major Japanese battery manufacturer, with full-scale production possible in 2017. Silatronix employs 15 full-time researchers and nine part-time consultants. UW System President Ray Cross visited Silatronix in November (see photo above, right).

Professor Robert McMahon presented seminars at several institutions in Changchun, China, and gave conference lectures in Córdoba, Argentina; Beatenberg, Switzerland; and Honolulu. He served as an editor for a special issue of the Journal of Organic Chemistry commemorating the 50th anniversary of the Woodward-Hoffmann rules. This issue concluded his 16-year term as associate editor of the journal.

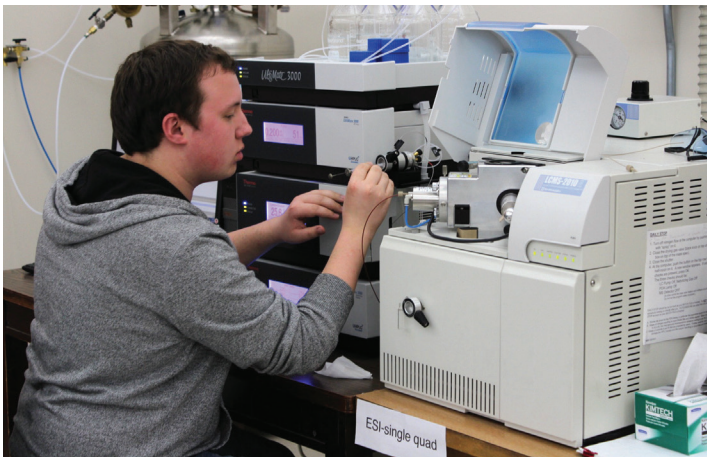
In July 2015, Professor Cathy Middlecamp was appointed interim co-director of the UW-Madison Office of

Sustainability (sustainability.wisc.edu). She is serving as 2016 chair of the ACS Division of Chemical Education.

Professor John Moore has been experimenting with active-learning methods in both inorganic and general chemistry courses. In fall 2015, Moore taught four discussion sections of Chemistry 109, Advanced General Chemistry, in a collaborative learning classroom in Sterling Hall that featured round tables and laptop hookups. Moore collaborated with three undergraduates to develop new lessons and worksheets for the active-learning sections. The lessons first involve students with online simulations, visualizations, or tutorials and then provide critical-thinking questions that encourage students to collaborate on solving problems. Students also write on whiteboards and are encouraged to interact with their TAs. "The discussion section goes by so fast and the TA is so busy," said one student. A professor and a graduate student from the Educational Psychology Department have been engaged to evaluate the new approach. Along with the undergraduates and TAs involved in shaping the course, as well as the evaluators, Moore presented a poster about the course at the UW System Chemistry Faculties Meeting in October. Moore also described this work at a seminar at Hope College in December.

In 2015, Professor James Skinner gave the Jonathan Sessler Lecture at Stanford University and the Malcolm Dole Lectures at Northwestern University.

In 2015, Professor Emeritus Robert West officially closed his research laboratory at UW-Madison and made the move to Canada. He still regularly travels and visits Madison.



Trevor Christenson (left), an undergraduate chemistry researcher, and Emilia Alfaro-Viquez, an animal sciences graduate student, analyze samples in the Department of Chemistry's Mass Spectrometry Laboratory. The laboratory added three new instruments in 2015.

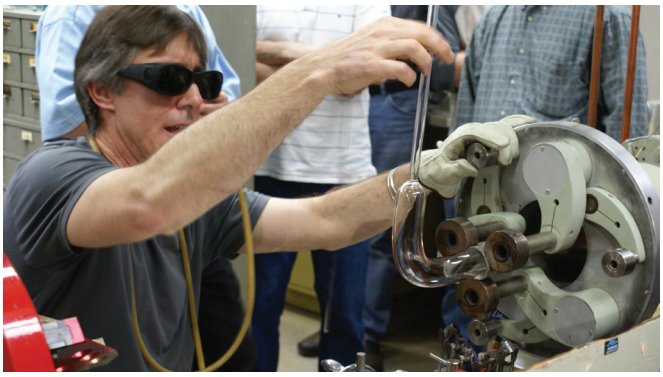
Mass Spectrometry Laboratory Gains New Instruments

In 2015, the Mass Spectrometry Laboratory added three new instruments to its roster. They are a Thermo Fisher Scientific Q Exactive™ Plus funded by a grant from the National Institutes of Health, as well as a Bruker impact™ II and a Bruker microflex™ LRF. The Bruker instruments were funded by a generous bequest from former Professor Paul Bender and his wife, Margaret McLean Bender. The new instruments provide cutting-edge data that will help advance research in the department and across campus. The Q Exactive and the impact bring to the lab for the first time both accurate mass measurements of ions and fragments of ions (MSMS).

As part of the Paul Bender Chemical Instrumentation Laboratories in the Department of Chemistry, the Mass Spectrometry Laboratory trains students in mass spectrometry techniques, provides students open access to most instruments in the laboratory, and processes samples for researchers across campus as a service. To date, 41 researchers have been trained on the new instruments.

"These three new instruments bring the lab into *this* century as they replace two instruments acquired in the 1990s," says Dr. Martha Vestling, Mass Spectrometry Laboratory director.

Visit massspec.chem.wisc.edu to learn more about the lab.



News from the Glass Shop

This year, Tracy Drier, master scientific glassblower, began collaborating with Catherine Jackson, assistant professor of the history of science at UW-Madison. Jackson, who holds a doctorate in chemistry and a doctorate in the history of science, studies the material culture associated with chemistry. Jackson's recent work has featured the history of the *kaliapparat*, a glass laboratory device designed by Justus von Liebig in the 1830s. Used for chemical analysis, this piece of scientific glassware was the first for which detailed documentation (including instruction for construction, set-up, use, and associated analytical techniques) was recorded. Through this collaboration, Jackson and Drier have begun creating outreach materials related to scientific glassware, glassblowing, and the material culture history of chemistry.

Drier remains an active member of the American Scientific Glassblowers Society (ASGS), serving as secretary of the Midwest ASGS section. He chairs the national Questions and Answers Committee and chaired the one-day technical demonstrations program at the 2015 ASGS national symposium. The Department of Chemistry hosted one of the 2015 Midwest ASGS meetings, where Drier demonstrated how to tool a flat flange on a lathe and how to bend large-diameter tubing on the lathe. He also gave a talk about the construction of marine invertebrate models created by Leopold and Rudolph Blaschka in the 1800s.

Drier and students associated with the Glass Shop also continue to engage in outreach activities such as Science Expeditions and the Wisconsin Science Festival. Students who have taken Drier's graduate glassblowing class also donated their time to create glass pieces for the department's Partners in Giving silent auction.

Hermans Group Works to Drive Change in Chemical Industry

Two years ago, Professor Ive Hermans uprooted from Switzerland, crossed a hemisphere and landed in Madison. In the blizzard of new faces and information, he met staff from the Wisconsin Alumni Research Foundation (WARF) who outlined UW-Madison's patent and licensing procedures. He liked what he heard.

Hermans and his group seek to mechanistically understand reactions to improve how chemical building blocks are made. Within a year they made their first invention disclosure.

Now, Hermans is using WARF funding to pursue an exciting new project. His modest proposal is to overhaul 40 years of petrochemical manufacturing.

The price of oil and natural gas has traditionally been coupled, he says, because they originated from the same source. But the rise of fracking has unleashed a wellspring of cheap shale gas and sparked "a complete renaissance of how people are thinking about the chemical industry in the United States."

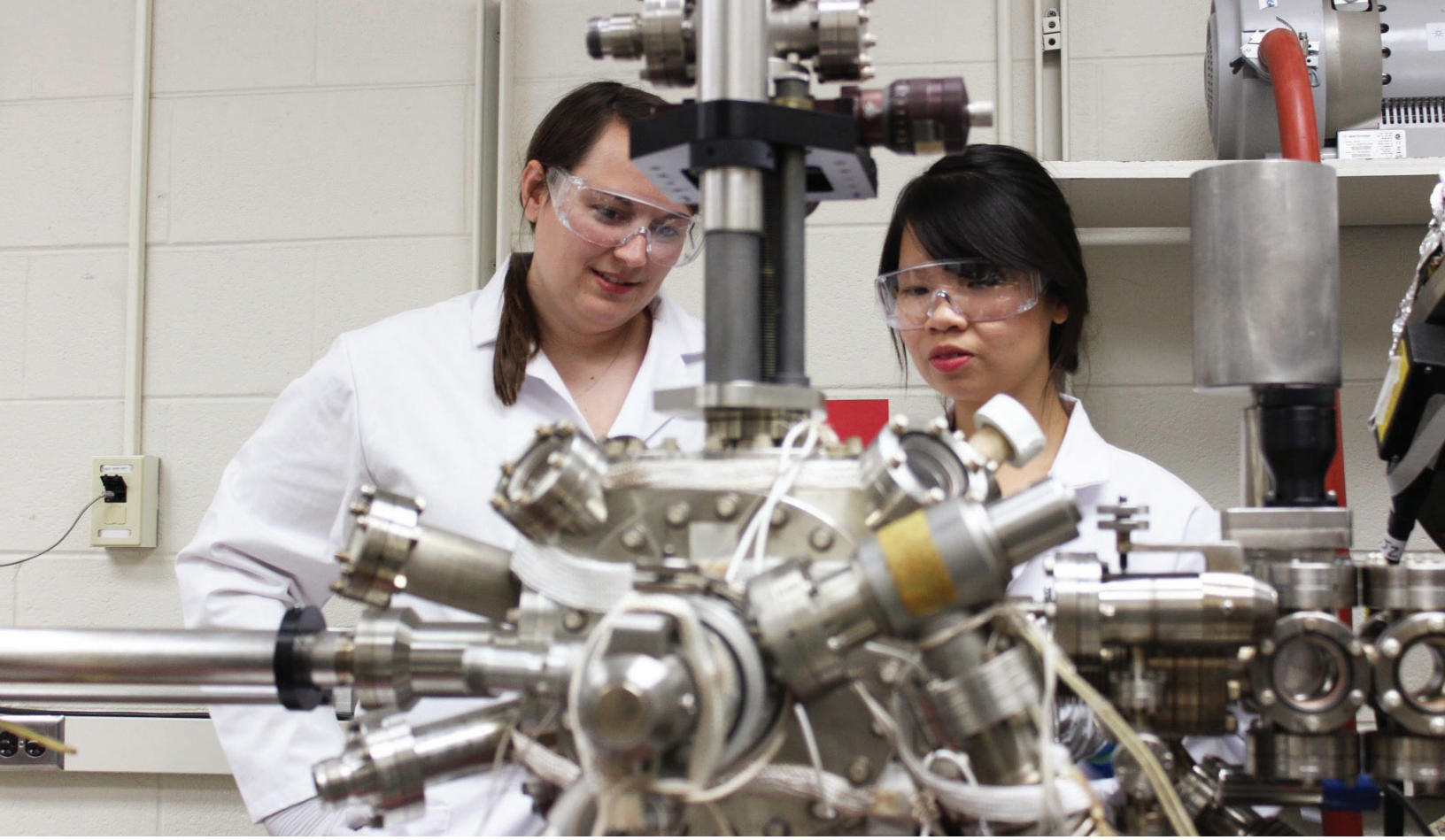
It's a domino effect — more gas means more propane that could be directly converted into prized compounds such as propylene, used to make plastic.

Yet current methods suck energy, are blazing hot, and are plagued with technical difficulties. Hermans is developing a catalyst that can drive a much more efficient reaction with unprecedented selectivity.

He's found support through the WARF Accelerator Program, which identifies promising early-stage technologies and speeds them to commercial success. The program offers targeted funding and expert guidance. He and his group have made strides on the project in a matter of months.

"There is not a single grant available in this country than can move as fast as that," Hermans says. "When you have really exciting results, you don't want to wait."

—WARF Communications



Mimi Hang (right) and Arielle Mensch (left), graduate students in the Hamers group, are part of the Center for Sustainable Nanotechnology, an NSF-funded Center for Chemical Innovation involving researchers at 12 institutions throughout the U.S.

Small-scale Science Leads to Large-scale Collaboration

Center for Sustainable Nanotechnology broadens graduate student Mimi Hang's exposure to science at multiple universities

For chemistry graduate student Mimi Hang, science is all about connections. Whether the connections happen among ideas or among people, she recognizes that scientific and interpersonal intersections will help her get where she wants to go.

As a first-year graduate student, Hang quickly landed in Professor Robert Hamers' research group. She saw the group as a good fit because she knew she would gain exposure to new areas of science, even beyond chemistry.

"I wanted to make sure what I was doing wasn't just me at my lab bench doing something that would only impact science on a small scale," Hang says. "I wanted to do something that would be quite impactful, where I could collaborate with a lot of people."

Her arrival in the group coincided with the launch of the Center for Sustainable Nanotechnology (CSN), a National Science Foundation-funded Center for Chemical Innovation directed by Hamers and headquartered at UW-Madison. Even in its nascent stages, Hang saw the opportunities that such a collaboration would afford and was eager to sign on as one of the very first graduate students involved with the center.

Although it began in 2012 as a three-year, $1.75 million Phase I center, the CSN is now a Phase II center with an additional $20 million in funding over five years. The collaboration involves three research groups at UW-Madison, as well as researchers at 11 additional institutions throughout the U.S. Its mission is to investigate the molecular mechanisms by which nanoparticles interact with biological systems.

Hang uses synthetic methods to develop nanomaterials that show promise for use in various technologies. She is currently synthesizing complex metal oxide nanomaterials that could be used as next-generation battery cathodes.

In typical research collaborations, chemists might develop nanomaterial samples and send them off to colleagues at other institutions for further studies. And to some degree, that is what happens within the Center for Sustainable Nanotechnology. However, because the center is devoted to collaborative science, some of the researchers go beyond the normal process.

Hang is one such scientist. In 2013, she began pursuing opportunities to visit and work alongside her CSN colleagues in person. She set up several trips to other CSN sites so that she could get a hands-on sense for the other steps involved in studying the nanomaterials she develops. She began with a one-day visit to Northwestern University to see the experimental setup in Professor Franz Geiger's laboratory.

Her second trip took her to the University of Minnesota to work with Professor Christy Haynes' group. She shadowed graduate student Ian Gunsolus, who demonstrated how he conducts bacterial exposures to see how Hang's nanoparticles impact the growth and survival of bacteria.

Hang then visited Professor Rebecca Klaper's group at the University of Wisconsin-Milwaukee. Working alongside graduate student Jared Bozich, she learned how he prepares gene expression assays and also developed a new appreciation for the tiny water fleas used to assess nanoparticle toxicity.

Hang's role in the CSN involves creating nanoparticles, sending the samples to collaborators to study their biological impacts, then redesigning the materials to lower these impacts. These visits have helped her to better visualize her collaborators' processes and more fully understand their findings. She feels more involved with each step of the project as a result.

"It's a cycle," Hang says. "I'm continually a part of it, and my collaborators are continually a part of it. For example, Natalie Hudson-Smith from the Haynes lab and Jared Bozich from the Klaper lab have traveled here to synthesize these materials with me."

To date, CSN researchers from Northwestern University, Tuskegee University, and University of Maryland-Baltimore County similarly have visited Madison to learn from the Hamers group. The research, collaboration, and connections go in all directions, Hang says.

"Being able to work with people from other fields and obtain knowledge in that area and having people share their expertise with you and sharing my expertise with them is a really neat experience," she says. "I feel like I've grown a lot as a graduate student from being able to do such collaborative science."

When she returns to Madison, Hang reports back to her labmates. Since her on-site collaborators are mostly chemists, the information she shares is new for many of them as well.

She has enjoyed the fast-paced research happening in the center, as well as the opportunity to strengthen her scientific network by getting to work with collaborators across the country. She anticipates that the skills she's learning now — effective time management, working with a decentralized team, collaborating with other types of scientists, and working on several projects at once — will equip her for a variety of potential future paths.

Center for Sustainable Nanotechology

susnano.wisc.edu · sustainable-nano.com

RESEARCH FOCUS

The Center for Sustainable Nanotechnology investigates the molecular mechanisms by which nanoparticles interact with biological systems.

UW-MADISON INVESTIGATORS

Professors Qiang Cui, Robert Hamers, and Joel Pedersen

COLLABORATORS

UW-Madison, UW-Milwaukee, University of Minnesota, University of Illinois, Northwestern University, Pacific Northwest National Laboratory, Tuskegee University, Johns Hopkins University, University of Iowa, Augsburg College, Georgia Tech, University of Maryland-Baltimore County

FUNDING

NSF recently awarded the center a five-year, $20-million grant renewal as part of its Centers for Chemical Innovation program.

"The purpose of the center is to explore how we can make sure nanotechnologies come to fruition with little or no environmental impact. We're looking at nanoparticles in emerging technologies." — Professor and Center Director Robert Hamers

Opening a Door to Discovery

Chemistry Building Project set to move forward

Undergraduate chemistry students now are one step closer to learning the exciting science of chemistry in modern laboratories, lecture halls, and classrooms at UW-Madison.

For years, the Chemistry Department has recognized an acute need for additional space for general chemistry and organic chemistry labs. Toward this end, department leaders have worked over the last decade to plan toward an instructional space addition and renovation to bring the undergraduate teaching facilities into the modern era.

In 2012, recognizing the importance of the project, UW System listed the Chemistry Building Project among its top building project priorities. In 2013, the Governor's office recommended UW-Madison move forward with the project's design phase, which is currently in process. As part of the 2015-17 State of Wisconsin capital budget passed in 2015, the state approved $86.2 million out of the total $107.8 million requested in funding for the project. UW-Madison and the Department of Chemistry now seek $36.6 million in private support in order to complete the full project as originally envisioned.

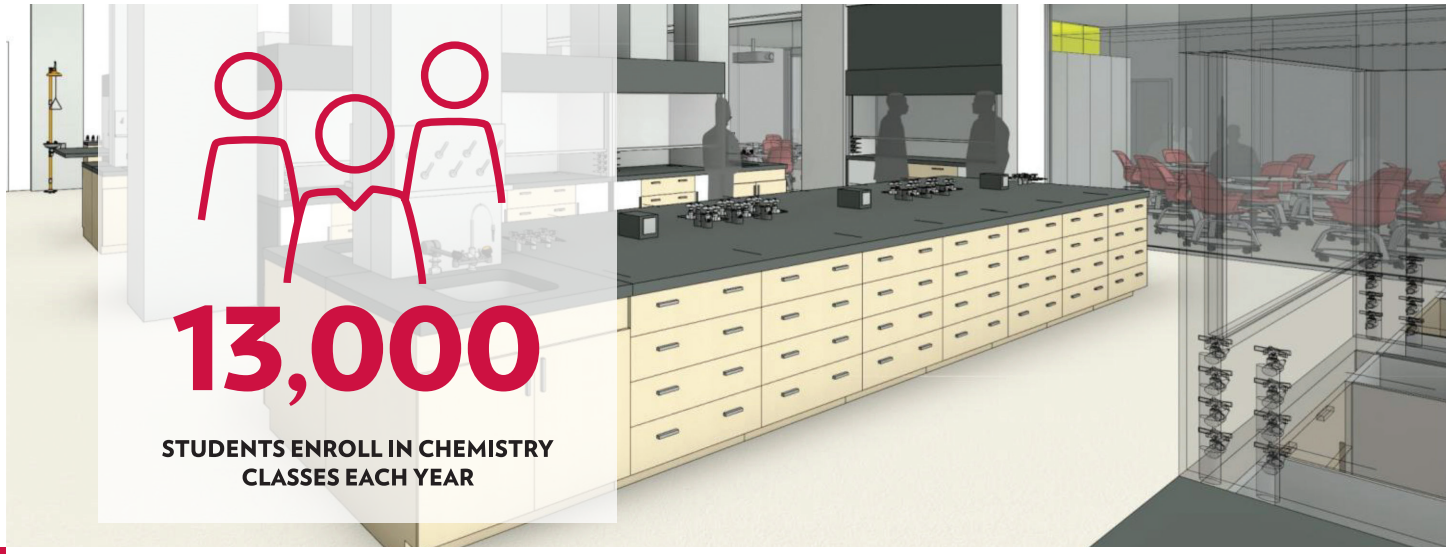
Anyone who has been a part of undergraduate chemistry classes on campus in the last 50 years is familiar with the lecture halls and labs in the Daniels wing of the Chemistry Building. The 1960s-era facilities serve thousands of students each semester. And as more and more students pursue degrees in STEM fields and the health professions, this number is only growing.

Today, these spaces fail to adequately meet student demand for spots in undergraduate chemistry classes, especially organic chemistry. What's more, they were not built with modern safety practices in mind, significantly limiting the lab component of the undergraduate curriculum.

Chemistry 103 and 104 are now the courses with the highest enrollments on campus during the fall and spring semesters, respectively. These and other undergraduate chemistry courses serve as the on-ramps to science at the university. The concepts learned and experiments conducted in these courses help prepare students as they go on to take advanced courses in a wide array of scientific disciplines. Chemistry faculty and instructors believe these future nurses, engineers, veterinarians, farmers, entrepreneurs, conservationists, and physicians should be learning cutting-edge science in safe and modern learning environments.

We're counting on generous Badgers and corporate partners to help make this vision a reality. Because one of every two undergraduates will take a chemistry course at UW-Madison, this project is poised to have a profound impact on the university as a whole. With your support, we can improve the quality of the educational experience at UW-Madison for thousands of students each year.

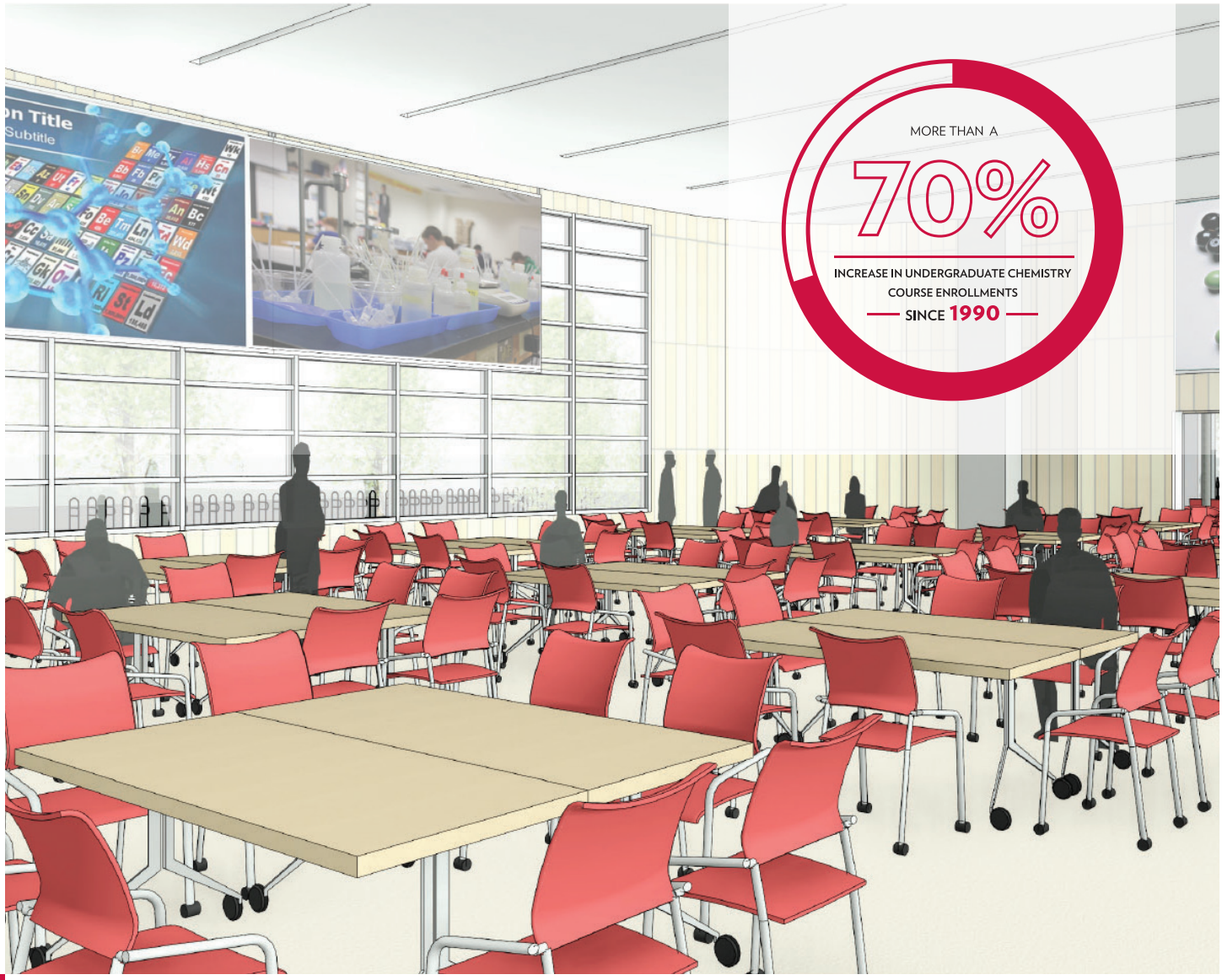
Learn more at go.wisc.edu/CBP.



Chemistry Building Project: Designed for Future Flexibility

From the project's inception, the new and renovated instructional spaces included in the Chemistry Building Project have been designed to accommodate modern teaching and learning styles. Project leaders believe the flexible spaces will continue to accommodate various types of chemistry classes even as teaching methods continue to evolve in the future.

In preparation for these new facilities, several chemistry faculty members have tested out active learning teaching methods as well as active learning classrooms around campus. Professor John Moore has taught class sessions for Advanced General Chemistry 109 using an active learning approach to replace some of the traditional lectures. In comparison to the traditional class structure, students who struggled in the course benefitted from the active learning class sessions and extra group work; these students scored higher on the third and fourth exams than their peers in the traditional version of the course. Moore, an expert in chemistry education, has served as a department leader for the design phase of the Chemistry Building Project. He has made great efforts to engage faculty and instructional staff in the design of the new facilities and in envisioning how the new spaces could open the door to new approaches to teaching undergraduate chemistry.



Research and Innovation

SMITH GROUP

Functional Vocal Cord Tissue Grown in the Lab


FLICKR: C_PICHLER

Led by Dr. Nathan Welham, a UW-Madison speech-language pathologist, an interdisciplinary team of scientists, including Smith group members, has succeeded in growing functional vocal-cord tissue in the laboratory. This represents a major step towards restoring a voice to people who have lost their vocal cords to cancer surgery or other injuries. The researchers bioengineered vocal-cord tissue able to transmit sound. Clinical applications are still years away, but Welham says this proof-of-principle study is a "robust benchmark" along the route to replacement vocal-cord tissue.

>> More at go.wisc.edu/vocal-cord

CHOI GROUP

Combining Biomass Conversion, Solar Energy Conversion


FLICKR: ENERGÍAS RENOVABLES

The Choi group has developed a new approach to combine solar energy conversion and biomass conversion, two important research areas for renewable energy. The new approach includes a novel photoelectrochemical cell (PEC) setup with a new anode reaction. The anode reaction requires less energy and is faster than water oxidation while producing an industrially relevant chemical product. Their efficient electrochemical method oxidizes HMF to FDCA at room temperature and ambient pressure using water as the oxygen source.

>> More at go.wisc.edu/PEC

BERTRAM GROUP

Unraveling the Mysteries of Cloud Formation

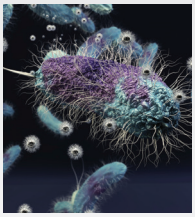

BERTRAM GROUP

Professor Timothy Bertram and his research group have taken a step to peel back the mysteries of the structures of tiny aerosol particles at the surface of the ocean. Their new methodology shows how aerosol particles' chemical composition influences their abilities to take in moisture from the air, which indicates whether the particle will help to form a cloud — a key to many basic problems in climate prediction. This more precise method categorizes aerosol particles based on their likelihood of taking up water from the surrounding environment and forming a cloud.

>> More at go.wisc.edu/cloud-formation

HAMERS GROUP

Lithium Batteries and the Environment


HAMERS GROUP

The Hamers group and collaborators have shown that the material at the heart of lithium ion batteries impairs a key soil bacterium. The study is an early signal that the growing use of the new nanoscale materials used in the rechargeable batteries that power portable electronics and electric and hybrid vehicles may have untold environmental consequences. The researchers explored the effects of nickel manganese cobalt oxide (NMC), an emerging material, on the common soil and sediment bacterium *Shewanella oneidensis*.

>> More at go.wisc.edu/battery

KIESSLING GROUP

Combating Microbes


FLICKR: OLIVER_DODD

The newfound ability of a protein of the intestines and lungs to distinguish between human cells and the cells of bacterial invaders could underpin new strategies to fight infections. A recent Kiessling group paper shows that the human protein intelectin has a knack for distinguishing between human cells and those of the disease-causing microbes that invade our bodies. Intelectin is not new to science, Kiessling notes, but its ability to selectively identify many different kinds of pathogens and distinguish those cells from human cells was unknown.

>> More at go.wisc.edu/microbes

EDIGER GROUP

Chemical Strategy Hints at Better Peptide Drug Delivery Options


FLICKR: DAVID HAWKINS-WEEKS

By figuring out how to precisely order the molecules that make up organic glasses, the Ediger group has set the stage for more efficient and sturdier portable electronic devices and possibly a new generation of solar cells based on organic materials. The new organic glasses "have the molecules oriented in specific ways, standing up or lying down," Ediger explains. The orientation affects performance and can confer greater levels of efficiency and durability in the devices in which they are used.

>> More at go.wisc.edu/organic-glass

Awards and Honors

Drs. Matthew Bowman (left) and Stephen Block received the James W. Taylor Excellence in Teaching Award.

Dr. Jeanne Hamers introduces undergraduate chemistry scholarship recipients at the 2015 Student Awards Ceremony.

FACULTY

Dr. Bill Banholzer, chemistry honorary fellow, received the 2016 Arthur M. Bueche Award from the National Academy of Engineering.

Professor Etienne Garand is a 2016 Sloan Research Fellow. Additionally, the American Society for Mass Spectrometry (ASMS) has selected Garand for an ASMS Research Award.

Professor Ying Ge has received the 2016 Georges Guiochon Faculty Fellowship, which is given to an individual advancing the field of liquid phase separations.

Assistant Professor Randall Goldsmith was named a 2015 New Investigator by the Alzheimer's Association International Research Grant Program. Goldsmith also received a College of Letters & Science 2015 Distinguished Honors Faculty Award and a College of Engineering Benjamin Smith Reynolds Award for Excellence in Teaching Engineers.

Professor Robert Hamers has been named the 2016 Langmuir Lecturer. Hamers will present an award lecture at the fall ACS National Meeting in Philadelphia.

Professor Laura Kiessling will receive the 2016 Gibbs Award, given by the Chicago Section of the American Chemical Society. She is also the 2016 UW-Madison Hilldale Award in the Physical Sciences recipient.

Professor Ronald Raines was awarded the ACS Ralph F. Hirschmann Award in Peptide Chemistry.

Professor J.R. Schmidt has received the 2016 Journal of Physical Chemistry C Lectureship Award. The lecture and award will be presented at the fall ACS meeting.

Professor Shannon Stahl received the ACS Award for Affordable Green Chemistry, along with collaborators at Eli Lilly and Company, for efforts to utilize environmentally friendly aerobic oxidations in commercial settings. Stahl also was a 2015 UW-Madison Kellett Mid-career Award recipient.

Professor Tehshik Yoon was one of the three 2015 Teva Scholars. Along with Professor Padma Gopalan, Yoon also received the 2015 UW-Madison Romnes Faculty Fellowship.

Professor Kyoung-Shin Choi has been named a 2016 UW-Madison Vilas Associate.

Professor Qiang Cui received a 2016 UW-Madison Kellett Mid-career Award.

Professor John Moore is one of 12 UW-Madison faculty to receive a 2016 Distinguished Teaching Award. He was honored with the Van Hise Outreach Teaching Award.

In 2015, Professor James Skinner received a UW-Madison Hilldale Award in the Physical Sciences.

STAFF

Dr. Desiree Bates, computational chemistry leader, received a 2014-15 UW-Madison College of Letters & Science Academic Staff Early Career Award.

Dr. Matthew Bowman, lecturer, and Dr. Stephen Block, assistant general chemistry lab director, have been awarded the 2015-16 Taylor Excellence in Teaching Award. Block also will receive a 2015-16 UW-Madison College of Letters & Science Early Career Award.

Tracy Drier, master scientific glassblower, earned the 2016 Chancellor's Hilldale Award for Excellence in Research for Critical Support.

Dr. Ilia Guzei, Molecular Structure Laboratory director, received a 2015 Outreach Volunteer of the Year award from the ACS Wisconsin Section and a 2015 Service Award from the American Crystallographic Association.

Dr. Jeanne Hamers, undergraduate chemistry director and chemistry major advisor, received a 2014-15 College of Letters & Science Academic Advising Award.

Jim Zernicke, research stockroom manager, received a College of Letters & Science University Staff Excellence Award.

STUDENTS

U.S. National Science Foundation Fellowship awardees for 2015 included Alexa Barres (Mecozzi), Allison Cardiel (Choi), Kassandra Knapper (Goldsmith), Melinda Shearer (Hamers/Jin), Matthew Stolt (Jin), and Joseph Vasquez (Blackwell). 2016 recipients are Jordan Buhle (Stahl), Brian Cary (Gellman), Lianna Dang (Jin), Kirandeep Deol (Strieter), Sarah Guillot (Hamers), Caitlin Kozack (Stahl), Chase Salazar (Stahl), Tom Sobyra (Nathanson), and Hillary Mitchell Warden (Fredrickson). Amanda Buchberger (Li) received a 2016 NIH NRSA F31 Fellowship.

Several graduate students and staff were recognized as Outstanding Chemistry Teaching Assistant Award recipients. 2013-14 award recipients are Benjamin Dunnington (Schmidt), Chris Jordan (Brunold), Megan Livingston (Beebe), Matthew Stolt (Jin), Valerie Tripp (Raines), Michael Tylinski (Ediger), and Anastasiya Vinokur (Fredrickson). 2014-15 recipients are Manar Alherech (Stahl), Eric Cueny (Landis), Gregory Eyer (Andrew), Reb Pinhancos (Burstyn), Sarah Specht (Hermans), Lindy Stoll (faculty assistant), and Kelly Suralik (Ediger).

Undergraduates Sohil Shah and Meghan Turner were among the 300 students across the country named Goldwater Scholars in 2015.

Graduate student Rayna Addabbo (Cavagnero), won a Student Research Achievement Award in Biopolymers in Vivo for a presentation at the 2015 Biophysical Society Meeting.

Juliet Alderson, a graduate student in the Schomaker group, received an ACS Division of Organic Chemistry Graduate Fellowship. She will present a poster on her research at the 2017 National Organic Symposium.

Andrew Fuchs, a graduate student in the Cavagnero group, received an Educational Committee Travel Award to present his research at the 2016 Biophysical Society Meeting.

Graduate student Kevin Heylman (Goldsmith) was selected to attend the 65th Lindau Nobel Laureate Meeting.

Graduate student Yusuke Okuno (Cavagnero) was an invited speaker and gave a presentation on his research at the 2015 Chicago Area NMR Discussion Group Conference (CANMRDG). He also received a student travel grant to present at the 2015 Experimental NMR Conference.

STUDENT DEPARTMENTAL AWARDS 2015-16

DEPARTMENTAL SUMMER UNDERGRADUATE RESEARCH AWARDS

- Ackerman Scholarship: Johnny Zhang
- Margaret McLean Bender Scholarship: Emily Klade
- Henry & Eleanor Firminhac Chemistry Scholarship: Emily Klade
- Eugene & Patricia Kreger Herscher Scholarship: Alexandra Tamerius
- Edwin & Kathryn Larsen Scholarship: Zach Matusinec
- Edward Panek Memorial Scholarship: Alexandra Tamerius
- Mabel Duthey Reiner Scholarship: Nora Dahlgren
- Walter & Young-Ja Toy Scholarship: Sherry Lixue Cheng, Johnny Zhang
- Undergraduate Student Support in Chemistry Scholarship: Nora Dahlgren, Lea Koenig, Lucas Zarling
- George & Arleen Ziarnik Scholarship: Elliot Eklund, Lea Koenig

ACADEMIC YEAR UNDERGRADUATE AWARDS

- Ackerman Scholarship: Liam Eccles, Isaac Mades, Brandon Phillips, Johnny Zhang
- Don Brouse Scholarship: Yixu Zong
- Andrew Dorsey Memorial Scholarship: Yixu Zong
- Henry & Eleanor Firminhac Chemistry Scholarship: McKenna Goetz, Natalie Lenz
- Richard Fischer Scholarship: Kevin O'Connor
- Eugene & Patricia Kreger Herscher Scholarship: Sherry Lixue Cheng, Trevor Lardinois, Alexandra Tamerius
- Francis Craig Krauskopf Memorial Award: Benjamin Farley, Audrey Flack, Will Flanigan, Eric Heinz, Joseph Kemmerling, Ranveer Vasdev

- John & Elizabeth Moore Award for Excellence in General Chemistry: Kayla Bauhs, Yexuan (Ron) Hao, Natalie Kulhanek, Kayla Rasmussen
- Wayland Noland Undergraduate Research Fellowship: Michael Stone

- Lindsey Plank & Richard Putze Memorial Scholarship: Christopher Webster
- Ieva Reich Undergraduate Scholarship: McKenna Goetz
- Saco Polymers Scholarship: Nicolas Padilla, Cynthia Schreiber
- Robert Franklin Taylor Scholarship: Douglas Fraser
- Undergraduate Student Support in Chemistry Scholarship: Aaron Mallek, Lucas Zarling
- Martha Gunhild Week Scholarship: Victoria Cooley

OTHER UNDERGRADUATE AWARDS

- ACS Undergraduate Award in Inorganic Chemistry: Yicong (Brian) Ge
- ACS Undergraduate Award in Organic Chemistry: Tong Wang
- Alpha Chi Sigma Alumni Scholarship: Jennifer Weier
- ACS Wisconsin Section Excellence in Analytical Chemistry Award: Jordan Lewandowski, Stephanie Fricke
- ACS Wisconsin Section Excellence in Inorganic Chemistry Award: Fengchun Miao
- ACS Wisconsin Section Excellence in Organic Chemistry Award: Wen Fu, Isaac Mades, Jackson Moran, Jennifer Umhoefer, Thejas Wesley
- ACS Wisconsin Section Excellence in Physical Chemistry Award: McKenna Goetz, Kyle Gustafson

UNDERGRADUATE/GRADUATE AWARDS

- Stephen Morton Research Award - Undergraduate Mentee: Michael Chemello
- Stephen Morton Research Award - Graduate Mentor: Anthony Cesnik (Smith)

GRADUATE AWARDS

- Leah Cohodas Berk Award for Excellence in Chemistry Research: Alison Wendlandt (Stahl)
- Roger Carlson Award: Kevin Heylman (Goldsmith), Daniel Kohler (Wright)
- Charles & Martha Casey Excellence in Research Award (Chemical Biology): Heejun Choi (Weisshaar)
- Charles & Martha Casey Excellence in Research Award (Inorganic Chemistry): Wes Brogden (Berry)
- Charles & Martha Casey Excellence in Research Award (Organic Chemistry): Joshua Fishman (Kiessling)
- Robert Doban Mentorship Award: James Checco (Gellman), Ross Cheloha (Gellman), Heejun Choi (Weisshaar), Sarah Decato (Mecozzi), Brian Fisher (Gellman)
- Goering Organic Chemistry Fellowship: Juliet Alderson (Schomaker), Travis Blum (Yoon), Brian Fisher (Gellman), Dian Wang (Stahl)
- Richard & Joan Hartl Excellence in Research Award (Analytical Chemistry): Erin Gemperline (Li)
- Richard & Joan Hartl Excellence in Research Award (Materials Chemistry): Linsen Li (Jin)
- Richard & Joan Hartl Excellence in Research Award (Physical Chemistry): Randy Mehlenbacher (Zanni)
- Hirschfelder Prize Graduate Award: Xiya Lu (Cui)
- Hirschmann/Rich Graduate Award in Bioorganic Chemistry: Joseph Moore (Blackwell), Robert Newberry (Raines), Michael Welsh (Blackwell)
- Michael McCoy Memorial Award: Marco Torelli (Hamers)
- Gary Parr Memorial Award: Catie Minogue (Coon)
- PPG Industries Mentorship Award: Brandon Kilduff (Fredrickson), Ryan Van Hoveln (Schomaker)
- K.V. Reddy Award in Physical Chemistry: Jennifer Faust (Nathanson)

OTHER GRADUATE AWARDS

- GSFLC Mentor Awards: Dr. Carlos Carrero Marquez (Hermans), Erin Gemperline (Li), Alison Wendlandt (Stahl)

How do scholarships and fellowships impact chemistry students?

"This award will be a huge aid in continuing my studies at UW-Madison."

"This scholarship allows me to focus more on the most important aspect of school — learning. I feel very motivated to pursue my dream, and now I am one step closer to it."

STUDENT AWARDS CEREMONY 2015

In total, 70+ students were honored at the May 2015 Student Awards Ceremony. Thanks to the generosity of alumni and friends of the department, students received more than $150,000 in departmental scholarships and fellowships.

GRADUATION CELEBRATION 2015

The department recognized graduating chemistry majors and graduate students at a May 2015 graduation ceremony. Family members, friends, and research mentors gathered to honor the graduates.

Institute for Chemical Education

The Institute for Chemical Education (ICE) continues its strong outreach program. For the past 10 years, this work has been supported by the UW-Madison Nanoscale Science and Engineering Center (NSEC). The UW-Madison Materials Research Science and Engineering Center (MRSEC) supports ICE science kits. Grants from the Sigma-Aldrich Foundation have enabled the expansion of ICE Chemistry Camps through scholarships, and Sigma-Aldrich employees continue to volunteer in the SCIENCountErs program.

SCIENCountErs

SCIENCountErs, the main ICE outreach program, collaborates with Boys & Girls Clubs of Dane County to provide after-school science activities for children from groups underrepresented in science. In addition to Wisconsin, SCIENCountErs has spread to sites in five other states: Arkansas, California, Maryland, Texas, and West Virginia. In Madison, more than 175 children from the Boys & Girls Clubs of Dane County participated in the program and more than 50 UW-Madison undergraduate and graduate students guided the children through hands-on, inquiry-based activities. During the 2014-15 academic year, several employees from Sigma-Aldrich also volunteered as mentors for the Boys & Girls Clubs students and the UW-Madison student volunteers. During fall 2015, the students completed a new themed unit, "Engineers and Machines," which focuses on the importance of the engineering design process. In spring 2015, a "Phun with Physics" unit focused on fundamental physics. Boys & Girls Club students learned about energy, velocity, acceleration, friction, and simple machines. For more information about SCIENCountErs or to start your own SCIENCountErs program with a local organization, visit sciencounters.chem.wisc.edu.

Fusion Science Theater

Several new Fusion Science Theater (FST) scripts and a handbook with details about how to plan, rehearse, and present a FST show have been added to ICE's catalog this year (ice.chem.wisc.edu/Catalog/SciKits.html#FST). These shows use elements of story to teach science concepts through demonstrations, prediction, audience participation, modeling, and embedded assessment. Assessment results indicate that FST produces demonstrable gains in learning, interest, and self-efficacy. The shows target children in grades 1–5 and can be performed by teachers, students, outreach specialists, and museum educators. Holly Walter Kerby, an award-winning chemistry teacher and playwright, developed the Fusion Science Theater outreach model. ICE/FST kits include all of the information needed to plan and present each show. Scripts are available for "Will It Light?," which investigates electrical conductivity, and two short shows about atoms and molecules, "Atom in a Solid" (kinetic-molecular theory) and "Bouncemania" (molecular structure and polymer properties).

Students Participating in Chemical Education (SPICE)

SPICE, a UW-Madison student organization, continued visiting schools, museums, and libraries, as well as performing demonstration shows for student groups visiting campus. SPICE participated in more than 35 events, including hands-on activities, science fairs, and family science nights. The organization's more than 30 active and enthusiastic members make SPICE more vibrant than ever.

Chem Camps

ICE continued offering summer camps for middle-school students. Offerings for 2015 included Fun with Chemistry, Fun with Forensics Chemistry, and Fun with Inventions. ICE collaborated with the MRSEC to develop new activities and experiments, including the synthesis of ferrofluids, nanogold as a sensor, and synthesis of nanosilver particles. More than 250 students participated in the camps in 2015.

Research Experience for Undergraduates

In 2015, ICE hosted four Research Experience for Undergraduates (REU) programs and continued to organize a research exchange program with the University of Science and Technology of China (USTC). The four REU programs were: Research Experience for Undergraduates in Nanotechnology, Research Experience for Undergraduates in Chemistry and Chemical and Biological Engineering, and Research Experience for Undergraduates in the Chemistry of Materials for Renewable Energy. Chemistry faculty who hosted REU and USTC students included Professors Blackwell, Burstyn, Cavagnero, Gellman, Gopalan, Hamers, Jin, Kiessling, Landis, McMahon, Schmidt, Schomaker, Strieter, and Wright. Activities for the summer included a weekly lunch seminar series with talks by chemistry faculty, staff, and students. Additional activities included a tour of Sigma-Aldrich facilities in Madison, and an improv night. Chemistry graduate students also hosted a special seminar on applying to and surviving in graduate school. The summer culminated with a department-wide poster session where students presented results from their summer research. The REU programs are funded by the National Science Foundation.

Visit ice.chem.wisc.edu to learn more about ICE.

Top: SCIENCountErs students participate in Earth Day activities with volunteers from NOBCChE; Middle: Boys & Girls Clubs of Dane County students work with SCIENCountErs volunteer Charnell Chasten; Bottom: A SCIENCountErs student participates in an activity

In Memoriam

Hans J. Borchardt (Ph.D. 1956, Daniels)

Hans J. Borchardt graduated from Brooklyn College and later received a doctorate from the UW-Madison. There, he invented a testing procedure for differential thermal analysis called the Borchardt-Daniels method, which is still in use today. He worked for DuPont and held more than 20 patents.

Norbert F. Cywinski (B.S. 1954)

Norbert F. Cywinski, 86, died July 7, 2015. Cywinski enlisted in the U.S. Marine Corps before the end of World War II. Cywinski received several doctoral fellowships from chemical and oil companies to complete his studies in organic chemistry at Northwestern University. He worked as a research chemist for Phillips Petroleum Company from 1959-65. He worked for El Paso Products and Southwest Analytic Chemistry. Cywinski held 17 U.S. patents on chemical processes and two patents in Germany.

Jack Dunaway (M.S. 1950, Schuette)

Jack Dunaway, 93, died March 3, 2015. He interrupted his years at the College of Idaho to enter the U.S. Army Air Force as a lieutenant. After the war, Dunaway returned to college. After working at the Oregon Wood Chemical Company, Dunaway moved to Idaho, where he taught high school chemistry and math. He later moved to Wilmington, Del., where he worked as a chemist at the Joseph Bancroft and Sons fabric finishing mill. In 1958, his family returned to Idaho where Dunaway worked for Potlatch Forest Incorporated until his retirement in 1982.

Lester D. Grandine Jr. (B.S. 1948, Ferry)

Lester D. Grandine, 89, died April 10, 2015. He served in Europe during World War II. In 1948, Grandine graduated from UW-Madison, where he met his wife of 62 years, Phyllis. He worked as a chemist and a financial analyst for DuPont.

David F. Hillenbrand (Ph.D. 1974, Yu)

David F. Hillenbrand, 69, died April 19, 2015. He graduated from the Ohio State University with a bachelor's in chemistry in 1967. Hillenbrand was employed in Japan by JEOL, a manufacturer of scientific instruments, worked for Optical Diagnostic Systems, and co-founded Resonance Research, Inc. in Billerica, Mass., specializing in MRI and NMR applications. He held multiple patents.

Jack E. Jayne (B.S. 1947, M.S. 1948, Wilds)

Jack E. Jayne, 89, died Aug. 18, 2015. He grew up in Stevens Point, Wis. and attended UW-Madison and the Institute of Paper Chemistry. Jayne served in the U.S. Navy from 1944-46. He worked for Kimberly Clark, managing R&D in various laboratories. He worked for Green Bay Packaging as corporate environmental manager from 1974-88. He is survived by his wife, Doris, whom he met in 1943 as a student at UW-Madison.

Professor Edward L. King

Edward L. King, 95, a former UW-Madison chemistry professor, died Aug. 17 in Boulder, Colo. From 1945-46, he worked as a research associate on the Manhattan Project. From 1946-48, he served as a chemistry instructor and postdoctoral research fellow at Harvard University. King came to UW-Madison in 1948 as an assistant professor. In 1963, he left Madison to take a position at the University of Colorado, Boulder. The King group conducted research in the field of solution chemistry of inorganic substances, resulting in more than 65 publications. He authored two textbooks. In 1964, he became editor of ACS Inorganic Chemistry.

Charles S. Kraihanzel (M.S. 1959, Ph.D. 1962, West)

Charles S. Kraihanzel, 79, died March 24, 2015. He received a bachelor's in chemistry from Brown University and a master's and doctorate in chemistry from UW-Madison. He did his postdoctoral studies at the Massachusetts Institute of Technology. Kraihanzel was a chemistry professor at Lehigh University for 40 years.

Joseph M. Malik (Ph.D. 1972, O'Leary)

Joseph M. Malik died Aug. 23, 2015. Malik received his bachelor's from Michigan State University. He worked in various management positions at Monsanto and Sigma-Aldrich and was a consultant and executive for Arkalon Chemical Technologies and LipoSpectrum LLC.

Abner B. Prescott (B.S. 1941, Meloche)

Abner "Barney" Prescott, 96, died Feb. 26, 2015. Prescott enlisted in the U.S. Navy, serving on the minesweeper USS Harding during World War II. Prescott later worked for Goodyear Rubber Company in Detroit and Oscar Meyer in Madison. At Oscar Meyer, he managed the spice department.

Dorothy S. Rae (B.S. 1941, M.S. 1943, Meloche)

Dorothy S. Rae, 95, died April 7, 2015. While in college, Rae was inducted into the Phi Beta Kappa Society. She married fellow chemist, John Rae (Ph.D. '43, Hall), who died before her. Rae worked for Shell Oil Company in Emeryville, Calif. during World War II and taught high school chemistry for 27 years. She was chair of the Science Department at Memorial High School for many years and was named Teacher of the Year in 1970.

Earl F. Richter (B.S. 1951, Meloche)

Earl F. Richter, 90, died March 23, 2015. He served in the U.S. Army in World War II. Richter joined the Wisconsin Alumni Research Foundation (WARF) in 1949 as a chemist and enjoyed a successful career in chemistry and leadership. He served as director of analytical chemistry for Raltech, Hazleton, and Covance.

Javan Shelly (Ph.D. 1975, Whitesides)

Javan Shelly, 67, died April 21, 2015. He earned a bachelor's in chemistry from Bethel College in 1970 and a doctorate in chemistry from UW-Madison in 1975. He volunteered with the

Mennonite Central Committee in Swaziland from 1975-78 as manager of the water laboratory for the Water Board. Shelly completed a postdoctoral position at Rice University before working for Gulf Oil Company as a research chemist until 1982. After Gulf Oil he worked at USI/Quantum Chemicals/ Millennium Chemicals as a research chemist from 1983 to 2001. He finished his career as a machine operator at LSI from 2002-11.

DuWayne W. Statz (B.S. 1970, Nelsen)

DuWayne W. Statz, 66, died Jan. 9, 2015. He worked as a chemist for WARF for 15 years, heading a lab that developed compounds to fight cancer. Spurred by a love of and fascination with the stock market, he went on to work as an investment advisor for more than 30 years.

Jolyon A. Stein (B.S. 1950, Schuette)

Jolyon A. Stein, 87, died July 24, 2015. Stein enlisted in the U.S. Navy in 1945. He attended UW-Madison, where he earned a bachelor's in chemistry in 1950 and a doctorate in food chemistry in 1954. For 34 years, he worked for the Pillsbury Company in Minneapolis. He retired from the company in 1988 as vice president of quality.

Glenn R. Svoboda (B.S. 1952, Daniels)

Glenn R. Svoboda served in the U.S. Army as a researcher at Fitzsimmons Army Hospital in Aurora, Colo. He later earned a doctorate in pharmaceutical chemistry from UW-Madison. He was a member of the American Chemical Society and served as chair of the Milwaukee Section in 1969. He received the ACS Milwaukee Section Award in 1978.

Gordon L. Vandervort (B.S. 1948, Willard)

Gordon L. Vandervort, 89, died March 1, 2015. A veteran of the U.S. Army, Vandervort worked on the Manhattan Project from 1944-45 at Penn State University. After graduating from UW-Madison, he earned a doctorate in astrophysics from the University of Virginia. He worked as a physics professor in universities all over the world: Puerto Rico, Indonesia, Afghanistan, Malaysia, Ethiopia, Kenya, Algeria, Turkey, Sudan, Zimbabwe, Germany, Virginia and New York.

Theodore G. Waech (Ph.D. 1969, Bernstein)

Theodore G. Waech, 74, died July 1, 2015. Waech did his postdoctoral work at McGill University in Canada. He went on to teach at St. Norbert College prior to moving to Milwaukee, Wis., where he taught at Concordia College. He then worked for 20 years for the Beloit Corporation before teaching at the University of Wisconsin-Rock County.

Bruce E. Williams (Ph.D. 1977, Trost)

Bruce E. Williams, 65, died May 10, 2015. Williams attended Macalester College, where he received a bachelor's in chemistry. He earned a doctorate in organic chemistry from UW-Madison in 1977. Williams spent nearly his entire career working in the pharmaceutical division at 3M.

Jay F. Wishau (B.S. 1949)

Jay F. Wishau, 89, died Sept. 15, 2015. He taught high school science in Nebraska and Florida. When Seminole Community College was established in 1966, Wishau was named chair of the Math and Science Division. He received a doctorate in educational administration from NOVA University.

Eugene L. Woroch (B.S. 1944, M.S. 1945, Ph.D. 1948, Johnson)

Eugene L. Woroch, 93, died June 20, 2015. During his time at UW-Madison, Woroch fell in love with fellow student Anna Jean Reppen, whom he married in 1949. Woroch then completed a fellowship in chemistry at the Mayo Clinic, where he worked on the production of cortisone as a research scientist under Nobel Prize recipient Dr. Edward Kendall. Later, at Glidden Company, Woroch worked in steroid research. In 1958, he joined Abbott Laboratories as an organic chemist and ended his career there as director of pharmaceutical R&D. After retirement, he joined the Board of the Clara Abbott Foundation, a charity he was involved with for 25 years, serving as its president from 1993-98.

David C. Zecher (Ph.D. 1967, West)

Dave C. Zecher died Sept. 15, 2015. He attended Franklin & Marshall College. He worked for Hercules for 31 years as a research chemist. Zecher was an avid golfer and enjoyed hiking, biking, visiting National Parks, and time with his family.

Duane F. Zinkel (B.S. 1956, Daniels)

Duane F. Zinkel, 81, died Aug. 19, 2015. He graduated from UW-Madison in 1961 with a doctorate in biochemistry. Zinkel worked his entire career in naval stores research at the USDA Forest Products Lab in Madison and was internationally recognized for his work.

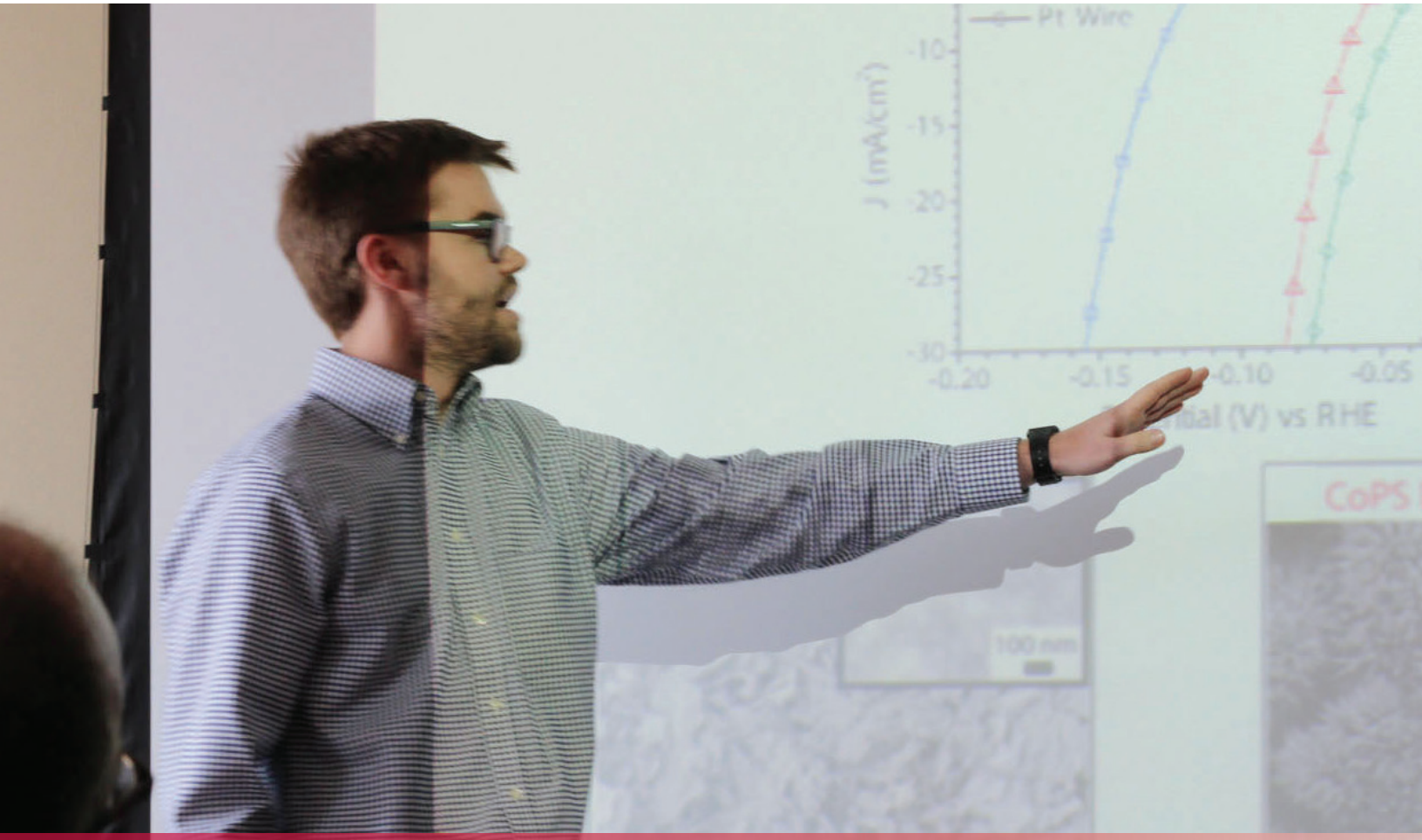
We also have been informed of the deaths of the following alumni:

James E. Black (B.S. 1970, M.S. 1977, Fenske)
David L. Davis (B.S. 1965)
John S. Delphenich (B.S. 1949, Ihde)
David E. Grant (Ph.D. 1951, Willard)
Martha J. Hahn (B.S. 2001)
Carl C. Hardman (M.S. 1947, Hall)
Donald C. Hay (B.S. 1943, McElvain)
Robert H. Jones (Ph.D. 1949, Adkins)
Mary E. Mohlke (B.S. 1962)
Norman S. Nelson (M.S. 1960, Dahl)
William C. Proost (B.S. 1949, M.S. 1953, Aycock)
Carl L. Sandberg (B.S. 1948, M.S. 1949, Meloche)
Frederic W. Schuler (B.S. 1944, Ph.D. 1950, Murphy)
Russell A. Schmidt (B.S. 1942)
Robert R. Walters (B.S. 1952, King)
Richard S. Wilson (M.S. 1952)
C.V. Wittenwyler (B.S. 1942, Meloche)
Mary E. Zosel (M.S. 1970, Evans)

DEPARTMENT OF
Chemistry
UNIVERSITY OF WISCONSIN–MADISON

1101 University Ave.
Madison, Wisconsin 53706

chem.wisc.edu
608.262.1483



Help chemistry students get a strong start.

Gifts from alumni and friends like you help:

- Bring renowned researchers to campus to share ideas and meet with students;
- Provide opportunities for faculty and students to interact outside of the lab;
- Support fellowships and scholarships for promising students at all levels.

Make a gift online at **go.wisc.edu/SupportChemistry**.